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Reverence to our Founder Chairman

Late Shri Krishan Lal Gupta

Founder, Chairman
GNIOT Group of Institutions

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Message from the Editor-in-Chief:

Dear Colleagues,

It is with immense joy and pride on the forthcoming publication of the latest edition of our esteemed institute's journal “EKANSH”. As the Editor-in-Chief, I am delighted to share this remarkable achievement with all of you who have tirelessly dedicated your expertise, time, and passion to make this journal a beacon of intellectual exploration.

The heart and soul of any academic institution lie in its ability to foster an environment of scholarly inquiry, critical thinking, and knowledge dissemination. EKANSH stands as a testament to these values, showcasing the dedication and ingenuity of our contributors. The diverse range of research articles, insightful reviews, and thought-provoking perspectives presented within these pages reflect the depth and breadth of academic excellence that defines our institute.

I extend my sincere gratitude to the authors who have entrusted us with their groundbreaking research, the peer reviewers whose meticulous assessments have ensured the quality of the content, and the editorial team whose unwavering commitment has shaped this publication.

This journal not only serves as a repository of knowledge but also as a platform for fostering meaningful discourse and inspiring future research endeavors. As we embark on this journey of knowledge sharing, let us remember that our collective efforts contribute not only to the advancement of our respective fields but also to the greater pursuit of understanding and progress.

I invite all of you to explore the pages of this journal, engage with the ideas presented, and continue to contribute to the vibrant academic community. Your involvement is vital to the continued success of EKANSH and the enrichment of our intellectual landscape.

Thank you all for your dedication and unwavering commitment.

Warm regards,

Baibaswata Mohapatra
Professor & Dean-R&D
Editor-in-Chief, EKANSH

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Brain-inspired Replay for Continual Learning with Artificial Neural Networks

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***Abstract* - Artificial neural networks suffer from catastrophic forgetting. Unlike humans, when these networks are trained on something new, they rapidly forget what was learned before. In the brain, a mechanism thought to be important for protecting memories is the reactivation of neuronal activity patterns representing those memories. In artificial neural networks, such memory replay can be implemented as 'generative replay', which can successfully – and surprisingly efficiently – prevent catastrophic forgetting on toy examples even in a class-incremental learning scenario. However, scaling up generative replay to complicated problems with many tasks or complex inputs is challenging. We propose a brain-inspired variant of replay in which internal or hidden representations are replayed that are generated by the network's own, context-modulated feedback connections.**

Keywords: Machine Learning, Neural Networks, Artificial Intelligence

1. INTRODUCTION

Current state-of-the-art deep neural networks can be trained to impressive performance on a wide variety of tasks. But when these networks are trained on a new task, previously learned tasks are typically quickly forgotten. Importantly, this 'catastrophic forgetting' is not due to limited network capacity, as the same networks can learn many tasks when trained in an interleaved fashion. In the real world, however, training examples are not presented interleaved but appear in sequences with temporal correlations. One solution would be to store previously encountered examples and revisit them when learning something new. Although such 'replay' or 'rehearsal' solves catastrophic forgetting, the scalability of this solution has been questioned as constantly retraining on all previously learned tasks is highly inefficient and the amount of data that would have to be stored becomes unmanageable quickly. Yet, in the brain—which clearly has implemented an efficient and scalable algorithm for continual learning—the reactivation of neuronal activity patterns that represent previous experiences is believed to be important for stabilizing new memories. Such memory replay is orchestrated by the hippocampus but also observed in the cortex, and mainly occurs in sharp-wave/ripples during both sleep and awake. Inspired by this, here we revisit the use of replay as a tool for continual learning in artificial neural networks (ANNs).

As alluded to above, a straight-forward way to add replay to an ANN is to use stored data from previously learned tasks and interleave them with the current task's training data. Relying on stored data is however undesirable for a number of reasons. Firstly, it is a disadvantage from a machine learning perspective as storing data is not always possible in practice (e.g., due to safety or privacy concerns) and it is problematic when scaling up to problems with very many tasks. Secondly, from a neuroscience perspective, if we hope to use replay in ANNs as a model for reactivation in the brain, using stored data is unwanted as it is questionable how the brain could directly store data (e.g., all pixels of an image), while empirically it is clear that human memory is not perfect. As alternative to storing data, here we focus on generating the data to be replayed with a learned generative neural network model of past observations.

Fig. 1: Schematic of how current approaches of adding replay to an artificial neural network could be to mapped onto the brain.

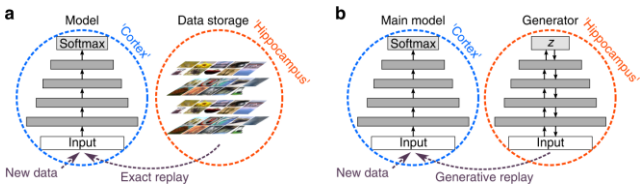

Fig. 1 Schematic diagram

Exact or experience replay, which views the hippocampus as a memory buffer in which experiences can simply be stored, akin to traditional views of episodic memory. Generative replay with a separate generative model, which views the hippocampus as a generative neural network and replay as a generative process.

Recent evidence indicates that depending on how a continual learning problem is set up, replay might even be unavoidable. Typically, continual learning is studied in a task- incremental learning (Task-IL) scenario, in which an agent must incrementally learn to perform several distinct tasks. Although this is a natural scenario for many reinforcement learning problems (e.g., incrementally learning to play Atari games), for classification this scenario is often artificial. Imagine an agent that first learns to classify cats and dogs, and then cows and horses. It seems reasonable to expect that this agent should now also be able to distinguish between cats

and cows. In the Task-IL scenario, however, the agent is only expected to be able to solve the exact classification tasks it was trained on. Distinguishing between classes from different learning episodes is only required in the class-incremental learning (Class-IL) scenario. Although this difference might seem subtle, it turns out to dramatically affect the difficulty of a continual learning problem: established machine learning algorithms for continual learning fail in the Class-IL scenario even on seemingly simple toy examples. Generative replay (GR) is currently the only method capable of performing well in this scenario without storing data.

An important potential drawback of GR, however, is that scaling it up to more challenging problems has been reported to be problematic. As a direct result, Class-IL with more complex inputs (e.g., natural images) remains an open problem in deep learning, as acceptable performance on such problems has so far only been achieved by methods that explicitly store data. In addition, from a neuroscience perspective, the reported inability of replay to scale to more realistic problems in a biologically plausible way (i.e., without storing data) is puzzling as it raises the question how replay could underlie memory consolidation in the brain.

Here, we challenge the unscalability of GR. After first confirming the importance of replay for Class-IL, we report experiments on the MNIST dataset highlighting the surprising efficiency and robustness of replay: replaying just a few or low-quality samples can already be enough. Yet, despite these promising experiments with hand- written digits, we also find that scaling up GR to more complicated problems is not straight-forward. To address this, we propose a new variant of GR in which internal or hidden representations are replayed that are generated by the network's own, context- modulated feedback connections. We demonstrate that this brain-inspired replay method achieves state-of-the-art performance on challenging continual learning benchmarks with many tasks ($\geq$100) or complex inputs (natural images) without the need to store data.

2. AI TECHNIQUE COPIES HUMAN MEMORY TO MINIMIZE DATA STORAGE BURDEN

Artificial intelligence (AI) experts at the University of Massachusetts Amherst and the Baylor College of Medicine report that they have successfully addressed what they call a "major, long-standing obstacle to increasing AI capabilities" by drawing inspiration from a human brain memory mechanism known as "replay."

First author and postdoctoral researcher Gido van de Ven and principal investigator Andreas Tolias at Baylor, with Hava Siegelmann at UMass Amherst, write in Nature Communications that they have developed a new method to protect - "surprisingly efficiently" - deep neural networks from "catastrophic forgetting" - upon learning new lessons, the networks forget what they had learned before.

Siegelmann and colleagues point out that deep neural networks are the main drivers behind recent AI advances, but progress is held back by this forgetting. They write, "One solution would be to store previously encountered examples and revisit them when learning something new. Although such 'replay' or 'rehearsal' solves catastrophic forgetting," they add, "constantly retraining on all previously learned tasks is highly inefficient and the amount of data that would have to be stored becomes unmanageable quickly."

Unlike AI neural networks, humans are able to continuously accumulate information throughout their life, building on earlier lessons. An important mechanism in the brain believed to protect memories against forgetting is the replay of neuronal activity patterns representing those memories, they explain. Siegelmann says the team's major insight is in "recognizing that replay in the brain does not store data." Rather, "the brain generates representations of memories at a high, more abstract level with no need to generate detailed memories." Inspired by this, she and colleagues created an artificial brain-like replay, in which no data is stored. Instead, like the brain, the network generates high-level representations of what it has seen before.

The "abstract generative brain replay" proved extremely efficient, and the team showed that replaying just a few generated representations is sufficient to remember older memories while learning new ones. Generative replay not only prevents catastrophic forgetting and provides a new, more streamlined path for system learning, it allows the system to generalize learning from one situation to another, they state.

For example, "if our network with generative replay first learns to separate cats from dogs, and then to separate bears from foxes, it will also tell cats from foxes without specifically being trained to do so. And notably, the more the system learns, the better it becomes at learning new tasks," says van de Ven.

He and colleagues write, "We propose a new, brain-inspired variant of replay in which internal or hidden representations are replayed that are generated by the network's own, context-modulated feedback connections. Our method achieves state-of-the-art performance on challenging continual learning benchmarks without storing data, and it provides a novel model for abstract level replay in the brain."

Van de Ven says, "Our method makes several interesting predictions about the way replay might contribute to memory consolidation in the brain. We are already running an experiment to test some of these predictions."

3. RESULTS

3.1 COMPARING CONTINUAL LEARNING METHODS

Our first goal was to compare the performance of GR with that of established continual learning methods. For this, as for the remainder of this study, we focused on image classification based continual learning problems. To quantify performance, we used the average test accuracy over all tasks or classes seen so far.

3.2 CLASS-INCREMENTAL LEARNING MIGHT REQUIRED REPLAY

To compare these continual learning methods, we first used the popular deep learning example of classifying MNIST digits33. When trained on all digits simultaneously, this is a very simple problem for modern deep neural networks and they make almost no mistakes. But when the dataset is split up into multiple tasks or episodes that must be learned in sequence, the problem becomes substantially more difficult.

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A Traditional Wastage Water Purifier and Filtration System in Rural Area

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***Abstract*-Seeing the increasing water problem in our country, the cost of clean water is known in today's time. In view of this problem, we want to create a system. which would be like this. A simple, "Traditional Wastage Water Purifier and Filtration System in Rural Areas". In which the dirty water is sent to the bar screening tank with the help of motor. In which about 50-60% of the impurity is removed, after which the sand and gravel are removed in the grit tank, after which the water is kept in the settling tank for 2 - 6 hours to remove the sludge from the dirty water and aeration tank the activated sludge when the air are added into the water it encourage microbial growth. the small microbes in the water all the organic material which are present it gets settle down and use clarifiers to remove solid particles. And to remove the bacteria, it is passed through disinfectant, after which the clean water obtained is used. In this process, solar panels have been used to drive the motor.**

Keywords -Rain water (Pond water), Motor pump, Solar panel, Bio-sand, Water filter system.

1. INTRODUCTION

Water is a natural resource which is extremely useful for all the living beings on earth, the use of water includes agricultural, industrial, domestic and environmental activities because the water resources available in a particular area should be protected from pollution and only then it should be used.

as we know that in earth there is an about 71% of water but drinking water is available only 2.5-3 %. In the whole world 4% of the water present in our India. whereas 16% of the total world population resides in India.

In view of the parameters, the percentage of clean water in our India is becoming very less day by day. In this situation the rain water is the boon for us.

Rain water is very helpful in few situation but about 60-70% of the rain water is wasted. but out of this, 30-40% water gets collected in ponds and pits.so in view of this problem, such a system so that we can be make water usable for different purposes. (e.g.-Drinking water for animals, Cleaning, Irrigation).

2. BACKGROUND

The main purpose of making this paper is that the pond water or rain water can be cleaned and made usable. By the way, many researchers have done their research on this topic. Most of the purpose is to make water obtained from nature potable by using several methods (e.g.-by boiling water, passing through many other filters and passing electricity) but we have made the pond and rain water clean and usable by using filter aeration method in this system.

3.WATER FILTRATION PROCESS

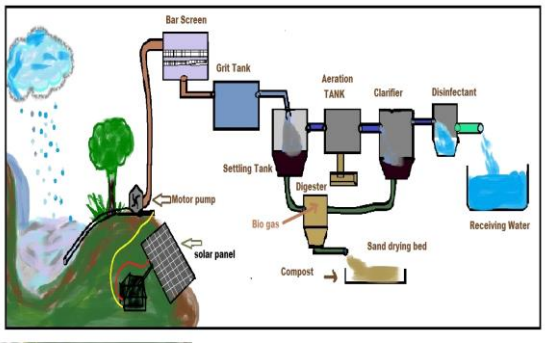

Fig. 1 Filteration Process

In this process, first we send the dirty water to the screen tank with the help of motor pump, solar system has been used to operate the motor. this process will be completed in the following step.

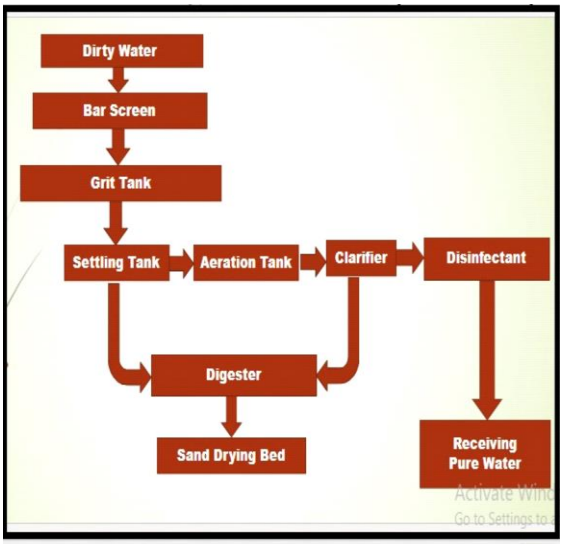

Fig. 2 Stepwise Procedure

3.1 BAR SCREENING

In this process the direct water coming from the motor is passed through a passed through a small mesh. one to which large sized particles which are in the bar screen process. such as stone, fibres, woods. In this way about 50-60% of the harmful solid separated by the process of bar screening after which the impure water is received is further sent to the grit tank for proceeding the next level.

3.2 GRIT TANK

In this process the impure water is obtained from the bar screening is brought into the big tank. In this big tank, the water is swirled in a circular motion from which other material are sand and gravel are removed. the water in this tank is kept for 20 to 60 seconds, after which the impure water received is from grit tank 's further sent to the settling tank.

3.3 SETTLING TANK

In this process the second water received from the grit tank is left to stand still for 2 to 6 hours in a large settling tank.
Due to which heavy particles present in the other water settle down due gravity and the relatively clean water. above is sent for further treatment by removing the impurities from water in setting tank. coagulant is added to separate the fine particles and colloid present in the contaminated wate. so that the impurities are easily removed.

3.4 AERATION TANK

In this process the sludge or impurities present in the water which is pass from the settling tank is gone into the aeration tank which is next process after setting tank here in aeration tank the activated sludge when the air added into the water it encourages microbial growth. the small microbes in the water all the organic material which are present it gets settle down.
It is usually of two types –

- Blowers
- Mixer

3.5 CLARIFIER

In this process which comes after aeration tank. the clarifiers are generally used to remove the solid particles or the water. concentrated impurities, which is discharged from the bottom of the tank known as sludge, when the surface of the liquid and it makes the scum. and other are move to the next level.

3.6 DISINFECTANT
In this process after the clarifier the water is pass into the disinfectant. The bacteria present in liquid are destroy. all surfaces are cleaned manually or by pressure washer with disinfectant in this process, the best and cheapest chemical is chlorine, due to which we eliminate almost all the pesticide bacteria present in the water, thus water is obtained in the form of a purifier.

3.7 DIGESTER

In this process activated sludge and waste material from the settling tank and clarifier is collected in the digester which in this process is decomposed by anaerobic bacteria to produce bio gas. And we can use the rate obtained from it as fertilizer in our crops and we can use air gas as fuel.

3.8. FLOW DIAGRAM

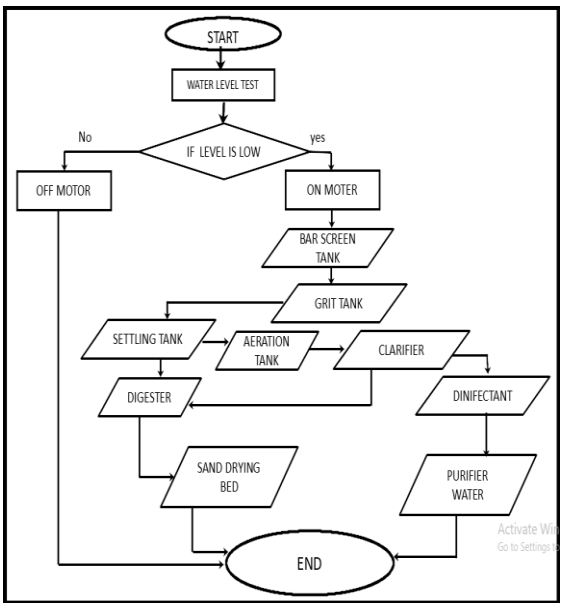

Figure 3 Flow diagram

4. ADVANTAGE

(i). We can use this clean water to feed our animals.
(ii). We can use this water for irrigation.
(iii). We can use the rate obtained from the digester as a feed for crops.
(iv). We can use this water for cleaning our house and washing clothes.

5. CONCLUSION

According to the Constitution of India, the provision of clean water has been considered as the first, for this the central and state governments have taken new steps. The biggest challenge is that not only is the water clean, but the clean water has to be saved from being wasted. For this, awareness is necessary in urban and rural areas. In view of this problem, we have designed a system which works like this.....In this system the dirty water is sent to

the bar screening tank with the help of motor. In which about 50-60% of the impurity is removed, after which the sand and gravel are removed in the grit tank, after which the water is kept in the settling tank for 2 - 6 hours to remove the sludge from the dirty water and aeration tank the activated sludge when the air added into the water it encourages microbial growth. the small microbes in the water all the organic material which are present it gets settle down and use clarifiers to remove solid particles. And to remove the bacteria, it is passed through disinfectant, after which the clean water obtained is used. In this process, solar panels have been used to drive the motor. after in this process we can use water in our work like as-Drinking water for animals, Cleaning, Irrigation.

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K-Means Clustering Approach for Prediction of Internet Data Utilization using Big Data

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***Abstract*-In our modern society, people are interacting with each other through different communication devices, and for sharing their thoughts they are using almost social media platforms. Social media are producing lots of data every second. The data set can be in the form of structured, unstructured, or semi-structured like text, image, video, etc. These types of datasets are called big data. There are many sectors where big data are produced continuously like health, business, government, smart city, and Institutions. In the education sector, the students also use the Internet for different purposes such as class notes, video lectures are uploading and downloading from the Internet, but we cannot say that all the students are active on the Internet and uses the same average size of the internet data. In this paper, to overcome these types of problems we have used one-month Internet data and predicted their behaviors of the data usage. Through the K-Means algorithm, we make clusters and through these clusters, we have given the predicted result of their data (upload, download, and total) utilization pattern.**

Keywords: Big Data, Machine Learning, Prediction, K-Means Clustering, Statistics, Data Set.

1. INTRODUCTION

The rapid growth of internet users, particularly online social communities, including online education system is producing different types of content in every second. The online content can be social media-based streaming data, emails, log files, video, text, images, and so on. The active users are using different types of words and sentences to express their sentiments on social media to exchange thoughts. These data are increasing exponentially with different formats such as structured, unstructured, and semi-structured. These large datasets are providing lots of opportunities in different sectors but it is very useful for the business perspective where a huge amount of data available related to the customers by using this large data set we can predict users' behavior, sentiments, opinion (negative, positive, like, dislike, etc.) regarding a particularproduct [1]. These types of data include high volume (large data), high variety (text, image, video), and high velocity (online data transfer rate). If any dataset has high volume, high velocity, and high variety then it is called bigdata that means the big data indicates the huge dataset and it is produced by the various fields like health sectors, business, government sectors, science and engineering where the big data is continuously growing day-to-day. There are three main characteristics of big data which has to define the big data, also known as big data three Vs which are volume, variety, and velocity and after that IBM added one more big data Vs that is known as veracity, these big data Vs also known as big data parameters [2]. Big data can be a group of structured data, unstructured data, and semi-structured data and it is a complex task to process these data. The traditional software has less ability to process these types of data because the large dataset needs high and advance computational algorithms that give timely response [3]. Machine learning (ML) algorithms are now widely used in different fields to process large datasets. In machine learning in the K-Means algorithm is frequently used to divide the large dataset into the differentclusters. The K-Means is an unsupervised learning algorithm which used to make cluster predictions [4]. The main aim of this paper is to predict Internet data utilization which is produced by users. The problem is to predict patterns of Internet data usage by all the registered users. For the prediction, we have used unsupervised machine learning K-Means algorithm, and have presented experimental results using one month Internet dataset in which 3290 users have registered through the campus Wi- Fi portal. In the experimental results, we have predicted data utilization patterns of upload data, download data, andtotal data used within the month. For example, to find the number of users which they have used data between 150-200 GB per month, such types of problems we have entertained in this paper.

2. MOTIVATION

Internet traffic measurement and analysis is important to research in the field of online education, due to its rapidly growing in day-by-day. At present, the University and Institutions are building the Wi-Fi campus and provide Internet access to all registered students. In the Wi-Fi campus, students can access the Internet every time and every place within the campus, so if the university management wants to purchase Internet data to any ISP (Internet Service Provider) then the problem is how much data are consumed and

or will consume. This researchpaper can help to make decisions during Internet data management based on the data utilization pattern of the users.

3. RELATED WORK

Adekitan et al. (2019) have developed a forecasting model using a supervised machine learning algorithm like Random Forest, Naïve Bayes, Decision Tree, and Neural Network. They have predicted Internet data traffic daily basis and have got a minimum accuracy of 55.66 %, while the maximum accuracy was 63.208 %.In that study, the authors have used download and upload internet traffic data which has produced at Nigeria University in 2017. The algorithms were applied to the KNIME and Orange software [5]. Izzat Alsmadi and Ikdam Alhami (2015), they have performed clustering and classification for a large collection of text emails. Theauthors have shown that the Ngram based classification is best for such large emails and has used three classification algorithms which are K-Means, SVM (Support Vector Machine), and KNN clustering algorithm. These classification algorithm's performance has evaluated and shown that the True Positive rate to be very high in all cases of NGram based clustering and classification [6]. Weijia (2019), has presented an improved version of the K-Means clustering algorithm he has focused on the clustering mining algorithms for big data and improves the efficiency under a parallel framework based on density. The author has shown the experimental based results and has achieved a better acceleration ratio with the help of a parallel platform when dealing with huge data [7].

4. MACHINE LEARNING

Machine Learning (ML) is a learning process to learn from past data and predict future information byitself. The ML algorithm splits the entire data set into two parts, one is a training data set and the second is called testing data sets. At the time to build a model, for train the model we used data which is known as a training data set, and for testing a model in which used the data set called testing dataset and the purpose is to check and test the performance of the model. The ML algorithm can computea large data set and perform on various tasks like speech recognition, automation, control, computer vision, bio- surveillance, and scientific experiments, etc. [8]. The ML algorithm can divide into three major categories supervised, unsupervised, and reinforcement learning. The supervised learning can be worked on the labeled dataset and unsupervised learning algorithms work on the unlabeled dataset and predicted to nearby data item groups (clustering). The reinforcement learning algorithm works based on a pattern of behavior in dynamic environments (there is no expected output) [9]. The following figure 1 is showing the classification of different types of machine learning algorithms.

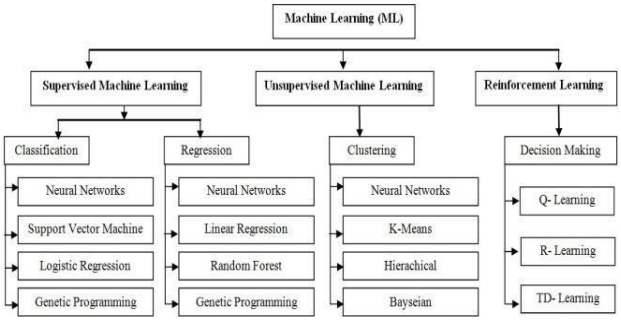

Fig. 1. Different Categories of ML Algorithms.

4.1 SUPERVISED MACHINE LEARNING

The supervised machine learning is one type of ML in which the instances are given with the labels means the supervised learning algorithms are working with the labeled dataset. The following figure 2 depicts the general classification of a supervised learning procedure [10].

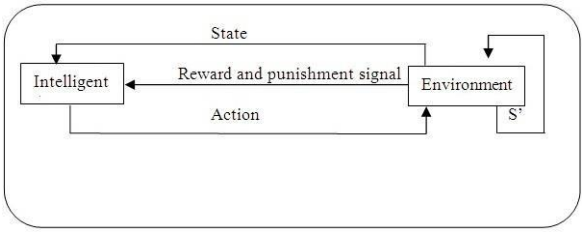

Fig. 2. General Model of Supervised Machine Learning.

Under supervised machine learning, the algorithms are used for data classification and these algorithms are logistic regression (LR), decision tree (DT), support vectorMachine (SVM), Bayes, and K-nearest neighbor (KNN) algorithm [11].

4.2 UNSUPERVISED MACHINE LEARNING

Unsupervised learning is used to cluster analysis of the dataset because the data set is given in unlabeled and the algorithm is like K-means, fuzzy C-Means clustering, and hierarchical clustering. The unsupervised learning can solve any particular task and build the specific featuredetector class from an unlabeled dataset, it has more abilityto learn higher non-linear models with a million number of parameters to use large unlabeled dataset [12, 13].

4.3 REINFORCEMENT LEARNING

Reinforcement learning is a subtype of ML in which the algorithm does not need prior knowledge, it can learn from the continuously interacting with the dynamic environment and this technology develops from statistics, control theory, and psychology. The

following figure 3 is showing the basic model of reinforcement learning.

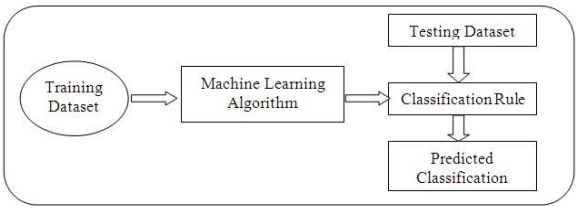

Fig. 3. General Model of Reinforcement Learning

According to the above figure 3, the model first receives the input of environment state S' and then, according to the internal interface mechanism the output of action acts the environment. The environment changes to a new state S' when accepting the actions. The model accepts the input of the new state S', and obtain a reward and punishment signal of the environment for the system [14].

5 K-MEANS CLUSTERING

Data clustering is a paradigm that is used in many applications including image segmentation, pattern classification, document retrieval, and data mining. It also can be used in digital signal processing for the laser phase noise in a coherent optical communication system [15]. K-Means algorithm is a very effective and frequently used for clustering in which the whole dataset (n object) partitions into different k cluster with high similarity based on input parameter k. The algorithm proceeds with the following steps-

TABLE 1: THE GENERAL PROCEDURE OF K-MEAN CLUSTERING

Step 1	Randomly select $k$object from the entire objects as an initial cluster
Step 2	Within remaining objects, similar objects are assigned to the cluster
Step 3	The step2 is based on the distance between the cluster center and dataset objects

It requires a total of (nk) distance computations in each iteration where k is the possible number of clusters and n is the number of objects. In every next irritation, the centers should be updated as a new center and this iteration must be executed serially [16]. Its center's coordinates are the arithmetic means for each dimension to distinguish overall points. K-Means algorithm operates on a dataset of d-dimensional vectors, $D = \{X_i | i = 1, \dots, N\}$, where $X_i \in K^d$ which is i^{th} data point. It is initialized by collecting K points in K^d as the initial K cluster representations; the algorithm is given below- $k - means(D, K)$

Let $i = float.MaxValue; j = 1$

Chose K centers from

$$D, let\ C^{(0)} = C_1^{(j)}, C_2^{(j)}, \dots, C_k^j$$

While $i > itre\ do$

From Kcluster by assigning each point in X to its nearest centroid

Reallocation of means with finding new centers of the Kcluster $C_1^{(++j)}, C_2^{(++j)}, \dots, K^{(++j)}$

$$i \leftarrow \sum_{m=0}^{K} \left\| C_m^j - C_m^{j-1} \right\|^2$$

Output C^j

The default measure of the nearest center is the Euclidean Distance [17, 18].

6 NEED OF PREDICTION

In the big data era, it is very difficult to process entire data and find the exact value from that huge data because they need so much processing cost, resources, and time. Hence predictive analytics is very helpful to predict the useful information from the larger data set by using different prediction techniques. The predicted value may not same an actual value, but it can be the nearby the actual value and this accuracy is decided by the performance of the predictive models. The statistical and machine learning-based forecasting methods are frequently used for predicting the information based on the user's needs. The social media community is rapidly growing in day-to-day by the entire world by using different mobile applications. Facebook, Twitter, and Instagram are very popular in terms of spread the information from one machine to another machine and these apps are producing the unstructured data which is very difficult to process by the traditional software. The different types of the algorithm of machine learning are frequently used to make predictions and its acquire more concentration in forecasting and it does not need any premise of the dataset. The ML algorithm often performs and gives more accuracy in the differentiation of the statistical method. The predictive analytics give an occasion that deals with the mining value of the unstructured dataset and forecasts the behavioral patterns of the human being. Especially in a business viewpoint, where the forecasting models investigate the pattern recognition using the old transactional data and to obtain lots of opportunities [19, 20, 21, 22].

7 DATA SET DESCRIPTION

For the experiment, we have used a month Internet dataset of Sagar University India, in which there are 3290 users have registered through the Wi-Fi portal they have used through their ids. The given dataset has upload, download and total used data within a month for each user where the data unit is a Gigabyte (GB). The following figure 4 shows the summary of the dataset.

