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Voice controlled car automation

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Abstract: Recent developments in artificial intelligence and natural language processing have transformed human-computer interaction and paved the way for the creation of voice-activated devices in a variety of fields. This paper describes the development and deployment of a voice-activated vehicle, a novel application meant to improve accessibility, safety, and driving pleasure. By fusing voice recognition technology with an automotive control interface, the system enables drivers to carry out a number of tasks with voice commands. These features include multimedia operation, climate control, navigation, and car diagnostics. The system can comprehend and execute natural language instructions by utilizing machine learning techniques, resulting in a smooth and user-friendly interface. Furthermore, the integration of cutting-edge safety technologies guarantees that voice commands won't jeopardize driving security. Results from experiments show how accurate the system is in identifying and carrying out instructions in a variety of settings. A major step towards the future of smart cars, this voice-activated automobile prototype shows how artificial intelligence (AI) might change transportation and make it more accessible for those with impairments.

I. INTRODUCTION

The combination of wireless communication, voice recognition, and embedded systems technology has produced novel and easily useable applications across a range of industries. Among them, there is a great deal of promise to improve user accessibility and convenience through the integration of voice-controlled technologies in automobile applications. The goal of this project is to design and build a voice-activated automobile system that uses servo motors, an Arduino Uno microprocessor, an HC-05 Bluetooth module, and windows and wipers.

The main goal of this project is to create a system that uses voice instructions sent through a Bluetooth-enabled device, like a smartphone, to control the wipers and windows of an automobile. The Arduino Uno and the user's device can communicate wirelessly thanks to the HC-05 Bluetooth module. The voice commands are processed by the Arduino Uno, a popular and potent microprocessor, which then uses the associated servo motors to precisely manipulate the car's wipers and windows.

This project intends to improve the overall user experience by using voice recognition technology to provide a hands-free, user-friendly way to handle the car's auxiliary functions. This is especially useful in situations where operating a manual device could be difficult or dangerous, such when driving. In order to ensure dependable and accurate system performance, the project also examines the difficulties and solutions related to implementing voice instructions in a dynamic and possibly noisy environment.

Voice-activated systems are becoming more and more common in many fields, including industrial control and home automation. The incorporation of this technology into automotive systems has distinct advantages and difficulties, necessitating a resilient architecture that can reliably and safely understand and carry out voice commands in real-time.
In this project, the Arduino Uno serves as the central processing unit, receiving voice commands through the HC-05 Bluetooth module. These commands are then processed and converted into control signals for the servo motors responsible for moving the car's windows and operating the wipers. The servo motors offer precise control, enabling smooth and accurate movement based on the user's voice inputs.

II. LITRATATURE REVIEW

Almost everyone in today's world suffers problems at some time, there will be trials and tribulations. On the other hand, there are barriers, might be more frequent and have a larger audience effect on individuals with disabilities Disabilities include blindness, impaired vision, leprosy-free, hearing impairment, locomotor disability, mental retardation, and mental sickness. They face obstacles such as those linked to attitude, communication, physical, social, and transportation, among others. This method focuses on the issues that particularly abled persons confront when they want to drive their car on their own but are unable to do so due to a natural reason. This proposed prototype focuses on voice control of the robot with automated wipers, windows, and other features. This goal might be achieved by our team's prototype, which makes use of servo motors, an Arduino Uno, and an HC-05 module.[1]

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A vehicle's windscreen wiper is a crucial part that removes rain or any other type of water from the windshield. It is significant because it lowers the risk of driving in the rain and makes it possible. The majority of nations have laws requiring all cars to have windscreen wiper installed by default. When conducting routine automobile safety inspections in Nigeria, "Vehicle Inspection Agencies" keep an eye out for several essential safety features, one of which is windscreen wipers. The wiper is made out of an arm with a long rubber blade attached to one end that may be rotated. The blade moves back and forth across the car's windshield, cleaning water that is on its surface. Ever since it was initially invented, the wiper has undergone numerous stages of development and improvement. By design, wiper speeds are typically modifiable. A great deal of cars have two synchronized radial-type wiper arms. A worm gear is attached to the output of a small electric motor to generate the enormous force required to drive the wiper blade over the windshield at the proper pace. Worm gear reduction can reduce the electric motor's output speed by the same amount while increasing the torque of the motor by around fifty times. The gear reduction's output is enabled to function.[2]

Over the past ten years, there have been notable gains in voice-controlled systems due to the expansion of wireless communication devices and advances in speech recognition technologies. The important studies and advancements in wireless communication, voice recognition, and their uses in automotive systems are reviewed in this study of the literature.

