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# IT204 MINI PROJECT

## Visual Hand Gesture Recognition with Convolutional Neural Network (CNN)

### ABSTRACT

In the era of human-computer interaction, gesture recognition has emerged as a pivotal technology with vast applications ranging from sign language interpretation to immersive gaming experiences.

This mini project, conducted using Python programming language, aims to explore the domain of Hand Gesture Recognition through the utilization of **Convolutional Neural Networks (CNN)** on the **Linux operating system**, employing key libraries such as **OpenCV, TensorFlow, Keras, Numpy** and with the assistance of **Google Teachable Machine**.

# STEPS INVOLVED:

**Data Collection:** I curate a diverse dataset comprising hand gesture images, encompassing various gestures, lighting conditions, backgrounds, and hand orientations. This dataset serves as the cornerstone for training and evaluating my model.

**Data Preprocessing:** Robust preprocessing techniques are applied to enhance the quality and consistency of the dataset. This involves tasks such as image resizing, normalization, and data augmentation to ensure that the model generalizes well to real-world scenarios.

**Model Architecture:** The core of my project lies in the design and implementation of a CNN architecture. We fine-tune and optimize the neural network to effectively extract features from hand gesture images. TensorFlow and Keras are used to construct, train, and evaluate the CNN model.

**Training and Validation:** I split the dataset into training and validation sets to train the model rigorously while monitoring its performance. I employ techniques like cross-validation and hyperparameter tuning to achieve optimal results.

**Testing and Inference:** Once trained the model is deployed to recognize hand gestures in real-time. OpenCV facilitates the capture of video frames from a camera feed, and

the trained model will predict and recognize gestures in these frames.

**Evaluation Metrics:** Various evaluation metrics, including accuracy, precision, recall, and F1-score gauge the model's effectiveness in gesture recognition.

**Future Scope:** I explore potential extensions and applications, such as integrating the model into interactive interfaces, sign language translation, or gaming systems.

## **RESEARCH PAPERS REFERED :**

1) F. Zhan, "Hand Gesture Recognition with Convolution Neural Networks," 2019 IEEE 20th International Conference on Information Reuse and Integration for Data Science (IRI), Los Angeles, CA, USA, 2019, pp. 295-298, doi: 10.1109/IRI.2019.00054.

2) M. Han, J. Chen, L. Li and Y. Chang, "Visual hand gesture recognition with convolution neural network," 2016 17th IEEE/ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD), Shanghai, China, 2016, pp. 287-291, doi: 10.1109/SNPD.2016.7515915.