	User	Online time	Download	Download_GB	Upload	Upload_GB	Total	Tota
0	User-1	66d 03:44:45	7.815526e+10	72.79	9065142409	8.44	8.722040e+10	
1	User-2	2d 03:03:51	2.092708e+09	1.95	104160455	0.10	2.196868e+09	
2	User-3	1:14:32	1.195347e+08	0.11	11379217	0.01	1.309139e+08	
3	User-4	2d 23:44:10	4.201035e+09	3.91	138169274	0.13	4.339204e+09	
4	User-5	2d 05:10:51	4.292931e+09	4.00	131739199	0.12	4.424670e+09	
...	...	...	...	...	...	...	...	
3285	User-3286	2d 07:20:24	7.483252e+08	0.70	459981490	0.43	1.208307e+09	
3286	User-3287	9d 09:39:29	3.838192e+10	35.75	2618425331	2.44	4.100035e+10	
3287	User-3288	2d 06:20:16	4.967180e+09	4.63	194152799	0.18	5.161332e+09	
3288	User-3289	5d 09:43:32	1.922897e+10	17.91	1352507800	1.26	2.058148e+10	
3289	User-3290	1:05:47	9.361672e+08	0.87	41717360	0.04	9.778846e+08	

3290 rows × 8 columns

Fig. 4. The Summary of the DataSet

The above figure 4 is showing the summary of the dataset which will be used in our experiment. In the dataset, there are 3290 rows and 8 columns in which we have focused on the columns- Download_GB, Upload_GB, and Total in GB. The following figure 5 is showing the description of the dataset in which the count, mean, standard deviation (std), minimum (min), maximum (max), etc. has given for each column or variable.

	Download	Download_GB	Upload	Upload_GB	Total	Total in
count	3.290000e+03	3290.000000	3.290000e+03	3290.000000	3.290000e+03	3290.00(
mean	8.426998e+09	7.848112	9.091611e+08	0.846699	9.335964e+09	8.69
std	1.506452e+10	14.028911	2.187286e+09	2.037138	1.640936e+10	15.28
min	1.477100e+04	0.000000	2.558000e+04	0.000000	9.924500e+04	0.00(
25%	8.565159e+08	0.800000	6.665214e+07	0.060000	1.035504e+09	0.96
50%	3.171339e+09	2.955000	2.522954e+08	0.235000	3.620382e+09	3.37(
75%	8.914937e+09	8.305000	8.762803e+08	0.820000	9.899599e+09	9.22(
max	2.350000e+11	218.970000	6.115025e+10	56.950000	2.460000e+11	229.15(

Fig. 5. Description of the Dataset

In the above figure 5, the utilization of download data is between (0.00-218.97 GB), similarly, upload data is between (0.00-56.95 GB) and consume data within the month for both download and upload is between (0.00-229 GB). In the next section (9), we will present the experimental results of the data utilization for separately like download, upload, and consumed Internet data.

8 PROBLEM DEFINITION

The Universities are monitoring the monthly internet data utilization of the campus used by the students within the campus through the Wi-Fi, so our problem is under as-

(I) Classification of upload internet data based on most similarities of the students in terms of data utilization within a month.

(II) Classification of download internet data based on most similarities of the students in terms of data utilization within a month.

(III) Classification of total downloads and uploads Internet data together based on most similarities of the students in terms of data utilization within a month.

9 EXPERIMENTAL RESULT AND DISCUSSION

Our experimental steps are- (i) find separating the behavior (upload, download, and total usage) between the users in utilizing the data, (ii) find the combine (upload, download, and total usage) of data usage pattern and. So first we have divided entire users (3290) into 5 clusters for each (upload, download, and total usage, using the K-Means algorithm and the number of clusters decided through the hidden trial method. Each cluster has a different length and behavior. The following figure 6 is showing the experimental result by the graph.

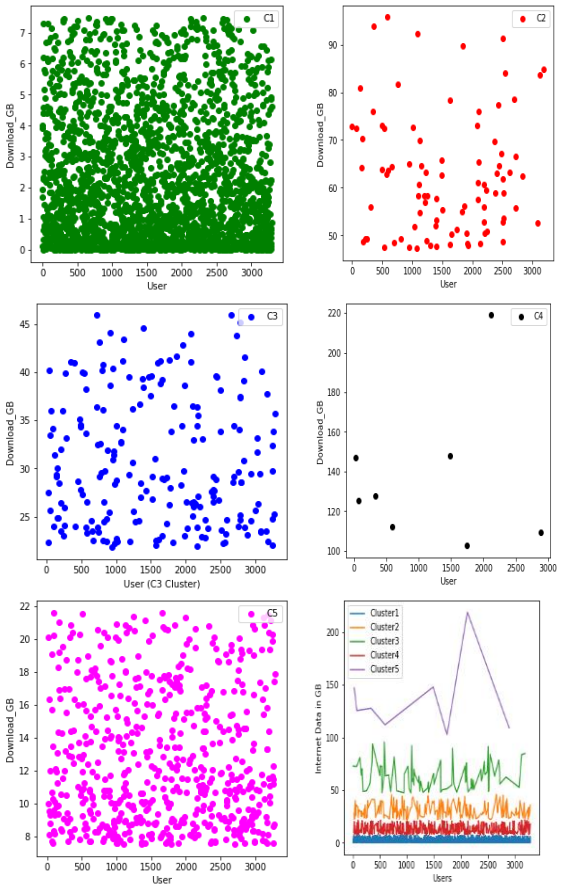

Fig. 6. Download Internet Data Clusters

In the above figure 6, there are 5 clusters (C1, C2, C3, C4, and C5). Each cluster has contained a different number of most similar users, which has downloaded the Internet data, and the last image in the above figure 6 is showing the trend of all clusters under the data downloaded within the month. According to the above figure 6, the following table 2 is showing the details of the downloaded data for each cluster.

TABLE 2: THE GENERAL DESCRIPTION OF DOWNLOAD DATA

Clusters	Size of Clusters	Downloaded Range (GB)	Mean of the Clusters	STD
Clusters1	2378	(0.00 – 7.32)	2.17	1.99
Clusters2	210	(21.55 – 45.93)	30.56	6.65
Clusters3	89	(47.24 – 95.74)	62.42	12.49
Clusters4	605	(7.34 – 21.50)	12.52	4.03
Clusters5	8	(102.53-218.97)	136.32	37.31

The above table has explored the details of the clusters and the data used by the different users. We can see in the above table, cluster 1 contains 2378 users and they have used the data between (0.00-7.32) GB and the average of 2378 users concerning data utilization is 2.17, which means each user within the cluster 1 have used Internet data 2.17 GB in the whole month. Similarly, the remaining cluster information is given in the above table and STD (Standard Deviation) also has shown.

The same above procedure has followed for upload and total utilization data within a month, so the following figure 7 has shown in the upload internet data.

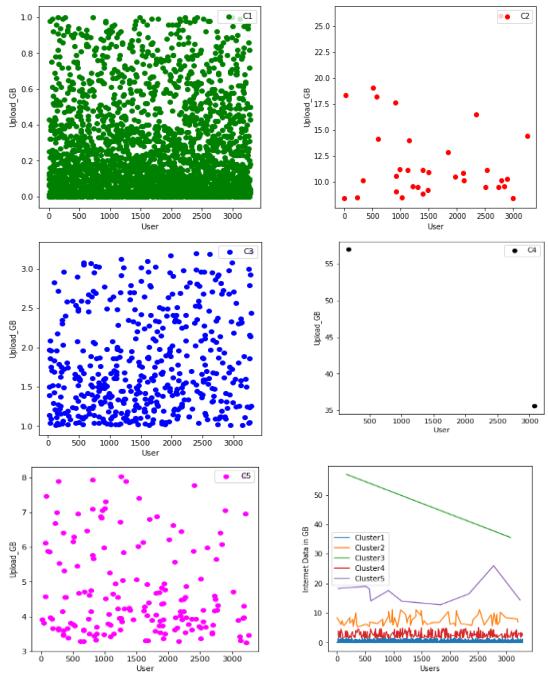

Fig. 7. Upload Internet Data Clusters

The following table 3 shows the details of the uploaded data clusters with their usage in one month.

TABLE 3: THE GENERAL DESCRIPTION OF UPLOAD DATA

Clusters	Size of Clusters	Uploaded Range (GB)	Mean of the Clusters	STD
Clusters1	72	(5.26-11.23)	7.66	1.77
Clusters2	393	(1.53-5.09)	2.74	0.96
Clusters3	2	(35.59-56.95)	46.27	15.10
Clusters4	10	(12.83-26.4)	17.12	3.80
Clusters5	2813	(0.00-1.52)	0.31	0.36

The following figure 8 is showing the total Internet data usage, this figure has explored that the total used data like a combination of download and upload of both. Finally, we analyzed the total data utilization behavior of the users.

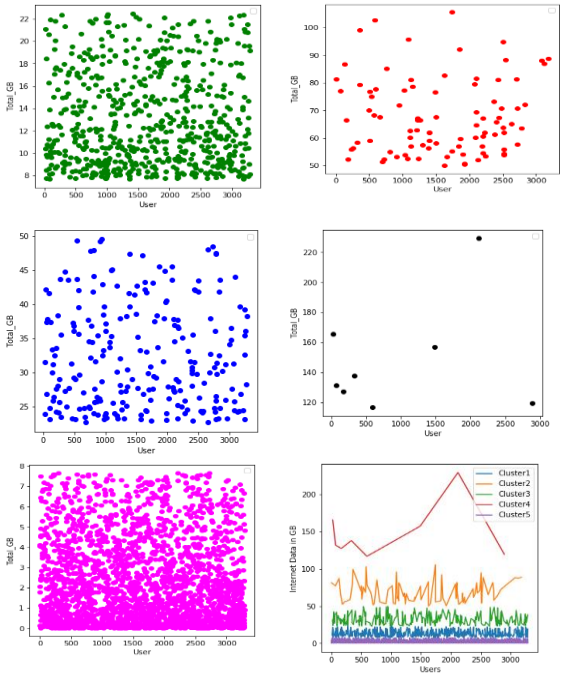

Fig. 8. Clusters of Total Internet Data

In the above figure 8, the cluster shows that the group of users in which how much data they have used and the last image shows the pattern of all clusters of users concerning their data usage. Based on the above figure 8, the following table 4 has explored the details of the clusters.

TABLE 4: THE GENERAL DESCRIPTION OF TOTAL DATA UTILIZATION

Clusters	Size of Clusters	Total Used Data Range (GB)	Mean of the Clusters	STD
Clusters1	2334	(0.00-7.74)	2.36	2.11
Clusters2	236	(22.93-49.96)	32.38	7.49
Clusters3	8	(116.64-229.15)	148.02	36.98
Clusters4	90	(50.42-105.56)	67.80	13.41
Clusters5	62.2	(7.76-22.72)	13.13	4.17

In the above table 4, we can see that cluster 3 users have used the data which means (148.02) size is very high, this means there are only 8 users that are used monthly average data is 148.02 GB.

10 CONCLUSION

In this paper, we have the predicted Internet data usage behavior of 3290 users separately like upload data, download data ant total utilized data through the K-Means clustering algorithm. This paper has explored that each group of users belongs to this range of data usage and monthly averages of data utilization of upload, download, and total consumed data. Furthermore, we have discussed big data, machine learning, and prediction. In the future, this paper will help to those who want to know about the patter of the internet data users in terms of upload, download, and total in a particular organization.

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Offline Virtual Personal Assistant

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Abstract: As the world gets closer to a technological paradise, people are becoming more open to the virtual world. Artificial intelligence (AI), which is the realization of natural conversation between humans and machines, is one of the most popular virtual technologies. Dialogue systems, also known as interactive conversational systems, have recently had the strongest growth in AI. Using dialogue systems technology, many companies have produced a variety of Virtual Personal Assistants (VPAs) depending on their applications and domains, including Microsoft's Cortana and Apple's Siri, Amazon Alexa, Google Assistant, etc. However, the virtual assistants created by different companies don't offer many offline functionalities. In order to achieve basic device functionality in offline mode using spoken commands, we are creating an offline personal virtual assistant for this project. Using this technology of virtual help, we may make them perform actions such as launch programs, turn on Bluetooth, send messages, play music, and more. We can also ask questions of machines and communicate with machines. The main benefit of an offline personal virtual assistant is the ability to complete all tasks without using the internet.

Keywords: Offline Virtual Assistant, Chatbot, Natural Language Processing (NLP), natural dialogue, voice user interface, Artificial Intelligence (AI), Virtual Personal Assistants (VPAs), Microsoft's Cortana, Apple's Siri, Amazon Alexa, and Google Assistant.

1. INTRODUCTION

We have long used several virtual personal assistants on our gadgets, including Microsoft's Cortana, Apple's Siri, Amazon Alexa, Google Assistant, and Samsung S Voice. In terms of system effectiveness and utility, these virtual devices are likewise evolving swiftly. However, as we may have already seen, practically all of these personal assistants need internet access to function. These systems require internet storage, such as cloud services, since the datasets in them are too big to be stored offline. In order to make the system, that is, the software and hardware operations, accessible to the user through voice commands and without the need for internet connectivity, software has been built.

Natural language processing technology is used by this application to process user input provided to the system via natural speech. The virtual assistant carries out the work in accordance with the features that were retrieved from the voice input.

Fig. 1. Existing System.

Figure 1 has image of all the above assistants which already exist in the market with the name of the company they are invented by [11]. Through spoken conversations, intelligent agents known as spoken dialogue systems can help users' complete tasks more rapidly. The program runs without internet access and keeps the datasets locally. Numerous smartphone users have reported experiencing issues with system settings, including starting of program and turning on/off Bluetooth, among others. People may do things without using their hands by speaking and communicating instead. Almost every technological equipment nowadays has a microphone input, which will be used to capture speech. By using voice commands as input, this program would enable users to effortlessly operate without any hassle. [8]

When working in a setting with which they are unfamiliar, people frequently struggle to find the apps they require, such as browsers, IDEs, and other software. The majority of the time, people will waste hours looking for the application. This wastes time that could be used elsewhere. A voice-activated personal assistant will therefore aid in automating this procedure. The user is just required to issue a verbal command; the assistant will do the rest. Depending on our needs, the voice-enabled personal assistant can be implemented utilizing speech-to-text and text-to-speech technologies, as well as additional functions.

Systems for voice-controlled home automation might provide consumers with a more pleasant living and make routine activities easier. People with impairments may live more independently thanks to voice control in sustainable homes, which opens up a world of possibilities. Adopting voice command technology might have a number of benefits, including offering support at work. The ease that these gadgets offer is further enhanced by voice control, which is already used in many systems. For instance, the aforementioned driver might use his car's GPS system without releasing his grip on the wheel, while the harried secretary may easily instruct her phone to dial a number while she is working on a crucial document. However, more technically proficient individuals can like using such a system because they find chatting to be more enjoyable than typing or just because it's amusing.

People become unclear about what to do during a pandemic. Everyone's risk of infection will grow if safety measures are not taken. For instance, going to the emergency department for minor issues might overtax the healthcare system and waste vital resources. Therefore, reliable information sources are essential for avoiding a "meningogenic" illness from spreading thanks to online disinformation. Organizations should have innovative communication mechanisms to handle the enormous volume of demands from citizens during pandemics like COVID-19. Chatbots are artificially intelligent, software-assisted services that may have voice or text conversations with users in their own language. From assistant clinic with clinical interviews, chatbot use for health-related reasons has considerably increased in recent years. Therefore, our suggested chatbot for Medicare would act as a medical advisor and offer simple precautions against covid-19 infection. [3][4]

The creation of chatbots as a digital interface is the most recent, coming after the expansion of mobile applications and the web. Natural language processing is used in these applications' automatic conversational agents, which are well-documented examples of software-based artificial intelligence relationships between people and automated systems. The technological development of question-answering systems that priorities natural language processing is reflected in a chatbot, on the other hand. [5]

2. LITERATURE REVIEW

These days, personal assistants and virtual assistants play a crucial role in our daily lives. Every business or person is adopting these technologies since they make it easier for them to do their tasks [1]. Based on a desktop application, this system. This system comprises a virtual assistant that can receive user input, comprehend it, analyze it, and carry out duties as necessary. Users may save a ton of time by doing this. Voice assistants have a long history and have made a number of important advances throughout the years. Voice assistant for dictation, search, and voice commands has evolved into a standard feature on smartphones and wearable technologies. The research is based on an inadequate review of the literature in order to provide general knowledge (theory and concepts) on voice control, virtual assistants, sectors of application, and other issues.

There are several instances of intelligent software that is currently available that can process natural language for a variety of purposes in daily life. The first voice recognition system, Audrey, was created by Bell Laboratories in 1952. Audrey was limited in her technology literacy and ability, understanding only 10 digits spoken by certain people (Pieraccini, 2012). A decade or so later, IBM created and unveiled its Shoebox Machine. 16 distinct spoken phrases, including all 10 numbers from "0" to "9," as well as calculations like "plus" and "minus," were detected and replied to by the gadget (IBM, 2018). Only in English by an authorized speaker, the Shoebox Machine recognized and replied to 16 uttered words, including the 10 numerals from "0" to "9". Later, these restrictions proved to be troublesome, which raised doubts about speech recognition. The Hidden Markov Model (HMM) was introduced about 1970. (Rabiner,1989). The HMM significantly changed the process of creating a workable voice recognition program. With the use of HMM, voice recognition technology began calculating the likelihood that sounds may represent words.

Apple Inc. When the Siri virtual personal assistant was unveiled in 2011, it created the first voice command system that was widely used. (Bostic,2013). Siri, an intelligent bot, is now a regular feature on Apple's mobile devices and is regarded as a key component of them. Siri is a personal assistant that employs natural language processing to respond to queries and delegate tasks to online services, which are subsequently completed on the user's behalf. [1].

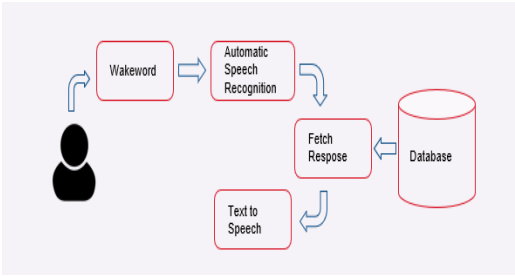

Fig. 2. System Mechanism.

Figure 2 shows the system mechanism how the work or the process is happening in the program. Below figure shows that the user has to send some voice

command as an input to the system then the system will convert voice into text as query which will then accessed by the code to process and execute the function to make an action and the output will also return in a voice command. After reading reviews from a lot of research papers, Aditya Deshpande, and Alisha Dandre presented a survey over several research papers on chatbot implementation techniques, how chatbots work, and how they differ from each other. To make a chatbot various technologies that are present can be used. This survey was about the existing approaches to make chatbots. In this paper various Chatbot from the first chatbot "Eliza" to the latest one like Alexa, and IBM Watson, tells how are they being implemented and how they work. Tarun Lal Lalwani Ashish Pal presents a chatbot for educational institutions for the faculty to fetch formation from college websites. AIML and NLP answered to create this kind of thing. [9]

Recruitments Chatbot, the first volume of the worldwide scientific journal of engineering and technology, in this paper author has explained that the chatbot behaves as a conversational partner and has been designed for exclusive human response. We have studied all the aspects of diving deep into the chatbot working principle and hence came across an idea to give a try to Offline Chatbot. [10]

3. METHODOLOGY

The Natural Language Processing algorithm is used by the Offline Personal Virtual Assistant. The system's ability to operate offline, or without an internet connection, is its most crucial feature. Due to the fact that it only accepts voice instructions as input, this software will assist users in saving time. Additionally, it benefits those without access to the internet. The 4 phases in which this system will work: 3.1 Input Speech, 3.2 Pre-processing the Input Speech, 3.3 Fetch Responses, 3.4 Text to Speech. These features are summarized below:
Voice commands from the user serve as input. Waves carrying the listener's speech are picked up by the listener. There is definitely undesirable background noise and ambient reverberation in the vocal input. We therefore process the spoken input to obtain the user's context in order to eliminate this noise. Speech Preprocessing is crucial for removing unimportant sources of variance. In the end, it increases speech recognition's precision. The features are extracted from the heavily processed voice recognition. Open <App Name>, for illustration, or toggle the brightness or set an alarm. Following the completion of the required query, the text-to-speech algorithm is used to turn the results into voice, which is then output to the user as speech.

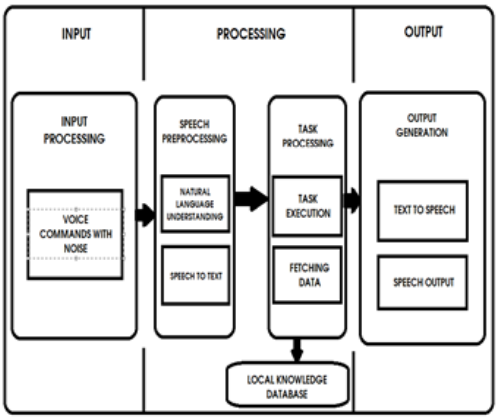

Fig. 3. Block Diagram.

This Figure 3 actually is a Block Diagram of the project we are creating this figure actually summarize the flow of the data from the user using voice and converting that voice into text using Natural Language Processing and then according to that context in the data the task is specifically done by the assistant and this whole function is done without using any kind of internet connectivity, So that a local knowledge of database is required which you can see in the figure which contains all the required data to make the assistant to complete all the possible task without the help of the internet connectivity.

4. TECHNOLOGY USED

4.1 Natural Language Processing:

This, a field of Artificial Intelligence also known as Natural Language Processing is focused with providing machines the ability and the capability to interpret with language through both spoken and written data in a significant way, analogous to how a person. NLP combines computational linguistics principle human language modelling with statistical, learning algorithms, and models from deep learning. These technologies work together to provide computers the ability to understand the whole meaning of mortal language, whether it be expressed through text or audio data, including the speaker's or the mortal's mood. NLP is employed to power software programmers which translate information between languages, respond with spoken queries, and swiftly and in real-time compress large volumes of data. NLP is most likely already employed by you in the form of speech-activated GPS system, digital assistants, voice-to-text transcription software, customer support chatbots, and other consumer requirements. Several NLP operations dissect real-world text and voice data to help the machine summarize the data that is processing. Some of the duties involved are as follows: Voice recognition software, often known as voice-to-text, is the process of properly converting speech input into text. Voice recognition is necessary for almost all the task that

reacts to spoken commands or questions. Voice recognition is particularly challenging due of the method that users interact, which is abrupt, quavering, with variable emphasis and emphasis, in varied stresses, and frequently employing wrong rudiments.

4.2 PYTHON PROGRAMMING LANGUAGE

This programming language is well-liked. Python provides understandable, compact code. Python's simplicity enables programmers to construct dependable systems, in contrast to the complicated algorithms and unpredictable workflows that underlie ML and AI. Instead of focusing on the intricate details of the language, programmers may focus all of their concentration on an ML problem.

4.3 VOSK MODULE

English, Indian English are among the languages that are spoken throughout the world for which speech recognition is available. Vosk models are smaller in size yet provide speech recognition, zero-quiescence response with streaming API, and continuous huge data of vocabulary recap. Voice recognition for smart home devices, chatbots and virtual assistants is available from Vosk. Additionally, it can create quotes for images, lecture summaries, and interview transcripts.

4.4 PYTTSX3 (TEXT-TO-SPEECH)

This is a Python library for text-to-speech conversion. Unlike necessary libraries, it is compatible with Python 2 and Python 3 and available to work offline. An operation calls the init() planting operation to obtain a reference to a pyttsx3. Machines case. It is a really easy to-use python tool that transforms the input text into vocal language. Two voices are supported by the pyttsx3 module. The " sapi5 " for Windows is handed the first, which is feminine, and the second, which is masculine.

5. CONCLUSION

Almost all of the applications that are already on the market today that we have examined function with internet connectivity. Some of them also struggle with speech recognition well. With the help of the installed Offline Personal Virtual Assistant, users can access the application without an internet connection. By just speaking commands to the application, the user can control the majority of system settings, whether they are software- or hardware-related, and it also aids in user mental health improvement.

The user is welcomed in the manner in which they feel most at ease and free to communicate with voice assistants. As a result of this project's modular design, it is more adaptable and simpler to incorporate new features. This development's component design provides it additional freedom and makes it easier to add new features without impairing existing system functionality.

6. FUTURE SCOPE

According to the study, we advise that an application be created that satisfies the needs of various users. The user wants to use the voice assistant primarily to simplify their lives without the need for internet access, thus by adopting the functions listed below, the user may be helped.

1. Creating content for various tongues and accents.
2. Versatility in any setting.
3. To increase security, voice authentication technology can be used.
4. To increase its adaptability and add new features without impairing the functionality of the present system.

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A Platform for Students to Buy and Sell Near the Campus

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Abstract: College students have a lot of needs, yet many are unable to afford them all. Therefore, we are developing a website where any student may sell their nearly-new items or they can purchase any things on our platform.Just like one would be expected to do in a classified site, a student who wishes to sell any things can post their adverts.A student may go through the listing if they wish to purchase something.There isn't yet a site just for students where they can simply buy and sell their goods.Students can ask questions about college life, studies, and other topics on the platform's Forum area.Any study-related question they submit will receive a response from another student.Only students are allowed to use this site.Students may purchase and sell goods on this platform, which will help them save time.

Keywords: **Buying, selling, trading, student, website, social, Campus Clan, Supplies, goods.**

1. INTRODUCTION

Education in its general sense is a form of learning in which knowledge, skills, and habits of a group of people transferred from one generation to the next through teaching, training, research, or simply through auto didacticism [1]. The primary goal of this project is to create a web-based application for buying and selling old goods and create a social website for students. It often happens as a result of any event that shapes how one thinks, feels, or behaves because education is the gateway to a person's future, it is incredibly significant. We may accomplish all kinds of goals in life with the aid of a good education. The reasons why different people pursue education might differ. Almost a quarter of our lives are spent on education. For both kids and their families, the time between elementary school, middle school, and high school are considerable.

Therefore, for the majority of students and their families, studying is not only time-consuming but also expensive. Educational supplies are a crucial component of any educational system.

In any subject of study, a textbook or course book is a handbook of instruction. When creating textbooks, the requirements of educational institutions are taken into account. Most of the time, many children and their parents complain about how expensive these school supplies are. Students can save money by purchasing almost new items from seniors or peers, and they can also make extra pocket money by selling goods and services to juniors and peers. After acquiring a textbook from a store for the first time, there are several ways a student might resale their products. The college or university store, their peers, or a range of online shops or student trade services such are the three places where students may sell their items on platforms such as Campus Clan.

Re-commerce describes transactions for secondhand products conducted online. Before making an online or in-person purchase, many individuals use the internet to compare product prices and browse the newest things available in addition to purchasing and selling. The internet is, nevertheless, changing the globe. Every step of the procedure is done online. Buying food, furniture, accessories, or even prescription drugs is one example. This ecommerce process aims to make it possible for customers to make some money by acting as sellers and reselling their used products.

We constantly promote the reuse, recycling, and resale of the owned products and treat used goods as renewable resources. Particularly the re-use and re-sell features give us the chance to use used goods as a source of entertainment. Facebook and other social media platforms are flooded with adverts for old goods. Recycling may be a more recent phenomenon, but the flow of a broad range of used goods is nothing new, despite the increased attention to consumption and the

value of old goods. Personal economics will be balanced and saved by selling and buying, which is beneficial.

This platform also has a Forum section where students can ask their queries regarding there college life, about their study and all. They can put any question about their study and they will find the answers from other students.In current scenario, there is no any such platform which is totally dedicated to students, where they can find answers of their all question at one platform. College Students have a lot of their needs, but they can't effort to buy everything. For each and every problem they have to switch their platform and still they couldn't find appropriate answer from there.

2. LITERATURE REVIEW

Literature review is thought to be the principal part of the examination fill in as it enables the specialist to get the prior important looks into about his exploration contemplate from web and other significant sources. The critical purpose of the present examination was "Buying and Selling Platform for Students"

We can now speak with individuals anywhere in the globe with only a few mouse clicks thanks to the internet, making it easier than ever to remain in contact with friends and family. As a result, social networking has overtaken other sectors to become the biggest industry today. One of the first social networking services on the Internet was introduced by GeoCities in 1994 when it initially opened its website. Its goal was to make it possible for users to create their own websites, and based on the data from each page, it organised them into "cities." TheGlobe.com, which was launched in 1995, enables users to interact with people who share their interests and produce original content. Two years later, in 1997, AOL Instant Messenger and SixDegrees.com were launched. This was the year instant messaging became popular and it was the first time internet users were able to create a profile and friend each other [4].

The amount of Internet customers is continually growing, which is furthermore centrality that web-based obtaining is extending rapidly. Online shopping and online customer lead depend upon these factors, for instance, Site deceivability, online shops legitimacy, information examination, portion security, insurance, webpage interface, supportive time, guideline level and experience of framework. One of the advantages of online buying is that it provides customers with detailed information and a range of options, enabling them to analyze products and estimate prices online. Finding the item or company you're looking for online is easier the more options and convenience there are. Because it is so convenient and comfortable, more and more individuals are choosing internet buying over traditional retail. Using an online medium for a purchase can result in both positive and negative consumer experiences. Despite the numerous advantages, some customers may not choose internet shopping as their primary method of purchasing, according to certain previous research.

This suggests they would now have the capacity to settle on more clever securing decisions in a way which isn't possible through ordinary shopping. What's more, they can purchase anonymously which is useful with respect to singular things that they may feel ungainly acquiring in stores. The typical assignments like searching for staple products have ended up being less requesting for customers who couldn't care less for gathering and driving the trolley around the store.

In [5] the author states, headphones, pendrive, earphones, speakers, mouse, mobile cover, phone cases, memory cards, USB cards, keyboards, mobile charger, laptop battery were some of the products bought by the students from the online stores. Under electronic goods category, cell phone, laptop, hardware, induction cooker coffee maker, MP3 player were bought by the students .

Despite all of the websites available to buy/sell textbooks, buying/selling textbook is still difficult, costly and time consuming for many students. Usability is a key consideration when creating websites for social networks for goods. The popularity and number of visitors to websites are influenced by usability. Many people won't visit the website if it is difficult to use [1].

