International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

DRONE DETECTION THROUGH LIVE CAMERA USING YOLOv3

[1]Ms. E. Padma, [2]Mr. A.S.H. PRANAV, [3]Mr. C. Adithya Siddhartha

[1]Assistant Professor,[2]Graduate Student,[3] Graduate student

Dept. of Computer Science Engineering,

SCSVMV (Deemed to be University), Enathur, India

Abstract: The production of unmanned aerial vehicle (UAV) also known as drones is increasing day by day and they are easily accessible to almost everyone. There are many uses of drones in the real world like medical industry also in defense. But the increase in drones also increased the safety concerns. This is because they are being used to perform terror attacks causing serious threats to public. Hence it has become very essential to detect and neutralize these drones in the real world. There are radar systems which detect these drones but we need more than that to detect these drones accurately. Radar can detect drones with a larger RCS at a greater distance that a drone with a small RCS. Typically, radar systems can detect drones up to 1 mile away for a Phantom 4 Size drone. The range is affected by Drone size. Radar detection range is also slightly affected by weather conditions like rain and fog. Computer vision is such technology with which we can detect the drones with a decent accuracy. Our project is to detect drones through a live camera at any atmosphere. We used some popular frameworks and machine learning algorithms with computer vision to make this project work.

Keywords: Machine Learning, Deep Learning, Python, YOLOv3.

I. INTRODUCTION

Drones are becoming more and more accessible to almost everyone, and production of unmanned aerial vehicles (UAVs) or drones is rising daily. Drones are used in a variety of real-world applications, including the medical and defense industries. But as the number of drones mounted, so did the worries about their safety. This is because they are being employed to carry out terrorist attacks that pose grave risks to the general public. Detection and destruction of these drones in the actual world are therefore now absolutely necessary. These drones can be detected by radar systems, but more is required for an accurate detection. Drones with a larger RCS are easier for radar to detect than those with a smaller RCS.A Phantom 4 Size drone can typically be detected by radar systems up to 1 mile away. The size of the drone affects the range. Weather variables like rain and fog have a very little impact on the radar detection range. With the use of computer vision technologies, we can identify drones fairly well. Our concept involves using a live camera to find drones in any environment. In order to complete this project successfully, we employed some well-known frameworks and computer vision machine learning techniques.

II. LITERATURE SURVEY

Hao liu, Drone Detection Based on an Audio-Assisted Camera Array, 2017 - In recent years, small, inexpensive UAV - also known as drone - has made great progress, which brings privacy and security issues. Drone detection is one of the important methods to solve these problems. The main challenges of drone detection are: (1) A drone is very confusing with other flying objects such as a bird, (2) the low-flying UAV occlusion happens very frequent, and (3) the existing surveillance coverage is limited. Camera array can be used for large-scale airspace observation. In this paper, we propose a modular camera array system with audio assistance, which consists of dozens of high-definition cameras and multiple microphones, to monitor drones. It can be mounted on a carrier after reducing the size. The system captures the image and audio information of the surroundings in various directions. The system can integrate the information of multiple sensors, and identify the characteristics of the drone to achieve higher efficiency of drone monitoring.

Chian cheng yeh, Mohammad khaleel, Roof Region Detection From Drone Images, 2019 **-** Due to the large data volume, the UAV image stitching and matching suffers from high computational cost. The traditional feature extraction algorithms—such as Scale-Invariant Feature Transform (SIFT), Speeded Up Robust Features (SURF), and Oriented FAST Rotated BRIEF (ORB)—require heavy computation to extract and describe features in high-resolution UAV images. To overcome this issue, You Only Look Once version 3 (YOLOv3) combined with the traditional feature point matching algorithms is utilized to extract descriptive features from the drone dataset of residential areas for roof detection. Unlike the traditional feature extraction algorithms, YOLOv3 performs the feature extraction solely on the proposed candidate regions instead of the entire image, thus the complexity of the image matching is reduced significantly. Then, all the extracted features are fed into Structural Similarity Index Measure (SSIM) to identify the corresponding roof region pair between consecutive image sequences. In addition, the candidate corresponding roof pair by our architecture serves as the coarse matching region pair and limits the search range of features matching to only the detected roof region.

