# Notice for the PhD Viva Voce Examination

Mr Michael Moses T (Registration Number: 1560076), PhD scholar at the School of Engineering and Technology, CHRIST (Deemed to be University), Bengaluru will defend his PhD thesis at the public viva-voce examination on Saturday, 10 December 2022 at 10.00 am in the CDI Conference Room, Block V, Bangalore Kengeri Campus, Bengaluru 560074.

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| **Title of the Thesis** | : | **Investigations on Affective Computing to Improve Classroom Engagement Analysis in Higher Education by Deep Learning** |
| **Discipline** | : | **Computer Science and Engineering** |
| **External Examiner**<br>(Outside Karnataka) | : | **Dr Harish Sharma**<br>Associate Professor<br>Rajasthan Technical University<br>Akelgarh, Kota<br>Rajasthan - 324010 |
| **External Examiner**<br>(Within Karnataka) | : | **Dr Shambhavi B R**<br>Associate Professor<br>Department of Computer Science and Engineering<br>BMS College of Engineering<br>Bull Temple Road. Basavanagudi<br>Bengaluru - 560019<br>Karnataka |
| **Supervisor** | : | **Dr Balachandran K**<br>Professor<br>Department of Computer Science and Engineering<br>School of Engineering and Technology<br>CHRIST (Deemed to be University)<br>Bengaluru – 560074<br>Karnataka |

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva.

**Registrar**

**Place:** Bengaluru
**Date:** 03 December 2022

# ABSTRACT

The learning and teaching experience can be improved by using approaches that are not obtrusive to perform a comprehensive student engagement analysis through- out the classroom. In these modern times, when courses are conducted through the internet mode, it is vital to accurately measure the levels of participation that each individual student has. It is crucial and essential to provide assistance to educators so that they may annotate and comprehend the significant learning rate of the students. A system that can perceive data and transpire it into information automates the learning and teaching experience in a classroom. In this study, videos are collected from online and offline classes that has one single student per frame or many students per frame that is analyzed for emotions and behavioral engagement through a multimodal system.

This work proposes a Hierarchical Video Summarization model to select keyframes for processing. The Key frames are used to detect faces; the face detection system uses an improved Reiterative Viola-Jones algorithm. On the faces that are detected Emotional analysis is carried out using Deep Neural Networks. These Networks were designed specifically to detect emotions and behavioural aspects of each student in a class and evaluate their engagement in a classroom. In addition to this a behavioral estimation using. In addition to the emotional analysis a dual channel is configured for a macro level attention estimation based on 3D pose estimation using Euler angles for Pitch, yaw and roll is used as a dual channel system that estimates the emotion and behavior to precisely estimate the engagement level.

The presented model accurately categorises students' emotional states as either in- structors attentive or in-attentive. Experiment results revealed a strong relation- ship between students' attentive affective state engagement scores and their rates of learning, both individually and in groups. A visual representation of the emotional states and a transition diagram to aid both students and instructors in the improve- ment of the educational process.



***Keywords:*** *Affective Computing, Behavioral Analysis, Face Detection, Emotional Analysis, Video Summarization, Multimodal student Analysis, Engagement Analysis, Deep Learning*