Project Proposal: Real-Time Sign Language Detection

Team Members

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Project Title

Real-Time Sign Language Detection with TensorFlow Object Detection and Python | Deep Learning SSD

Project Description

This collaborative project, led by Nikhil Singh Thakur and Sanjana Rayarala, aims to develop a real-time sign language detection system using **Deep learning** and **TensorFlow's Object Detection API**. The system will be capable of recognizing sign language gestures and translating them into text or spoken language, making communication easier for individuals with hearing impairments. It will help people to express themselves with gestures.

Objectives

- **Collect Images for Deep Learning:** Implement a system to collect images for deep learning using a webcam and OpenCV. This system will capture sign language gestures for later labeling and training.

- **Label Images:** Use Label img or a similar tool to label the collected images for sign language detection. Properly annotated data is crucial for training an accurate model.

- **Setup TensorFlow Object Detection Pipeline:** Configure the TensorFlow Object Detection pipeline, specifying the model architecture, data augmentation techniques, and hyperparameters.

- **Transfer Learning:** Utilize transfer learning to fine-tune a pre-trained deep learning model on the labeled dataset. This process will accelerate model training and improve performance.

- **Real-Time Sign Language Detection:** Develop a Python application for real-time sign language detection using the trained model. The application will capture video from the webcam, detect signs, and provide translations into text or spoken language.

Technologies and Tools

- TensorFlow for deep learning model development.
- Python for application development.
- TensorFlow Object Detection API for object detection.
- OpenCV for real-time video processing.
- Speech synthesis libraries (e.g., pyttsx3) for spoken language translation.

Project Timeline

- **Week 1 (October 1-7)**: Data collection and preprocessing.
- **Week 2 (October 8-14)**: Labeling of images for sign language gestures.
- **Week 3 (October 15-21)**: Setup of TensorFlow Object Detection pipeline configuration.
- **Week 4 (October 22-30)**: Transfer learning, model fine-tuning, initial application development, user interface design, testing, documentation.

Project Tasks

Data Collection and Preprocessing

Week 1 (October 1-7): Implement a system to collect images using a webcam and OpenCV.

Week 2 (October 8-14): Label the collected images with bounding boxes for sign language (Cropping).

Model Development

Week 3 (October 15-21): Configure the TensorFlow Object Detection pipeline.
Week 4 (October 22-30): Utilize transfer learning with a pre-trained model, train the model on the labeled dataset, and initiate application development.

User Interface

Week 4 (October 22-30): Create an intuitive and user-friendly interface for the application.

Testing and Validation

Week 4 (October 22-30): Perform rigorous testing and debugging of the application.

Documentation

Week 4 (October 22-30): Preparing comprehensive documentation, including usage guidelines, model training details, and guidelines for preparing the final report and presentation.

Conclusion

This collaborative project proposal outlines a comprehensive plan for developing a real-time sign language detection system using TensorFlow Object Detection and Python within the timeline of October 1st to October 30th. The resulting application will be a valuable tool for individuals with hearing impairments, facilitating better communication and inclusivity. We look forward to your approval and support for this impactful project.