Lokesh Allamki, Manjunath Panchakshari, Ashish Sateesha, K S Pratheek, Anti-Drone System with Multiple Surveillance Technologies: Architecture, Implementation, and Challenges, 2021 **-** In recent years, drones have undergone tremendous development. Due to the low price and ease of use, drones have been widely utilized in many application scenarios, which potentially pose great threats to public security and personal privacy. To mitigate these threats, it is necessary to deploy anti-drone systems in sensitive areas to detect, localize, and defend against the intruding drones. In this article, we provide a comprehensive overview of the technologies utilized for drone surveillance and the existing anti-drone systems. Then we develop an anti-drone system at Zhejiang University, named ADS-ZJU, which combines multiple passive surveillance technologies to realize drone detection, localization, and radio frequency jamming.

III. PROPOSED METHODOLOGY

A. EXISTING SYSTEM

The production of unmanned aerial vehicle (UAV) also known as drones are increasing day by day and they are easily accessible to almost everyone. The increase in drones also increased safety concerns as they are being used for activities that cause harm to mankind. Hence, it is essential to detect and neutralize these drones. The existing system to detect these are drones is a radar system which can detect up to 1 mile. The detection is affected by drone size and other climatic conditions. Computer vision is such technology with which we can detect the drones with a decent accuracy. Our project is to detect drones through a live camera at any atmosphere. We used some popular frameworks and machine learning algorithms with computer vision to make this project work and drawbacks of existing system are Fails to detect small quad-copters occupies more space, High cost and low reliability, Range < 350 ft, Difficult when altitude is high.

B. PROBLEM STATEMENT

The problem is detecting and localizing the drone (Unmanned Aerial Vehicles) in a video stream. Some challenges posed in this problem include:

Most of the object detection models often confuse birds with drones and hence they need to be trained on extensive datasets. There could be various weather conditions and the visibility might not be even in most cases. We also need to tackle the problem during night condition. This could be made possible by using infrared or thermal cameras.

C. PROPOSED SYSTEM

Proposed system of Drone detection is a video-based detection system using advanced deep learning algorithms and their frameworks. In this detection system, we used YOLOv3 algorithm and darknet as its framework to detect drones at any atmosphere and we are also used transfer learning. Advantages of proposed system are More accurate results**,** highly scalable**,** long range detection**,** User friendly**,** highly reliable and robust.

