 CANTILEVER AIML PROTERNSHIP 2025

**ABSTRACT**

# Project Title:

Real-time Emotion Detection for Virtual Learning Environments

# Team Details:

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## Abstract:

Virtual learning is increasingly adopted worldwide, highlighting the need for adaptive systems that can enhance student engagement by understanding emotional states. This project develops a deep learning-based emotion detection system to classify seven facial expressions—angry, disgusted, fearful, happy, neutral, sad, and surprised—in real time using webcam feeds. The system is trained on the FER-2013 dataset and employs a convolutional neural network (CNN) for emotion classification.

After preprocessing the dataset (handling class imbalance, applying data augmentation, and optimizing the data pipeline), we evaluated the model's performance, achieving an accuracy of approximately 50%. Real-time face detection is implemented using Haar Cascade classifiers and OpenCV’s DNN module to support seamless integration. Results indicate that while current performance is modest, the system can provide valuable insights into student emotions during virtual sessions. Future work may include GPU acceleration, transfer learning, and deployment in real-world educational settings.

**Keywords:** Emotion detection, deep learning, convolutional neural networks, virtual learning, FER-2013, real-time face recognition, student engagement, educational technology.