

Gesture Controlled Slide Presentation (Pattern Recognition)

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Introduction

The Gesture Controlled PPT Slide Presentation project represents a cutting-edge integration of edge AI technology and gesture recognition to revolutionize the way users interact with PowerPoint presentations. By harnessing the power of edge computing and machine learning algorithms, this project aims to provide a seamless and intuitive interface for navigating slides, addressing accessibility challenges, and enhancing user experience.

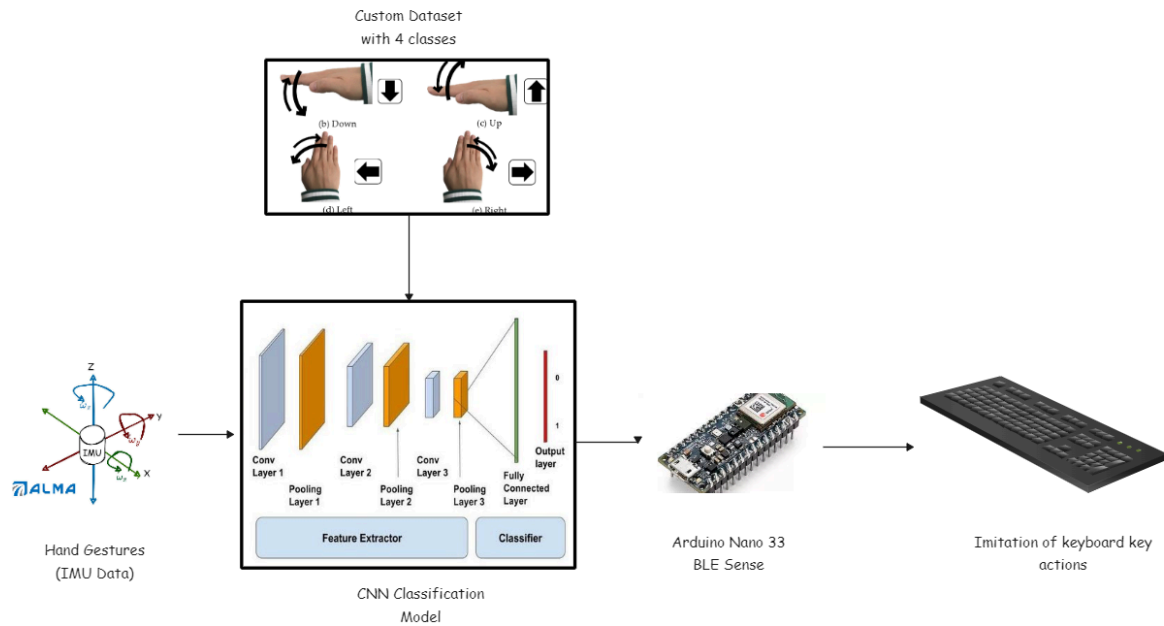
Objective

Develop a robust hand gesture-controlled interface capable of accurately interpreting user gestures in real-time.

Motivation

The impetus behind this project arises from the growing need to create more inclusive and user-friendly interfaces, particularly for individuals with disabilities and those facing ergonomic limitations. Traditional methods of navigating presentations, such as mouse clicks or keyboard commands, may pose challenges for some users. By introducing gesture control technology, we strive to democratize access to information and empower users to interact with presentations in a more natural and intuitive manner.

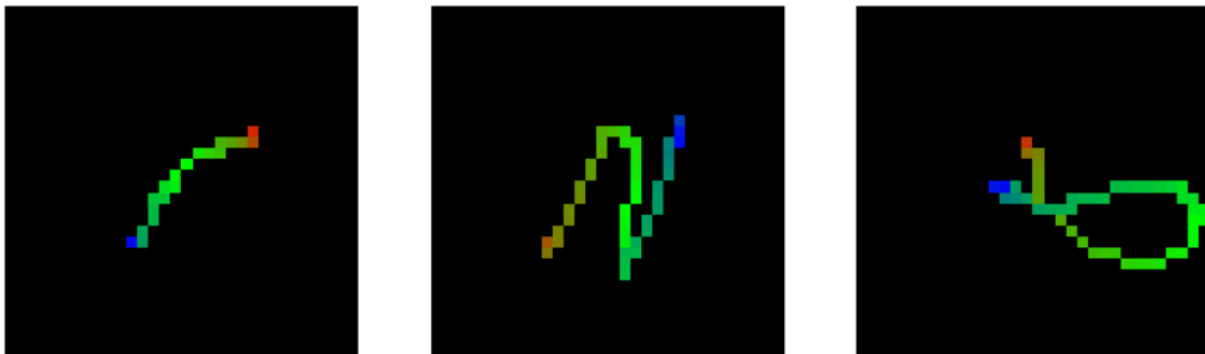
Methodology



1. Data Collection and Preprocessing:

- Gathered a dataset comprising hand gesture samples, with each gesture belonging to one of four predefined classes: "N", "S", "U", and "X".
- Pre-processed the dataset by converting raw gesture data into rasterized images, followed by data augmentation and shuffling to enhance the diversity and robustness of the training data.

Rasterized Images



2. Edge AI Model Architecture:

- Designed a Convolutional Neural Network (CNN) architecture tailored for gesture recognition tasks.
- The model architecture consists of three Conv2D layers with 16, 32, and 64 filters, respectively, each followed by Batch Normalization, ReLU activation, and Dropout layers to prevent overfitting.
- Global Average Pooling is employed to reduce spatial dimensions and capture global information from the feature maps.
- The output layer utilizes the softmax activation function for multi-class classification, with four output units corresponding to the four gesture classes.

3. Model Training and Optimization:

- Trained the model using the Keras deep learning framework, optimizing it to minimize categorical cross-entropy loss.
- Implemented image preprocessing techniques, including rescaling, to normalize pixel values and enhance model convergence.
- Incorporated dropout layers with a dropout rate of 0.5 to mitigate overfitting and improve generalization performance.

4. Edge Deployment and Performance Evaluation:

- Deployed the trained model on the Arduino Nano 33 BLE Sense board, leveraging its onboard IMU sensor for real-time gesture recognition.
- Evaluated the performance of the deployed model in terms of training, validation, and testing accuracy, achieving high accuracy rates across all datasets.

Application

The Gesture Controlled PPT Slide Presentation project has wide-ranging applications, including:

- Enhanced accessibility for individuals with disabilities
- Seamless navigation of PowerPoint slides in diverse environments
- Integration into home automation systems for intuitive control
- Potential use in gaming, multimedia, and interactive presentations

Contribution

Vandana Mourya: Data Collection and preprocessing, bluetooth interface for Arduino nano 33 BLE sense (ongoing)

Sayli Sawant: Creation, training and testing of CNN model, writing python script for mapping the gestures with keyboard actions

Conclusion

In conclusion, the Gesture Controlled PPT Slide Presentation project represents a significant advancement in human-computer interaction, leveraging edge AI technology to redefine the way users interact with presentations. By providing a gesture-controlled interface that is accessible, intuitive, and responsive, this project has the potential to improve accessibility, enhance user experience, and pave the way for innovative applications in various domains. Through collaborative efforts and expertise in edge AI, we have developed a scalable and versatile solution that holds promise for a wide range of real-world applications.

Link for the video:

[EdgeAI_project_video.mp4](#)