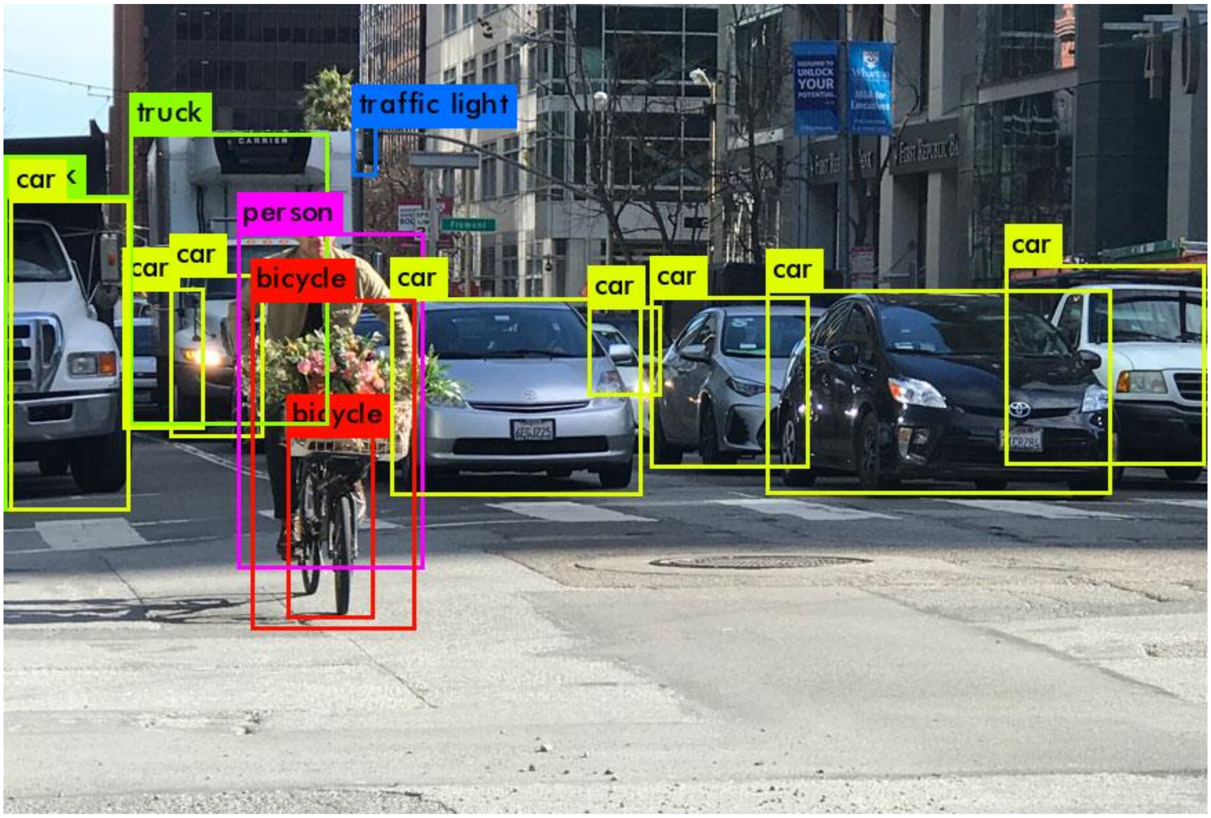


Figure 1: Object detection with YOLOv3

D. SYSTEM ARCHITECTURE

In this project, the system that is going to be developed will automatically detect and track drones. The system takes the weights after the model training and at the time of testing a GUI will start with a detect button and when that button is pressed a camera will be opened and live video stream will be started. If the video contains a drone, it will be localized and will be detect and later on the movement of the drone will be tracked.

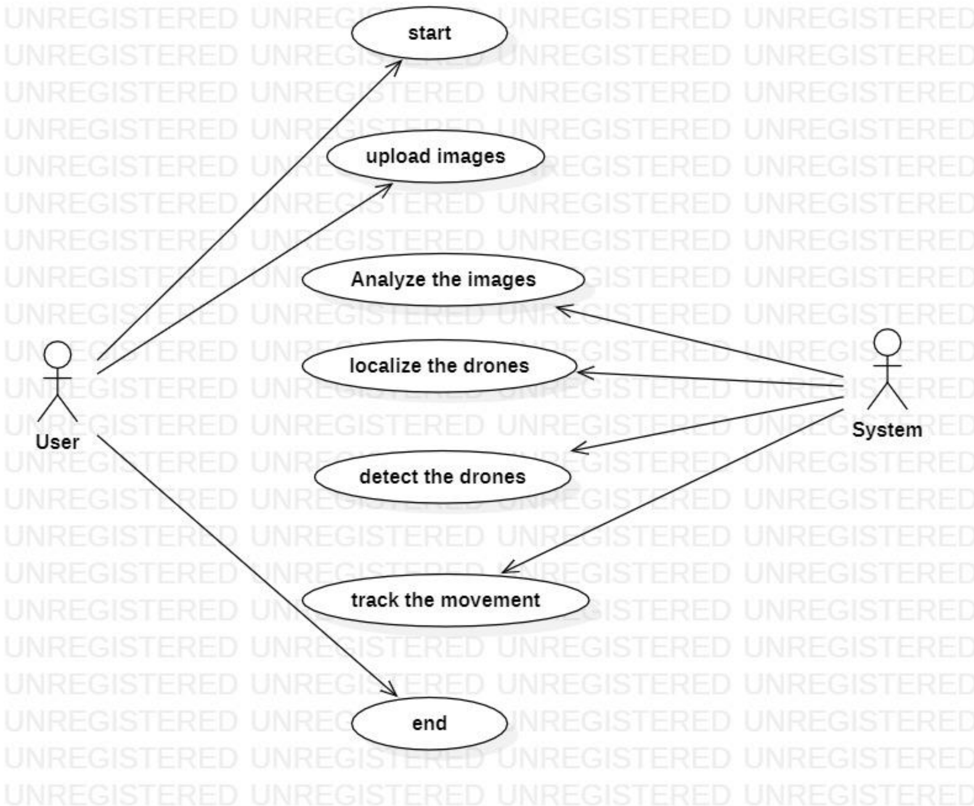


Figure 2: PROPOSED ARCHITECTURE

E. MODULES

Upon breaking down our project into different modules, below are the modules that describe our project in detail:

Feature module

This module describes the features of the drone detection system. The features include identifying, detecting and tracking of the drone. Identifying and detection of the drone will be done by using opencv and related libraries. Tracking of the drone involves tracing the movement of the drone. The bounding box moves with the drone after detecting it. With this the movement of the drone can be tracked

Train and test module

In this module, the dataset will be trained using various machine learning classifier algorithms and later it will be tested to get the insights of its working and accuracy of the model. The model requires atleast 2000 iterations to get properly trained. So that a decent accuracy can be achieved at the time of testing the module.