The field of voice recognition systems has seen tremendous development, moving from basic keyword-based systems to complex natural language processing (NLP) models. For speech recognition, early systems used Hidden Markov Models (HMM), as in the work of Rabiner and Juang (1993). In order to attain more accuracy and robustness, more recent developments make use of deep learning techniques, specifically Recurrent Neural Networks (RNN) and Convolutional Neural Networks (CNN). Notable examples of these developments are Apple's Siri and Google's Speech-to-Text API, which provide excellent accuracy in loud contexts and support a large number of languages and dialects.

A key component in the creation of DIY electronics projects and embedded systems is the Arduino platform. Because of its open-source design and strong community support, it's a great option for both prototyping and teaching. The adaptability and user-friendliness of Arduino microcontrollers are demonstrated by research conducted in 2014 by Banzi and Shiloh in a variety of applications such as wearable technology, robotics, and home automation. In particular, the Arduino Uno strikes the right mix between simplicity and performance, making it a good choice for real-time voice commands and servo motor control.[3]

Applications needing exact control over acceleration, velocity, and angular or linear position are commonplace for servo motors. They are frequently used in automotive systems, CNC machinery, and robotics. Anandan (2010) and other researchers' research has shown how well servo motors work to provide accurate and dependable control—a crucial feature for applications like operating car wipers and windows. Accurate and responsive control depending on user inputs is made possible by the combination of servo motors with microcontrollers such as Arduino.

Numerous studies and commercial applications have investigated the integration of voice control in vehicle systems. For instance, voice-activated multimedia, climate control, and navigation systems are now standard on vehicles from automakers like Mercedes-Benz, Tesla, and BMW. Li and Tsai's (2017) study investigated the usage of voice-activated functions in smart automobiles and showed how they may improve user safety and convenience. To ensure dependable performance in dynamic and loud surroundings, these systems make use of powerful wireless connection and sophisticated speech recognition algorithms. There are a number of difficulties in implementing voice-controlled systems in automotive applications, such as user safety, accurate command recognition, and noise interference. In order to enhance voice command recognition in loud contexts, Kim et al. (2018) conducted studies on the application of context-aware algorithms and noise reduction approaches. Furthermore, studies on user feedback loops and fail-safe procedures have shown how important it is to ensure the safety of voice-controlled devices.

Addressing issues including user safety, accurate command recognition, and noise interference are necessary when implementing voice-activated systems in automobiles.

Various algorithms, such as spectrum subtraction and beamforming, are employed as noise reduction techniques to improve the accuracy of voice recognition in noisy contexts. Systems Aware of Context: Enhancing dependability and user happiness can be achieved by creating systems that comprehend the context of commands.[4]

One could consider speech recognition to be a type of pattern recognition. The technique of translating speech to text is known as speech recognition. It is composed of Pitch and Treble are the features that were retrieved from the spoken signal.

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Power Spectral Density, Spectrogram. Using a sizable training dataset, the classification model's parameters are estimated during the training phase. During the testing step, each class's trained model is compared with the features of a test pattern data set. The test pattern is a member of the class whose model exactly matches the data in the test pattern. Linguistic components like words and syllables make up a sentence. Together, the acoustic evidence from the acoustic modeling creates a legitimate and significant sentence.[5]

When viewed in broad spectrum, a speech signal is composed of a series of sounds at various frequencies that combine to generate a lengthy stream of samples. Human voice may be heard between 65 and 600 Hz. The frequency of adult male speech is approximately 130 Hz, whereas the frequency of adult female speech is 210 Hz. The suggested system uses speech recognition to recognize verbal orders from the user. It does this by using a recognition algorithm to determine which command the user has spoken and then carrying out the specified action. In order to authenticate users, speech recognition and speaker recognition are combined. The Vector Quantization approach is utilized in speech recognition.[6]

