

**HUMAN COMPUTER INTERACTION BASED ON EYE GAZE  
ESTIMATION**

A Project Report

Submitted in fulfillment of the  
Requirements for the award of the degree of  
**BACHELOR OF TECHNOLOGY**

In

**COMPUTER SCIENCE AND ENGINEERING**

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**2019**

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**DECLARATION BY THE CANDIDATES**

We, **T. MOHAMMED AAZAM**, bearing the Regd.No. 15001A0501 and **SUBRATA DAS** bearing the Regd.No.15001A0563 hereby declare that the Major Project report entitled **HUMAN COMPUTER INTERACTION BASED ON EYE GAZE ESTIMATION** under the guidance of **Prof. A. Ananda Rao**, Director of Academic and Planning, JNTU Anantapur is submitted in partial fulfillment of the requirements for the award of the degree of **BACHELOR OF TECHNOLOGY** in **COMPUTER SCIENCE AND ENGINEERING**.

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**CERTIFICATE**

This is to certify that the project entitled “**HUMAN COMPUTER INTERACTION BASED ON EYE GAZE ESTIMATION**” is a bonafide work of **T MOHAMMED AAZAM**, bearing Admission No: 15001A0501 and **SUBRATA DAS**, bearing Admission No: 15001A0563, is submitted to the faculty of Computer Science & Engineering, in partial fulfillment of the requirements for the award of degree of **BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE AND ENGINEERING** from Jawaharlal Nehru Technological University Anantapur, College of Engineering (*Autonomous*), Ananthapuramu.

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## Acknowledgement

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people who made it possible, whose constant guidance and encouragement crowned our efforts with success. It is a pleasant aspect that I have now the opportunity to express my gratitude for all of them.

First and Foremost, I wish to thank **Prof. A. Ananda Rao**, Computer Science and Engineering Department, JNTUA College of Engineering (Autonomous), Ananthapuramu who has extended his support for the success of this project. His wide knowledge and logical way of thinking have made a deep impression on me. His understanding, encouragement and personal guidance have provided the basis for the project. His source of inspiration for the innovative ideas and his kind support is well to all his students and colleagues.

I wish to thank **Prof. K. Rama Naidu**, Principal of JNTUA College of Engineering (Autonomous), Ananthapuramu who has extended his support for the success of this project.

I wish to thank **Prof. A. Suresh Babu**, Professor and Head of Computer Science and Engineering Department, JNTUA College of Engineering (Autonomous), Ananthapuramu. His wide support, knowledge and enthusiastic encouragement have impressed me to better involvement into my project and technical design. Also his ethical morals helped me to develop my personal and technical skills to deploy my project in success.

I express my sincere thanks to the project committee members, faculty and staff of Computer Science and Engineering Department, JNTUA College of Engineering, Ananthapuramu, for their valuable guidance and technical support. Last but far from least, I also thank my family members and my friends for their moral support and constant encouragement, I am very much thankful to one and all who helped me for the successful completion of the project.

With Gratitude

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# **ABSTRACT**

Machine learning (ML) is a method of data analysis that automates analytics model building and identifies new cases. While a new case comes forward, it is not always possible to take decision every time. So, whenever it is required to reduce human effort and easiest recognition, machine learning techniques are used. The scope of ML is vast as it uses iterative process to learn new things and new possibilities. Large data set is fed and that helps to predict new output corresponding to input that is totally unknown to the machine.

Researchers in the field of Human Computer Interaction (HCI) have been designing new machine learning technologies that let humans interact with computers in novel ways. Till now hand movement gestures, voice commands have been used to establish communication with machine. In recent years Eye Gaze Tracking (EGT) has emerged as an attractive alternative to conventional communication modes. Gaze estimation can be effectively used in HCI, assistive devices for motor-disabled persons, autonomous robot control systems, safe car driving, diagnosis of diseases and even in human sentiment assessment. Implementation in any of these areas however mostly depends on the efficiency of detection algorithm along with usability and robustness of detection process. In this context we have proposed a Convolutional Neural Network (CNN) architecture to estimate the eye gaze direction from detected eyes using deep learning method.

In this project, python built-in library for image analysis are used to identify the position of face and eye position and a novel algorithm has been developed to increase the efficiency of eye gaze estimation. For training of the machine, we have introduced a new dataset named EGDC containing about 3500 images clicked by our own effort and we also have collected approximately 20,000 images form Eye-Chimera and HPEG datasets available in server. Training has been done based on multi-layer neural network and deep learning process.

This project has been implemented in three phases. At first, the face is identified in the environment and a border is made around the face. Secondly, the eye position is detected in the face. Finally, the eye gaze direction is estimated. This eye position is compared with the dataset and got a result of movement of eye direction. Predefined functions are implemented according to the necessity. The accuracy and the identification speed depend on the test dataset, training data set and the algorithm that is used for the project. Our proposed algorithm has outperformed all other state of the art results for Eye-Chimera dataset. The overall accuracies of this project are 90.21% and 99.19% for Eye-Chimera and HPEG datasets respectively. For EGDC, our proposed algorithm finds 86.93% accuracy.

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