Classification module

In this module the classification will be done. This module comes under visualization that is, the drone will be classified from all the other objects in the surroundings and will be detected and tracked. First the drone will be localised and then it will be detected.

UI Module

A GUI based system has been made using tkinter which has image of a drone and a Detect button. After the application window is popped up, user need to press the detect button which is available on the application window. Then a camera window will be popped up and starts to record the frames. After a drone enters the frame, the system analyzes the images in the dataset, localizes and detects the drones and also tracks their movement.

F. IMPLEMENTATION PROCESS

Custom dataset is created for this project. The dataset consists around 850 images of drones downloaded from the internet. After collecting them, LabelImg tool is used to label the images in order to train them after labelling them they were saved in yolo format. The dataset was split into training and test dataset with a python script(process.py). The batch size was set to 64 that is 64 images for one iteration. After splitting the dataset, the training is started and the whole training was done in windows command prompt. The weights were stored to the system and the path of those weights were given in the python code for testing the model that we trained.

IV. EXPERIMENTAL ANALYSIS

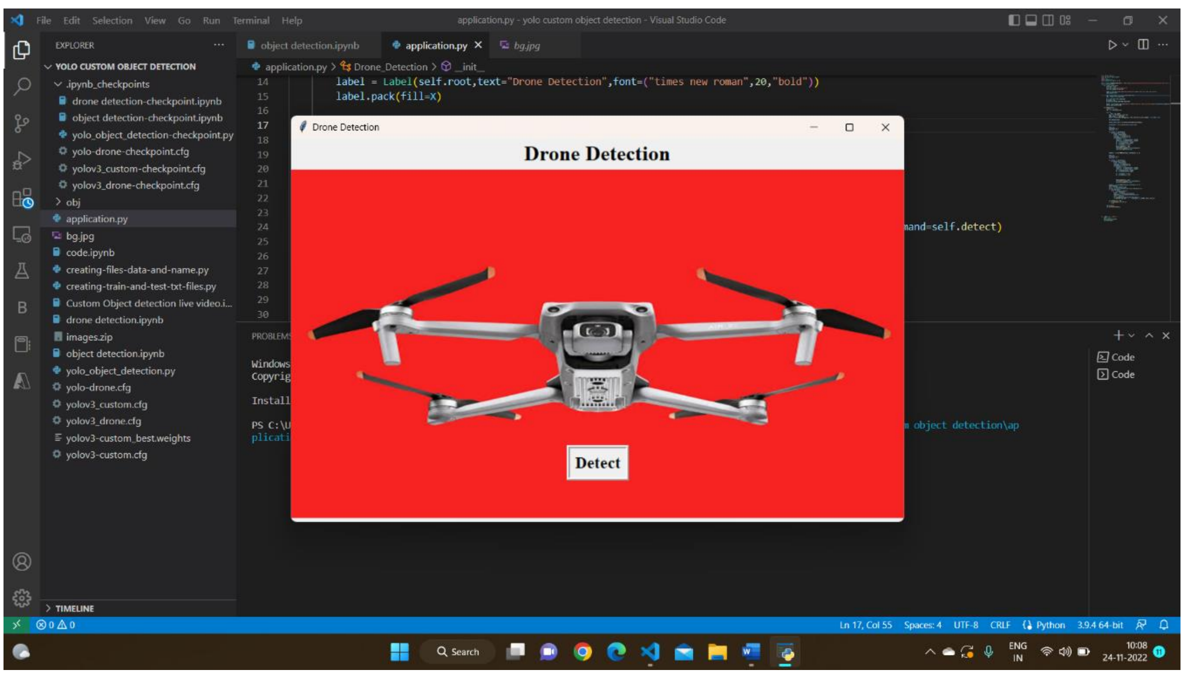


Figure 3: GUI of drone detection system

Figure 4: drone detection

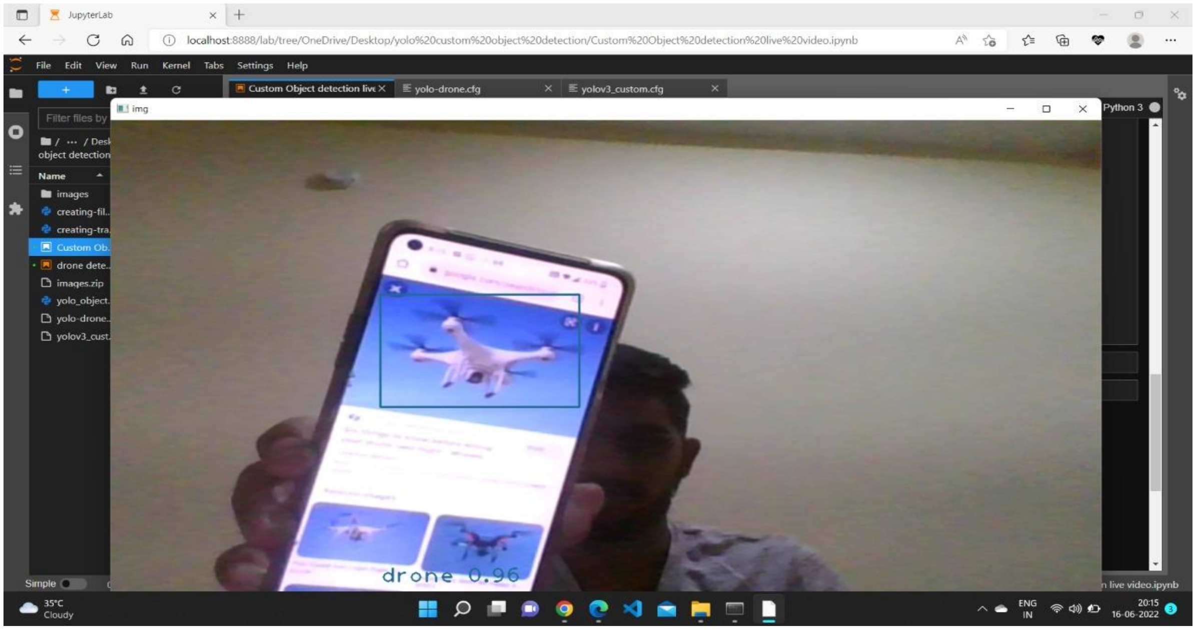
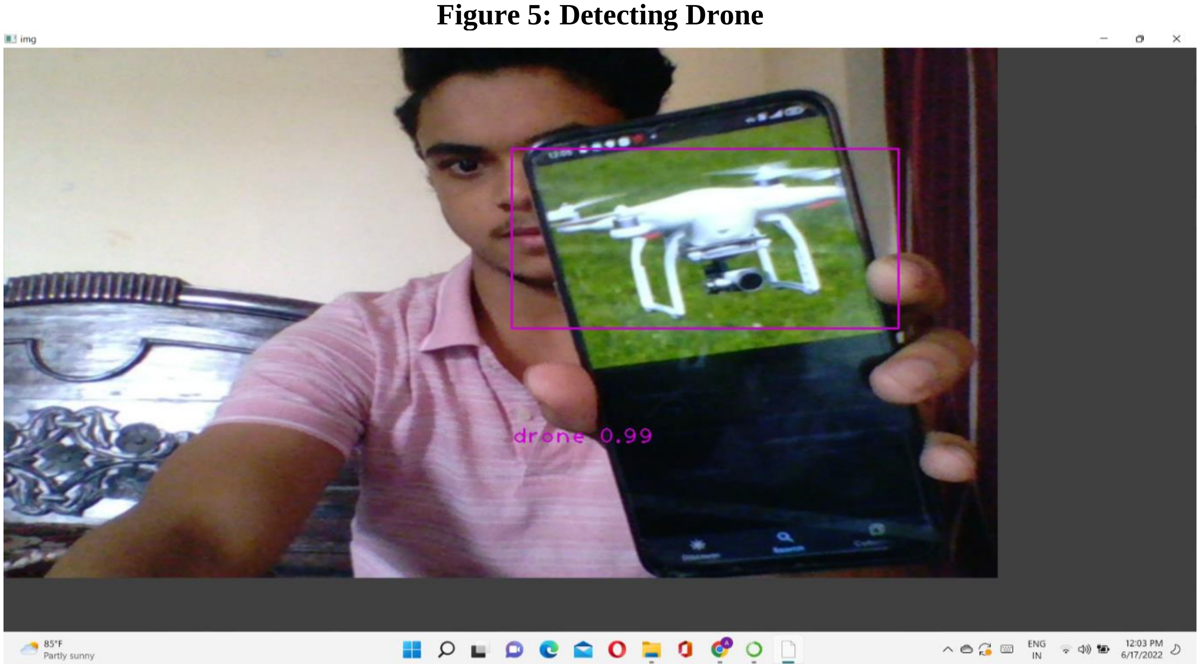


