# EasyTalk

A Translator for Sri Lankan Sign Language

2020_077

# Introduction

- **Special characteristics:**
  - A real-time translator which can detects low-resolution images
  - Able to convert Sri Lankan sign language to common verbal language
  - Able to translate verbal, basic communication phrases into Sri Lankan sign language
  - A web-based online application

# Introduction <small>contd.</small>

- **Requirements needed:**
  - A network connection with rich bandwidth
  - A laptop/ desktop computer with a web camera

- **Target Community**
  - Sri Lankan ordinary people who can speak verbal languages (Sinhala/Tamil/English)
  - Sri Lankan hearing-impaired & inarticulate people

# Introduction contd.

- **Inputs:**
  - Images captured by web cameras
  - Simple English text

- **Outputs:**
  - The definition of hand gesture in textual or audible format
  - A GIF image created by relevant hand signs

# Comparison with Existing Translators

| Feature | Nihanda Ridma | Ahanna | Kathana | Sanwadha | EasyTalk |
|---|---|---|---|---|---|
| Hand sign detection | ❌ | ❌ | ❌ | ❌ | ✅ |
| Text recognition | ❌ | ❌ | ❌ | ✅ | ✅ |
| Convert English text to sign language | ❌ | ❌ | ❌ | ❌ | ✅ |
| Display sign as GIF | ❌ | ❌ | ❌ | ✅ | ✅ |
| Display the sign definition in both text and voice formats | ❌ | ❌ | ❌ | ❌ | ✅ |
| Web-based application | ❌ | ❌ | ❌ | ❌ | ✅ |

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# Research Question

What is the better way of reduce the society distance between Sri Lankan ordinary people & hearing-impaired & inarticulate people by improving the communication between them?

# Research Solution

**EasyTalk**

| Data Acquisitor | Sign Recognizer & Translator | Text & Voice Output Generator | Text to Sign Language Translator |

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# Main Objective

*Improve the communication bond between the Sri Lankan ordinary society & hearing-impaired & articulate societies by implementing a common assistant which can be able to translate Sri Lankan sign language into common verbal language & vice-versa*

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# Sub Objectives

| | | | | |
|---|---|---|---|---|
| Verify the product is reliable for every Sri Lankan | Capture the images using low-resolution cameras in real-time | Build R-CNN model to identify a series of hand gestures | Prepare an optimal dataset to create an effective data model | Use ML algorithms effectively in sign classification & translation |
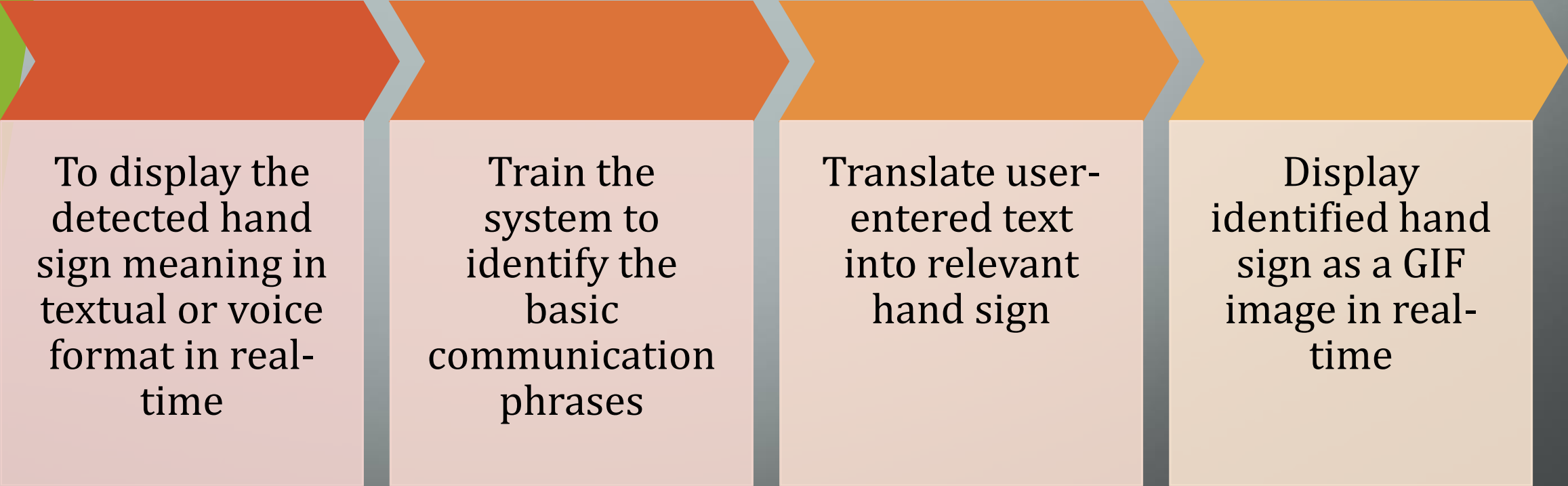
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# Sub Objectives contd.

| To display the detected hand sign meaning in textual or voice format in real-time | Train the system to identify the basic communication phrases | Translate user-entered text into relevant hand sign | Display identified hand sign as a GIF image in real-time |