III. METHODOLOGY

Block diagram

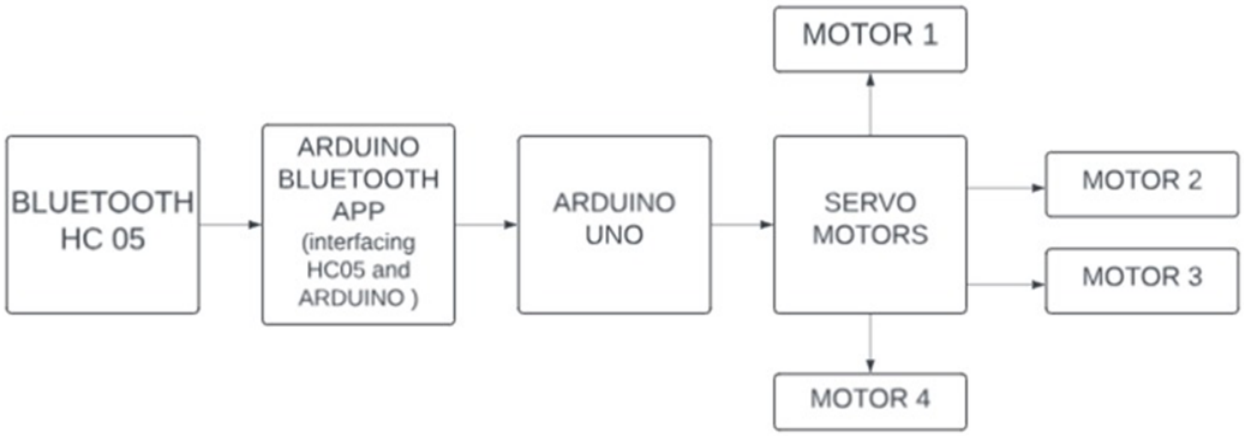

Fig: Block Diagram for the recognize the voice from the HC-05 Bluetooth module

Circuit Diagram

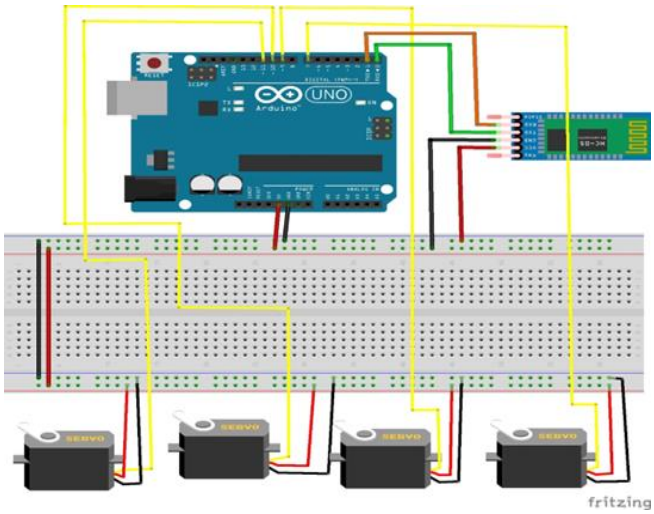

Fig: Circuit diagram of voice control car automation

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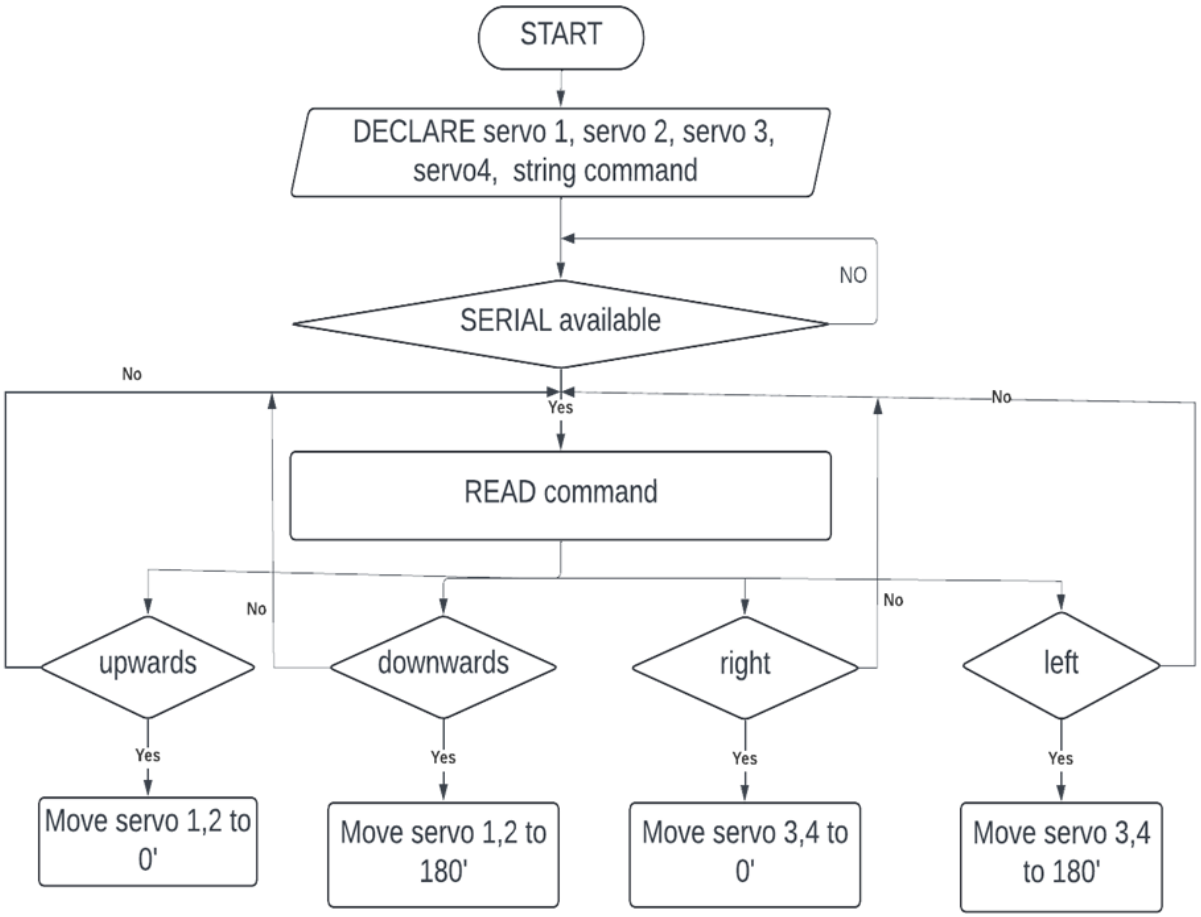
FLOW CHART



1. Voice Command Input

- The user speaks a command into a Bluetooth-enabled device, such as a smartphone. The device runs a voice recognition application that converts the spoken words into corresponding text commands.
- Common commands in the program include phrases like "upwards", "downwards"(for servo motor), "right wipers", and "left"(for wipers).

2. Bluetooth Communication

- The text command is then transmitted via Bluetooth from the smartphone to the HC-05 Bluetooth module integrated into the car's control system.
- The HC-05 Bluetooth module, connected to the Arduino Uno, receives the incoming data wirelessly.

3. Analyzing Instructions using an Arduino Uno

- The text command is processed by the Arduino Uno microcontroller. Every potential command has a set of predefined actions encoded into the microcontroller. The Arduino decides what needs to be done based on the command it receives. When the user inputs "downwards" for instance, the Arduino initiates a servo motor that moves the window to the open position.

4. Servo Motor Control

- The Arduino Uno sends control signals to the servo motors connected to the car's windows and wipers.
- For window control, the servo motor is configured to move the window up or down based on the command. For wiper control, the servo motor moves the wipers to the on or off position.
- The servos are precisely controlled to ensure smooth and accurate movement.

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IV. RESULT

Fig: Working of the Windows and the Wipers in the car.

