**Project Motivation**

**What is the problem you want to solve?**

As the pandemic hit humanity, the whole burden of conducting meets, webinars, classes, etc. was shifted on platforms like Zoom, Microsoft teams, Cisco where a majority of the meetings are conducted especially in India. This puts the deaf community in a tough spot as they face difficulty in attending these meets due to the lack of resources required for communication as these apps are not designed to cater to the deaf community. There have been huge advancements for the deaf community in order to provide them with aided platforms where they can communicate and voice their thoughts from the comfort of one place but still, there has not been any specific development to connect them with normal non-aided meets, where they can communicate or even attend a random meeting conducted on these platforms as they just provide the majorly verbal type of communication. Statistically, people who communicate through ISL already face a lot of difficulty in continuing their education so they mostly drop out, and now when it is impossible to even communicate with the teacher directly many more have been discouraged.

**What strategic goal is this connected to ?**

This is connected to the strategic goals for learning and growth and customers and as for finance, it won’t be delivered to gain any financial profit.

It allows to achieve goals like surveying our team, implement performance review to find out potential of each individual, improve internal communications, improve team member satisfaction due to engagement.

Some of the other important goals will be to achieve, customer satisfaction, increase %of defaults on products, increase response time to complaints ,improve our service approach for new and existing customers and finally increase in new customers.

We would test the project further with institutions by serving this app to the deaf community near us and try to fix the problems according to them. We would then engage with social media apps where the videos on Facebook or Instagram can be translated through our app which in turn will help us reach our app to a larger audience as the number of people using social media increases day by day. Increasing our outreach through social media as tagging people who use our app so that they can further share this experience with their mates. Also our solution currently is based upon Indian Audiences but in later future we will try to develop the application for all the specially able natives of different countries. Furthermore we will add language options in our applications so that people knowing languages other than English can use it too.

**Problem Definition**

**What specific output do you want to predict ?**

The availability of language translation is solely for online video lectures as it diminishes the possibilities of creating another platform for specially-abled to learn and study and they can easily study on current platforms used for learning like Microsoft teams. To able to provide a framework that provides the most accurate conversion into Indian Sign Language as India being a diverse country comes with a diversity of languages as well which has made it difficult to provide one Sign Language for the whole country. To be able to provide HD quality representation of hands to increase the intensity of visualization making it convenient for the user to interpret. Reduced lag so that the user is able to keep up with the information at the same speed as others and be able to participate and voice their opinions to others.

As our main model is LSTM model which works as a translator model in our case, the specific output would require it to convert the text into Indian Sign Language as accurate as possible. Be able to convert synchronously and be able to handle a large dataset.Also , it is predicted to perform well for sequence data without having short-term memory problem.

**What input data do you have for the algorithm?**

As for now we have implemented translation for the common phrases and words in English language only . So, our dataset consist of those text phrases and the ISL letters files in order to make the model learn the translation technique.

**For each dataset describe:-**

**Number of rows(roughly):-**

200

**Number of years of history available** :-

Not defined as the data includes only the text phrases and their ISL letters

**Location(where it is saved) and how can it be accessed?**

It is saved on a GitHub account named inspo13 and it can be accessed through sending request to that account.

**How is the dataset generated & how frequently updated?**

Dataset is generated through taking the image of ISL letters from the internet and then integrating them with the text letters in order to provide the model with both input\_sentence and output\_sentence . It is updated on a biweekly basis in order to keep a check on accuracy/usage of ISL letters.

**Are there any big changes /biases in the data ?**

Right now there are not any biases in the data but as the system will be modified time and over again then the definition of attributes captured in the data will change as it interacts with the system.

**What in your opinion , are the most relevant factors for being able to predict the output?**

For being able to predict the output ,the computational speed of the algorithm should be good.

The preprocessing of dataset should be accurate as splitting of the dataset should be in the correct ratio in order to train the model.

Error should be minimum while implementing noise removal methods. Tokenization and padding should be done in order to get similar lengths properly as LSTM expects input instances with same length.

Implementation of word embeddings to achieve a lot more information about words which will help predict the accurate output.

**How many training examples can you provide ?**

We have provided with over 50 training examples in order to provide the algorithm with every kind of input processed data.

**Performance Measurement**

**Do you have a simple benchmark to compare against ?**

**If yes:-**

**What is its performance?**

Yes , there is an app developed on the same domains which was trained through NLP for text to Indian Sign Language Conversion. It was developed in Jan,2020.It has not been rolled out in public yet . But the performance mentioned in the research paper (1) was 80% accuracy with NLP .

**Is there a documentation? Who built it ?**

Yes, there is a research paper developed on it and it was published in May,2020. The link for it will be mentioned at the end of this document.