3. METHODOLOGY

The aim of this study is to investigate how user-friendly social networking sites are for students. This study examined the most popular student social networking sites in numerous web design fields. In order to achieve the goals of the study, a single template website was used, which accommodated the usability features. Usability studies examine user/technology interfaces in order to improve design so that it is more user oriented [8][9][10]. Applied to websites, the term usability means intuitive navigation, a good search function and easy checkout. Slow downloading raises the likelihood

that customers abandon the site [8] .Campus Clan was created so that college students and other learners would have access to it. Thanks to the Campus Clan website, students may easily trade their supplies and products on campus. Based on the needs of the students, the essential updates for the Campus Clan website were selected. The Campus Clan website's home page is seen in Figure 2.

On the website, you can see the logo in the upper-left corner. The navigation always appears next to the Logo on every page, in the same place. In the top-right corner, there are buttons for both logging in and signing up. On the home page's main body are the most popular product categories. The kinds of links that often appear on websites, where they are placed, and how they aesthetically look all affect how simple the navigation is to use. Prior to gathering data, it was crucial to develop a set of standards that could recognize the common components of navigational interfaces across the sample of student social network websites.

Fig.1. Navbar , All the main navigation options of Campus Clan Website.

It is generally accepted that the following five essential usability characteristics should be part of any software project [6] :

a) **Learnability**: This feature caused the web page's size to grow. The initial page's pictures and buttons have larger sizes, and when users click on the links or buttons, a connected page will load. Users are now able to quickly start using the system thanks to these enhancements [1].

b) **Efficiency**: To enhance user productivity, the home page and MyAccount were positioned at the top of the navigation. Consumers believe they may get the information they are searching for by utilizing this navigation. The website now operates quite quickly and is tailored to their browser as a result of this update [1].

c) **Memorability**: The website was created so that users may return to it after a break without having to learn everything from scratch. For instance, a login section includes the capability for the browser to remember the user. In addition, the username and password fields in the login component include a reminder attribute. When users forget their login or password, this tool is helpful [1].

d) **Low mistake rate**: The website reduces user error by including left and top navigation. The related link at the top of the page can be used to navigate back to the correct page if visitors unintentionally click on a different link. By doing this, users interact with the system more effectively and with fewer catastrophic failures that can be quickly fixed [1].

e) **Satisfaction**: In order to make the system pleasant to use, the banner size was increased, and attractive banner chosen. In addition to this, sizes of images were increased, so the users could easily see the product they wanted in the website [1].

A browser may be used to access The Campus Clan, an online program, on websites. The only requirements for utilizing this website are a device with high-speed internet capability and an active internet connection. If you don't sign in the first time, you'll have to register and do it again. The server will keep your information.

The website created was a campus social network where students could interact by messaging each other, creating forums, and taking part in discussions. The ability for students to trade, swap, and purchase textbooks online was the project's main objective.

The database query is one of the inputs, and the query solutions are one of the outputs. The user will also receive information about their accounts as part of the output. The inputs for this project will be user-fired queries like "establish an account."

When the user asks the server to retrieve information about their own account as well as the accounts of other users in the form of time and date, the output will now be displayed.

3.1. FLOWCHART

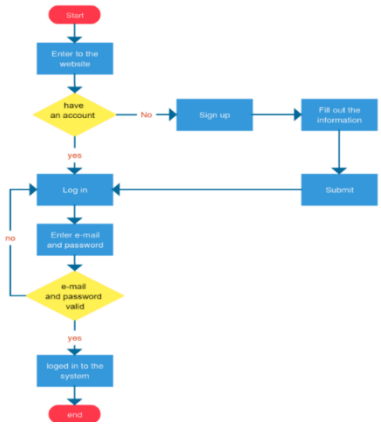

Fig. 2. Flowchart ,Flow of Website experienced by the user.

4. RESULT

The goal of this initiative is to unite all college students from individuals to the entire campus—under a single framework. The Student Forum works to keep all of the students informed about college news, corrections, and activities. This programme was created with the help of HTML, CSS, the Bootstrap front end framework, JavaScript client side validation, Node.js server side validation, MySQL database storage, and Apache web server.

4.1. SCREENSHOT

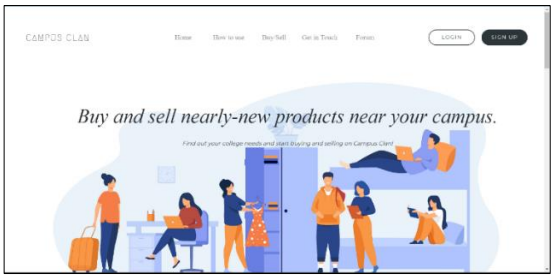

Fig.3. Showing Homepage of Campus Clan Website

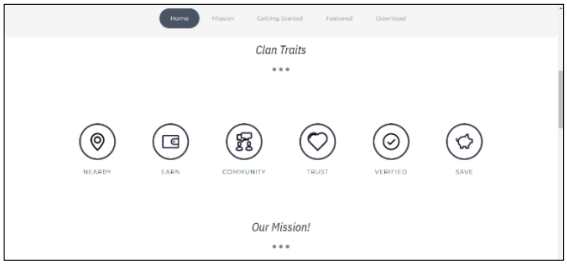

Fig. 4. Features , Features offered by Campus Clan Website to the students.

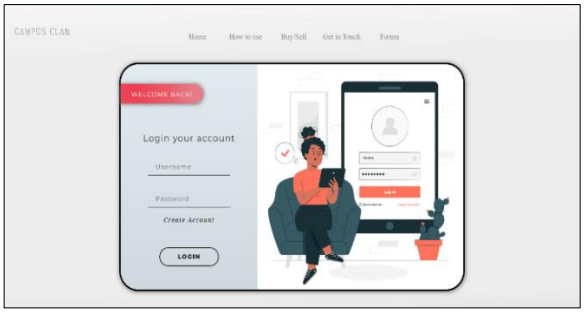

Fig. 5 Login page Login page of the Campus Clan website to access user account

4.2. LIMITATION

The research team had hoped to include as many students from various universities in this study, but it was challenging to ensure that internet users from various campuses would reply to the survey. Additionally, due to time restrictions, the study team was unable to provide a sizable number of users of both websites who were both on campus at our campus and outside of it.

5. DISCUSSION

The first thing to keep in mind while we work on this initiative is to unite all of the college's members, from individuals to the entire campus. Students can use this website to sell or buy their brand-new things in or around their school. And if they have any questions or issues connected to their studies or college life, they may post them in the website's forum area, where other students can help them out.

The database on this website is secure. Normal users may only read instructions and use the system; they are not allowed to alter or modify anything but their personal information and a small amount of other data. Users cannot access the database; only the administrator is authorized to make changes or updates.

Each user and administrator must keep their login information in mind. In the event that they forget their password, they may safely update it by email. Internet access on a personal computer or mobile device is required for use. The user is required to be vigilant of any scams and to notify us of them using the social contact information provided on the website.

Campus Clan's reach is expanding, and today it gives a lot of assistance to the college campus by adding the much-needed touch of care. Students' time will also be saved. With the technology now being included into mobile phones as well, the promising future of campus networking is further demonstrated..

6. CONCLUSION

As a result, we are developing a platform that is entirely devoted to students, where they can quickly sell or purchase their brand-new items and get answers to all of their questions. To eliminate the need for users to migrate to another platform, the major goal of this platform is to offer everything connected to college life on a single platform. Students may purchase and sell goods nearby or on this platform, which will help them save time.

Our project is only a modest effort to meet the demands of managing their project work. A variety of user-friendly code has also been employed. This product will show itself to be effective in meeting all the requirements. The goal of software planning is to offer a framework that allows the management to make realistic projections made within a constrained time period at the beginning of the software project. This framework should be updated often as the project moves forward.

7. FUTURE SCOPE

The tremendous popularity of using the social media networking could never have been realized before.

In fact, social media have become an important tool of marketing in true sense of customer orientation. But this kind of social networking site which can access only for college campus not from outside the college will make a dramatic change inside the college campus.

I. The scope of Campus Clan is widening and today it offers a strong support to the college campus in providing the much desired touch of concern.
II. The bright future prospect of college networking is also proven with the fact that the technology is integrated in mobile phones as well.
III. The project is developing with the power of interpersonal communication on a globalized outlook.

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Convolutional Neural Network for Image Classification Analysis

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Abstract- The fundamental purpose of this research is to explore the efficiency of the convolutional neural networks (CNN) in identifying items, various objects in real. Alex Net, GoogLeNet, and ResNet-50 are the most often used convolutional neural networks during photo classification and recognition. Several data sets are available for assessing the effectiveness of various variations of CNN models. ImageNet data-sets, as well as CIFAR10, CIFAR100, and MNIST picture data sets, are widely used assessment metrics for assessing convolutional neural network performance. This study examines the effectiveness and efficiency of three prominent network models i.e,: Alex Net, GoogLeNet, and ResNet50. We picked the many common data for the study: ImageNet, CIFAR10, and CIFAR100, because assessing a network's performance on a single data set is in efficientin exposing its genuine capabilities and limits. It should be highlighted that videos are employed as testing data sets rather than training data sets. According to our findings, GoogLeNet and ResNet50 can recognize objects with more precision than Alex Net. Furthermore, the efficiency of trained CNN model differs accordingly between various categories of objects, which we shall explore in this study article.

Keywords: CNNs, Deep learning, Object recognition, Image Classification.

1. INTRODUCTION

The internet is teeming with photos and videos these days, spurring the creation of applications and algorithms which can examine the content investigation [1] of photos and videos in order to give the user with better search content and result's summary. According to many academics throughout the world, there has been considerable advances achieved in image labeling, object-recognition, and scene categorization [2] [3]. As a result, solutions to issues as such object identification and image classification are now possible. Since artificial networks, notably convolutional neural networks CNN, has shown productivity gains in the domains of object recognition and environment classification[3] , our research deals with identifying the finest network model for this definition. A very critical stage in the process is data reduction, which involves extracting a limited number of features from pictures that includea significant quantity of content or scene data from picture resolution pixel values, capturing the distinction between both the item categories concerned. Oriented gradient histogram (HOG), Content-Based Image Retrieval (CBIR), and other traditional image feature extraction techniques are used. Once the features have been extracted, they are classified based on the objects in the image. Support vector machine (SVM), regression models, random forest decision tree, and other classifiers are examples [4].

2. LITERATURE SURVEY

According to the literature study, CNN may be used to tackle a wide range of tasks, such as recognising animals or plants or segmenting automobiles and buses pixel by pixel, and multiple studies have shown that CNN surpasses shallow machine learning approaches. Several studies show that CNN capacity to exploit spatial characteristics increases the utility of data with some very high spatial and temporal resolution. The modularity of popular deep learning frameworks enables significant flexibility in design adaption, which helps multimodal or multi temporal applications in particular. The easy accessibility of techniques for envisioning features learned by CNN models will help us not only interpret but also learn from such models, improving our comprehension of remotely sensed vegetation signals. Despite the fact that CNN has only been around for a short time, but they appear to be ushering in a new world of image sensing and classification. The test data sets consist of images from various categories and subjects. The contradiction arises as a result of the extracting

features capabilities of various CNNs. Our main contribution is to provide object identification approaches that employ multiple types of supervised neural network models, where current models exhibit varying success ranges for test movies or photos in comparison to certified photos. We can understand better what these models are learning and presenting after training them for distinct object categoriesprovided data in the types of pictures and therefore, examining them for the more specific video/picture feeds.. The following is how this study is structured. We proceed by introducing related prior works, then ongoing the issue statement and the methodological standard way of making comparisons the networks selected for the study, including model and data set descriptions. Then, we show a thorough establishment of the out comes received from various data sets. GoogleNet is a complex convolutional neural network with 22 layers system. You have the option of uploading a predefined variant of the ImageNet-trained networks. The ImageNet-trained network classifies photographs into thousand class labels, such as keyboards, mice, pencils, and other animals. AlexNet is a complex convolutional neural network with eight layers system. Resnet50 is a complex neural system network with fifty layers system. It is possible to load pre-trained models of the networks that have been tested with over a thousand pictures out from Imagenet data-set [5]. The pre-trained models network can categorise photographs into 1000 different item classifications, like keyboards, mice, pens, and various animals. As an outcome, the model architect has studied extensive image attributes from a wide range of photos. The photo's required structure for the model is 224 by 224 pixels.

3. EXISTING WORK

Convolutional networks are utilised in a range of applications for a variety of tasks with outstanding performance. Handwritten character recognition [6] was the early implementations of the CNN architecture. Since the creation of CNN, network has been continually developed by adding more layers and using other computer vision methods [6]. Convolutional networks are frequently utilised in classification tasks with varied sketch data-set formats [7]. Few studies have compared the detecting abilities of a real person with a trained network on photos. According to the comparative results, individuals have a 73.1% overall accuracy on the data set, whereas trained networks have a 64% overall accuracy. When Convolutional Neural Networks were applied to the identical data set, they obtained an accuracy of 74.9%, exceeding human accuracy [7]. The approaches most commonly employed to get a considerably greater accuracy rate make the use of the strokes order. Deep Neural Network behavioural patterns in a range of settings are being studied in depth [7]. These experiments show how slight adjustments to a picture may substantially impact the results of grouping. This experiment works also includes photographs that are incomprehensible to humans but are precisely identified by trained networks [8]. Previous researches focuses on single item recognition and classification utilizing a human-defined collection of attributes. These proposed methodologies investigate the relationship of objects in scene recognition [8]. Most of environment categorization methodologies were employed to assess the object bank's utility. Many studies have been conducted, with an emphasis on low-level component extraction for object summarizing and categorization. for instance the (HOG) Histogram of the Oriented Gradient, filtering bank, and a bag of significant improvement in performance using words.

4. EVALUATING METHOD

This project's major goal is to grasp performance of the network for video streams. The initial stage is to run a supervised learning on the networks with picture data. On picture files and actual video feeds, the predictions rate for the same item is then assessed. The different efficiency ratings are noted, recorded, and shown in the columns supplied in the next sections. The third critical performance criteria were to evaluate if prediction accuracy differed between every CNN employed in this study. It can be highlighted that the feed are employed as testing data sets instead of preparation data sets. As an outcome, we are looking for fittest photo classify action, when the main characteristic for scene categorization is the objects [9]. The CNN layers included:

(a) CONVOLUTION LAYER (CONV): Convolution is the applying of filters to an input, resulting in activation. When a comparable filter is applied repeatedly to an input, a feature map is produced, which displays the positions and intensity of a detectable characteristic in an input, for example a photograph.

(b) ACTIVATION LAYER: Next to each CONV layer in a CNN, we insert a nonlinear activation functionality, as such ReLU, ELU, or few of many leaky ReLU variations. Because ReLU activations seem to be the most often used, we generally label activation layers as ReLU in network diagrams. However, we may also simply declare Activation — for either instance, it is indicated that such an

activation function is being applied from the inside of the model's infrastructure.

(c) POOLING LAYER: The Pooling (pool) layer's principal role is to gradually lower the spatial dimension (length and width) of the input matrix. This causes us to remove the quantity of factors and calculations in the network while maintaining control over over fitting. Pooling layers use the max or average function to act independently on each depth slice of an input. To minimize space size, maximum pooling is often employed in the middle of CNN design, whereas averaging pooling is typically used as the model's last layer.(e.g., AlexNet, ResNet), in cases when we don't want to utilize tiers completely. The frequent common kind for layer is maximum pool, it is however changing such many odd or unusual micro-architectures are created.

(d) FULLY CONNECTED LAYER: As in the study of for word feed networks, network is completely attached to layers are fully linked to all activation's in the preceding tier. Fully Connected layer is applied at the system's end (i.e., we don't apply a CONV tier, then a Fully Connected row, then other Convolutiontier.

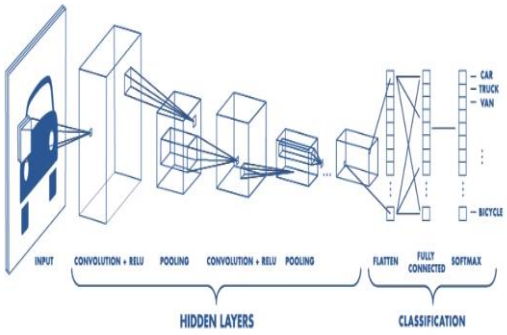

Fig .1 Different Layers of Convolution Neural Network

5. STEPS OF THE METHODS

(a) The ultimate category photos used for preparing are lessen to 224 by 224 pixels for AlexNet and 297 by 297 pixels for GoogLeNet and ResNet50, and the data set is segmented into two classifications: preparing and descriptive sets.

(b) When altering, convert the three systems of a CNNs model with entirely linked layers, soft - max level, and a classifying outcome output. Determine the number of classes within training data set as the final fully linked layer size, t o prepare the network system faster, improve the improving a range settings in the completely linked system..

(c)Exercise the models- set of the options available, including Bayesian models, and validating data, in accordance with the system's Graphical Processing Unit specifications. Using the training data, train your network.

(d) Testing the network's accuracy using the fine-tuned network, classify the confirmation photos and calculate the accuracy of classification. Similarly, for accurate results, examine the finely tuned network model on real-time videos.

(e) It is critical to develop the best metric for a given computer vision problem because accuracy alone is not always the best measure of performance. The presence of imbalanced classes in the data set can skew our results heavily in favour of a model that only accurately predicts the max category, resulting in a more fitnetwork. The metric we choose is also determined by the goal we hope to achieve with the implementation. For example, if we are going to use x-ray images of patients' lungs to determine covid-positive patients, we should choose a model with the highest recall so that a misdiagnosis does not delay corrective actions (appropriate medical treatment) for a patient. Similarly, depending on the objective or goal for the specific implementation, sensitivity and precision may be important factors [10].

6. MODELS IN CNN

There are numerous smart pre-trained CNNs that are capable of transfer learning. As a result, its input layer just demands data set testing and training. The core layers and techniques utilised in network architecture vary. GoogleNet's Inception Modules execute various sizes of convolution operations as well as filter combining from the upcoming layer system. AlexNet, on the other hand, does not use filter pooling and rather than uses the outcome of the preceding layer as described. Both model networks were evaluated individually and employ the implementations of the Caffe Deep Framework. Caffe is a deep learning platform developed for expressiveness, speed, and versatility. Berkeley AI Research (BAIR) and community collaborators work on it. ResNet50 is a complex network with fifty layers system. It is possible to load a pre - trained models edition of the model that has been trained on more than a million photos from the ImageNet base. The pre trained network can categorise pictures into thousand different item classifications, such as keyboards, mice, pencils, and other animals. As a result, the network has learned extensive visual attributes for a wide range of photos. Photo requirement for the model is 224 by

224 pixels. GoogLeNet is a deep convolutional neural network with 22 layers system. It is capable of loading a pre-trained the next model variants of the models that has been training on one of the ImageNet sets. Image-trained model categorize pictures in thousands of item categories, including keyboards, mice, pencils, and other animals. AlexNet is a CNN with eight layers system. ResNet is an acronym for Residual Network. Several other object classification works has profited tremendously from extremely deep models. So, over time, there has been a tendency toward digging deeper, tackling other difficult works, and continuing to increase identification effective results. As we dive deeper, however, neural model training gets increasingly difficult, and performance starts to underperform and which finally declines. Res network seeks to overcome all of those concerns. In general, numerous layers are layered and taught to handle the task at hand in a deep convolutional network. At the end of its layers, the model learns various low/mid/high-level features [11]. AlexNets, Google Nets, and ResNet50 are three existing neural networks that are compared. Transfer learning concepts are then used to train current networks and generate new networks for more analysis. Despite having the same number of levels as the predecessor, the efficacy of the networks and current networks changes dramatically.

7. TESTING CNN DATA

CIFAR 100 image data collection contains a large number of super-classes of generic object photos as well as a number of subclass categories inside each super class. CIFAR100 comprises hundred photos categories, each comprising six hundred photos [12]. These six hundred photos are then subdivided into five hundred training set examples and hundred test data-set for each category, for a total of sixty thousand distinct photos. These hundred categories have been divided into twenty super categories. The subcategories chosen for testing and training include a bed, cycle, bus, chair, sofa, motorcycle, car, table, train, and clothes [12]. Several broad categories of the each super class must be employed for network training in the proposed job; the super classifications used are home furnishings and autos. The chosen categories are listed in the table below. ImageNet datasets were selected as the second example, which comprise super-classes of photos that are even further subdivided. ImageNet is a photo dataset that is categorized using the Word-net hierarchy. The dataset has been categorizedinto useful ideas as described in Fig.2 and each notion in Word Net is defined by a "byword set" or "sync set" of words.

Fig.2 Few of CIFAR 10 Data-sets

Fig.3 Few of CIFAR 100 Data-sets

Each notion in Word Net is defined by a "byword set" or "sync set" of words. There are almost 100,000 sync sets in the data-set. All photos are annotated by humans. In addition, for our investigation, we grouped Image Net's less descriptions into more meaningful groupings that matched the super-class. For example, "table" was renamed "furniture," and many more photos were combined into super-classes to provide a more informative and relevant description. A CIFAR-10 image data-set was chosen as the third dataset for the investigation. The CIFAR-10 dataset contains 32by32 color pictures separated into 10 classes, each with 6000 photos, for a total of 60000 photos. There are 50000 training photos and 10000 testing data in the given set [13]. The data is split into five 7 stages and one test batches, each with ten thousand photos.Table5.1 & Table5.2 test photographs are chosen at random from every categories

Table.1 Success rate of CIFAR10 CNN data-set

CIFAR-10		AlexNet	GoogLeNet	ResNet50
Image Category	Airplane	41.00%	52.10%	91.80%
	Automobile	20.00%	61.10%	66.50%
	Bird	0.02%	55.00%	73.60%
	Cat	0.03%	79.50%	61.90%
	Deer	87.00%	50.80%	74.50%
	Dog	25%	59.60%	81.00%
	Frog	26.20%	91.20%	76.00%
	Horse	38.70%	79.20%	85.57%
	Ship	29.70%	93.50%	84.60%
	Truck	94.50%	98.10%	86.50%

Table.2 Success rate of CNN for the CIFAR 100 data-set

CIFAR-100		AlexNet	GoogLeNet	ResNet50
Image Category	Bed	0.08%	69.80%	50.70%
	Bicycle	20.00%	75.20%	56.00%
	Bus	85.00%	65.30%	40.60%
	Chair	92.00%	90.75%	57.20%
	Couch	12.00%	15.60%	75.50%
	Motorcycle	96%	75.60%	98.42%
	Streetcar	21.00%	0.90%	64.80%
	Table	0.00%	75.60%	34.40%
	Train	32.00%	75.70%	30.20%
	Wardrobe	90.00%	87.40%	95.20%

8. RESULT ANALYSIS

Each network's performance is assessed by running it on the CIFAR100 & CIFAR10set. The precision of several picture categorizations with in CIFAR 100 test data-set is shown in Table 1. For example, Alex Net successfully labels 84 of 100 Bus test photos, whereas GoogLeNet identifies Bus in approximately 63 photos and ResNet-50 accurately labels 37 Bus photos. The predictive performance of CNNs when evaluated on various picture classifications from of the CIFAR 100 and CIFAR 10 test data-set is shown in Tables 1 and 2. AlexNet correctly recognises a horse with 35 of 100 photos, GoogLenet recognises a horse in 78 photos, and ResNet50 correctly labels a horse in 85 photographs. Taking into consideration the probability values generated from the confusion matrix after training for any and all three CNNs, the following is a detailed preview of prediction by three CNNs [14].

Table.3 Performance of BICYCLE data set

AlexNet's Output	Prediction Accuracy (%)	GoogLeNet's Output	Prediction Accuracy (%)	ResNet50 Output	Prediction Accuracy (%)
Motorcycle	48	Bicycle	72	Bicycle	56
Bus	25	Train	14	Motorcycle	34
Bicycle	22	Table	7.5	Streetcar	4.4
Chair	3	Motorcycle	4.8	Couch	2.5
Train	4	Chair	1.4	Bed	1
Streetcar	2	Wardrobe	1.2	Train	1.8
Wardrobe	2	Bus	1.2	Wardrobe	1.8
Couch	0	Streetcar	0	Table	0.5
Bed	1	Couch	0	Bus	0
Table	1	Bed	0	Chair	0

Table.4 Performance of CHAIR data set

AlexNet's Output	Prediction Accuracy (%)	GoogLeNet's Output	Prediction Accuracy (%)	ResNet50 Output	Prediction Accuracy (%)
Chair	91	Chair	88.4	Chair	56
Wardrobe	4	Bed	8	Couch	22
Bus	5	Table	2.9	Bed	7.5
Motorcycle	2	Wardrobe	0.5	Wardrobe	5.9
Couch	2	Train	0.9	Train	5.5
Bed	0	Bicycle	0	Motorcycle	3
Bicycle	0	Bus	0	Streetcar	0.7
Streetcar	1	Couch	1	Bicycle	0.5
Table	1	Motorcycle	1	Bus	1
Train	2	Streetcar	0	Train	1

Table.3 compares the outputs of network layers for the Bicycle class. In those others respect, both network models provides accurate differences on a constant basis. When all tables are evaluated, the maximum accuracy for all photographs across all categories varies. AlexNet predicts a motorbike as the best bet, although GoogLeNet and ResNet50 suggest a bicycle as the best bet for the bicycle class. For other, less prevalent classifications, there remains a significant amount of overlap across various groups.Table.4 displays the outcomes for the Chair category. The predicted label, together with its score, reflects how effectively a certain network recognises an object. When each table is evaluated independently, it is clear that GoogleNet accurately labels and categorizes the majority of the classifications as the CIFAR 100 data-set, whereas ResNet50 recognises an average of classifications in the CIFAR100 data-set. At CIFAR10, however, resnet50 delivers the finest classification performance, while GoogLeNet continue to be poor performer. Considering this, both networks are really quite dependable, with large picks for a small number of categorize. Most classifications appear to be trained for categories with simple, slender traces, including such bobby pins and bowstrings, which appears to be the explanation for this behaviour. As

a consequence, it is natural for networks to make errors in the presentation and properties of things.

Table.5 Accuracy on video feed

Object Category	AlexNet's Prediction Accuracy (%)	GoogLeNet's Prediction Accuracy (%)	ResNet50 Prediction Accuracy (%)	Object Category	AlexNet's Prediction Accuracy (%)	GoogLeNet's Prediction Accuracy (%)	ResNet50 Prediction Accuracy (%)
Bed	13	86	30	Airplane	15	85	95
Bicycle	11	79	55	Automobile	15	60	53
Bus	15	45	95	Bird	13	49	54
Chair	13	46	31	Cat	14	63	50
Couch	13	26	95	Deer	15	49	36
Motorcycle	15	52	36	Dog	12	53	53
Streetcar	13	46	24	Frog	15	55	29
Table	13	65	52	Horse	17	83	62
Train	15	77	43	Ship	16	98	20
Wardrobe	14	57	33	Truck	20	93	56

Alex Net has an average efficiency of 13% in recognizing accurate items in the scene, according to a live examination for the efficiency of CNNs. Similarly, the classification accuracy of GoogleNet and ResNet50 is 68.95% and 52.55%, respectively. The performance of CNNs on photos varies significantly when compared to real testing results. CNNs become confused distinguishing a few things in real testing; for example, ResNet50 frequently has difficulty identifying dog and deer. In most scenarios, it classifies them as horses. The accuracy findings show that GoogleNet outperforms all other networks in terms of performance and detection accuracy.

9. EVALUATION SCORES

Both CNNs generate a probability distribution across the available input classes. The findings were computed using two separate approaches. The first technique simply evaluates the ten most likely classes, but the second records the right class's location over the whole probability range. The first method involves categorizing network possibilities based on their probability and examining only the ten most likely groups. For each image, we determine the number of times each class appears in each pointed classes. This procedure not only enables you to figure out whether a good and substantial possibility is assigned to the successful outcome, but it also allows you to perform a highly subjective analysis of the uniformity of either the research results for every classification, i.e., this is estimated that the best 10 possibilities for every category would no longer differ indifferently. In the nextstep, we can generate descriptive stats on the right ccategory's position in the logical range. This is accomplished by rating the classifier's output. The higher the rating, the more accurate the categorization. The right class should logically be first. For each category, compute the Calculus. A least number co-incides with a better ranking, but a low standard deviation demonstrates consistency of output for separate instances of the same group. Similarly, for the CIFAR10 dataset, the overall average performance of CNN is: AlexNet- 46.12%, GoogLeNet- 61.67%, and ResNet-50- 76.18% [14].

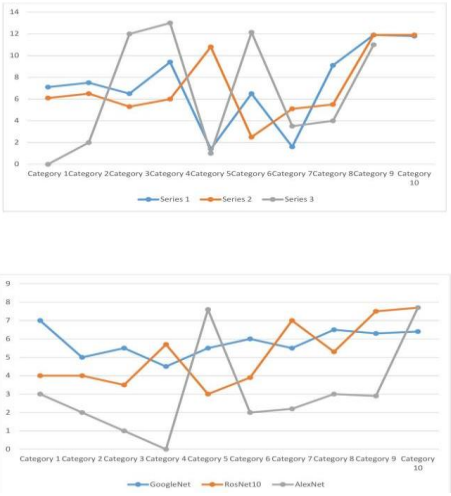

Fig.4 (a) CIFAR100 data-set probability vs category graph (b) CIFAR10 data-set probability vs category graph

10. CONCLUSION & FUTURE WORK

The researchers examined the predictive performance of alternative kinds of CNN employing the commonly used training and testing data-set, CIFAR 10 and CIFAR 100. In each data-set, we only examined the top TEN classes. Our primary objective was to analyse the regularity of predictions utilizing CNN and the accuracy of various networks using identical data-set. We provided a comprehensive prediction analysis to compare the effectiveness of networks for various types of objects. It should be emphasized that complicated frames typically make the network's detection and recognition of the scene more difficult. It was also highlighted that, in the actual world, beds, sofas, and chairs are distinct and readily recognized items, whereas trained networks are not.' accuracy rates vary due to ambiguity. The researchers discovered that trained networks adopting transfer learning beat current ones in terms of precision. Few objects, including such "chairs," "trains," and "clothes", were accurately recognized by 157 layered networks, while "vehicles" were precisely identified by 197

layered networks. We may readily summarize from our studies about the efficiency of 27 layered networks was underrated. As a result, more layers there are, more training there is, and hence the better the performance of prediction analysis efficiency. In conclusion, Artificial neural networks are latest and determining developing strategies for making a computer intelligent for addressing numerous real-world item classification challenges. It is the focus of extensive investigation and effort. It has a wide range of functions and is simple to use and adaptable to a variety of systems. The technical specifications may preclude the network from becoming trained on traditional desktop work, however the network might well be trained and the proper model developed with relatively few requirements. Deep Convolutional Neural Networks offer a lot of future promise, mostly since they don't require any type of feature engineering. Deep Learning collects elements from the data rather than delivering them to it after it has extracted them from the data. This solves our main issue with feature engineering. Furthermore, because features are learnt by the model, it has a higher possibility of developing a model that is more generic than feature created models. These factors alone are compelling enough to choose DL above other technologies. With the recent advancement in Deep Convolutional Neural Networks, we now have more cutting-edge results on a variety of tasks such as Natural Language Processing {NLP}, Language Translation, Automatic Voice Recognition, Multi Label Image Acknowledgement, and Language Generation, among others. Artificial Intelligence has multiplied more times in the last 8 years with Deep Learning than it did in the previous 20 years.