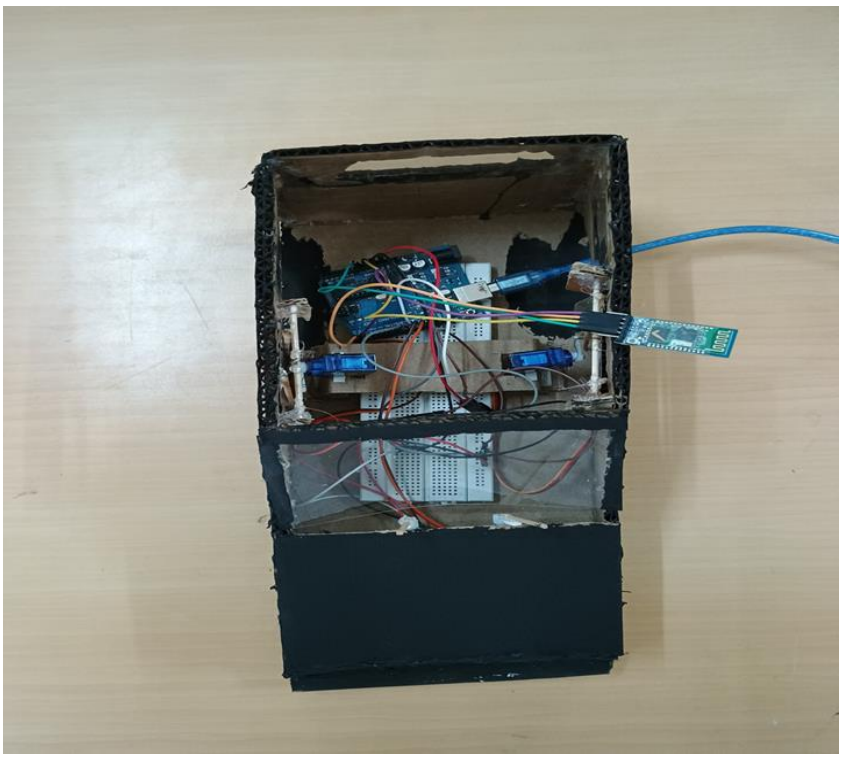

Fig: implementation of the servo motors to the car.

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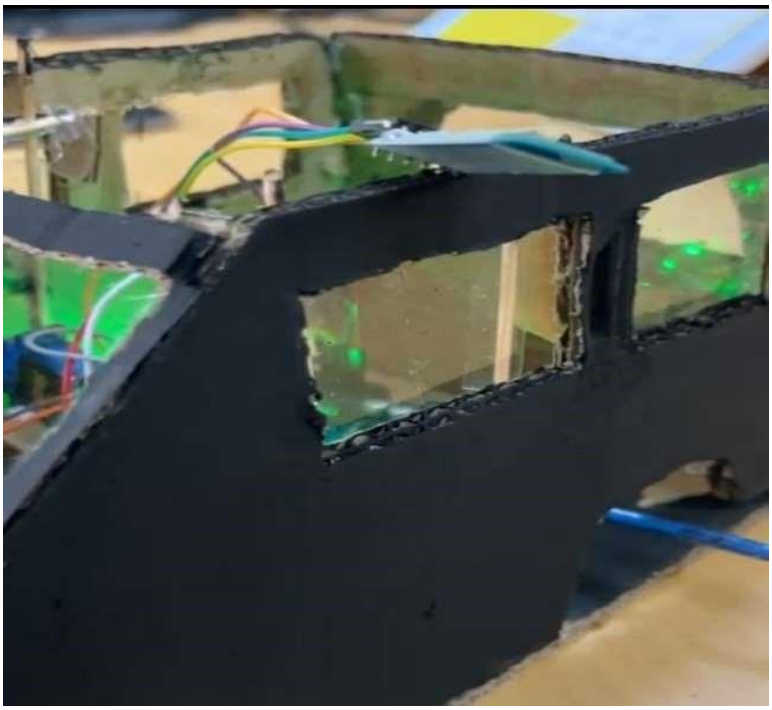

Fig: movement of windows through voice commands.