Students of SNDT Women's University, Juhu-Tara Road, Sir Vitthaldas Vidyavihar, Santacruz(W), Mumbai implemented it.

**How will you measure the accuracy of the predictions?**

The method of evaluation is to predict 100 source sequences and calculate the correct number if target sequences. Using Numpy on the decoded sequence array\_equal() function to check foe equality. According to the decoded source, target and predicted target sequence values the model’s accuracy will be checked.

**What is the minimum accuracy you expect?**

The minimum accuracy will be at least on average 87 % for our sequence to sequence model .

**What would a perfect solution do ?**

A perfect solution will be able to predict the English text input from google speech api converted text to the Indian Sign Language and will be able to give the accuracy of 100% and the flow of translation will be synchronous until the speakers stops speaking .The TensorFlow Graphics generated code for the 3-D figures will be able to detect the response from the model and display accurate hand movements.

**Are there any reference solutions? (E.g.research papers)?**

Yes, there are 2-3 reference solutions the link for which will be attached at the end.

First one (2)is about the implementation of the V2S system for Malaysian Deaf People. They used three phases in their proposed work in their work: A.Sound Recording – a microphone is used to capture and record sound. Digital Signal Processing (DSP) is a type of digital signal processing.

The another is named “Audio to Sign language translation for deaf people by students of SNDT’s Women’s University. They proposed a communication system for deaf people which converts audio to sign language. Where they have solely worked on the non-synchronous translation of audio to text to Indian Sign Language.

The third one(3) is of development of Indian Sign Language Dictionary using synthetic animationsThey used HamNoSys -Hamburg Notation System which was converted to Signing Gesture Markup Language. This paper was solely for referencing our enhancement of representation of hand movements.

**TimeLine**

**Are there any deadlines to be aware of ?**

Yes. The deadline for each review were specified beforehand .

28.02.2021-05.03.2021- For Zeroth Review

30.03.2021-14.04.2021- For First Review

29.04.2021- 03.05.2021- For Final Review

Project Report Submission- On or before 05.05.2021

**By when do you need to see first results ?**

By 15.03.2021 it will be required to see first results as the implementation part will be started after 7 days of learning and studying about the aspects of the model.

**By when do you want a finished solution?**

As , it is an app where there are 4 modules to be implemented , the expected time of getting final results is assumed to be till the final review.

**Contacts**

**Who is responsible for project(PM)?**

Our Team Guide :- Dr. Amit Mishra

**Who can grant access to datasets?**

The datasets were available on the Internet which did not require any official access.

**Who can help understand the current process and/ or the naive benchmark(Domain expert)?**

Our Team Guide- Dr. Amit Mishra

**Collaboration**

**Set a bi-weekly update between business and engineering .**

As all of us were focused on the engineering part, we did set weekly meets in order to discuss our progress.

**Who should be involved ? What should they learn?**

All of us will be involved in every module of our project but to specify, Prachi Bhatt(19BAI10111) will be involved with the android application part . Toshini Agrawal (19BAI10115) will be involved with the LSTM model and Shivangi Singh (19BAI10097) will be involved with the remodeling and representation part.

Through android app development, Prachi has learned about Java Langauge, XML, Android SDK, Android Studio, APIs, Material design. And for Recognition and Translation (Modules of the project) she learned about Word Embbeding, TF-IDF, and Google API for speech-to-text translation respectively and also learned about different ML model functionalities and how to choose which one is better for our process. Github also comes under one of our new learnings through this project.

Through the LSTM model, Toshini Agrawal learned about python language, various libraries, packages, data preparation, data preprocessing, Tokenization and Padding, model creation, and also learned about different ML model functionalities and how to choose which one is better for our process and through android development, she learned about java, material design, Android studio, and XML. Github also comes under one of our new learnings through this project.

Through Animation Shivangi learned about animation tools, drawing skills, presentation skills,  familiarity with graphics software, and through android development she learned about java, material design, Android studio, and XML, she also learned about python (through machine learning model) and also learned about different ML model functionalities and how to choose which one is better for our process. Github also comes under one of our new learnings through this project.

**Define where codes & issues are located and accessible.**

The codes are located on Github page of one of our member named Prachi Bhatt and the page is named inspo13, where all the dataset with the code is presented and how to access it and run the application is also mentioned.

**Reference links:-**

1. <https://www.ijeit.com/Vol%209/Issue%2010/IJEIT1412202004_05.pdf>
2. <https://link.springer.com/chapter/10.1007/978-3-642-05036-7_82>
3. <https://www.researchgate.net/publication/308127791_Development_of_Indian_Sign_Language_Dictionary_using_Synthetic_Animations>