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Driver Drowsiness Detection using Deep Learning

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***Abstract*-Driver negligence and mistakes account for the bulk of current traffic collisions. The three main contributors to serious driving errors are alcohol, inattention, and reckless driving. For the Intelligent Transportation System, this project focuses on a driver drowsiness detection system that looks for unusual behaviour the driver exhibits when using a computer. For ensuring traffic safety, driving assistance systems must be able to assess a driver's level of alertness. By analysing blink patterns and eye movements, driver fatigue can be identified early enough to prevent crashes brought on by drowsiness. In the suggested system, a non-intrusive driver sleepiness monitoring system has been developed using computer vision techniques. The system is able to identify fatigue despite the driver wearing eyeglasses and the degree of interior darkness, according to the simulation results.**

Keywords: Machine Learning, Prediction, Deep Learning

1. INTRODUCTION:

In the modern world, an increasing number of vocations require long-term care. In order to respond promptly to unforeseen occurrences, drivers must maintain a close eye on the road. Driver intoxication plays a direct role in many traffic incidents. Technologies that can identify and warn a driver when they are in a bad psychophysical condition must be developed in order to lessen the frequency of fatigue-related auto accidents[1]. The speedy and precise assessment of a driver's fatigue symptoms is one of several difficulties in the development of such systems. One of the technical alternatives for establishing driver sleepiness detection systems is the use of a vision-based technique. In this study, we describe a simple and customizable vision-based drowsy detection system for bus driver monitoring. The system may be installed in buses and other large vehicles. The system's components include face detection, head detection, eye detection, eye openness estimation, sleepy measure estimation, and classification[5].

The structure of the paper is as follows: Section 2 discusses the proposed architecture, Section 3 explains the performance evaluation and Section 4 provides the description of system design and methodology. Finally, Section 5 concludes the overall work.

2. PROPOSED ARCHITECTURE

The architecture of the proposed system is depicted in the figure 1, which includes representations of all work modules. User input is captured by the camera, and the Drowsiness Detection signal is received[1].

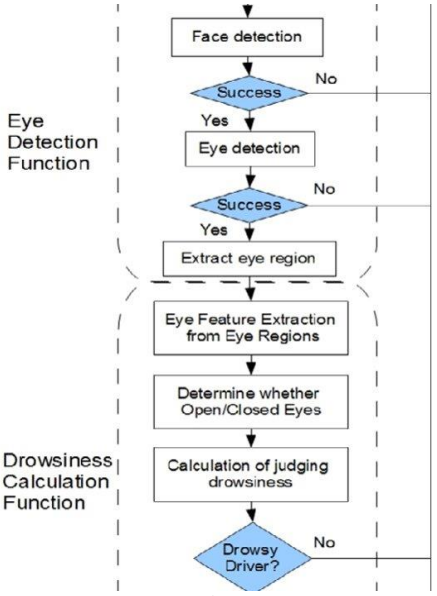


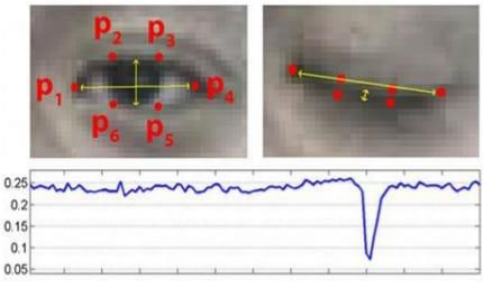
Fig 1. Architecture of the proposed system

This section clarifies the suggested approach to Identify the driver's sluggishness, which undermines two tiers. The driver's mobile device is updated with the application. executing the Android framework (OS). The Android application functions as a ready framework if there is no internet connection and is suitable for use without it. There should be no organization in a far-off place. The face planning is completed inside the cell phone using the Java Dlib library, open CV and it is prepared to produce a reliable alarm for the driver to awaken or pull over[6]. However, the customer worker design is used to remotely monitor the driver and follow the development of the car. The casings are captured from the camera inside the vehicle and are sent off to the worker. In the employee side, the cases are prepared using the Dlib library to arrange the facial tourist areas and edge esteem is correctly determined and an edge esteem is used to identify whether a driver is drowsy. In our situation, the edge value taken genuinely 0.25 modified by the driver seated inside the vehicle would be compared to the Eye Aspect Ratio (EAR) value obtained at the end of the Python application.

This would indicate a weak state if the EAR esteem is not exactly the edge esteem. If drowsiness should occur, the driver and other passengers would receive a warning, and the individual heads or the chief would be alerted to indicate the emergency or risk. The next section explains the specifics of how each module operates.

3. PERFORMANCE EVALUATION

Dlib library was sent and imported into our program in order to remove the drivers' face tourist attractions. In order to identify objects, the library uses a pre-made face indication that relies on a change in the histogram of arranged angles and employs direct SVM (uphold vector machine) methodology. Then a real face milestone indicator was implemented, and the application's detection of facial tourist places was used to calculate the separation between focuses. These distances were used to measure the EAR value.



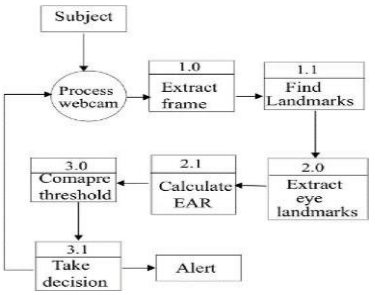
The phase offers the presentation evaluation of the proposed approach by using playing out an observational exam of received consequences. inside the first region, the framework gathers the continuing information of the drivers portrayed by way of Figures 2-a, 2-b and 2-c. It at that point comes to a decision sleepiness of the drivers depending on the EAR esteems which might be figured depending on the pics stuck of the purchaser and its response from the worker. It moreover identifies the sleepiness making use of ECR esteems.

4. SYSTEM DESIGN AND METHODLOGY

In this section, the design of the system is represented using class and deployment diagram. Furthermore, it includes the description of Convolutional Neural Network (CNN), adopted to design the system[3].

4.1 CLASS DIAGRAM

Class diagrams serve as a system's or subsystem's blueprint. Class diagrams are used to represent the system's constituent parts, show how they relate to one another, and explain the functions and services each component performs. In many phases of system design, class diagrams are helpful. Figure 2 represents the class diagram of the proposed system.



4.2 DEPLOYMENT DIAGRAM

These diagrams are used to visualize the topology of the physical parts of any system, where software components are installed, is depicted using deployment diagrams. The static deployment view of a system is described using deployment diagrams. Nodes and Nodes connections are the leading components of deployment diagrams. Figure 3 and 4 represent the deployment diagram of the proposed system[3].

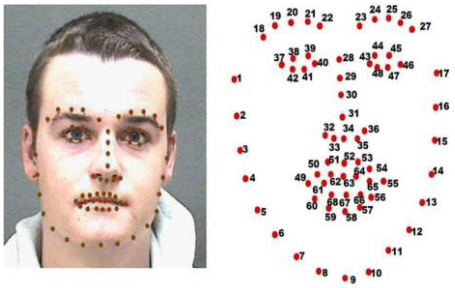


Fig 3. Deployment Diagram of the proposed system

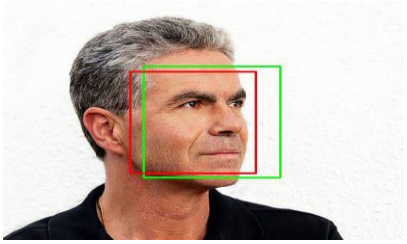


Fig 4. Deployment Diagram

4.3 CONVOLUTION NEURAL NETWORK

Convolutional neural networks is a subset of deep neural networks which is used in deep learning to evaluate visual data. Due to their shared-weights architecture and translation invariance qualities, convolutional neural networks are frequently referred to as shift invariant or space invariant artificial neural networks. The regularized version of CNNs are multilayer perceptions. Multilayer perceptions are often fully connected networks, which means that all

of the neurons in one layer are connected to all of the neurons in the layer above. These networks are susceptible to data over fitting because of their "full connectedness." One typical method of regularization involves adding some kind of magnitude measurement of weights to the loss function. CNNs employ the data's hierarchical structure to piece together more complex patterns from smaller, simpler patterns, which is a distinct method to regularization**.** As a result, CNNs are at the bottom end of the connectedness and complexity spectrum**.**

The following steps are in the CNN-based approach:

Step1: Firstly, import all the required libraries.

Step2: Change the tabular data into a data frame for obtaining a format and check it for classifier analysis.

Step3: Once the data has been converted, load it into Python and separate our dependent variables from independent variables. Create a train set and a test set from the dataset.

Step4: Build classifier model.

Step5: Put the model to train set..

Step6: Finally, calculate the accuracy and print the output.

5. CONCLUSION

Drowsy, drunk, and risky driving behaviours can all be quickly detected by the specially designed driver abnormality monitoring system. The driver's eye closure serves as the basis for the Tiredness Detection System, which can discriminate between a regular eye blink and tiredness as well as detect drowsiness while driving. The proposed system can aid in preventing accidents brought on by fatigued driving. The device works well in low light conditions even if the driver is wearing glasses if the camera output is increased. Information on the head and eye positions is gathered using a variety of self-created picture processing techniques. Whether the eyes are open or closed while being monitored can be determined by the technology. When a driver's eyes remain closed for a lengthy period of time, a warning signal is given. Eye closures that occur continuously are used to gauge the driver's level of awareness.

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Data Transmission using Li-Fi

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***Abstract*—Light fidelity, also known as optical Wi-Fi, is abbreviated as Li-Fi. A light-based communication technique called Li-Fi makes use of light to convey data at rapid rates from across visible, ultraviolet, and infrared wavelength spectrums by shifting the intensity of the light more quickly than the eye can percieve. The LED Visual Light data transmission method is utilized for data transmission in which visible light within a specific frequency range is used as the medium of communication. This amounts to at least 1 Gbit/s of data speed. In comparison, the highest feasible data rates for Wi-Fi are 100 Mbits/s, which is at least ten times lower. This paper introduces a few innovative conceptual ideas for parallel data transfer using VLC technology. We will be able to use each light bulb like an area network connection and transport information with rate up to 10 Gbits/s if this application is implemented.**

Keywords: Li-Fi, LED, Wi-Fi.

1. *INTRODUCTION*

During the twenty-first century, the internet has become a basic requirement for all humans since data and information transfer is critical for day-to-day daily activities. LEDs have been studied as a possible source of energy-efficient lighting. LEDs in red and amber are now commonly employed in traffic lights and automobiles. During 2011 TED International Conference, Researcher Harald Haas of the University of Edinburgh's Department of Mobile Communications introduced the idea of "data transmission from every light-bulb [1]," which is how the name "Li-Fi" was first coined. In 2011, physicist Harold Haas presented a new method that might overcome concerns with increased data transfer by using the notion of light to generate light waves instead of radio waves, which were previously employed in Wi-Fi. The Li-Fi technology may share information using an LED light bulb, which consumes very little electricity. It may provide excellent security, wide data transmission capacity, and convenience of use at a reasonable cost. Transponders would be used by Li-Fi furnished with lights bulbs that It could transmit and receive information, as well as illuminate a space by incorporating new and underutilized infrared and visible band into existing accessible radio frequencies for transmission of information. This takes advantage of under utilized visible part of the electromagnetic spectrum. Because Wi-Fi has some restrictions, Li-Fi may be regarded superior. Wi-Fi employs a radio frequency of 2.4-5GHz to provide wireless internet connection, and its capacity is restricted to 50-100Mbps.

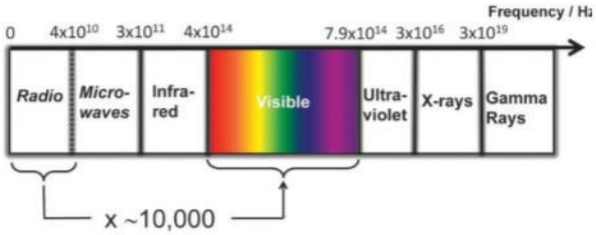

Figure 1. Light Spectrum

Another possibility is that Li-Fi is a more mobile variant of Wi-Fi. With simple terms, this uses light to transfer data instead of electromagnetic radiation. Light scattering inside a particular spectral region is used as the data transfer medium in the Free - space optical Transmission method of communication. VLC has a visible light frequency range of 400 to 800 THz. VLC uses the notion of data transmission by light waves to convey messages over a defined distance. Using LED lights, VLC may be used to substitute radio frequencies in situations where they cannot be utilized. Additionally, VLC has an advantage over RF signals since this offers both wide capacity and super duper data delivery. It's been notably evident, among other places, at signalized intersection. This raises questions regarding its applicability, functioning, especially areas where it is most suited due to its complexity. Visible light has no effect on eyesight. Light has not materially impacted our way of life throughout millions and millions of years. As radio-based wireless communication devices become more widely used, more and more devices transferring more and more data. However, the accessible radio spectrum is restricted. LEDs are solid-state semiconductors that, unlike traditional incandescent and fluorescent lights,

can be controlled and switched at high speeds in the same way as any other electronic appliance can. VLC alternates an LED bulb instead of a Bluetooth transmitter; naturally, a light sensor serves as the receiving end's aerial.

2. LITERATURE SURVEY

Today, the vast majority of people use Bluetooth networking devices, therefore 2.4-5 Gigahertz RF will be useful for providing wireless connectivity across homes, offices, classrooms, and some crowded places. Although Wi-Fi may now span a whole workplace, frequency is currently restricted to between 50 and 100 Mbps. Although the newest web servers have become accessible, they are inadequate for transmitting massive data items such as NDTV videos, audio collections, and games consoles. As a result, RF technology (Wi-Fi) is not the greatest option right now. Furthermore, Wi-Fi might be the least effective method of supplying new critical capabilities like as machine vision and accurate inside location. VLC (visible light communication) was first proposed around 1880.Once Alexander Graham Bell invented the telephone with a camera, he used this technique for the first time. The system used modulated light to convey speech over long ranges. Nevertheless, the idea was not generally adopted at the time since it was centuries ahead of its era. Technology therefore paved the way for delayed messaging services, which never really took off. Consequently, when fibre optic connection became introduced throughout the 1980s, this functioned as a general direction. Afterwards around 1995, students at the Universidad of Buenos Aires expanded upon that idea, creating a laser diode used in photodiode detection. In 2003, three Japanese academics of Keio University continued to develop the idea of Lighting system. Because it existed, advanced technology could be controlled and adopted by people. In 2006, CICTR study integrates transmission lines networking with Light bulbs to provide a number of interior VLC applications. As a consequence of several technological advancements and modifications throughout the years, a broad variety of applications—including High Definition films—have been produced. Such effective methodology the transportation, banking, and exactly known between 2010 and 2017.

In terms of transmission speed, usability, customization, and consistency, wireless technology represents a whole breakthrough. VLC is now accessible as a potential worldwide wireless spectrum management alternative. Now there is a quick and low-cost optical alternative of Wi-Fi technology. There is currently an optical communication channel that employs light as a transmitting antenna for light illumination only between 4000 THz and 375 THz. By altering the jitter rate, the information is converted into light to produce a binary code, and it displays the communications source by modifying the Light source with the transmitted data [4]. When compared to the radio signal range, this object over here currently has an entire new platform of opportunities, and it also has a 1000 times bigger radio wave spectrum. It is also now 1000 times greater in size. Visible light is presently available, is not detrimental for human eyes, and is a necessary element of construction.

3. PROPOSED METHODOLOGY

Building and implementing a wireless data receiver and sender devices that rely on Li-Fi advanced technologies and the Arduino Microcontroller is the present objective of this paper over here. Figure 2 below shows the approach of wireless transceiver described in this object over here paper. Currently, the microcontroller-equipped Arduino UNO circuit is linked to a computer-based transmitter circuit. The receiver will acquire the signal through the detector, while the Arduino Microcontroller will generate three LEDs, which are now the three principal colours of the device delivering the Li-Fi. Currently, the transponder and Li-Fi are used to direction of flow the sound wave from the system. It is picked up by the detector and sent analogically to the storage server after being detected.

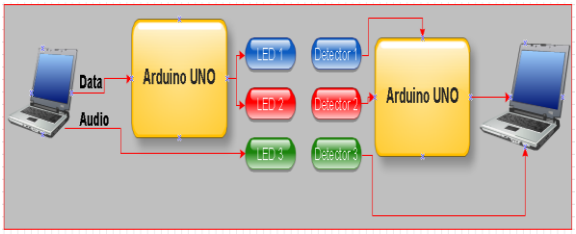

Figure 2: Wireless data transceiver setup

A. Working of LI-FI

Led lamps (LEDs) may turn up and then off rapidly than the human visual system can perceive since their efficiency is less than - 1m, giving the appearance that the source of light is flickering. Use this undetectable operation consistently to allow binary coding for data transmission. By adjusting the pace at which lights flicker turning on and off, it is feasible to encode and decode in illumination. This will result in different combinations of 0s and 1s when the rate of Light flickering is changed.

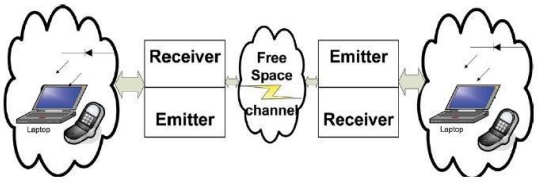

Figure 3: Basic visible light communication

Li-Fi setup at the plunging broadcaster typically uses LED fluorescent lighting. The main purpose of these gadgets is to deliver constant current for lighting. Li-

Fi is a faster and more inexpensive kind of wireless connection since it transmits information using lED bulbs rather than RF waves. Li-Fi can provide data speeds of more than 10 mbps, which is far quicker than our current internet service. LED lights have microchips built within them that can easily transform light into digital form by detecting variations in light flicker. You can send an encoded data when the Lightbulb is on, but you can only send 0 when it is off. It is possible to communicate data by swiftly turning the Lightbulb off and on. This method has been improved by creating an array of parallel-operating LEDs for data on a combination of green, blue, and red LEDs to distinguish a light frequency, with each light frequency stored in separate data channels. With a possible capacity of 10 gigabits per second, this type of development ensures that an entire HD movie can be streamed in under 30 seconds. All information is communicated to the lamp driver when the Light bulb is turned on at the receiver end. The LED's microchip transforms logical data into light from digital data. In order for the eyes to recover the information and data utilising a straightforward Li-Fi device, the photo sensor in the lightbulb captures the incoming optical pulses and turns it back into the initial and digitized form.

B. Software Block

There is currently a microcontroller with a memory block and a programme that is burned into it to control the hardware.

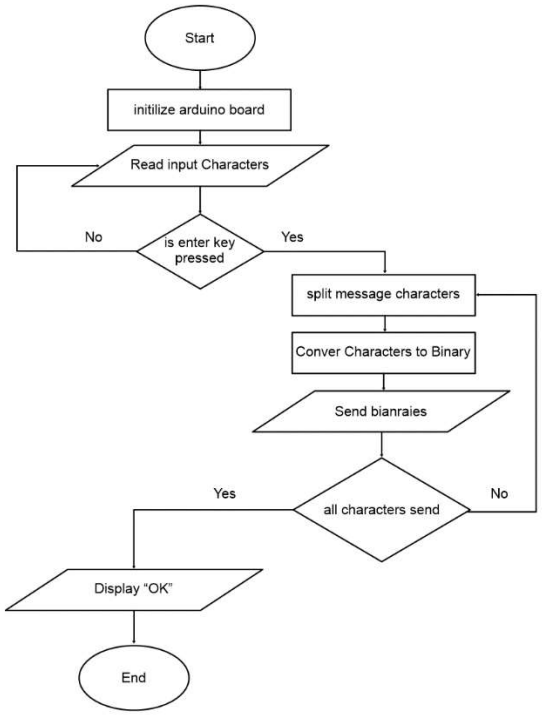

Figure 4: Computer model

C. Detection of light

Since the optical sensor was employed to transform light gathered into a dc energy, however the photodiode has become asymmetric, the 100k-ohm potentiometer was just utilized as a potential source to the real output in order to transfer the message to the Microcontroller.

4. MERITS OVER WI-FI

Led lights are used in Li-Fi, a relatively new method that utilizes internet connectivity. Instead of using the radio frequencies, it uses the visible wavelengths of light. Li-Fi devices employ light bulbs for broadcast and photo-detectors in the receivers as opposed to Radio communications systems, which need directional antennas for communication. Li-Fi has its own special circuit simulation wiith different types of equipment. Li-Fi can now deliver exceptionally high data speeds since the infrared and visible range is 10,000 times wider than the RF signals. The visible wavelength spectrum is now unrestricted and available for usage. In addition to these features of Li-Fi connectivity, power luminaires are currently available everywhere. Additionally, it has a fundamental circuit, which acts as a built-in security measure because light cannot flow through barriers. Furthermore, multi-path fading is not an issue with Li-Fi systems like it is with Radio communications systems. In addition, Li-Fi systems are now more affordable and safe than Radio communications systems.

A. Capacity

The capacity to provide high data rates is currently the most crucial characteristic of Li-Fi technology. The current top limit on bit rate in network technologies is channel capacity. The Shannon-Hartley theory states that the highest bit rate (rmax) is presently proportionate to the channel capacity that is accessible. Since functioning in the visible wavelengths indicates a more bandwidth, this will gradually result in a greater potential bandwidth (b) and bit rate[6].As seen in figure 4, the near infrared spectrum now spans (1014-1016) Hz whereas the radio system spans (104-1012) Hz. Because of this, we may all attain data speeds in the 2.4-GHz band or greater by utilizing this object's technology.

B. Complexity

Li-Fi is a fairly straightforward concept when compared to radio technology. Currently, it operates on stimulated emission and simultaneous audio decoding, together with an illumination on the transmitter side and a photo-detector on the receiving side. But every wireless network infrastructure, including Wi-Fi, needs a challenging Radio frequency device to generate the data and an aerial to broadcast it. Furthermore, because it needs a sequential decoding circuit and a receiver module, radio receivers nowadays are more powerful.

5. RESULT

This item over here is an Arduino-based wireless data receiver and transmitter that was conceived, constructed, and experimentally validated. The problem with this endeavour over there was unsafe radio frequency-based bluetooth connectivity. The daily usage of radio frequency connectivity may have negative health effects in addition to induced electric interference degrading radio frequency-based transmission. It may now be used in places like clinics, aeroplanes, and hazardous buildings where Radio frequency transmissions are now prohibited. Additionally, Li-Fi may now be utilised to manage traffic and lessen accidents. Additionally, it is already capable of providing communications for submarines. Even Li-Fi can now easily link us to the internet outside as long as we are all adjacent to LED lights. Li-Fi is also now effective in academic system, where a phenomenally increased data speed is now required for multiple clients. The combination of Wi-Fi and Li-Fi networks, which would combine the advantages of both technologies, was another potential use that was originally thought about there. The aggregated conjunction approach has been shown to give the best results out of the two types of such combinations—pairings and amalgamation.

6. CONCLUSION

Light bulbs are used in Li-Fi, a relatively new method that employs internet connectivity. Instead of using the radio spectrum, it uses the spectrum of visible light. Li-Fi systems employ light bulbs for broadcast and photo-detectors in the reception as opposed to Antenna systems, which need arrays for both the receiver and transmitter. Li-Fi can now deliver extremely high transmission rate since the infrared and visible range is 10,000 times wider than the frequency band. Additionally, Li-Fi technology now allows for the expansion of the idea of bits in Wireless connections to optical attocells. It has been shown that the hcpp performs best for random deployments of optical applications, whereas the object over there hexagonal pixels architecture performs best for predictable installations. Multi-user connection in Li-Fi was the final application suggested and is already accessible. Currently, a significant number of clients can be served using the Noma technique at high data rates. There will be more practical uses of this technology in the future because it is still in its infancy.

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Study of Various Wireless Technologies: Infrared, Bluetooth, NFC, Wi-Fi & ZigBee

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Abstract-In this paper, a relative comparison of various wireless connectivity techniques with supplemented data is discussed. It consists various connectivity methods like Bluetooth, Infrared, Zigbee, NFC and Wi-Fi. Today's world is emerging into more advance world in which advancements of these technologies is emerging day by day. To efficiently use these techniques, we have to analyze about the pros and cons of each technology.

Keywords: Infrared, Bluetooth, NFC, Wireless connectivity, Wi-Fi, Zigbee.

1. INTRODUCTION

Transmission of data or information from two or more points without any physical connection is done with the help of various wireless technologies. Transmission of the information can be done through any distance either be short or long. Many things can come under the examples of the points of connectivity such as mobiles, GPS, computers, etc. With physical lines or cables it was not feasible to transmit data or information to a distant point, imagine sending an image via cable between two different countries, how much of long wires and maintenance of those wires would cost. On the other hand Wireless communication can send data or transmit data from one country to another just in a minute with the help of such technologies in a very cost effective way. Also there is a huge risk in physical connection and transmission of data in them it could be easily accessible to anyone who knows the path of it. Wireless connections are faster and more secure than that as the data transmitted through wireless technologies is encrypted and cannot be decrypted without the knowledge of some special codes.

2. Different Wireless Connectivity

A. Infrared

It allows communication within a limited range. It uses line-of-sight propagation, through which communication can be bidirectional. Infrared transmission uses the electro-magnetic radiation spectrum, which has a longer wavelength as compared to visible light. The main reason for using this is to overcome short-range transmission issues. Thus, it has been used in many device that are easy to use and carry, like mobiles, printers, etc. The main characteristics of infrared are that it is very efficient, the data transfer is secure, and the bit rate error is low.

The infrared transmission technique works by continuously emitting IR light and attempting to catch the reflected IR light at the receiver end. When the IR light transmitted gets bounced off of different objects and the receiver catches it, this phenomenon helps in object detection as well. It is mainly used in televisions and other low-frequency devices, as the processor and sensor must be in plain sight. Infrared is basically divided into four parts:

- Far far Infrared: 40,000-1milimeter
- Far Infrared: 6000-40,000 nm
- Near Far Infrared: 1500-6000 nm
- Near Infrared: 750- 1500 nm

In 1993, over 50 companies founded the Infrared Data Association (IrDA). IrDA specifies a comprehensive set of protocols that are used for infrared wireless communications and the term "IrDA" applies to that set of rules as well.

B. Bluetooth

Bluetooth, which employs Frequency Hopping Spread Spectrum (FHSS), is a short-range wireless communication technology in order to reduce interference. Bluetooth radios operate in a limited range around 2.4 GHz, using 79 distinct radio frequencies. Bluetooth communication has a range of 0 to 100 meters, depending on the power of the devices. Bluetooth devices are further divided into three parts:

- Class 1
- Class 2
- Class3

Types of Data transfer are:

- ACL (Asynchronous Connectionless)
- SCO (Synchronous Connection Oriented)

Bluetooth is available in a variety of versions. This technology works on only two concepts, which are Bluetooth profiles and Bluetooth protocol. This

technology's operations are specified by the Bluetooth protocol, and its application is specified by Bluetooth profiles. The Bluetooth Special Interest Group (SIG) employs its own stack of protocols instead of the OSI or TCP/IP models. Bluetooth profiles exists, like AVRCP, BIP, A2DP, BPP, DUN, FTP, HDP, HFP, HID, HSP, PAN, PBAP, OPP, OBEX, SDP, MAP, etc. Each profile has its own purpose, like A2DP, which is used for the transmission of the audio.

C. Near Field Communication (NFC)

Near Field Communication (NFC) standards enable smart devices to transfer data or information when come closer like for some centimetres or by touching. A non-powered chip known as a NFC tag can be used for such communication. NFC is an improvement on radio-frequency identification (RFID) technologies because it enables two-way communication between endpoints. Initial systems, like smart cards which has NFC was used to do transaction and it was only one way data transfer or communication between endpoints. As theses unpowered NFC tags can be easily read by such devices, it can be a good substitute to the initially used systems. NFC works under 4cm contact of wireless short range devices. NFC runs at 13.56 MHz over the ISO/IEC 18000-3 air interface, with speeds ranging from 106 to 424 Kbit/s.

NFC includes two points, one is the initiator and the other is the target; the former actively generates an RF field that may power the latter. Therefore, NFC targets may adopt simple designs like tags, stickers, key chains, or cards that don't need batteries. When both devices are powered, NFC peer-to-peer communication is available. These tags are used for only read only purpose but also they can be rewritten to hold any data.

They may be factory-encoded or employ the specifications published by the NFC Forum, an industry organisation tasked with promoting the technology and establishing critical standards. These tags can hold loyalty programme data, networking connections, also pins and information of debit or credit card such type of personal data also can be safely stored in it. On the basis of their basic capabilities in terms of communication, memory, configurability, data retention, security, and write endurance, the NFC Forum classifies tags into four categories. The memory capacity an NFC tag varies from 96 to 4096bytes. NFC standards comprise communications protocols with the help of data exchange formats and are based on FeliCa RFID and ISO/IEC 14443. The NFC and ISO/IEC 18092 Forum, which was created by Philips, Nokia, and Sony in 2004 and today has more than 160 members, are among the standards.

