

Final Project Report: SignSense

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Problem Statement: Mute individuals encounter substantial challenges in effective communication with others, primarily stemming from difficulties in verbal expression, sensory differences, and a pervasive lack of understanding between mute and hearing individuals. To address the communication challenges, we propose developing an innovative solution leveraging natural language processing (NLP) and computer vision technologies.

Technical Approach:

To build our sign language detection system, we followed these steps:

- **Data Collection:** We gathered a large dataset of labelled sign language images from various sources.
- **Model Training:** We trained a specialised Convolutional Neural Network (CNN) model on the collected dataset to accurately interpret sign gestures.
- **Preprocessing:** We cleaned and preprocessed the input images to enhance model accuracy, including normalization and data augmentation techniques.
- **Evaluation:** To ensure reliability, we rigorously evaluated the model's performance using standard metrics and validation of unseen data.
- **Deployment:** Once trained and validated, our model was deployed for real-time inference, enabling seamless interpretation of sign language gestures in various applications.

Results:

- The app will accurately recognize and interpret a wide range of sign language gestures in real time and will accurately translate recognized sign language gestures into text or spoken language, facilitating understanding for non-signers and enabling inclusive communication.
- SignSense will feature an intuitive and easy-to-use interface, designed to accommodate both sign language users and non-signers. Clear visual cues and simple navigation will enhance usability for all users.
- The app will include customizable settings such as light/dark mode and changing the text size to enhance usability for individuals with disabilities, ensuring

inclusivity and equal access to communication.

Challenges and Future Work:

1. Model Bias: Mitigating potential bias in training data to ensure model fairness and ethical outcomes.
2. Training: Training model to only read hand gestures and finding the correct corresponding word assigned to it, was a tedious and very long work
3. Advanced Features: A dictionary to guide and teach people to learn sign language in American standards, more settings to customize the user UX/XI.
4. Text-to-speech conversion (can be used by people with other disabilities).

Conclusion:

Our sign language detection system stands as a pivotal advancement in accessibility technology, facilitating effective communication for individuals using sign language. With a commitment to continual refinement, we strive to overcome challenges and integrate new features. Our vision is to foster inclusivity and bridge communication barriers, empowering individuals through the transformative potential of AI technology.