The wipers and the windows (up and down) are moved using voice commands. This is achieved through Bluetooth communication by integrating Bluetooth HC05 module with Arduino uno using Arduino Bluetooth control app. The voice-controlled car windows system was successfully implemented and tested, demonstrating reliable performance across various conditions. The system exhibited an average response time of less than one second from voice command to window movement and achieved a voice recognition accuracy rate of approximately 90% in controlled environments, slightly decreasing to 85% in noisy conditions. The servo motors provided precise and smooth control over window movements, with no issues of stalling or jittering. Users found the system intuitive and easy to use, with a user-friendly smartphone application for issuing commands. Additionally, the anti-pinch safety mechanism effectively prevented the windows from closing if an obstruction was detected, ensuring user safety

V. CONCLUSION

A major advancement in the fusion of contemporary technology with vehicle convenience and safety has been made with the invention of the voice-activated car system that makes use of the HC-05 Bluetooth module, Arduino Uno, and servo motors. The technology uses voice recognition to reduce distractions and improve the driving experience by allowing drivers to operate car wipers and windows without the need for human interaction.

Throughout the project, the development of a dependable and user-friendly system was guaranteed by the methodical integration, careful component selection, and thorough testing. The Arduino Uno effectively processed orders and precisely controlled the servo motors, while the HC-05 Bluetooth module maintained a reliable communication link between the smartphone and the Arduino. The project effectively tackled typical issues including unpredictability and noise interference the creation of the voice-activated automobile system that makes use of the HC-05 in user accents has produced a reliable system that can operate in a variety of environments.

This study demonstrates the potential for future innovations as well as the usefulness of speech recognition technology in vehicle systems. Future improvements can include adding more voice-activated features, utilizing sophisticated noise reduction algorithms, and applying machine learning to customize the system for each user.

In summary, the voice-activated automobile system represents the integration of technology and real-world use, providing an insight into the direction of intelligent automotive solutions in the future. Through enhancing driving safety and convenience, this system lays the groundwork for the creation of increasingly sophisticated, user-friendly, and intuitive automobile technology.

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VI. FUTURE SCOPE

With the ability to integrate voice commands for a wider range of automotive functions including lighting, climate control, and infotainment systems, the voice-controlled car system has a great future potential. The system can be made more resilient and inclusive by improving voice recognition accuracy using machine learning and sophisticated noise reduction techniques. Personalized user profile and integration with Advanced Driver Assistance Systems (ADAS) can improve user experience and safety even further. Integration with autonomous vehicle technology can enhance communication between the driver and the vehicle, while IoT connectivity can facilitate real-time diagnostics and remote control. To guarantee that only authorized users can give commands, security mechanisms such as biometric authentication can be used. Additionally, efficiency and safety can be raised in a number of industries by modifying this technology for commercial and industrial use.

REFERENCES

[1]. "Voice Controlled Vehicle Dashboard"Shridhar D. Pagar, Shivani J. Pote, Ankush S. Anmulwar, Ashwini S. Shinde- International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878 (Online), Volume-9 Issue-1, May 2020 (Page no:2-5)

[2]. "Development of an Automatic Rain and Voice Activated Vehicle WindscreenWiper"Hassan A. B., Abdulmalik D.M., Yusuf M.A., Garba A.B.- NIPES Journal of Science and Technology Research 2(2) 2020 pp. 201-211 ISSN-2682-5821 (Pages no:3-5)

[3]. "Identification of the effective directivity of the human voice for a person sitting in the car seat with head restraints."-CHALMERS UNIVERSITY OF TECHNOLOGY Göteborg, Sweden 2010 (Pages no:3-5)

[4]. "SmartCOdetect: An Automated Car Window Opening System on Detection of Carbon Monoxide"Neera Batraa, Jasleen Kaura and N.K. Batrab -september 2020-MechAero Foundation for Technical Research &Education Excellence ISSN: 0975-3060 , 0975-3540 (Pages no:2-4)

[5]. "Design of an Intelligent Voice Controlled Home Automation System"Sonali Sen, Shamik Chakrabarty, Raghav Toshniwal, Ankita Bhaumik- International Journal of Computer Applications (0975 – 8887) Volume 121 – No.15, July 2015(Pages no:2-4)

[6]. Intelligent Car with Voice Assistance and Obstacle Detector to Aid the DisabledAuthor links open overlay panel

[7]. Ujjwal Gulati, Ishaan, Rajeshwar Dass- International Conference on Computational Intelligence and Data Science Procedia Computer Science 167 (2020) 1732–1738 (Pages no:2-3)