CS 584 - F24

Sign Language Detection Project Proposal

Team 12
Vignesh Ram Ramesh Kutti
Vishnu Priyan Sellam Shanmugavel
Aravind Balaji Srinivasan
Kavin Raj Karuppusamy Ramasamy
Kishan Murali

Project Goal

Task (T)

- Recognizing sign language gestures using neural networks.

Experience (E)

- Measured by the percentage of gestures correctly classified by the model.

Performance (P)

- Utilized a database of labeled images of sign language gestures for training the model.

Steps Involved

- **Data Collection:** Gather a diverse dataset of sign language gestures from different source.
- **Data Cleaning:** Preprocess the data to remove noise and inconsistencies.
- **Feature Extraction:** Extract key features like hand shapes, orientations, and movements, using neural networks techniques.
- **Model Training:** Train a neural network model on the preprocessed data to recognize and classify sign language gestures.
- **Model Validation:** Evaluate the model's performance using a validation dataset.
- **Model Testing:** Test the model on new data to ensure generalization.
- **Real-Time Recognition:** Implement the trained model to recognize and translate gestures in real-time.

Phase I Progress

- **Sources:** Gather data from diverse sources, including existing datasets, crowdsourcing platforms, and in-house recordings. **(completed)**
- **Diversity:** Ensure the dataset includes a wide range of signers, backgrounds, and lighting conditions. **(completed)**
- **Quantity:** Aim for a large dataset to provide sufficient training data. **(completed)**
- **Noise Removal:** Remove unwanted noise, artifacts, and distortions from the data.
- **Inconsistency Handling:** Address inconsistencies in data formatting, labeling, and gesture performance.
- **Normalization:** Standardize the data to a common scale for consistent input to the neural network.

Phase II Steps

Feature Extraction

- **Deep Learning Techniques:** Explore deep learning techniques like Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) to automatically extract relevant features from the images or videos.

Model Training

- **Neural Network Architecture:** Experiment with different neural network architectures, such as CNNs, RNNs, or hybrid models, to find the most suitable approach for your task.
- **Hyperparameter Tuning:** Optimize hyperparameters (e.g., learning rate, batch size, number of epochs) to improve model performance.
- **Transfer Learning:** Consider using pre-trained models (e.g., from image classification tasks) as a starting point to accelerate training and potentially improve accuracy.

Datasets for the Project

- Dataset 1: ASL Dataset
- Dataset 2: Interpret Sign Language with Deep Learning
- Dataset 3: Sign Language MNIST
- Dataset 4: Sign Language Detection Using Images

Challenges and Feasibility

- Building neural networks for accurate gesture recognition.
- Real-time detection with low latency.

Applications & Future Scope

- **Real-time Sign Language Interpretation**

  Enabling communication between deaf and hearing individuals by converting sign language into spoken language or text.

- **Accessible Technology**

  Developing accessible interfaces for devices and software, allowing deaf individuals to interact with technology using sign language.

- **Sign Language Education**

  Creating interactive learning tools and platforms for sign language education, enhancing accessibility and promoting inclusivity.

References

- Camgoz et al., 2018: Neural Sign Language Translation. CVPR 2018 Paper
- NeurIPS 2022: Multimodal Sign Language Translation. NeurIPS 2022 Paper

Thank You! ;)