AI Powered Sign LANGUAGE PREDICTION SYSTEM

Name: Sri Krishna Chaitanya Suragani

Student ID: 21060889

# **Project Introduction**

A computational task which involves recognizing actions between deaf people among their own community is known as sign language (Sinha et al., 2019). When deaf and dumb people try to communicate between the normal people, they use hand signs to communicate which in turn make normal people face problems in recognizing their signs (Ranjan et al., 2021). So, there is a lack of efficient and accurate sign language prediction systems, which makes it difficult for the hearing-impaired to communicate with non-sign language users. The inspiration for this project comes from the desire to bridge this communication gap and provide a means for the hearing-impaired to communicate with ease. The aim of this proposal is to develop a sign language prediction system using deep learning algorithms that can accurately predict sign language gestures. The project will involve the development of a deep learning model that can recognize and translate sign language gestures into text and speech. This project will also serve as a steppingstone towards more advanced research in the field of natural language processing.

# **Project Aim**

The aim of this project is to develop a sign language prediction system that can accurately predict sign language gestures. The system will be designed to recognize and translate sign language gestures into text and speech. The project's secondary aim is to investigate the effectiveness of various deep learning algorithms in sign language prediction and select the most suitable algorithm for this purpose.

# **Project Requirements**

## **Core Project Requirements**

The following are the core project requirements that will be implemented to achieve the project's aim:

* Collect a sufficient dataset of sign language gestures: The dataset that will be used to train the deep learning model for the sign language prediction will be collected from the existing database libraries such as Kaggle, UCI Machine learning and Google datasets.
* Preprocess the dataset to ensure it is suitable for training the deep learning model: The collected dataset will be preprocessed before it is used to train the model for the better efficiency of the prediction and the preprocessing will include the technique such as resizing images and augmentation.
* Train and test various deep learning models on the dataset to determine the most suitable model: Different deep learning techniques such as CNN and transfer learning with inception V3 can be used to train the model and will be tested on a test dataset to check for the efficiency.

## **Advanced Project Aims**

The following are the advanced project aims that will be implemented to achieve the project's aim:

* Investigate the use of deep learning algorithms in sign language prediction.
* Test the developed model with the different types of images, with different size and color.

# **Secondary Research Aims**

The secondary research aims of this project are as follows:

* To conduct a literature review of the state-of-the-art research in the field of sign language prediction.
* To conduct a literature review on the architecture of the proposed deep learning model.
* To evaluate and select suitable deep learning algorithms for sign language prediction.
* To compare the accuracy of the Proposed model to the state-of-the-art methods.

# **Primary Research**

The primary research for this project involves the following:

* Collecting a dataset of sign language gestures
* Checking the feasibility of the dataset
* Preprocessing the dataset to ensure it is suitable for training the deep learning model.
* Training and testing various deep learning models on the dataset to determine the most suitable algorithm.
* Testing the efficiency and accuracy of the model by testing it with different types of images.

# **Project Resources**

The hardware and software resources required for this project include:

* A computer with suitable specifications for deep learning models is RAM of 8GB, SSD minimum of 256GB and Graphics card minimum 2GB.
* Various deep learning libraries, such as TensorFlow and PyTorch should be available.
* A dataset of sign language gestures
* Software development tools, such as Python and suitable code editor with high computational resources such as google collab or jupyter notebook.

# **Project Risk and their Mitigation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Risk Description** | **Probability** | **Possible Effects** | **Mitigation Methods** |
| 1 | Insufficient dataset | Medium | Inaccurate and inefficient prediction system. | Collect additional data or augment existing data. |
| 2 | Inadequate deep learning model selection | High | Inaccurate and inefficient prediction system. | Conduct a thorough literature review and evaluate multiple models. |
| 3 | Performance issue with real time prediction | Medium | Unusable testing | Optimize the algorithm and hardware resources |
| 4 | Training Time | High | Large amount of training time | Set the GPU on the system |

# **Project Plan**

The project objectives are as follows:

* Objective 1 – To conduct a literature review of state-of-the-art research in sign language prediction, select suitable deep learning algorithms l by July 15 , 2023.
* Objective 2 – To collect a dataset of sign language gestures and preprocess it for deep learning model training by July 25, 2023.
* Objective 3 – To train and evaluate deep learning models on the dataset and select the most suitable algorithm by Aug 10, 2023.
* Objective 4 – To test the developed model to ensure it is accurate and efficient in predicting sign language gestures by Sep 30, 2023.
* Objective 5- To test the developed model with different types of images differing in shape, size and color.

The project will be divided into the following tasks, including their estimated durations:

* Task 1 – Literature review and algorithm selection (20 days)
* Task 2 – Dataset collection and preprocessing (10 days)
* Task 3 – Deep learning model training and selection (15 days)
* Task 4 – Optimization of the algorithm for real-time performance (10 days)
* Task 5- Model testing with the unlabeled data (5 days)

# **Project Outcomes and Lesson to Be Learned**

The AI-powered sign language prediction system project aims to bridge the communication gap between hearing-impaired individuals and non-sign language users. The primary objective is to develop a deep learning model that can accurately predict sign language gestures and translate them into text and speech. The project also aims to investigate the effectiveness of various deep learning algorithms in sign language prediction and select the most suitable algorithm for this purpose. To achieve the project aims, the project requires collecting a sufficient dataset of sign language gestures, preprocessing the dataset to ensure it is suitable for training the deep learning model, training and testing various deep learning models on the dataset to determine the most suitable model, and evaluate the model with test images so that it can recognize and translate sign language gestures into text and speech. The project also includes advanced aims such as investigating the use of deep learning algorithms in sign language prediction and implementing a user-friendly interface that allows users to customize the system to their needs. The project's outcomes will be a deep learning model that can accurately predict sign language gestures, a final testing that can recognize and translate sign language gestures into text and speech, and a comparison of the accuracy of the proposed model to the state-of-the-art methods. The project also aims to provide insights into the effectiveness of various deep learning algorithms in sign language prediction and the potential for future research in this field. The project's success will depend on collecting a sufficient dataset of sign language gestures, selecting the most suitable deep learning algorithm, optimizing the algorithm and evaluate the developed model with different types of images differing in size and color, to ensure its accuracy and efficiency in predicting sign language gestures. The project presents an opportunity to learn about the challenges involved in developing an AI-powered system for sign language prediction. It will require a thorough understanding of deep learning algorithms and natural language processing. The AI-powered sign language prediction system project presents an exciting opportunity to bridge the communication gap between hearing-impaired individuals and non-sign language users.

# **References**

Ranjan, R., Patro, B. S., Khan, M. D., Behera, M. C., Kumar, R., & Raj, U. (2021). A review on Sign language recognition systems. *2021 IEEE 2nd International Conference on Applied Electromagnetics, Signal Processing, &amp; Communication (AESPC)*. https://doi.org/10.1109/aespc52704.2021.9708526

sinha, Shirshat, & Kurhekar. (2019). Real time sign language estimation system - IEEE xplore. https://ieeexplore.ieee.org/document/8862701/figures