D. Wireless Fidelity (Wi-Fi)

Through the use of radio waves, wireless fidelity (Wi-Fi) may transfer data between a device and a router. Computers on a Wi-Fi network may communicate with one another, as well as with the internet and a wired network. Wireless fidelity (Wi-Fi) sends data between a device and a router via radio waves. Computers link to one another, the internet, and the wired network through Wi-Fi.

There are two radio wave frequencies, 2.4 GHz and 5 GHz, used based on the amount of data transmission. These bands are qualified by the Federal Communications Commission (FCC). The frequencies utilised by 802.11 are specifically in the "unlicensed bands," which are frequency ranges that anyone can be able to utilize for the radio communication without even a license. The specific frequencies employee's uses are determined by whether the system adheres to these parameters:

- 802.11 high rate
- 802.11a
- 802.11g WiFi

A relative comparison of various IEEE 802.11 standards in terms of frequency band, speed and coverage area is shown in Table 1. There are three protocols by which Wi-Fi is secured:

- **WEP:** Wireless Equivalent Privacy, It was designed to provide a security and privacy level as compared to LAN (Local Area Network).
- **WPA:** Wi-Fi Protected Access, it was later on designed by Wi-Fi alliance to provide much better privacy and security as compared to WEP
- **WPA2:** Wi-Fi Protected Access 2 is the post generation of the WPA.

These security measures not only keep data hidden and communications secure, but they also prevent hackers from accessing the same network. When comparing these, WPA2 is the best choice, but it also uses more processing power than others. Bluetooth and Wi-Fi use the same spectrum, but due to Bluetooth's lower power consumption, they do not interfere with Wi-Fi. Bluetooth employs FHSS, which hops in 79 distinct channels at a rate of 1600 hops per second and a width of 1 MHz. Whereas Wi-Fi employs DSSS in 11 channels 22 MHz wide and 83 MHz wide, which is equally divided into 11 channels, any channel does not change its frequency and remains only on one channel.

TABLE I. CONTRASTING VARIOUS IEEE 802.11 STANDARD [1-8]

Criteria	**Various IEEE 802.11**		
	802.11a	***802.11b***	***802.11g***
Bandwidth speed	Less Intrusion, more bandwidth	Less speed	More speed than 802.11b
Frequency Band	5 Giga Hertz	2.4 Giga Hertz	2.4 Giga Hertz
Speed	54 Mega Bits Per Second	11 Mega Bits Per Second	54 Mega Bits Per Second

Criteria	Various IEEE 802.11		
	802.11a	***802.11b***	***802.11g***
Coverage	It is not used that much, and have less area coverage	Considered as best in all range	Good coverage than 802.11a but not better than 802.11b

E. ZigBee

ZigBee is an IEEE 802 personal area network standard for high-level communication protocols employing tiny, low-power digital radios. It is a wireless protocol that is majorly used in communicating with different smart devices, such as light bulbs, smart locks, motion sensors, etc. By connecting ZigBee to a smart home controller, you can use the full potential of home automation. It has a rate of 250 kbits/s, which is the most preferable rate for single transmission from input devices.

ZigBee offers the user stability, security, affordability, lower power requirements, and firmware updates. It is also widely used in wireless monitoring control due to its low cost. Its stability is described as such that when any of the devices goes offline, it automatically reroutes itself; we can also call it a self-healing network. ZigBee uses 128-bit AES encryption, which is identical to the systems used in online banking. Due to its low power requirement, it can offer greater battery life and a small size. The services that ZigBee offers (OTA)—over the air firmware updates are provided for the devices to be up to date. These devices are differentiated into 3 types: ZigBee End Device (ZED), ZigBee Router (ZR), and ZigBee Coordinator (ZC).

II. COMPARATIVE ANALYSIS

Every wireless communication tech can be differentiated by some criteria. Differences among all wireless techs are stated in the Table 2.

TABLE II. COMPARISON OF VARIOUS WIRELESS TECHNOLOGIES [1-8]

Standard	Various wireless technologies				
	Infrared	***Bluetooth***	***NFC***	***Wi-Fi***	***ZigBee***
Governing Body	Infrared Data Association	SIG	NFC Forum	Wi-Fi Alliance	ZigBee Alliance
IEEE Specification	802.11	802.15.1	802.2	802.11a/b/g	802.15.4
Frequency Band	875 nm	2.4 GHz	13.56 MHz	2.4 GHz, 5 MHz	868/915 MHz, 2.4 GHz
Data Security in CRC	16-bit	16-bit	32-bit	32-bit	16-bit
Bandwidth speed	Less Intrusion, more bandwidth	Less speed	Less speed	Less speed	More speed than 802.11b
Data Transfer Rate	4 Mbit/s	3 Mbit/s	424 Kbit/s	54 Mbit/s	250 Kbit/s
RF Channels	50	79	1	14	1/10, 16
Standard Range in meter	0.2 to 1	1 to 100	Less than 0.2	100	10 to 100
Spreading	PPM	FHSS	NA	DSSS, CCK, OFDM	DSSS
Max number of nodes	2	8	2	2007	>65000
Modulation type	pulse	GFSK	ASK	BPSK, QPSK, OFDM, CCK, M-QAM	BPSK (+ PSK), O-QPSK
Encryption method	NA	E0 stream cipher	AES	(WEP), AES block cipher RC4 stream cipher	AES block cipher
Basic Cell	Point-to-Point	Piconet	Point-to-Point	BSS	Star
Authentication	NA	Shared secret	In-built	WPA2	CBC-MAC

3.CONCLUSION

In this paper, we can draw conclusions about the differences between various wireless technologies and which technology is best for a given user. The comparison is done on the basis of frequency, range, transfer rate, etc.

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Analysis of Basin Type Solar Still Water Distillation

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***Abstract*- The main objective of this research is to manufacture and analyze the performance of sun powered water refining framework that has refined the water, which is polluted by utilizing a methodical plan should have minimal expense for manufacturing and acts in view of environmentally friendly power of sun oriented. There is less sum of water just left on the earth which is protected to take without refinement to next 20-25 years. The vast majority of the water of earth is in a strong state and other sullied structure and the left over is in liquid form. This is the main reason to accumulate the purification of water. The purposes the sunlight based still is developed which will change over the debased water into un adulterated water rushing the sustainable sun powered energy. The approaching sun powered radiation from the sun is warming the water, which put in the bowl in debased structure, and this water gets dissipated and cooled into the usable water.**

Keywords: Water Distillation, Solar System, Cabin Temperature, Environment Temperature.

1. INTRODUCTION

Sun based refining has been rehearsed for quite a while. The principal huge scope sun-based distillation plant that was developed in 1872 at Las Salinas, Chile, and comprised of sun powered stills of about 4700 m^2 all out region, creating around 23,000 l/day. Sun oriented refining is reasonable for remote, dry, and semiarid regions, where drinking water deficiency is a significant issue and solar radiation is high. The disadvantages to involving sun powered energy for refining are the high initial cost and the discontinuous idea of the sun. Those plants are little to medium-limit installations serving a small number of individuals and poor communities. Since, the (1980) no enormous limit sun based refining plants have been fabricated, basically for the accompanying reasons: Large installation regions are required, sun oriented distillation plants have low efficiencies, and sun powered driven desalination has been created, which now and again can supplant sun powered distillation [1-2].

A sun oriented still is made out of basic gear, which acts at the same time as a converter of solar radiation into nuclear power and gives stock piling to the intensity. Most of the solar stills have no pragmatic applications. Studies have focused essentially on expanding yield by different means; however this prompts an increment in capital or operation cost, so these are highly applicable in large applications. They can be effortlessly built from neighborhood materials and effectively operated

The one of the techniques to cleanse the dirtied water called sunlight based water refining system and it tends to be call as sun oriented still. It is a framework used to refining of water. In our undertaking we have built dark covered sun oriented stills and figure out the covering that is more efficient experimentally. Single basin basin stills are easy to fabricate at low price in refining water with a high complete broke down salt substance and microscopic organism's removal. The normal water creation is around 0.5 liters per square meter each sun hour. The single basin sunlight based still can be utilized for water refining.

The glass at the bowl used to permit the sunlight to go through it to accomplish the water. The examination made with the distillate showed that expulsion of salts is viable with a refining of normal water, the qualities of chlorides and sulfates in distillate are basically than 2 mg/L and zero separately. From the water, salt content was removed, which reached values greater than 80%.The performance assessment did on the created Sun based Still has demonstrated the way that it can be used for the salty water desalinization. The results have shown that a high enough temperature was accomplished which delivered vanishing and the distillate delivered and that is un adulterated can utilized for drink. The sun oriented as yet having a limit of 79355cm3 and produces a yield of 0.39litres.

This is an apparently intense assertion, yet it is sadly obvious. Just 1%of Earth's water is in a new, fluid state, and practically this is all contaminated by both diseases and poisonous synthetics. Consequently, sanitization of water supplies is very important. Keeping these things at the top of the priority list, we have contrived a model which will change over the messy/saline water into unadulterated/consumable water utilizing the sustainable wellspring of energy (for example sun-based energy). The water fume structures as drops on an overlying cover (generally glass) that are diverted and collected in a different bowl as freshwater. Sun powered water distillers are basically and relatively cheap advances that give elective wellsprings of freshwater in water focused on areas. The components and fabricated solar distillation are shown in fig. 1 and 2.

Salt water or delicate water can be utilized to create safe drinking water, while all the more vigorously dirtied water, for example, water ought to just be utilized for non-drinking purposes, for example, modern water reuse, except if also treated. Little and simple sun based water distillers are typically worked for single families, however bigger mechanism to improve its applicability [3].

This investigation presents a generally summed up presentational view of the examination work to be talked about on the sun oriented still. The flow survey paper also includes the imbued emergency and battle for getting new water for drinking reason and consumption for other family exercises which are a consequence of the environmental imbalance that has won and is in continuation for past numerous hundreds of years. The utilization of sun-oriented desalination technology is examined extravagantly for a more extensive utilization to be utilized in the current and future works.

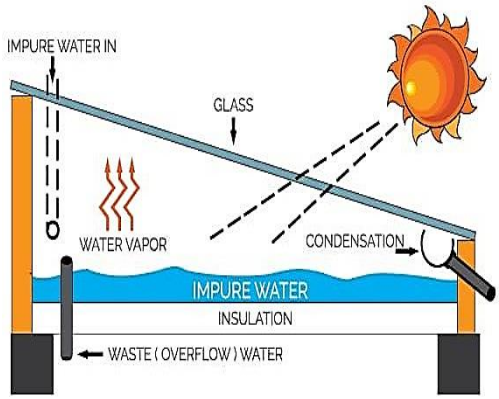

Fig.-1: Components of Solar Distillation

Fig.-2: Fabricated Distillation Set-up

2. LITERATURE REVIEW

Mehta et.al. Recorded the maximum evaporation scheduled of 11:15 am to 1:30 pm, the greatest temperature they accomplished was 53◦ C at 1:30 pm and afterward the temperature diminishes. They filtered 1.5 liters of water by adding 14 liters of brackish water to their sun based distiller. The TDS level of filtered water acquired by them was 81PPM [4]. Kalita et. al. reviewed recent developments in solar distillation unit. They emphasized to introduce an exhaustive survey of the impacts of different working boundaries, such as solar force, air velocity, temperature, water-glass temperature difference, free surface area of water, temperature of gulf water, glass point and depth of water, on the presentation of sun oriented refining units. They detailed 3.5 liter perm2 in the passive solar still [5]. Jadhav et.al. Planned, created and investigated the sun based still for purification of water. They fabricated four solar stills of different capacities. They analyzed pace of refined water creation. The most elevated was recorded between 11:30 am to12:30 early afternoons. The recorded pH was 7of refined water. The TS, TDS, TSS, sulfates, phosphates and chlorides were decreased to no after the sunlight based refining in all the four solar stills [6].

Bhattacharyya performed the experimentation on solar stills for distillation of water in rural households. He upgraded the sun based still variant by capillarity abilities, which gives high result. The heart of capillarity actually is texture which works with high dissipation of water at least heating and cost-effective manner [7].Jaime et al analyzed the effects on water yield utilizing Fresnel focal point. Their average test delivered 47.1 grams of water, contrasted with the 32.6 grams created by the control as yet during 120 minutes preliminary. The Fresnel glass has expanded practically 44% of water production [8].Jain et al assessed the most effective calculations of the distiller and box concentration system, that maximizes evaporation and build up and recover squander intensity to limit warm misfortunes. They designed a framework consolidating explanatory sun powered box combined with a custom designed distillation gadget [9].

Gugulothu et.al. Utilized nuclear power stockpiling to build their proficiency and result of solar power. They tested blend of sun global positioning framework combined with PCM,dyes, wipes and nano materials. They demonstrated that idle intensity stockpiling (LHS) one of the effective approaches to putting away nuclear power. It gives higher capacity thickness a smaller temperature difference between storing and releasing energy [10].Sifat et.al. Explored the improvement of various parameters of refining process. They created a sun based as yet centering the expense and effectiveness towards water purging. They additionally did hypothetical examination of an unbalanced solar distiller is presented. They estimated maximum output in the month of March and April [11].Kumar et.al. Assessed plans of seven kinds of solar stills. The greatest yeild was seen in rounded solar still combined with pyramid sun based still due to concentrator impact. The concentrator effect played a

vital role to increase the water temperature upto 95◦C [12].

Hasan and Tiwari included the sun based refining system such single and two fold incline sun oriented still. Taking into account 15, 30 and 45degree slanted slope. They tracked down that energy, exergy and encapsulated energy of single slant sun oriented still are found higher than the two fold incline sun powered still [13]. Medugu et.al. Analyzed the heat and mass transfer mechanisms inside the still. They probed refining execution of the solar still. Their framework had refining effectiveness of 99.67% when contrasted with the theoretical analysis [14].

2.1GAPS IN LITERATURE REVIEW

In open writing, it has been accounted for that, few boundaries. Aside from adjusting the state of sun oriented still (single or twofold slant, single or multi basin, square and three-sided pyramid, semi-circular and round, and cylindrical sort, the research persons evaluated the various modifications like cooling of various elements like fins, glass covers, nano-particles, streak evaporator etc. Not very many works has been reported in the literature by considering the local conditions of greater Noida. Thus, endeavor has been put to create an efficient based sun oriented still and gather the experimental data at our institute premises.

There is an incredible need to track down ways of providing water for the World's populace. Various nations are doing the water shortages as well as have residents those have to drink and use the contaminated water. Tracking down various ways of utilizing our sustainable assets (for instance, sunlight-based power) has become an interest. Sunlight based water refining is the most common way of utilizing energy from the sunlight to isolate freshwater salts free or different pollutants.

3. METHODOLOGY

Construction of Solar Still

Galvanized Iron (GI) box of length 10 cm, breadth 5 cm and height 10 cm is fabricated for the base. The length, breadth and height of solar still are 61 cm, 63 cm and 38 cm, respectively. The opposite side and angle of inclination have been taken as 15 cm and 30 degree. The effect of gravity is used to slip the water on the glass surface. A straight forward hermetically sealed cover that encases totally the spaces above the basin. It has a rooftop like shape. The cover, which is of glass, is inclined towards a collection trough. Sun based radiation goes through the cover and is consumed and changed over into heat in the dark painted aluminum surface. Tainted water in the bowl or plate is warmed and the vapour created is dense to refined water on the cooler inside of the glass rooftop.

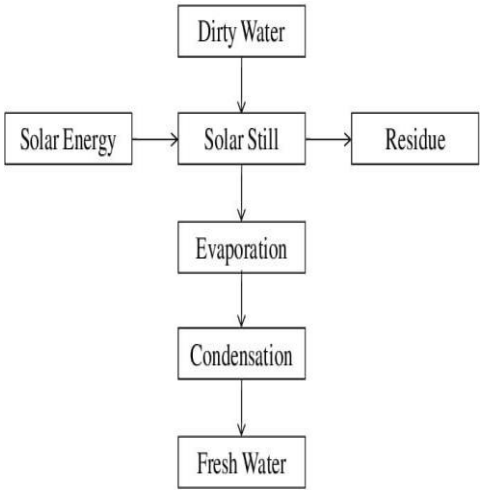

Fig.-3: Methodology

The transparent glass communicates essentially all radiation falling on it and retains very little; consequently, it remains adequately cool to consolidate the water fume. The consolidated water streams down the sloping rooftop and is gathered in gathering channel. Saline water can be supplanted in the operation by either continuous operation or by batches. The basin type solar water refining framework has created refined water at an expense for each unit of item lower than other types of solar equipment. The cover can be either glass or plastic. Glass is desirable over plastic on the grounds that most plastic degrades in the long haul because of bright light from daylight and on the grounds that more hard for water to gather onto it. Treated low-iron glass is the best material to use because it is profoundly straightforward and not handily harmed. However, if this is too costly or inaccessible, typical window glass can be utilized. This needs to be4mm think or more to decrease breakages. Plastic (like polyethylene) can be utilized for short-term use.

4. RESULTS AND DISCUSSIONS

4.1 PERFORMANCE OF STILLS AND OBSERVATIONS:

The exhibition of the basin still has been evaluated by two methods of water collections. Firstly, we utilized it to the sanitize rain water gathered from a pond in ground. Secondly, water is collected from natural sources. The properties of purified water have been improved. Table 1 and 2 addresses the perusing taken for sunlight-based still. The water temperature has been measured between 10:00 am to 04:00 pm in summer days.

Table-1: Observations for Solar Still at Different Time Slots

Time	Environment Temp (°C)	Cabin Temp °C	Quantity of Distilled water outlet
10:00AM	39	54	-
11:00AM	41	60	300ml
12:00PM	41	64	640ml
01:00PM	43	74	800ml
02:00PM	42	65	950ml
03:00PM	39	61.5	1200ml
04:00PM	38	57	Approx.1500ml

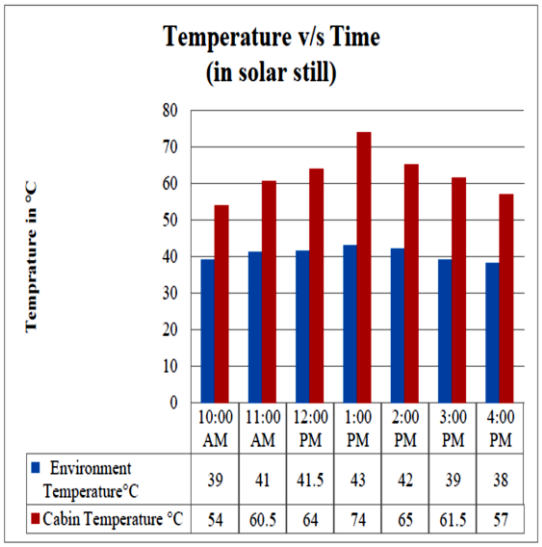

Fig.-4: Graph Showing the Temperature at Different Time Slot

Figure 4 & 5 shows the graph addressing the temperature variations in the sun oriented obtained at 01:00 pm, still for six hours. The maximum value of temperature in the system is 74 °C and 55°C.

Table-2: Temperature of Glass and Absorber plates

Time	Glass Temp. (°C)	Absorber Plate Temp. (°C)
10:00AM	23.5	41.5
11:00 AM	24.5	43.5
12:00 PM	29	47
01:00 PM	35	55.5
02:00 PM	33	50.5
03:00 PM	30.5	48.5
04:00 PM	28	45

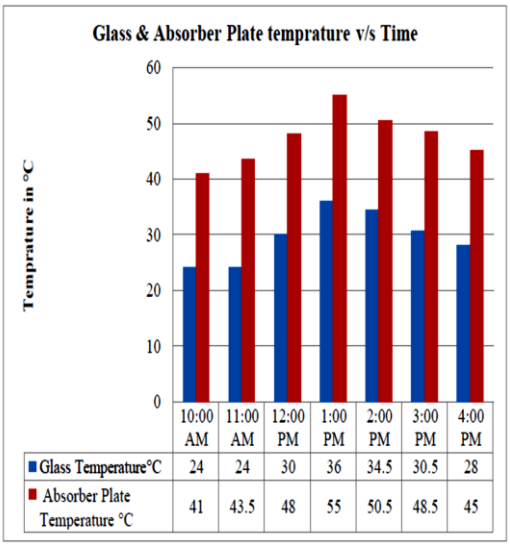

Fig. - 5: Temperature Variation for Glass and Absorber Plates.

5. CONCLUSIONS

In view of the audit and conversations, the accompanying point could be concluded:

a) The daily productivity of the single basin single slope solar still is 2Liter/0.384m/sq.(12hrs).
b) Sunlight-based still is fit for towns and for large-scale manufacturing water decontamination.
c) The two major benefits of a sun-based still are that it utilizes second-rate sun-oriented energy which is available perpetually and there is no nursery toxin development similar to other desalination techniques using fossil fuels.
d) The fabricated still has an absolute expose of around 14 %.
e) Double slope active solar still has less thermal efficiency and energy efficiency with respect to double slope passive solar still.

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1.

Analysis of Performance of Domestic Refrigerators Using LPG Cylinder

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Abstract- In some countries of the world, the continuous power supply is still not available and refrigerators consume more electricity. This project eliminates electrical problems. Using LPG as a refrigerant, this project involves the design and analysis of a refrigerator that stores LPG in high-pressure cylinders. This pressurized LPG is passed through a capillary tube with a small internal diameter, so a household refrigerator is designed to work with LPG pressure and R-134a refrigerant. As refrigerant, pure butane, isobutene, and a mixture of these were used. The performance of refrigerators using hydrocarbons as refrigerants was examined as well as compared to the performance of refrigerators using R-134a as refrigerants. To get a better result, the effect of condenser temperature and evaporator temperature on COP, cooling effect, condenser performance, work of compression and heat removal ratio were investigated.

Keywords: LPG, Evaporator Temperature, Capillary Temperature, Water Temperature.

1. INTRODUCTION

Due to the heavy requirement of electricity all over the world, we are thinking of cover up the energy that has been supplied but is not further used to recover this crisis at least investment price. A lot of money is spent annually to fulfill the requirement of required electric power. From now on we recommend a free cooling system. These new settlement patterns spurred the construction of large cities that are able to thrive in areas that were otherwise considered inhospitable, such as Mumbai, Delhi, and Bangalore in West Bengal. This project uses the principle of Expansion and Second Law of Thermodynamics (LPG, Gas valve, Regulator, Evaporator). The main aim/object of the design provided in this project is to make a refrigerator which use R290, R600/R600a in place of R134a Refrigerants then constructing a Evaporator or gas pressure. Also, the device can be made sure to be available at a low cost so that everyone can afford it.

In this research work, we designed and analyzed a refrigerator system using LPG as a refrigerant. Since, the pressure of LP G is high; it is placed in a cylinder, because this compressed LPG passes through a capillary with a least internal diameter, the pressure of LPG decreases because of expansion as well as the change in the phase of LPG. The phase change from the latent heat of vaporization of the liquid the gas gains liquid refrigerant and the temperature decreases. So, LPG can produce ambient cooling, where we have seen that LPG cooling COP is better compared to Indoor.

A) Advantages of LPG Refrigeration System:

The applicability of LPG as a refrigerant additionally rises the overall performance upto 20%. Ozone depletion ability (ODA) of LPG is zero and global warming capacity (GWC) is 8. GWC less than 10% is negligible significantly as evaluated to other refrigerants. It is environmentally friendly. LPG does now not form acids as well as removes the hassle with blocked type of capillaries. There's 60% discount in the measured weight of the system because of the better LPG density. Fridge works whilst power is off. The components found silent during operation. Going for walks cost is zero. No need of compressor and condenser.

B) Application of LPG Refrigeration System:

It may play a critical function in eating places where constantly heating and cooling are needed. It could be applicable in chemical industries. It is able to be applicable in far-flung components in which electricity isn't to be had. It could be used in the refineries wherein the high LPG consumptions takes place.

2. METHODOLOGY

The block diagram of this project is shown below in Fig. Outline description of how we carry out our project and the various steps involved. From the block diagram below. From the block diagram given below, the first step is to release the LPG gas which is used as a refrigerant in evaporator. Evaporator is used to produce cooling effect where outer side of refrigerator a burner is fixed which is used as a heat source. Hence an LPG is used for making both process cooling and heating effect as a refrigerator and burner.

A) Hardware Specification:

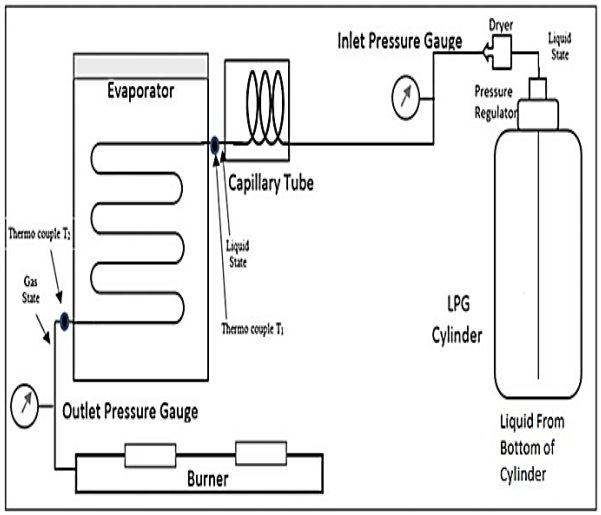

Fig. 1: Block Diagram

i) LPG gas cylinder:

LPG gas cylinder (Liquefied petroleum gas) is consisting of propane (C3H8) and butane (C4H10). LPG is used for Domestic and Industrial use here we are in this project; we use GAS pipeline for getting a constant temperature which is also hazardous.

ii) Capillary tube:

The throttling device which is highly applicable in domestic refrigeration is the capillary tube the domestic refrigeration heating water and switches off automatically, in the situation of the water reaches its boiling point as represented in the figure. It has been observed that the length and diameter of capillary is responsible to the pressure drop of the refrigerant. The smaller the diameter, the longer the capillary, the lower the pressure drop from the refrigerant when passing through the capillary tube.

iii) Evaporator:

Evaporators are another dominated component of refrigeration devices. The cooling effect is generated in a refrigeration system by means of evaporators. An evaporator is a heat exchanger plane surface which transfers heat to a refrigerant to cool it, thus removing heat from the substance. Evaporator acts as a heat exchanger surface which is applicable to heat transfer from the elements to cool the refrigeration.

Fig. 2. LPG Cylinder

Fig. 3. Capillary Tube

iv) Pressure Gauge:

A lot of methods are developed for pressure and vacuums measurements. Pressure gauge and/or vacuum gauge equipment are used to measure. Basically, it is miles a stiff, flattened steel tube bent right into a round form. The fluid whose strain is to be measured is within the tube. One give-up of the tube is taken as fixed and every other stop is unfastened to move inward or outward.

v) High Pressure Pipes:

The range of excessive-strain pipes covers most software wherein there's a demand to switch gasoline at excessive strain. These contains of a metal pipe with a metallic ball fitted to each end. Two swiveling joint nipples compress the balls in opposition to the positioning of the connecting hole and for this reason sealing in opposition to gas leakage.

A) Working of LPG Refrigeration

The working procedure is described below-

- The primary idea in the back of LPG fridge is to apply the LPG to take in warmness. The simple mechanism of the LPG refrigeration running is proven within the fig.1
- LPG is saved in the LPG cylinder underneath excessive pressure, when the fuel tank of the

regulators is opened then high-pressure LPG passes through the excessive-pressure pipe.

- This LPG is going via high stress gasoline pipe to capillary tube.
- HP LPG is transformed in low pressure at the capillary tube at constant enthalpy.
- After it, LPG is exceeded via the evaporator. LPG is transformed into low strain and temperature vapor from and passes the evaporator which absorbs warmness. Thus, the chamber will become quiet down. as a result, we will achieve a cooling impact in the refrigerator.
- After passing via the evaporator low strain LPG is handed via the pipe to the burner. And we are able to use the low strain of LPG in burning techniques.

Fig. 4. Evaporator

Fig.5. Pressure Gauges

Fig.6. High Pressure Pipes

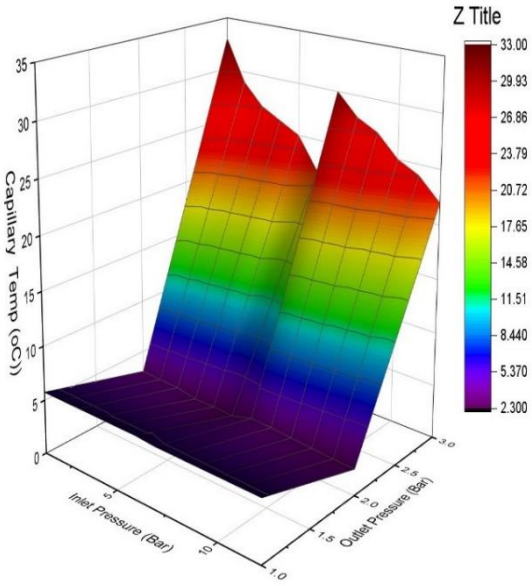

Fig. 7. Effects of Inlet and outlet pressure on Capillary Temperature

3. RESULTS AND DISCUSSIONS

Observations have been taken at 10 minute's intervals, with the LPG cylinder for 1 hour, as shown in table-1. The inlet pressure of LPG gas has been taken at two levels of inlet pressure as 5.75 bar and 5.608 bar. The outlet pressure varies according to their corresponding values. The time has been fixed as 10 minutes for each reading.

The capillary temperature, evaporator temperature and water temperature have been measured and represented in graphs as shown in fig. 7, 8 and 9. The capillary temperature firstly decreases slightly then increased suddenly with a high slope. However, the effects on evaporation temperature and water temperature represents slightly similar nature with respect to inlet and outlet pressure.