Figure 5: Detecting Drone



V. CONCLUSION

Everything that were required to complete our project like tools used, architectural diagram, research papers, working modules etc. is included. Custom dataset is created by downloading images from the internet and labelled them using lableImg tool, trained the model in command prompt and tested the model using a python code. The coding was done in VSCode. The objective is to localize, detect and track the movement of the drones in live stream. There is a significant scope for further enhancement of our project. That is, tracking can be done in a more efficient way by exactly tracking the route and direction in which the drone moved. It can be done by many methods. For example OpticalFlow, GOTURN, MEDIANFLOW etc. The main purpose of this project is not only to detect and track the drones but also to neutralize them. This can be done by using shooting down them. This feature completes the project.

REFERENCES

[1] R. Clarke and L. Bennett Moses, "The regulation of civilian drones' impacts on public safety", 2018 , Comput. Law Secur. Rev., vol. 30, pp. 263-285.
[2] M. Brooks, "Welcome to the personal drone revolution", 2012 New Sci., vol. 216, no. 2894, pp. 42-45.
[3] D. Chiang, W. Fishbein and D. Sheppard, "Acoustic aircraft detection sensor", 2013 Proceedings of IEEE International Carnahan Conference on Security Technology, pp. 127-133.
[4] K. Dimitropoulos, N. Grammalidis, D. Simitopoulos, N. Pavlidou and M. Strintzis, "Aircraft detection and tracking using intelligent cameras", IEEE International Conference on Image Processing 2015, vol. 2, pp. II-594-7.
[5] B. Kamgar-Parsi, A. K. Jain and J. E. Dayhoff, "Aircraft detection: a case study in using human similarity measure", 2017 IEEE Trans. Pattern Anal. Mach. Intell., vol. 23, no. 12, pp. 1404-1414.
[6] R. H. Khan and D. Power, "Aircraft detection and tracking with high frequency radar", 2014 Proceedings International Radar Conference, pp. 44-48.
[7] Grassi, P., Garcia, M., & Fenton, J. (2017). Digital identity guidelines (No. NIST Special
[8] Publication (SP) 800-63-3 (Draft)). National Institute of Standards and Technology.
[9] Grassi, P., Garcia, M., & Fenton, J. (2017). Digital identity guidelines (No. NIST Special
[10] Publication (SP) 800-63-3 (Draft)). National Institute of Standards and Technology.
[11] Grassi, P., Garcia, M., & Fenton, J. (2017). Digital identity guidelines (No. NIST Special
[12] Publication (SP) 800-63-3 (Draft)). National Institute of Standards and Technology.
[13] Grassi, P., Garcia, M., & Fenton, J. (2017). Digital identity guidelines (No. NIST Special
[14] Publication (SP) 800-63-3 (Draft)). National Institute of Standards and Technology

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

AUTHORS PROFILE

Mrs. E. Padma(M.E, M.C.A, M.Phil, (Ph.D))
Assistant professor in the Department of computer science and engineering, Sri Chandrasekarendra Saraswathi Viswa Maha Vidyalaya, Enathur, Kanchipuram, India. Specialized in Network security.

A.S.H. Pranav, B.E. Computer science and engineering, Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya, Enathur, Kanchipuram, India.

C. Adithya Siddhartha, B.E. Computer Science and Engineering, Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya Enathur, Kanchipuram, India.