Table-1: Observations of Different Parameters and their corresponding Responses

S. N.	Inlet Pressure (Bar)	Outlet Pressure (Bar)	Capillary Temp. (ºC)	Evaporator Temp. (ºC)	Water Temp. (ºC)
1.	5.75	3.00	33	33	33
2.	5.75	2.91	29	31	32
3.	5.75	2.84	27	27	30
4.	5.75	2.50	26	21	29
5.	5.75	2.50	25	19	28
6.	5.75	2.42	22	17	27
7.	5.608	2.941	30	31	32
8.	5.608	2.872	28	29	31
9.	5.608	2.736	27	26	29
10.	5.608	2.599	25	23	28
11.	5.608	2.462	24	19	27
12.	5.608	2.394	22	17	27

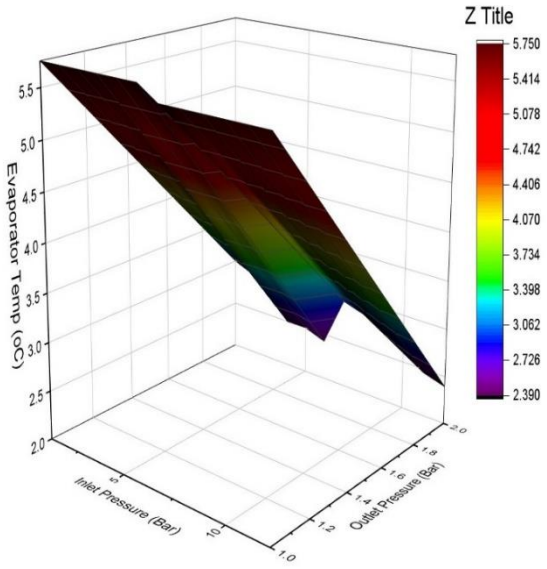

Fig. 8. Effects of Inlet and outlet Pressure on Evaporator Temperature

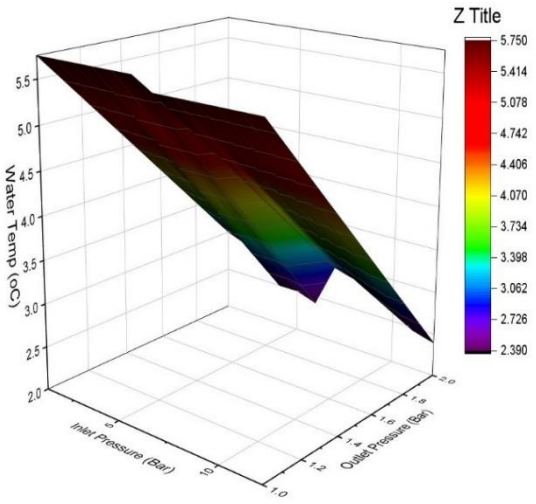

Fig. 9. Effects of Inlet and outlet Pressure on Water Temperature

4. CONCLUSIONS

From the analysis presented in previous section, it has been concluded that PG gasoline was saved at high pressure in a container at 12.410 bar of 14.5 kg weight, prepared with an HP regulator. During LPG gasoline is launched, pressure decrement takes place and the weight will be dropped. By using a capillary tube, the strain decreased all the way down to 1 bar from its working pressure 4.82 bar because of the decrease in pressure changes the cooling effect takes in the evaporators. The cooling impact adjustments the homes of LPG. Therefore, we will use LPG as a working refrigerant in this process. LPG does not harm the surroundings. Ozone layer depletion (OLD) and international warming could be decreased because of the usage of contemporary refrigerants in home refrigerators.

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Design, Development and Deployment of SiC/Al Metal Matrix Composite Fabricated by Powder Metallurgy

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***Abstract*-This research work describes the manufacturing process of composite, harder reinforcement materials that are included with the parent matrix by many processes and are used for industrial applications. Aluminium Matrix Composites (AMCs) are the most commonly used composite material in modern manufacturing industries because of their wide applications in aerospace, automobile, marine areas, etc. Here, aluminium matrix composite has been prepared using the powder metallurgy technique and uni-directional compression process. Silicon carbide in particulate form was used as reinforcements in aluminium matrices with different weight percentages. The analysis of micro-hardness has been performed. aluminium metal matrix composites formed by powder metallurgy resulted in improved mechanical properties. Present research work concluded that the rise in hardness of Al-SiC MMC with an increase the amount of SiC reinforcement.**

Keywords: Composite, Aluminium Metal Matrix, SiC Reinforcement, Unidirectional Compression, Design Aspects.

1. INTRODUCTION

Composite materials rise in popularity and use due to their attractive combination of durability, durability, and lightweight and corrosion-resistant properties. A composite asset, the word itself, in essence, conveys a sense of belonging. It is the formation of two or more structural elements with very different physical as well as chemical properties when they are put together to produce an object with unique chemical properties. From ancient times the builders, the craftsmen, the engineers, and the builders continued to build and maintain compositions for a wide variety of materials. The first known use of composites is said to be in Mesopotamia. These ancient people attached pieces of wood at different angles to make plywood in 3400 B.C. Most of the major advances in integration were the result of wartime needs. Some equipment was needed for lightweight military aircraft. Engineers soon realized the benefits of the combination other than simplicity and power. It was found, for example, that fiberglass composites were exposed to radio waves, and the material was immediately changed to be used for the protection of radar equipment (Radomes). Composite materials are made up of two or more separate phases (matrix phase and dispersed phase) and have many structures that are very different from those of any element. Matrix phase - The first phase, consisting of a continuous character, is called a matrix. The Matrix is usually ductile and has a slightly heavier phase. It holds the dispersed section and shares the load with it. Scattered phase (reinforcement) - The second phase (or phases) is integrated into the matrix in a non-continuous way. This second phase is called the dispersed phase. We are fabricating Aluminium Matrix Composite, which is a Metal Matrix Composite, in our project, thus our field of interest will be limited to constructing Metal Matrix Composite. Processing of the metal matrix composite can be grouped into three forms based on the temperature of the metal matrix: - a) Solid State Processing, b) Liquid Phase Processing, and c) In-Situ Processing. This technology is commonly used to manufacture metal matrix composites made of aluminium and magnesium.

We reviewed several research papers which helped us get an insight about Metal Matrix Composites and their tribological behavior. It also helped us in finding the best and cost-effective method to fabricate MMC which will improve characteristic properties of fabricated MMC. SINGLA, et al. constructed the aluminum-based silicon carbide particulate MMCs. To attain these goals, a two-step mixing procedure using the stir casting process was used, followed by a property study. The matrix and reinforcing materials were chosen to be aluminium (98.41 percent C.P) and SiC (320 grit). According to the findings, an increase in hardness, impact strength, and normalised displacement has been noticed when the content of SiC increases. The greatest results were obtained using a 25 percent weight fraction of SiC particles with a grit size of 320. Maximum Impact Strength = 36 N-m and Maximum Hardness = 45.5 BHN [1]. SURAPPA, MIRLE KRISHNEGOWDA. - The purpose of this work is to provide an overview of AMC material systems in terms of processing, microstructure, characteristics, and applications. This paper examines Aluminum Matrix Composites reinforced with various types of reinforcements, as well as the problems and opportunities that come with them. There is a need to increase the damage tolerant qualities of AMCs, particularly fracture toughness and ductility, which came up throughout this research work and which must be overcome. Industrial wastes and by-products should be used to make high-quality, low-cost reinforcements. Efforts should be made to produce AMCs with matrices

constructed of non-standard aluminium alloys. Different grades of AMCs must be classified based on their property profiles and manufacturing costs. To assess unwanted faults in AMCs, simple, inexpensive, and portable non-destructive kits are urgently needed [2]. PUROHIT, RAJESH, et al. described the construction of a ball mill to grind aluminium and SiC particles. The morphology of powder particles during mechanical alloying of aluminium and silicon carbide powders in a horizontal ball mill was investigated. Powder metallurgy was used to create Al-SiCp composites with SiCp content ranging from 5 to 30%. After 12 hours of milling, mechanical alloying of aluminium and silicon carbide powders produces a fine homogenous equiaxed composite powder structure. The properties owing to the impact of steel balls, and SiC nanoparticles become entrenched in the aluminium matrix, according to SEM examinations of ball-milled powders at intermediate stages. The Al-SiCp composite powders are finally obtained [3]. MANOHAR, et al. - This research focuses on the importance of powder metallurgy in achieving uniform reinforcement distribution in the matrix by ball milling or mechanical milling. Powder metallurgy-produced composites were found to have higher strength and toughness. In comparison to traditional approaches, powder metallurgy routes provide a more homogeneous reinforcement distribution and higher homogeneity of reinforcement particles. As a result, powder metallurgy approaches for fabricating metal matrix composites are revolutionizing research and industrial sectors [4]. REDDY, A. CHENNAKESAVA, et al. studied the mechanical properties of several MMCswere evaluated in this study. Alloying elements including Si, Fe, Mg, and Cu have had a significant impact on the mechanical characteristics of Al/SIC composites. By lowering the SiO2 layer, Mg has increased the wettability between Al and SiC particles [5]. DEVANEYAN, S. PRADEEP, et al. analyzed the mechanical nature of aluminium 7075 with reinforcement Silicon Carbide (SiC) as well as Titanium Carbide (TiC) via powder metallurgy is presented in this work. Powder metallurgy was used to create these specimens. A realistic comparison could be made by measuring the microhardness of several samples, and the results for varied compositions were improved as a result. The highest microhardness value was 52.12 HV, which was achieved using 90% Al 7075, 4% SiC, and 8% TiC[6]. VANI et al. focused on the variation of parameters on the microstructure of aluminium MMCs. The microstructure of the composites was shown to be dependent on a variety of parameters, including sintering duration, sintering temperature, size, and volume percentage of reinforcement. The diffusion rate increases with greater sintering temperatures, resulting in a denser structure. For consistent reinforcement dispersion into the metallic matrix, proper reinforcement and matrix particle size selection is critical. Due to hard ceramic particles acting as a barrier to grain boundaries and so delaying grain growth, the optimal amount of reinforcement results in a finer microstructure [7]. SYED AHAMED, et al. - The individual and simultaneous impacts of Aluminum and reinforcing metal matrix composites are examined in this review paper. The reinforcement materials have a significant impact on the mechanical, physical, and tribological properties of various aluminium series materials, according to the research report. When compared to the base matrix, adding the reinforcement material reduces wear rate by up to 50% [8]. CHANDIO, ALI DAD, et al. - Powder metallurgical methods were used to make aluminium silicon carbide (Al/SiC) composites in this study. The mechanical and morphological evaluations were carried out using different reinforcement percentages, namely 10, 15, and 20% SiC powder as reinforcements in an aluminium matrix. The particle reinforcements were seen by Scanning Electron Microscopy, and the powder metallurgy approach was compared to the stir casting method of preparing Al/(SiC) composites (SEM). The results showed that increasing the weight percent of SiC particles increased the hardness [9]. PRADEEP DEVANEYAN, S., et al. concluded the realistic comparison could be made by measuring the microhardness of several samples, and the results for varied compositions were improved as a result. This phenomenon clearly demonstrates that incorporating SiC and TiC along the aluminium matrix improves the alloy's wear resistance [10]. VENKATESH, B., et al. -The density and hardness parameters of MMC increase with increasing sintering temperature, according to this study. As the SiC reinforcement, weight percent, and mesh size increase after heat treatment, the percentage of density increases. After heat treatment, the percentage of hardness increases with increasing weight percent but decreases with increasing mesh size of SiC. The characteristics are influenced by heat treatment after sintering, according to the findings. When SiC levels rise, the density rises as well. The hardness of MMC increases as the weight percent of SiC in the composite and the mesh size increase. As reinforcement, SiC particles with varied weight fractions (10 and 15 wt %) and mesh sizes (300 and 400) are utilised. The work describes the powder metallurgy method for processing Al/SiC to obtain desirable qualities, as well as the findings of an experimental examination into the mechanical properties of Al/SiC [11]. JAWALKAR, CHANDRASHEKHAR, et al. - We look at a synopsis of work on Aluminum metal matrix composites with particle reinforcement in this publication. In this study work, many writers who have contributed in the domain of Aluminum metal matrix composites with particulate reinforcement using stir casting discuss the issues they have faced and the outcomes they have produced. According to the findings, reducing particle size and increasing the proportion of

reinforcement increases the composite's hardness and tensile strength. Composite powders of (Al-SiCp-Mg and Al-SiCp) composites that act as reinforcement boost the composites' hardness and strength; however, composites reinforced with composite powders created using stir casting have a reduced porosity content. Smaller particle size reinforcement increased hardness and tensile strength [12]. MATTLI, MANOHAR REDDY, et al. studied the microstructure and mechanical properties of aluminium hybrid metal matrix nanocomposites (Al/SiC/TiO2) were studied after they were manufactured using a microwave-assisted powder metallurgy technique. In the aluminium matrix, the SEM data show a homogeneous distribution of SiC and TiO2 reinforcements. The nanocomposites' nano hardness improved from 3.91 0.3 GPa for pure Al to 7.91 0.7 GPa for the Al/5SiC/9TiO2 nanocomposite [13]. PONRAJ, N.VIJAY, et al. used the powder metallurgy process to create Copper (Cu)/Graphene Nanao Sheet (GNS) composites in this study. They were used to investigate and characterize the microstructure and mechanical properties (TEM). This method has been proved by GNS to achieve great homogeneity in dispersion using Cu. With 0.2 percent GNS, an excellent increase in compressive stress is achieved. When compared to pure Cu, it is more than 10%. SEM analysis of the Cu/GNS composite reveals a uniform distribution of GNS on the composite and satisfactory bonding. The diameters of the GNS range between 3–5 nm, according to TEM investigations [14]. SINGH, PREETKANWAL, et al. - This study provides an up-to-date evaluation of advances and benefits of various composite fabrication and machining processes. It includes numerous difficulties on fabrication and machining of MMCs, as well as some practical analyses and research discoveries. Polycrystalline and diamond-coated tools are found to be the most suitable for different traditional machining procedures. To achieve a better finish, use a high speed, a modest depth of cut, and a low feed rate. Furthermore, hybrid electrical discharge machining has been a hot topic in critical and nonconventional machining for the past several years [15].

1.1 GAPS IN LITERATURE REVIEW

This work has been carried out to fabricate the AMC. A little effort has been put to fabricate the economical-based MMC by incorporating the powder metallurgical approach. Hence approach will be made to fabricate the economical-based AMC and to characterize the fabricated samples based on metallographic and metallurgical techniques.

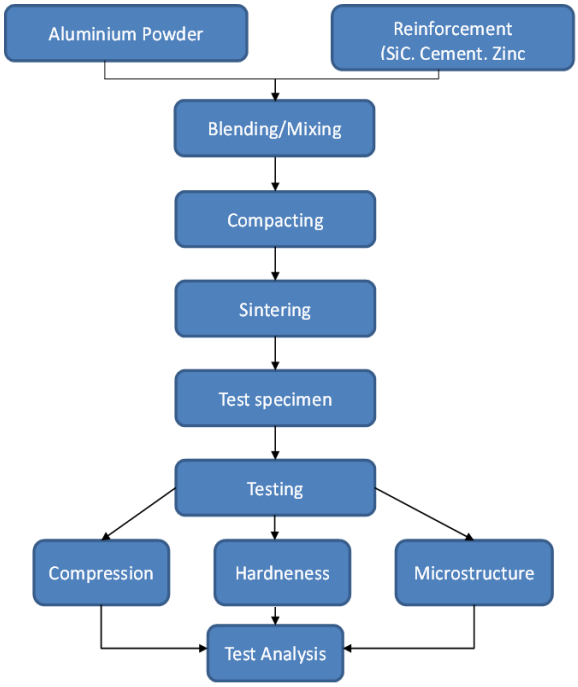

Figure 1: Methodology

2. METHODOLOGY

Methodology process in steps (Figure-1): -

1. First, we reviewed a number of research papers related to the fabrication of AMC.
2. Then we set our objective after finding the gap in the literature review.
3. We then design the 3D model of the die with suitable dimensions using Solid Works software.
4. Then we bought the required materials (matrix, reinforcements, and steel).
5. Then we fabricated the die by machining the steel using CNC lathe machine as per the dimensions in the 3d model.
6. Then we prepare a mixture by taking various compositions of aluminium and reinforcements (SiC, Cement).
7. We then put the mixture inside the die chamber and compact the powder by applying load.
8. Green compact formed will then be sintered in a muffle furnace.
9. After sintering the properties of the sample will be tested and analyzed.

Based on the results we write our conclusions.

3. DESIGN AND EXPERIMENTATION

3.1 INITIAL DESIGN

The die used to compress the materials in die has been designed the green compaction samples of Al-MMC with specimen diameter 20 mm and a thickness 5 mm. A 3D model mating parts die as well as punch had been drawn using Solidworks software. The drawings of die and punch are shown below in Figure 2 and 3.

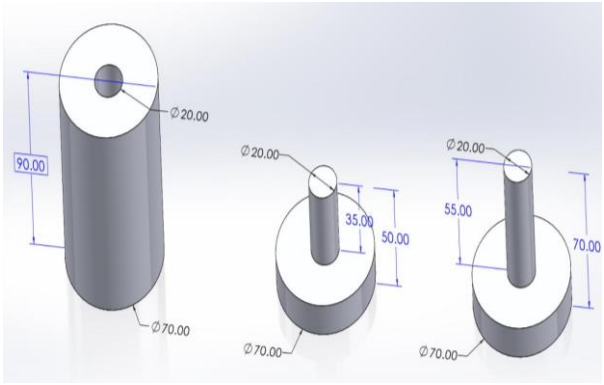

Figure 2: 3D drawing of both components: Die and Punch with Dimensions

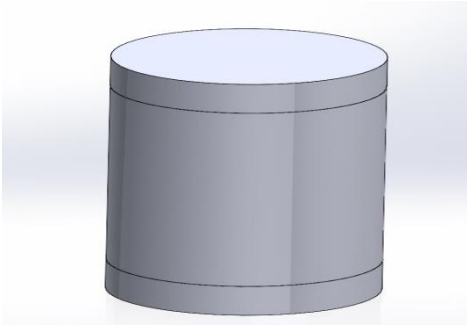

Figure 3 Die Assembly

Figure 4 Universal Testing Machine (UTM)

3.2 COMPACTION

The principal of this process is to apply pressure and produce the bonding between the particles, to generate cohesion among the particles of powder, known as green compact. Aluminium and cement mixture (total 10gm) was taken in the ratio of 9:1 where 90% is Aluminium (9gm) and 10% Cement (1gm), the mixture was then put inside the die. After that load was applied through UTM machine to compress the powder particles. Figure 4 shows the Compaction process on UTM machine. The expected load to be applied was 8 ton but due to improper control 20 Ton of load was applied and this sudden high load led to shaft expansion inside the die which made the punch stuck inside the die leading to failure.

For powder compaction mixture of Aluminium and silicon carbide was taken in various percentages of different ratios as shown in the Table 1.

Table 1: Composition of Mild steel

S.No.	Ratio	Aluminium (Al) wt.%	Silicon Carbide (SiC) wt.%
1	9:1	90	10
2	8:2	80	20
3	7:3	70	30
4	6:4	60	40

3.3 INTERMEDIATE DESIGN

We made a new design with different dimensions from our previous design so that it could sustain more load and it would be easy to take out the green compact formed inside it. For this reason, we reduced the Die and Punch height. 3D model of the design was made in Solid works software. 3D drawing of the die, base and punch is shown in Figure 5, 6& 7.

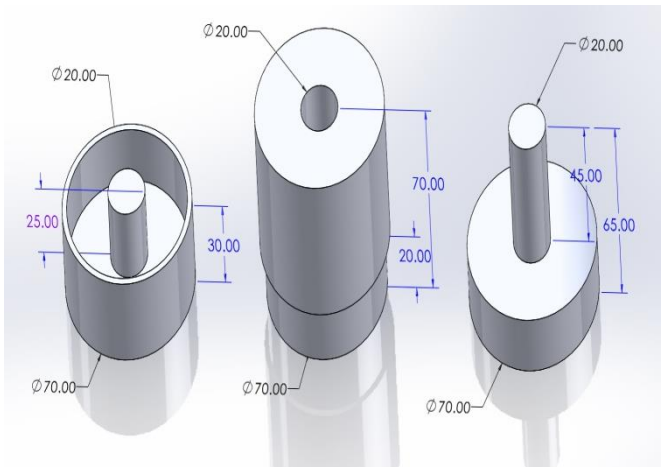

Figure 5: 3d Drawing of Die, Base and Punch with Dimensions

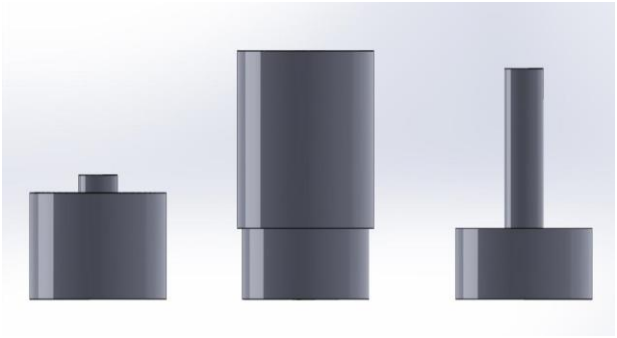

Figure 6: Front View of Design

Figure 7: Hole Die Setup

First, the die was properly cleaned and some oil was applied inside the die surface for lubrication. After that 9:1 powder was poured inside the die. Then 5 Tons of load was applied using UTM machine to compress the powder. After the compression punch was removed and green compact gets ejected. The strength of green compact formed was weak due to high porosity which led to the breaking down of the sample. **Figure 8** shows pieces of green compact formed.

Figure 8: Dispersed Green Sample

To increase the strength of the composite we increased the load to 12 ton. 8:2 powder was taken and put inside the die and then 12 Ton load was applied using UTM machine. After compression the punch got stuck inside the die. Main reason why this happened was due to poor surface finish inside die which led to increase in friction on the walls causing the powder to get stuck between the punch and die walls due to plastic deformation. There was also some noticeable shaft expansion.

3.4 DESIGN OPTIMIZATION

From our first and second design we get to know that in order to develop green compact samples with sufficient strength and with no problem of stuck punch and die, we will have to do following improvements in our die: -

1. Use of better-quality steel which could sustain the load and prevent the shaft from expanding. For this purpose, we are using Die steel.
2. Improving the internal surface finish of the die to minimize the friction and prevent the powder to get stuck between the punch and die chamber walls.
3. For the gradual application of load, we are using a manual hand press instead of UTM machine.

3.5 DRAWING OF DIE

SOLIDWORKS design software is used to modelling the die, punch and base plate. The 3D drawing of Die chamber with base is shown in Figure 9. The 3D drawing of Plunger and spacer is shown in Figure 10. 3D model of die assembly is shown in Figure 11 and its cross-sectional view in Figure 12.

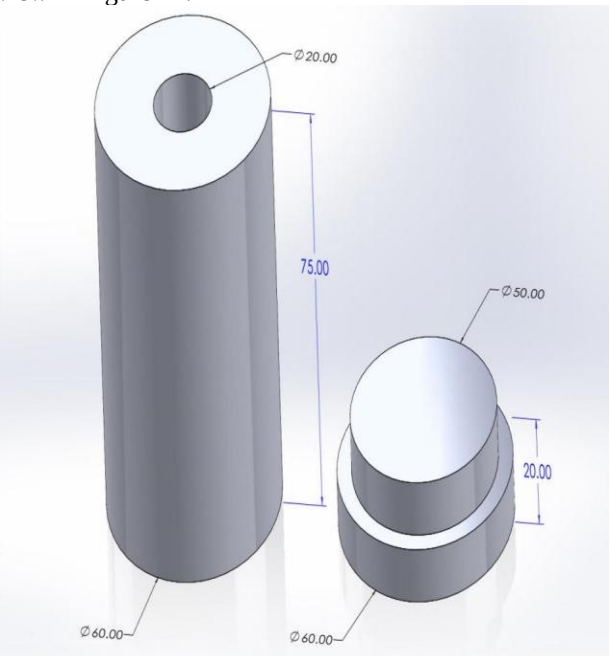

Figure 9: Die Chamber with Base

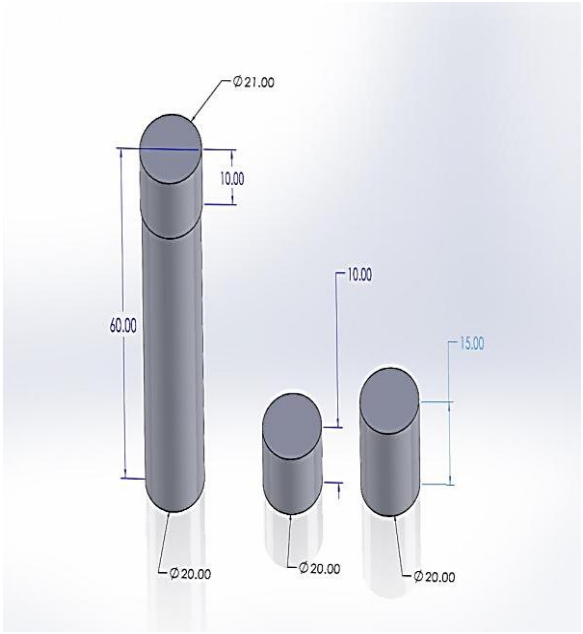

Figure-10: Plunger and Spacer

Figure 11: Die Assembly

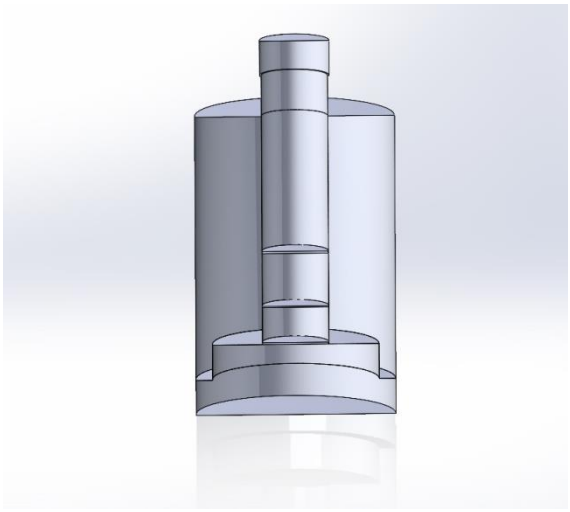

Figure 12: Cross section of Die Assembly

Table 2 shows various composition of mixture taken where we have taken Silicon Carbide and Cement as our reinforcements and Aluminium as our matrix.

Table2: Various weight percentages of Al-SiC/ Cement + Zinc stearate

S. No.	Ratio	Aluminium (Al) wt.%	Silicon Carbide (SiC) wt.%	Cement wt.%	Zinc Stearate wt%	Load (in kN)
1	9:1	90	10	-	-	75
2	8:2	80	20	-	-	75
3	7:3	70	30	-	-	75
4	6:4	60	40	-	-	75
5	9:1	90	-	10	-	100
6	8:2	80	-	20	-	105
7	6:4	60	-	40	-	125
8	8:1:1	80	10	10	-	125
9	6:2:2	60	20	20	-	150
10	6:4	60	40	-	5	125

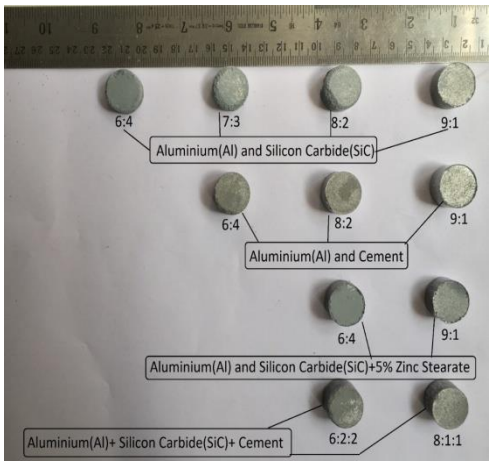

Figure 13: Green Compact Samples

3.6 SINTERING

The green compact sample was sintered at 450^0 C in muffle furnace for 30 min at the heating rate of 150 C/min. After heating samples were taken out of the furnace and was allowed to cool. **Figure 14** below shows putting of samples inside the furnace. **Figure 15** shows furnace during the sintering process.

Figure 14: Placing samples inside the furnace.

Figure15: Muffle Furnace during Sintering Process

Figure 16: Micro hardness tester (Model-VMHT HMV-G21 Series)

4. RESULTS AND DISCUSSIONS

4.1 HARDNESS TESTING

After successful sintering, all the samples were then prepared for hardness testing. For hardness Vickers hardness testing was done on sintered and non-sintered samples of AMC. It consists the indenting impression of a diamond indenter whose shape is pyramid along with a square base and an angle of 136° between opposite sides under a test force ranging from 1gf to 100kgf. The analysis of microhardness has been done on a UHL microhardness tester (Model-VMHT HMV-G21 Series) **figure 16**. The load was applied for 10 s with indentation load of HV0.05 (490.3mN). The indention was processed through dedicated software to estimate Vickers hardness numbers. The test was repeated four times and the mean was recorded. The results as indicated in fig.-17, shows the increasing trend of hardness with increase in weight percentage of SiC. The best value of hardness comes out to be of sample containing 20% SiCi.e. 109.648 HV (Hardness).

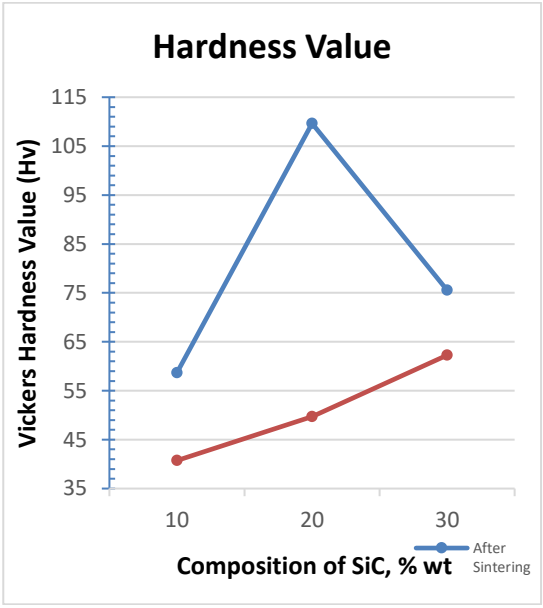

Figure 16: Vicker's hardness number for the aluminium and the composites with various % reinforcement.

Table 3: Vickers Hardness Value before & after sintering

Composition of SiC, % wt	Vickers Hardness Value (Hv)	
	After Sintering	Before Sintering
10	58.6843	40.7335
20	109.648	49.6962
30	75.5263	62.2648

5. CONCLUSIONS

The influences of compression load and volume ratio of reinforcement SiC on the hardness have been observed as-

1. The amount of reinforcement SiC affects the hardness the of the specimen. For a large amount of SiC particles, the hardness has been increased. At 125 kN compact load, the mean microhardness is higher than the 75 kN compaction load.
2. It has been observed that the microhardness of specimens has been increased with the addition of SiC particles at a sintering temperature of 450 °C.
3. The behaviour of unsintered specimens represented as microhardness increases, the amount of SiC increased till 30 wt%. But for sintered specimens, the maximum hardness has been achieved at 20 wt% of SiC. The sintered and unsintered specimens exhibited different nature.
4. The composite at reinforcement of 10 wt % and 20wt % amount, the hardness was concluded as 58.68 HV and 109.6 HV, respectively.

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A Review on the Effects of Avalanches in India

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Abstract-In this review paper, we studied the avalanche situation and the equipment present for the avalanche. In the study, we find about the flash flood and the avalanche accident at CT-8, with their analysis and also the reason for ignorance of the forecasting. We also find the reason of the avalanche like people's moments, Global warming etc. The many equipment also present related to the avalanche like a Pulse power generator, low gain avalanche detector, Avalanche photodiode (Photoelectric Measurement System) etc.

Keywords: Avalanche, Mechanical Properties,Safety,Natural Digesters.

1. INTRODUCTION

Avalanche are a type of digester which occurs in the mountain region and damage the human as well as wild life. In this large amount of ice, mud, tree's and rocks are present which flow from top to bottom of the mountain. It's study is done by many organizations like Snow Avalanche Study Establishment (SASE) meteorological stations in J&K, in which the study is done by the different equipment like synthetic aperture radar (SAR) satellites etc. In the avalanche the main role is done by the glacier which is formed by the compaction and re-crystallization of snow at the top. The stresses generated by large amount of snow makes the reson for the movement down in downward direction. The flowing movement, irrespective of whether it is a few centimeters a day or, as in the case of surging glaciers, tens of meters a day, differentiates a glacier from a dead ice body. The determining and location of torrential slide exercises in elevated locales are basic for arranging safe navigation courses and landing destinations for snow tasks and ecological change. Synthetic Aperture Radar (SAR) mission exacted assessment of two basic boundaries of the snowpack i.e., snow profundity (SD) and snow water same (SWE) at high spatial goal is as yet an excellent test in the radar local area. This is an expansion in the surface unpleasantness because of torrential slide garbage prompts an expansion in backscattering, which is utilized to identify the torrential slide movement from the transient SAR data. This is the snow thickness map that shows the least thickness over the test site. There is the snow thickness esteem in the torrential slide locale is high which recommends that the torrential slide inclined area can be portrayed by a most extreme worth of snow thickness and D file when contrasted with the non- torrential slide region. The effects of Anthropocene Bearing on Snow-Avalanche Disasters over the West Indian Himalayas are a big concern. The maximum avalanche occurrences during the first quarter months of the year, where the maximum frequency of the disaster is optimum in the month of March and most of the snow avalanche exposed areas are >3500m altitude, slopes within the range 30- 45°, north-facing convex slopes. The strong coordination between the line departments of the government and DRR responses on PPP mode during, the pre and post disaster period shall reduce the risk, vulnerability, and impact of the increasing frequency of the avalanche disaster. During Anthropocene, the epoch avalanche threat has surged up in high altitudes and steep slopes of snowy WIH steep gulley.

2. LITERATURE REVIEW

Martha et al learned about a huge junk stream set off by a stone torrential slide in the Raunthi glaciated valley brought about streak floods in the Rishiganga and Dhauliganga waterway on 7 February 2021 in Uttarakhand, India. They uncovered the slant disappointment a ~197-m-high head scarp close to by the crown which was constrained by two arrangements of added and a foliation that assisted in the wedge with composing disappointment. This kind of disappointment of the stone mass was constrained by prior set of joints along the stone

substance of the incline, which transcendently comprises of fissile transformative rocks. The volume of the stone and ice mass is huge (~29.3 million m3) and subsequently is the high innate expected energy at an elevation of ~5474 m. The stone torrential slide delivered a lot of energy on influence, causing an air impact, crushing material on the valley floor, dissolving huge amount of ice, bringing about flotsam and jetsam stream which then immersed downstream dams and settlements [1]. Singh et al analysed about a snow torrential slide mishap in lower western Himalaya, India (5 January 2018).They researches about the torrential slide mishap at CT-8 torrential slide site of Chowkibal-Tangdhar street pivot in association domain Jammu and Kashmir, lower Western Himalaya, India and find the primary driver of torrential slide mishap was ill-advised site determination for leaving of the vehicle and absence of consciousness of standard SOPs while moving in torrential slide inclined regions. In examination RAMMS model assessed greatest torrential slide speed almost 25 ms-1, greatest torrential slide stream level almost 3.0 m and greatest effect pressure of almost 9.39 9 104 kgm-1s-2 [2]. Tiwari et al addressed that boundary significance appraisal further develops viability of AI techniques for anticipating snow torrential slide locales in Leh- Manali Expressway, India. They find that the major stretches of Leh-Manali expressway are inside exceptionally high and high torrential slide vulnerability classes and are under the extraordinary danger of torrential slide .They give depiction about spatial likelihood of torrential slides by Torrential slide powerlessness map (ASM) which is one of the fundamental data in spatial anticipating torrential slide inclined areas. They at first recognized for the SVM portion based ML calculation, out of which just nine were considered significant by a famous component determination algorithm known as the Boruta calculation. We observed that the adequacy of SVM was either improved or continued as before while utilizing just the significant boundary [3].

Horáková et al analysed about torrential slide entombments address one of the most perilous dangers related with winter exercises in the mountains. They considered to examine potential idiosyncrasies, dangers and constraints of the utilization of clinical gadgets in outside breathing tests reenacting torrential slide snow entombment. In this a legitimate consideration ought to be devoted to the ideal setting of the singular bits of gear and concentrated care screens and gadgets are utilized in conditions considerably not quite the same as a standard ICU. They are the physiological boundaries of the subjects get rapidly out of ordinary reach which expands a gamble of complications. [4]. Patil et al discussed about the determining and location of torrential slide exercises in elevated locales are basic for arranging safe navigate courses and landing destinations for snow tasks and ecological change. They concentrated on the SAR mission exact assessment of two basic boundaries of the snowpack i.e., snow profundity (SD) and snow water same (SWE) at high spatial goal is as yet an excellent test in the radar local area. This is expansions in the surface unpleasantness because of torrential slide garbage prompts an expansion in backscattering, which is utilized to identify the torrential slide movement from the transient SAR data.This is the snow thickness map shows least thickness over the test site. There are the snow thickness esteem in the torrential slide locale is high which recommend that the torrential slide inclined area can be portrayed by a most extreme worth of snow thickness and D file when contrasted with the non-torrential slide region [5]. Mishra and Samal assessed about Anthropocene Bearing on Snow-Torrential slide Debacles over the West Indian Himalayas. They found from accessible information that greatest torrential slide events during the principal quarter a very long time of the year, where the greatest recurrence of the fiasco is ideal in the period of Spring and the greater part of the snow torrential slide uncovered regions are >3500m elevation, slants inside the reach 30-45°, north-bound raised inclines. The solid coordination between the line divisions of the public authority and DRR reactions on PPP mode during, pre and post fiasco period will diminish the gamble, weakness, effect of the rising recurrence of the torrential slide calamity. During Anthropocene, the age torrential slide danger has flooded up in high elevations and steep slants of blanketed WIH steep gulley[[6].

Tajik and Nateghi learned about the various properties of the beat power generator in view of the torrential slide breakdown peculiarity in semiconductors. In this they find the impact of different circuit plan for this generator and tackle the issues of the exchanging of the part planning. They involved semiconductors in recreation and development with DC voltage source in trigger and fundamental circuit. In this reenactment result they find the impact of evolving capacitor, resistivity, inductance and so on various heartbeat level. They additionally find that yield voltage expands as per the quantity of levels and proficiency of the semiconductors are significant in high current. [7]. Schweizer et al represented work on the likelihood of torrential slide event in blend with the normal torrential slide type and size settle on the degree of

danger in a given conjecture region. They examine different torrential slide circumstances are commonly dense into one explicit risk level, which brings about a deficiency of data and "many torrential slides", expected at peril level 4-High, implies on the request for no less than 10 torrential slides for every 100 km2. This is a torrential slide size didn't increment with expanding risk level: the most continuous torrential slides were size 2 torrential slides at any peril level. They are also propose returning to the meanings of the risk scale and perhaps measuring some of the descriptions.[8]. Deng et al discussed on high voltage nanosecond beat generator in light of torrential slide semiconductor Marx bank circuit and straight transformer driver. Torrential slide semiconductor Marx bank circuits (MBCs) are generally utilized in high voltage redundant nanosecond beat generators, however issues exist concerning expanding the result voltage because of the restricted beat current. , these last option of which displays invaluable pressure appropriation and measured structure. For a 50 ? resistive burden, the model can create beats with a sufficiency of 10.9 kV, an ascent season of 3.3 ns, and a voltage superposition productivity of 89% [9]. Yu et al learned about Superior Temperature Assessment Model of 4H-SiC MOSFET under Torrential slide Condition Silicon Carbide (SiC) Metallic Oxide Semiconductor Field Impact Semiconductor (MOSFET) has quick Exchanging speed and under unclamped inductive exchanging (UIS) climate, the gadget might experience the ill effects of torrential slide Breakdown. In important to assess the Temperature inside SiC MOSFET precisely and first relationship b/w temperature and material boundaries is represented. In the development of third era wide- bandgap Semiconductor materials addressed by Silicon Carbide (SiC) have worthwhile actual properties. Power gadgets In view of SiC have expansive application perspectives to build the Power thickness of force hardware framework. In the Torrential slide condition, the temperature inside SiC MOSFET Depends on 1000 °C or higher . An electro-warm model is fabricated utilizing Innovation PC Helped Plan (TCAD) and is confirmed By trial test [10].

Villegas et assessed the time-series thresholding and torrential slide size definition. They talked about such sorts of torrential slides and their statics who allude to the presence any engrossing state and limit. They play out their assessment on a model Ornstein-Hollenbeck process. In which they dissect those changes around a given mean worth and, the related torrential slides ought to be connected with journeys of irregular walkers and not to basic fanning processes [11]. Morin et al learned about Torrential slide risk anticipating requires data about the past, current and future condition of the snowpack. These Such perception depend on perceptions from enrolled spectator at laid out reports, computerized perception organization. It likewise features a huge variety in the manner the data is present handled and conveyed on forecasters. The data post-handling and perception.

part is most likely the most vulnerable place of current model chains for functional torrential slide anticipating, hampering their utilization by the forecasters in numerous functional centers [12]. Roubik et al surveyed that Perlite is a reasonable model material for tests exploring taking in high thickness snow. Various open air breathing preliminaries with sound workers has been directed to research factors influencing the endurance of casualties covered with torrential slide snow. The primary exploration has been centered around the gas trade happening in air. Their properties are introduced in Kaplan- Meier plot of time to the breathing trial end for the entire gathering of 13 workers and for all the three phaseNone of the tests endured longer than 418 s, aside from one in snow (480 s). Simultaneously, none of the breathing stages remembered for the review ended sooner than at the 240th second. This is the review to record that is feasible to utilize a material could reproduce a portion of the properties of torrential slide snow in lab conditions. The review recommends that perlite can be utilized as a substitute of high-thickness snow for concentrating on gas trade. Besides because of security and homogeneity of perlite, and repeatable outcomes [13]. Haegeli and Herla explained by the Snowpack models point by point knowledge about the development of the snow stratigraphy in a manner that is preposterous with direct perceptions. We introduced an averaging calculation for snow profiles that really integrates most extreme quantities of snow profiles into a significant by and large point of view of the current circumstances. These are the two-snow profile averaging calculation introduced here proceed with a line of improvement that means to make snowpack reproductions more open and pertinent to torrential slide advance notice administrations and specialists. This is better approaches for mining accessible and important data mean to move new methodologies for the functional utilization of conveyed snowpack recreations that are extra helpful for torrential slide forecasting [14].

Herla et al concentrated on the introduced strategies support the examination of huge volumes

of snowpack recreations along both existence by (I) giving fast synopsis perceptions that assist with evaluating the development of snow profundities, new snow sums, and feeble layer and piece blends and by (ii) working with recovery of different rundown measurements and circulations of layer and profile attributes. By giving synopsis insights of layers rather than the whole snow section, our calculations give new open doors to how circulated or troupe snowpack reenactments can be approved and taken advantage of new opportunities [15]. Grant et al analysed the calculated model of torrential slide danger recognizes the vital parts of torrential slide peril and designs them into a precise, steady work process for peril and hazard evaluations. We used to critical deterioration to evoke the torrential slide estimating process from forecasters and afterward portrayed it inside a gamble based structure that is steady with other normal dangers disciplines. They torrential slide determining has given a decent outline of the overall idea of the evaluation interaction and its bits of feedbacks, it is missing substantial direction on the most proficient method to embrace and collect a peril or hazard evaluation for torrential slide guaging and boondocks tasks. The subsequent reasonable model represents the critical parts of torrential slide danger and designs them into a methodical, reliable work process for peril and hazard evaluation. Torrential slide estimating has forever been hard to make sense of and laden with vulnerability [16]. Kevin et al learned about the Improvement of Low-Gain Torrential slide Identifiers in the Casing of the Acceptor Evacuation Peculiarity. They join the benefits of ordinary n-I-p-diodes like a low commotion with a huge sign of torrential slide duplication diodes. The increase layer "vanishes" after light as an outcome of a deactivation of the increase layer doping species, which is typically boron. That is boron, loses after light its properties as an acceptor to give a negative space charge. This is an increase of around 10 are extremely quick n++ - p+ - p- - p++-finders with similarly low commotion. Two clarification approaches for the acceptor evacuation peculiarity are examined, specifically the development of a Bi-Oi- defectand the arrangement of a BSi-Siidefect. The first depends on a fast movement of boron at room temperature [17].

Pinaki et al examined about on interevent time conveyances of torrential slide elements. We utilize granular frameworks under very much controlled typical anxieties, apply slow shear strain rates to prompt torrential slides and screen them with high fleeting goal. We measure the power drops with high transient goal to determine the elements of both the enormous and little torrential slide occasions. The model targets reproducing two repulsing liquids. Coarsening is unequivocally stifled by utilizing a dissatisfaction system, which settles the point of interaction. This is one of the fundamental suppositions in numerous hypothetical systems so far proposed to anticipate the (general) scaling properties of torrential slide size distribution [18]. Mali and Gautam made sense of the remote organization is a wired free organization set up proportion single recurrence for correspondence between network gadgets. They dissected radio wave are utilization of remote organization for association between gadgets, for example, wireless, PC, and so on. These are the remote correspondence is a quicker mechanism of transmission of guidelines or information between two gadgets, which are not connected with any electrical channel, wires or link immediately and misfortune rates. There are different numerous approaches to taking care of vertical handoff choices in view of one or different reasons. These are the alter in the hash key is considers as the torrential slide impact and this at last triggers in this course of the opposite handoff during the steering system of the information [19]. Hamid et al addressed another convention that accomplishes Shannon wonderful mystery execution utilizing essentially lower key size than the genuine methodology of one-time cushion. They are interesting joining of these two keys creates the last keys that are utilized for encryption. These are an iterative calculation is acquainted that permits us with decline the proportion of conclusive keys to the proportion of the data bits. This paper acquaints by a clever methodology with accomplish better mystery with most minimal key size necessities. These are the methodology ensures ideal mystery for scrambled information [20]. Fu et al learned about in this report is created by 4-HSic p I-n photodiodes with the assistance of different miniature opening cluster. It is estimated by photoelectric measurement framework and reproduction framework. Occasional miniature opening exhibit is utilized acquire by drawing innovation and it increment area of photosensitive and lessen the ultra-abuse assimilation p - layer. It has normal dim current worth of estimated 6.0*10^-15 An and inclination scope of 0-10V.The execution of gadget is best at 4um miniature openings and responsivity increment by 10% when contrasted with traditional gadget. This examination paper so nearby torrential slide work at moderately low inclination and work on the obligation and quantum effectiveness gives extraordinary importance work on the application for week UV detection [21].

Ran et al Ran et al assessed this report miniature electro release machining (EDM)single beat energy supply to the restricted to a miniature request of the extent

.in this creating course is to be decline the release beat width improved releasing recurrence. The beat power supply with smaller heartbeat width and better quality and high handling productivity. Demonstrate release happens &absorbed then cavity morphology application utilizing an AFM framework, as AFM tips thickness 5nm and platinum film utilized as terminals and silicon wafer 100nm thickness. These in light of triode avalanched rule, The nanosecond pulsed supply the nanosecond beat power supply got single release pulse. A nanosecond releasing heartbeat with a low heartbeat width of 18ns successfully [22].

Amiri et al studied about the characteristics effect and performance of the infrared wide bandwidth on temperature for different avalanche photodiodes structures. The all evaluation and analysis is done through different steps like model analysis done through MATLAB software in which they find the effect of temperature on energy of band gap for semiconductors and the effect of thermal and spectral variations on avalanche photodiode characteristics. After the analysis and experiment the find that the increase in temperature is not affect the avalanche photodiode band gap energy but it slightly effects on the detector responsivity, its rapid increasing is also increasing spectral density noise current. The increase in temperature increases lightly Photocurrent, BER and dark current increases but SNR decreases [23].

2.1 GAPS AND OPPORTUNITIES

The project “Design & Fabrication of avalanche resistance equipment” fills the following gaps:

(i) To protect human life during an avalanche.
(ii) To make the bulletproof equipment.
(iii) To provide oxygen in an emergency at the height.
(iv) To make the type of equipment that is easily navigated
(v) To find the material which is more feasible in the avalanche
(vi) To design the equipment which is much more feasible in the avalanche

3. METHODOLOGY

The following are the points defined the different steps of the methodology processes involved in the project “Design & Fabrication of Avalanche Resistance Equipment”.

- Study about the cause and the effects of avalanche. In this we study about the different avalanche occurs in the world and we mainly focus on the Himalaya reason. we also research about the different data’s on the Internet or in the different research paper.
- Comparative study between various alternatives. In this we compare the different and situation to find the maximum and minimum value of the avalanche. Ex: - Impact pressure, angle of sites or maintain, speed etc.

4. FEASIBILITY

This project work is feasible because the optimum value of size and shapes of the outer surface of equipment has been achieved in mechanical properties such as wear resistance, flexible strength, compressive strength, bending strength, breathability and sensing mechanism. With these values, the equipment will be able to sustain the effect of avalanches. So, it is feasible to design and fabricate the avalanche resistance equipment.

4. FUTURE SCOPE

The future scope of this equipment is very wide and dedicated to the nation. It is also required to save human lives from accidents due to snow, mud, and stones sliding in mountain regions. In order to achieve these aspects, the following points may be the future scope in steps.

- To make equipment invisible in ice and movable at the mountains.
- Selection of equipment’s and materials. In this we find the details about the different materials by considering the requirement and compare it and by comparing it we find best out of them.
- Design the avalanche resistance equipment using SOLIDORKS application. In this, we design the avalanche resistance equipment by different commands of the solid works by considering the different parameters of an avalanche.
- Analyze the avalanche resistance equipment using Analysis Softtwares like ANSYS application. In this, we analyze the designed avalanche-resistant equipment using ANSYS software on different parameters of the avalanche. Ex: - Force, speed, temperature, etc.
- Work on the real-time simulation or Crash test. In this, we create or manufacture the prototype avalanche-resistant equipment and did the Crash test for better output.

- To make self-destroyed by identifying the enemy and work on the material and increase itsstrength.

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Provision of Partial Grade Separation at a Major Intersection of Urban Roads under Highly Constrained Site Conditions

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Abstract- In urban roadway systems, intersections are considered to be very important nodal points and hence, special attention is required to solve the traffic problems at these nodal points. Major intersections of city roads in India are signalized and due to high rate of growth of traffic, capacities of most of these intersections have been exceeded. Hence, there is pressing need to solve the problems at these intersections by providing grade separation facilities. Provision of conventional grade separation facilities will require large area of land which is very difficult and expensive to acquire. Hence, as a compromise, partial grade separation facilities can be provided in combination with traffic signals. In the study reported here, the provision of partial grade separation facility at a high-volume intersection and an exclusive phase for pedestrian traffic with permissible bicycle movement along with pedestrians is discussed, according to the number of traffic streams and the direction of flow three phases for the vehicular traffic.

Keywords: urban road, intersections, traffic signal, grade separation

1. Introduction

The high rate of socio-economic development realised in India over the past few decades has resulted in high demand for transportation. The demand for transportation is particularly very high in urban areas resulting in high rate of growth of traffic in most cities of India. Currently, in most cases, the demand for transportation has exceeded the supply of transportation infrastructure comprising of the way, the vehicle, the terminal and the control. This traffic flow, in excess of the stipulated capacity [capacity stipulated by IRC 106 (1990)], has resulted in congestion and delay in most of the links and nodes of the road networks in Indian cities. The intersections being the vital nodal points of city road networks, increased attention needs to be paid to improve the efficiency of these nodal points. In order to reiterate the above stated point, we have selected a high volume intersection in Chennai, India as our site survey location.

2. Study Intersection

The signalized intersection involving, (i) Sardar Patel Road (ii) IT Expressway and (iii)West-Canal-Bank Road, located near Kasturba Nagar area in the southern part of Chennai city in India has been taken up as the case for the study. The location of the intersection, as in Google map, is shown in Figure 1. Sardar Patel Road is a four-lane divided road with raised footpath on both sides. The IT Expressway is a six-lane road with divider and service-road and raised footpath provided on both sides. The West-Canal-Bank Road is an intermediate-lane (5.5m wide carriageway) road with two-way traffic.

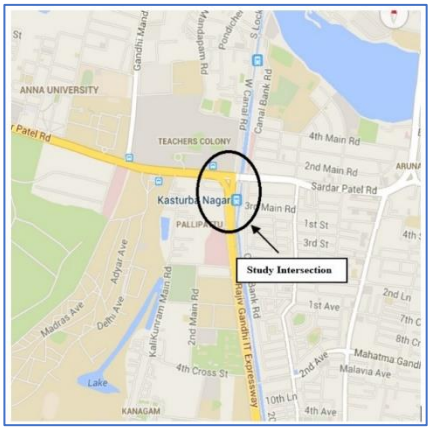

Figure 1: Location of the study intersection

The at-grade road intersections in urban areas in India, based on the operating conditions, are broadly classified into two categories: (i) Uncontrolled intersections and (ii) Controlled intersections. The uncontrolled intersections have no system of stop-

control and they are with or without channelization. The controlled intersections have either police control or signalization. Due to the high rate of growth of traffic, most of the signalized intersections in Indian Cities are overloaded leading to enormous delay to traffic. Thus, there is an urgent need for provision of grade separation at these intersections. Provision of conventional type of grade separation such as clover-leaf type, etc. however, requires considerable land space at the intersection area and acquisition of such large area of land is extremely difficult due to the high cost and the unwillingness of land owners to sell out such prime land space. Hence, it has become inevitable to go for partial grade separation in combination with signalization. The study reported here is concerned with provision of partial grade separation to work in combination with signal system and justification for the partial grade- separation facility based on economic grounds.

The intersection, taken for site-survey, has been provided with a three-phase fixed-time signal. The cycle time for the signal, as observed at site, during the morning peak period (8.30 to 9.30 AM) is 188 seconds. The timing diagram showing the details of all the three-phases is shown in Figure 2. Similarly, the cycle time for the signal during evening peak period (6.30 to 7.30 PM) is 195 seconds. The timing diagram showing the details of all the three phases is shown in Figure 3.

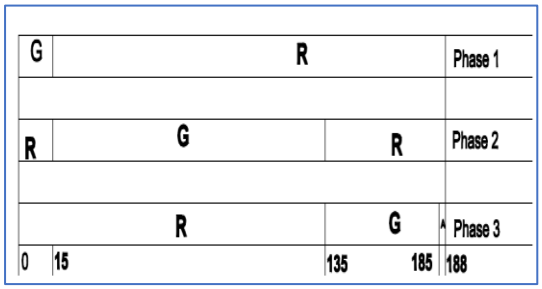

Figure 2: Timing diagram (Morning Peak)

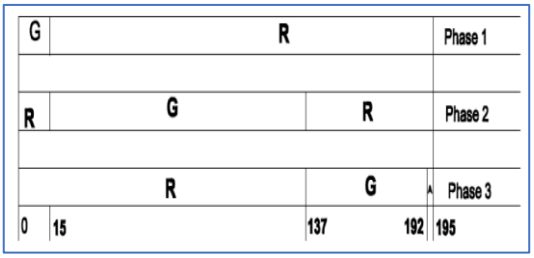

Figure 3: Timing diagram (Evening Peak)

3. Problem Formulation

Currently, the functioning of the study intersection is not satisfactory on several aspects. The specific issues concerned with the functional aspects of the signal are as follows:

(i) The signal cycle time at the study intersection is more than 3 minutes, both for morning and evening peak periods. Even this unusually long cycle time is unable to clear the accumulated queue of vehicles in the given phase and the vehicles, often, are to wait for more than a cycle to cross the intersection.

(ii) The existence of an elevated Railway line, very close to the intersection, is the major constraint for provision of a conventional grade separation facility.

(iii) The existence of a Higher Secondary School and other built-up land uses very close to the intersection puts severe constraint on land availability for the construction of a conventional grade separation facility.

4. Methodology of Approach

The methodology of approach adopted to solve the traffic problem at the study intersection has been formulated in the light of the problems discussed in Section 3 and based on the available information in the relevant literature.

By referring to Pinakin Patel, Ashish Dhamaniya, Dr. B.K. Katti (2015), Satyajit Mondal, Ankit Gupta (2019), Kumar A (2017), H. Qi, D. Wang , P. Chen, Y. M. Bie (2014), the following are the major aspects of the methodology of approach adopted to address the afore-mentioned issues:

(i) The existence of the elevated railway line on the eastern side of the intersection does not permit the use of the space either below or above the line to accommodate a conventional grade- separation facility. Hence, it is proposed to confine the construction of the proposed partial grade-separation facility to the area on the western side of the railway line.

(ii) Of all the traffic streams at the study intersection, the right turning stream from Sardar Patel Road to IT Expressway is having maximum volume. Hence, it is required to provide a grade separation facility for this stream of traffic. Based on site survey, it has been decided to provide an elevated grade separation for this stream.

5. Data Collection

Data collection is the most important phase of any project work as it is the base on which the whole of the project is constructed. Hence, it is required to collect information on all the relevant features of existing system that is taken up for the study with

utmost care. The system taken up for the study, in this case, is a high-volume signalized intersection, which is over-due to be converted into a grade separated intersection.

a) Roadway Data

The intersection is a staggered cross type of intersection with the IT Corridor and the West-Canal-Bank Road joining Sardar Patel Road at two different points. Sardar Patel Road is a four-lane divided road with 0.5m wide central median. The width of carriage way on the northern side is 9.10m and it is 8.9m on the southern side. The widths of raised footpaths on the northern and southern sides, respectively, are 3m and 2.5m.

The IT Expressway, which joins Sardar Patel Road on the southern side, is a six-lane road with central median of 2m width. The width of carriageway is 10.5m on both sides. There are service roads of 5m width provided on both sides and the width of the median dividing the service road and main carriageway is 1m. There are 2.5m wide raised and paved footpaths on both sides. An exclusive roadway for the left turning traffic from the IT Expressway on to Sardar Patel Road has also been provided at the intersection. A minor road with 5m wide carriageway joins the IT Expressway on its eastern side.

The West-Canal-Bank Road which joins Sardar Patel Road on its northern side is an intermediate-lane road with a carriageway width of 5.5m. This road has 2m wide earthen shoulder on both sides. The layout of the intersection area along with the adjoining land uses is shown in Figure 8 given under Section 7.

b) Traffic Data

The traffic data, for the purpose of this study, was collected by making a classified count of all the vehicles that pass through the intersection. For the purpose of the traffic-volume count, the different streams of traffic passing through the intersection were numbered as shown in Figure 4. To get the traffic data, the traffic flow at the intersection was captured using video camera mounted on vantage point. Since the intersection area is large, two cameras were used to capture the traffic flow. One camera was used to capture the left turning stream from IT Expressway and another camera was used to capture all the other streams of traffic. The two cameras were synchronized by matching their start and close times. A snap shot of the traffic flow at the intersection has been given Figure 5.

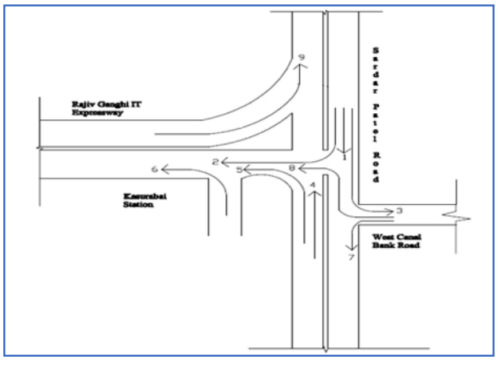

Figure 4: The numbered traffic streams at study intersection

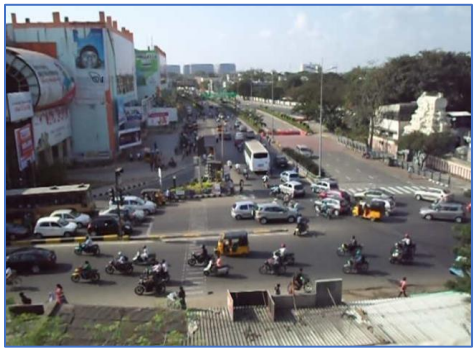

Figure 5: Photograph captured of the traffic flow at the study intersection

The traffic flow was captured for one hour each during morning and evening peak periods. To carry out the traffic-volume count, the various types of vehicles were classified into eleven categories as follows: (i) Trucks, (ii) Buses, (iii) Articulated Buses, (iv) Light commercial vehicles (goods), (v) Light commercial vehicles (passengers), (vi) Cars, Jeeps and Vans, (vii) Motor (three-wheelers), (viii) Motor (Two-Wheelers), (ix) Tricycles, (x) Bicycles and (xi) Animal Drawn Vehicles.

The video captured the traffic data of the study area and was then transferred to computer. The number of different types of vehicles in the different streams was manually counted by playing the video on the computer. The details of the percentage composition of the whole of the traffic, currently using the study intersection, during morning and evening peak periods, are shown Table 1.

6. Measurement of Traffic Volume

For the purpose of design of roadway and traffic-control system components, it is necessary to express the traffic volume in passenger car units (PCU) by converting the different type of vehicles into equivalent passenger cars. The PCU values to convert the different types of vehicles into equivalent passenger cars, derived based on the

available literature: Thamizh Arasan & Krishnamurthy (2012), Chandra & Sikdar (2000), Ganeshan, V. (1994), Partha Saha H.M., Iqbal Mahmud (2009), are given in Table 1 below. The details of traffic flow of all the streams of traffic, interms of PCU, in respect of morning peak and evening peak periods are shown in Figures 6 and 7 respectively.

Table 1: PCU Value of the Different Vehicles

Types of vehicles	PCU VALUE	Percentage composition	
		Morning Peak	Evening Peak
Truck	2.5	0	0
Buses	2.5	2	2
Buses Articulated	3.5	0	0
Light commercial vehicle (goods)	1.5	1	1
Light commercial vehicle (passenger)	1.5	2	2
Car, Jeep and Van	1	27	28
Motorized three-wheeler	1.2	6	6
Motorized two-wheeler	0.4	60	59
Tricycle	0.8	0	0
Bicycle	0.4	2	2
Animal Drawn Vehicle	5	0	0

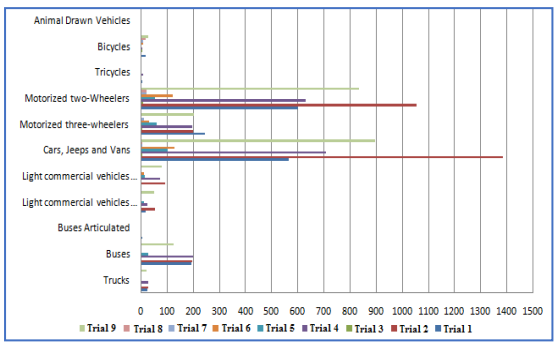

Figure 6: Volume of the different Traffic Streams (Morning Peak)

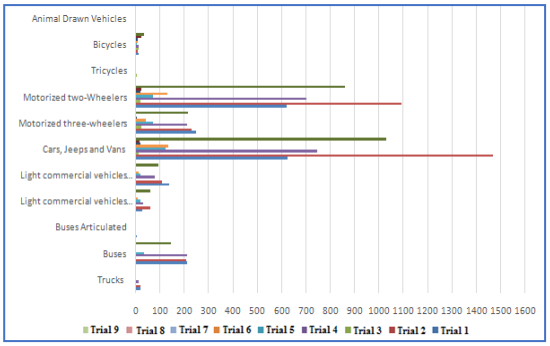

Figure 7: Volume of the different Traffic Streams (Evening Peak)

7. Proposed Partial Grade - Separation Facility

Keeping the above discussed aspects in consideration, a partial grade-separation facility at the intersection has been proposed with due consideration to the heavily built-up nature of the land use adjoining the intersection and the existence of the elevated Railway line very close to the intersection. Various options for providing the partial grade separation were considered by referring to the Geeta Tiwari (2002), Satyajit, Mondal and Ankit, Gupta (2019), as per the following details:

a) The option of taking the straight on traffic on Sardar Patel Road above the ground level was first ruled out because of the fact that the alignment of the flyover needs to cross the elevated railway line which has been laid at right angles to the alignment of Sardar Patel Road.

b) As the right turning stream form Sardar Patel Road on to IT Expressway is a high-volume stream, it was decided to take this stream of traffic above the ground level. Since the Railway line will not permit provision of a conventional right turning ramp, it was decided to provide the partial grade-separation facility on the up-steam-side of the intersection itself. Considering the volume of this stream of traffic and the constraints in widening of the two involved roads, it was decided to provide a 7.5 m wide elevated roadway for the stream at the intersection point with ramps at both the ends. The layout of the partial grade separation facility (for stream 2) is shown in Figure 8.

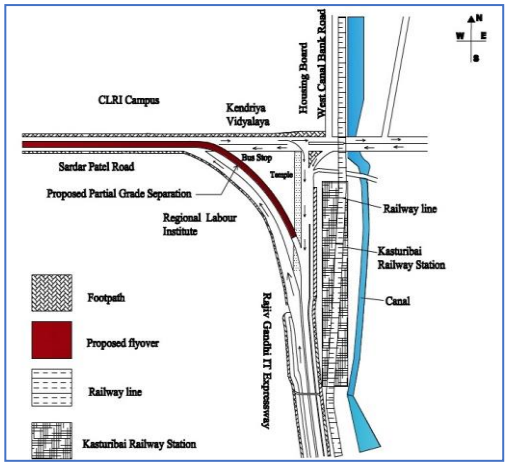

Figure 8: Layout of the Study Intersection showing the Alignment of the Proposed Partial Grade Separation Facility

8. Controlling the Rest of the Traffic at the Ground Level

As discussed in the previous section and by referring to the Qianjiao, Wu., Rong Lan, and Xianglong, Luo. (2009), Asaithambi, Gowri, Sekar Mourie, Hayjy, Sivanandan, Ramaswamy (2017) and Mathew, J. Korve and Debbie, A., Niemeier (2002), the proposed grade separation facility is limited in scope as it provides for only one right turning traffic stream (stream 2).'

As there are nine traffic streams to be dealt with at the intersection, the other traffic streams will cross the intersection at the ground level. Also, portions of the traffic (buses, bicycles, etc.) pertaining to the right turning stream (stream 2) will also move at the ground level. The details of this traffic are given in Tables 2 and 3, respectively, for the peak periods in the morning and evening time. Hence, there is a need to operate the study intersection as a signalized intersection in combination with the proposed partial grade- separation facility.

Table 2: Details of Ground Level Traffic Flow (Morning Peak)

Type of vehicle	Total no. of vehicles	Vehicle moving at ground level (%)	Volume in PCU per hour
	Stream 2	Stream 2	Stream 2
Buses	79	100	197
Buses Articulated	0	100	0
Light commercial vehicle (passenger)	32	50	48
Car, Jeep and Van	70	5	70
Motorized three-wheeler	42	25	50.4
Motorized two-wheeler	133	5	53.2
Bicycle	2	100	0.8
Total	358		419.4

Table 3: Details of Ground Level Traffic Flow (Evening Peak)

Type of vehicle	Total no of vehicles	Vehicle moving at ground level (%)	Volume in PCU in PCU per hour
	Stream 2	Stream 2	Stream 2
Buses	82	100	205
Buses Articulated	0	100	0
Light commercial vehicle (passenger)	46	50	69
Car, Jeep and Van	74	5	74
Motorized three-wheeler	48	25	57.6
Motorized two-wheeler	136	5	54.4
Bicycle	20	100	8
Total	406		468

9. Design of New Signal System

Considering the number of traffic streams and the direction of flow, it has been decided to provide

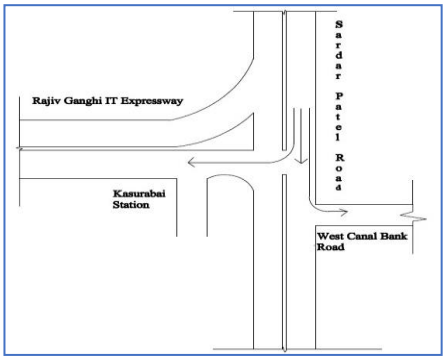

Figure 9: Traffic Flow Details in Phase 1

three phases for the vehicular traffic and an exclusive phase for pedestrian traffic with permissible bicycle movement along with pedestrians. The details of flow of traffic in the four phases are shown in the Figures 9 to 12.

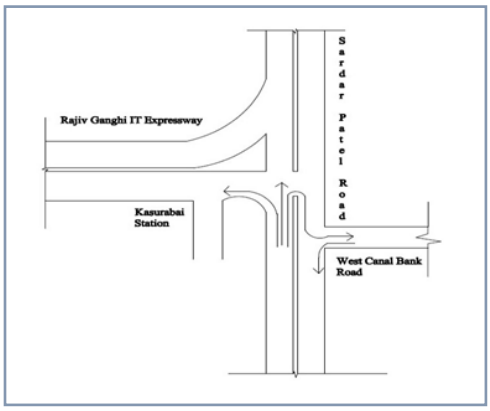

Figure 10: Traffic Flow Details in Phase 2

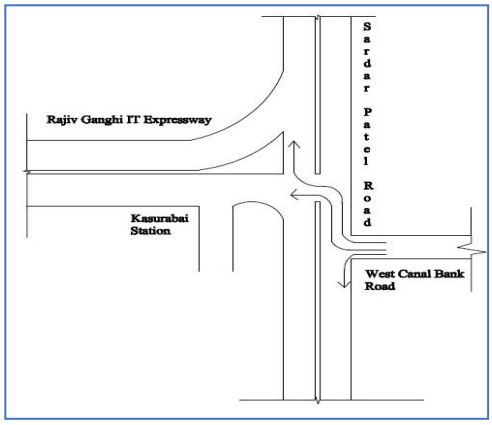

Figure 11: Traffic Flow Details in Phase 3

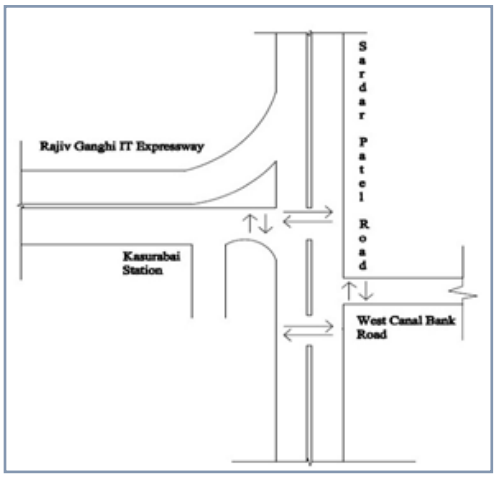

Figure 12: Pedestrian Phase

The design of cycle time for the signal was done using Webster's formula by referring to the relevant literature (Webster (1961), Federal Highway Administration, USA (1977), IRC: 93 (1985), IRC: 106 (1990), Kadiyali (1997), Thamizh Arasanand Manfred Boltze (2004), Cesar, A., Quiroga, P.E., and Darcy Bullock, P.E. (1999). The cycle time and phase split details are shown in Figures 13 and 14 for the morning and evening peak periods, respectively.

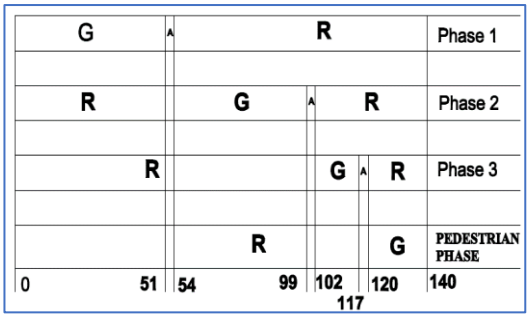

Figure 13: Timing Diagram for Morning Peak

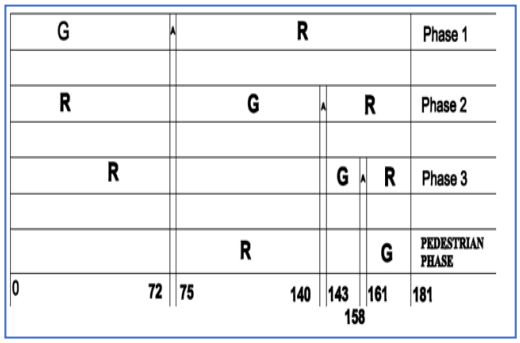

Figure 14: Timing Diagram for Evening Peak

10. Conclusion

In developing countries like India, the budgetary constraints and the non-availability of sufficient land to provide full-fledged grade separation facilities at high-volume signalized intersections on urban road has become extremely difficult and hence, it has become necessary to provide partial grade separation. Here, the methodology of approach for provision of partial grade separation has been demonstrated though a case study. The important findings of the study are stated, as follows:

a) The highly constrained site conditions such as the one concerned with this study require innovative approach to design partial grade separation facilities.
b) The unconventional right turning ramp proposed for the traffic taking right turn from Sardar Patel Road to IT Expressway is an innovative approach in the design of right turning ramps.
c) The partial grade separation facility proposed for the study intersection has

resulted in significant reduction in the signal cycle time. For example, during morning peak, the cycle time has got reduced from the value of 188 seconds to 140 seconds. Similarly, during evening peak period, the cycle time has got reduced from the value of 195 seconds to 181 seconds.

Declarations

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A Comparative Study on The Seismic and Cost Analysis of RCC and Composite Structure in India

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Abstract-As a replacement for pure steel and pure concrete, steel concrete composite construction has acquired widespread acceptance around the world. In comparison to many other emerging nations, India uses a fairly little amount of steel in the building sector. In the current study, steel concrete composite with RCC choices are taken into consideration for a comparative analysis of G+10, G+15, G+20, G+25, and G+30 story commercial buildings that are suitable for seismic zone IV with a base wind speed of 47 m/s. CSI ETABS software is utilized for the modeling and analysis of the structure. Both Composite and RCC constructions are analyzed using the Equivalent Static Method of Analysis. The findings demonstrate that composite constructions are more durable and economical than RCC structures.

Keywords: Cost Analysis; Composite Beam; Composite Column; CSI ETABS; RCC Beam; RCCColumn; Seismic Analysis.

1. INTRODUCTION

For more than three to four decades, reinforced concrete projects have met increasing demands in the construction and structural engineering fields. Any building structure utilizing various materials is referred to as a "composite construction" in general. In general, buildings composed of steel and reinforced concrete performs greater safely and effectively than those made of either element alone because they combine the special qualities of the two materials. Composite structure basically, different materials are totally parallel to one another and compatible with one another. They exhibit nearly equal thermal expansion, a perfect mixture of strengths with concrete being and useful in compression and steel to be effective in tension. Concrete also prevents steel from corrosion and behaves as a thermal insulator for steel at high temperatures and can protect slender steel sections from local or lateral-tensional buckling. This study compares and contrasts the construction of RCC and composite structures comparing Displacement at Top, Storey-Drift at Top, Base Shear, Maximum Axial Force in Column, Maximum Shear Force in Column, Maximum Bending
Moment in Column, Maximum Axial Force in Beam, Maximum Shear Force in Beam, and Maximum Bending Moment in Beam.
The salient objectives of the presentstudy have been identified as follows:

1. To determine the effect of lateral loadson RCC and Composite building using CSI ETABS software.
2. Equivalent Static Method of Analysisof both RCC and Composite commercial building suited in earthquake zone IV and basic wind speed 47 m/s.
3. Cost analysis of Composite with Respect to RCC structure using MS-Excel Programming.

2. ELEMENTS OF COMPOSITE STRUCTURE

The rigidity of the section in every stage isthe main difference between those kinds of sections. In reinforced concrete, all segments of the section are made of the same materials. And also, they're made of the same concrete strength and casted monolithically. So, when the concrete havereached at least 80% of its strength, every part of the section works together as one section. In composite section, the section is constructed from a variety of materials, including concrete and structural steel.

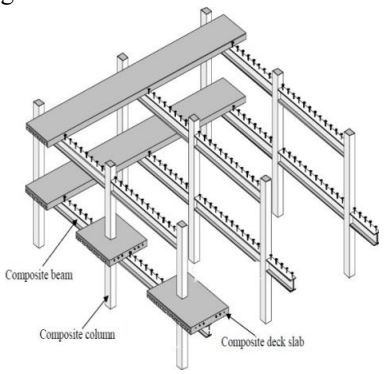

Fig 1: *Composite Framed Structure*

The following elements are the primary structural components for use in composite construction:

i) Composite Deck Slab
ii) Composite Beam
iii) Composite Column
iv) Shear Connectors

Composite Deck Slab: Steel beams, metal decking, and concrete make up the components of the composite floor system, or composite deck slab. The metal deck normally extends without support between steel components and acts as a work surface for concreting. While transferring wind and seismic shears to the lateral load-resisting components, the

composite floor system creates a stiff horizontal diaphragm that helps to stabilize the entire building structure.

Composite Beam: Steel beam and slab acting as a composite beam with action similar to that of a monolithic Tee beam Steel is liable to bending in compression, but concrete is stronger in compression than intension.

Composite Column: The steel concrete composite column is a compression member that is made of a hot-rolled steel section which has either being concrete-encased or hollowed out and filled with concrete. Compression and bending are the major stresses placed on composite parts.

Shear Connectors: The total shear force at the interface between concrete slab and steel beam is approximately eight times the total load carried by the beam. Therefore, mechanical shear connections are required at the steel- concrete interface.

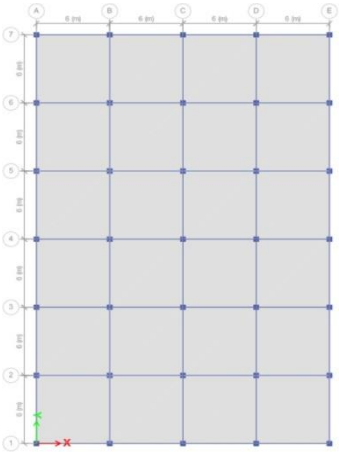

Fig 2: *Building Plan*

3. BUILDING DESCRIPTION

The structure being discussed here is a commercial structure with G+10, G+15, G+20; G+25, G+30 stories located in seismic zone IV and wind speed 47 m/s. Figure 2 displays the building's floor plan. The structure is designed to meet the essential needs of an office area. The floor design is maintained symmetric along both

4. METHODOLOGY

The dimension of the building is 24m X 36m.
Table 1 lists relevant information.

Table 1: Design Specifications

Particulars	**RCC Framed Structure**	**omposite Framed Structure**
Plan Dimension	24m X 36m	24m X 36m
Height of each storey	4m	4m
Size of Beams	300 X600mm	ISMB600@ 122.6kg/m
Size of Column	700 X700mm	500mm X 500mm (SC250@85 .6Kg/m +125mm ConcreteCover)
Thickness of Slab	150mm	150mm
Thickness of Wall	230mm	230mm
Density of Concrete	25KN/m^3	25KN/m^3
Density of Brick	20KN/m^3	20KN/m^3
Seismic Zone	IV	IV
Soil Condition	Medium Soil	Medium Soil
Response Reduction Factor	5	5
Importance Factor	1.5	1.5
Seismic Zone Factor	0.24	0.24
Live Load on all Floors	5KN/m^2	5KN/m^2
Live Load at Roof Level	2KN/m^2	2KN/m^2
Floor Finish	1.5KN/m^2	1.5KN/m^2
Damping Ratio	5%	3%

1. The building model is analyzed using the tabulated data in staticanalysis using CSI ETABS software.
2. Relevant IS Codes were used forthe parameters such as Seismic Load IS 1893:2002 is used, for Wind load IS 875 (PART-3) is used.
3. After applying the loads, loadcombinations were defined according to IS 456:2000, for LimitState of Design.
4. Seismic Load is defined by JointWeight Method. For selection of members of composite Structure, IS 808:1989 isused.
5. Models were analyzed according toIS 456:2000 and IS 800:2007 respectively.

5. LOAD COMBINATIONS

1. The following load combinations are used for the analysis of the building. The combinations are according toLimit State of Design Method.

2. Combinations are divided into two envelopes, Envelope 101 for Limitstate of Serviceability and 201 for Limit State of Collapse/Strength.

- **Loads:**
  - DL: Dead Load
  - LL: Live Load
  - WL: Wind Load
  - EQ: Seismic Load

Table 2: Envelope 101

Load Case No.	Load Combination
101	DL + LL
102	DL + 0.8LL + 0.8WL_+X
103	DL + 0.8LL + 0.8WL_+Z
104	DL + 0.8LL + 0.8WL_-X
105	DL + 0.8LL + 0.8WL_-Z
106	DL + WL_+X
107	DL + WL_+Z
108	DL + WL_-X
109	DL + WL_-Z
110	DL + 0.8LL + 0.8 EQ_+X + 0.24EQ_+Z
111	DL + 0.8LL + 0.8 EQ_+X + 0.24EQ_-Z
112	DL + 0.8LL + 0.8 EQ_-X + 0.24EQ_+Z
113	DL + 0.8LL + 0.8 EQ_-X + 0.24EQ_-Z
114	DL + 0.8LL + 0.24 EQ_+X + 0.8EQ_+Z
115	DL + 0.8LL + 0.24 EQ_-X + 0.8EQ_+Z
116	DL + 0.8LL + 0.24 EQ_+X + 0.8EQ_-Z
117	DL + 0.8LL + 0.24 EQ_-X + 0.8EQ_-Z
118	DL + EQ_+X + 0.3EQ_+Z
119	DL + EQ_+X + 0.3EQ_-Z
120	DL + EQ_-X + 0.3EQ_+Z
121	DL + EQ_-X + 0.3EQ_-Z
122	DL + 0.3EQ_+X + EQ_+Z
123	DL + 0.3EQ_-X + EQ_+Z
124	DL + 0.3EQ_+X + EQ_-Z
125	DL + 0.3EQ_-X + EQ_-Z

Load Case No.	Load Combination
201	1.5DL + 1.5LL
202	1.2DL +1.2LL +1.2WL_+X
203	1.2DL +1.2LL +1.2WL_+Z
204	1.2DL +1.2LL +1.2WL_-X
205	1.2DL +1.2LL +1.2WL_-Z
206	1.5DL + 1.5WL_+X
207	1.5DL + 1.5WL_+Z
208	1.5DL + 1.5WL_-X
209	1.5DL + 1.5WL_-Z
210	1.2DL + 1.2LL + 1.2 EQ_+X
	+ 0.36EQ_+Z
211	1.2DL + 1.2LL + 1.2 EQ_+X
	+ 0.36EQ_-Z
212	1.2DL + 1.2LL + 1.2 EQ_-X
	+ 0.36EQ_+Z
213	1.2DL + 1.2LL + 1.2 EQ_-X
	+ 0.36EQ_-Z
214	1.2DL + 1.2LL +
	0.36EQ_+X + 1.2EQ_+Z
215	1.2DL + 1.2LL + 0.36EQ_-X
	+ 1.2EQ_+Z
216	1.2DL + 1.2LL +
	0.36EQ_+X + 1.2EQ_-Z
217	1.2DL + 1.2LL + 0.36EQ_-X
	+ 1.2EQ_-Z
218	1.5DL + 1.5EQ_+X +
	0.45EQ_+Z
219	1.5DL + 1.5EQ_+X +
	0.45EQ_-Z
220	1.5DL + 1.5EQ_-X +
	0.45EQ_+Z
221	1.5DL + 1.5EQ_-X +
	0.45EQ_-Z
222	1.5DL + 0.45EQ_+X +
	1.5EQ_+Z
223	1.5DL + 0.45EQ_-X +
	1.5EQ_+Z
224	1.5DL + 0.45EQ_+X +
	1.5EQ_-Z
225	1.5DL + 0.45EQ_-X +
	1.5EQ_-Z

6. RESULTS

1. The results below are for both the envelopes. Above written values are for envelope 101 and below are for envelope 201.

2. Note: Storey- Drift is for combined load combinations.

1. G+10

The resultant values of the parameters dueto Static Analysis of the G+10 structures are given in Table 4.

Table 4: Resultant Values of G+10 Structure

2. G+15

The resultant values of the parameters dueto Static Analysis of the G+15 structures are given in Table 5.

Table 5: Resultant Values of G+15Structure

S. No.	Particulars	RCC Framed Structure	Composite Framed Structure
1.	Displacement at Top (mm)	279.432	206.612
		419.148	309.918
2.	Storey-Drift at Top (mm)	39.3063	29.7037
3.	Base Shear (kN)	10645.471	11949.541
		15968.206	17924.311
4.	Maximum Axial Force in Column (kN)	10645.471	10203.683
		15968.206	15305.525
5.	Maximum Shear Force in Column (kN)	248.378	293.135
		401.812	474.218
6.	Maximum Bending Moment in Column(kN-m)	700.082	857.461
		1050.123	1286.191
7.	Maximum Axial Force in Beam(kN)	149.199	140.605
		218.199	205.631
8.	Maximum Shear Force in Beam (kN)	307.438	337.291
		445.754	489.036
9.	Maximum Bending Moment in Beam(kN-m)	679.334	772.742
		1019.000	1159.112

3. G+20

The resultant values of the parameters dueto Static Analysis of the G+20 structures are given in Table 6.

Table 6: Resultant Values of G+20Structure

S. No.	Particulars	RCC Framed Structure	Composite Framed Structure
1	Displacement at Top (mm)	414.757	303.809
		622.135	455.713
2	Storey-Drift at Top (mm)	58.8662	44.491
3	Base Shear (kN)	13821.04	15514.11
		20731.56	23271.17
4	Maximum Axial	13821.04	13319.33
	Force in Column (kN)	20731.56	19979
5	Maximum Shear	292.555	338.252
	Force in Column (kN)	438.832	507.377
6	Maximum Bending Moment in Beam(kN-m)	752.018	892.419
		1128.027	1338.629
7	Maximum Axial Force in Beam(kN)	197.752	176.019
		286.284	254.821
8	Maximum Shear Force in Beam (kN)	326.943	344.336
		471.184	496.251
9	Maximum Bending Moment in Beam(kN-m)	731.006	802.791
		1096.509	1204.186

4. G+25

The resultant values of the parameters dueto Static Analysis of the G+25 structures are given in Table 7.

Table 7: Resultant Values of G+25Structure

S. No.	Particulars	RCC Framed Structure	Composite Framed Structure
1	Displacement at Top (mm)	574.392	422.695
		861.588	634.042
2	Storey-Drift at Top (mm)	81.964	60.523
3	Base Shear (kN)	16853.41	18924.69
		25280.11	28387.03
4	Maximum Axial Force in Column	16853.41	16346.12
	(kN)	25280.11	24519.18
5	Maximum Shear	314.296	358.171
	Force in Column (kN)	434.4	495.042
6	Maximum Bending Moment in Column(kN-m)	796.708	913.505
		1195.062	1370.258
7	Maximum Axial Force in	242.677	204.358
	Beam(kN)	361.959	304.805

8	Maximum Shear Force in Beam	343.893	366.521
	(kN)	492.149	524.532
9	Maximum Bending Moment in Beam(kN-m)	773.669	855.755
		1160.503	1283.323

S. No.	**Particulars**	**RCC**	**Composite**
		Framed Structure	**Framed Structure**
1	Displacement at Top (mm)	761.982	539.407
		1142.973	809.111
2	Storey-Drift at	109.1444	79.096
	Top (mm)		
3	Base Shear (kN)	19765.58	22358.83
		29648.37	33538.24
4	Maximum Axial Force in Column	19765.58	18913.69
	(kN)	29648.37	28370.53
5	Maximum Shear Force in Column	333.672	383.322
	(kN)	500.508	574.983
6	Maximum Bending Moment in	836.115	965.881
	Column(kN-m)	1254.173	1448.821
7	Maximum Axial Force in	288.042	239.996
	Beam(kN)	432.063	355.501
8	Maximum Shear Force in Beam	358.625	384.948
	(kN)	510.202	547.651
9	Maximum Bending Moment in	810.452	903.816
	Beam(kN-m)	1215.678	1355.724

5.G+30

The resultant values of the parameters dueto Static Analysis of the G+30 structures are given in Table 8.

Table 8: Resultant Values of G+30Structure

S. No.	**Particulars**	**RCC**	**Composite**
		Framed Structure	**Framed Structure**
1	Displacement at Top (mm)	761.982	539.407
		1142.973	809.111
2	Storey-Drift at	109.1444	79.096
	Top (mm)		
3	Base Shear (kN)	19765.58	22358.83
		29648.37	33538.24
4	Maximum Axial Force in Column	19765.58	18913.69
	(kN)	29648.37	28370.53
5	Maximum Shear Force in Column	333.672	383.322
	(kN)	500.508	574.983
6	Maximum Bending Moment in	836.115	965.881
	Column(kN-m)	1254.173	1448.821
7	Maximum Axial Force in	288.042	239.996
	Beam(kN)	432.063	355.501
8	Maximum Shear Force in Beam	358.625	384.948
	(kN)	510.202	547.651
9	Maximum Bending Moment in	810.452	903.816
	Beam(kN-m)	1215.678	1355.724

6. COST ANALYSIS

The cost analysis of only G+10 structures is carried out in this report and is tabulatedin Table 9 for RCC Framed Structure and Table 10 for Composite Framed Structure.Cost analysis of the structure is done in Indian National Rupees (Rs.).

Table 9: Cost Analysis of RCCStructure

S. No.	**Material**	**Quantity**	**Rate**	**Amount (Rs.)**
1	Concrete M30 Grade	1532 M3	Rs.5000 per M^3	76,60,000
2,	HYSD Bars Fe415 Grade	230930 Kg	Rs. 82 per Kg.	1,89,36,260
Total (Rs.)				2,65,96,260

Table 10: Cost Analysis of CompositeStructure

S. No.	Material	Quantity	Rate	Amount (Rs.)
1	Concrete M30 Grade	572 M^3	Rs.5000 per M^3	28,60,000
2	HYSD Bars Fe415 Grade	310230 Kg	Rs. 82 per Kg.	2,54,38,860
3	ISSC250 and ISMB600	643802 Kg	Rs. 85 per Kg.	5,47,23,170
Total(Rs.)				8,30,22,030

7. CONCLUSION

The results lead to the conclusion that about study and work done:

1. Composite framed structures have a better lateral load resisting capability than RCC framed structures.
2. Increase in Displacement is less in composite structures as compared to RCC Structures.
3. Because frames in composite structures have a lower self-weight, there is a noticeable decrease in building costs.
4. The Storey - Drift at top decreasesin composite structures as compared to RCC structures.
5. When compared to RCC constructions, the axial forces, bending moments, and shear forces of the composite structure are significantly lower for the same loadings. The columns and beams of the composite structure's lower dimensions are ultimately caused by the reduced bending moments and axial forces. As a result, it can be said that the composite construction is more cost-effective than the RCC building.
6. Due to its high cost, steel is a building material that can raise material costs. However, quick construction, less dead load, and a number of other factors can reduce the entire project cost.

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