# System Overview Diagram

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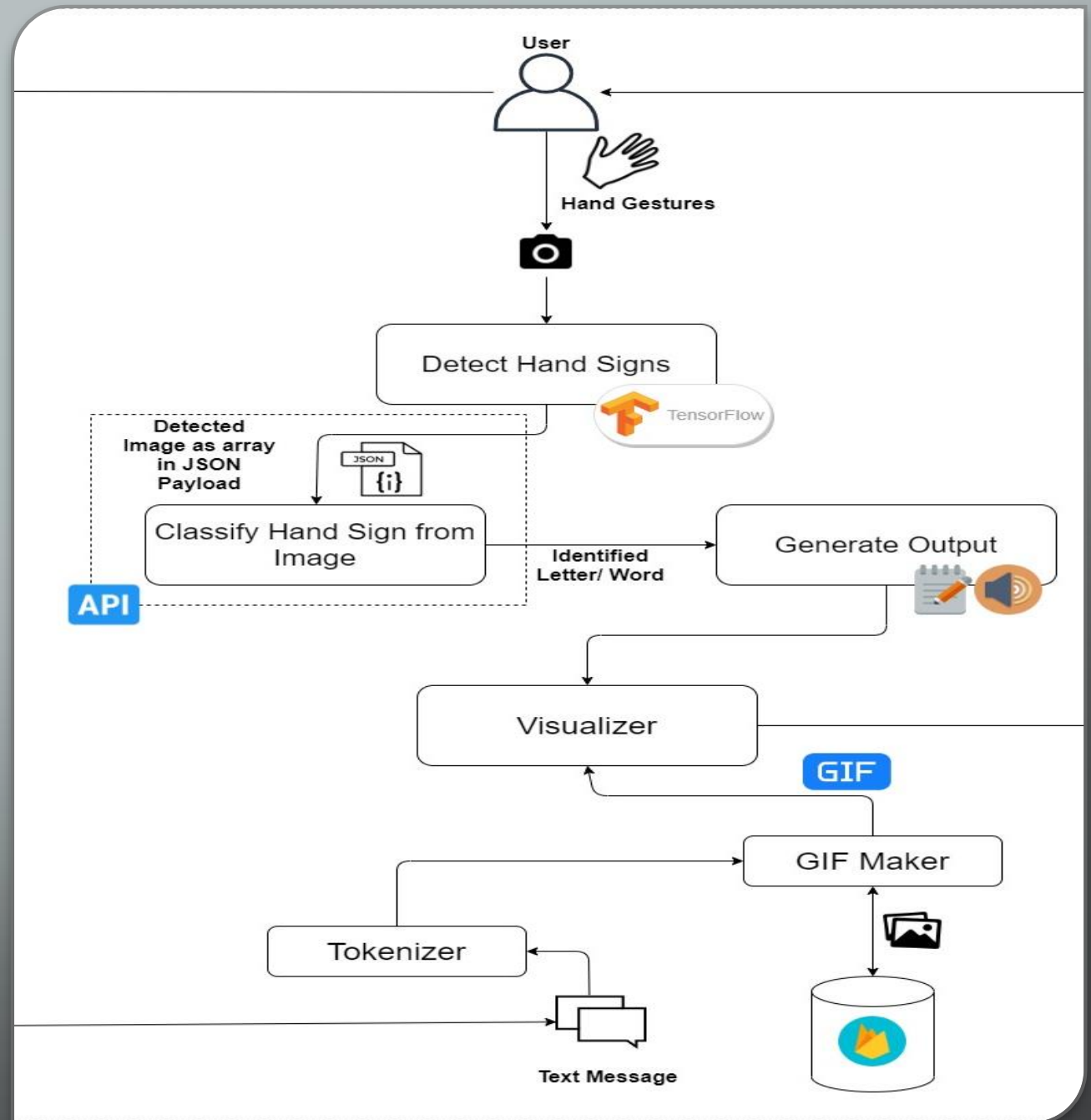
# Technologies Used

# IT17050272 | D. Manoj Kumar

Software Engineering

# Data Acquisition

- Background/Research Gap

- Research Question

- Specific and Sub Objectives

# Background

- Mostly hands are used by hearing-impaired & inarticulate people to communication purposes

- Each word in verbal language has a separate sign in sign language

- Sri Lanka owns a unique sign language calls SSL

- It consists with hand signs for letters & also common words

# Research Gap

- Most of the existing translators are based high-resolution images

- Many translators capture whole image get through camera – hard to identify the hand sign

- No enough real-time translators based on Sri Lankan sign language

- Can't use the existing translators as self-study material

# Research Question

- How to detect the real-time images for the translation process?

- What is the possible way of capturing images other than using high-resolution cameras?

# Research Solution

- Introducing **EasyTalk** translator
  - Able to identify the hand gesture in real-time
  - Able to capture images from low-resolution cameras specially

# Specific Objective

*Detect hand gestures using the images taken by a low-resolution cameras and present them with boundary box to user*

# Sub Objectives

**1**

Create an effective dataset using captured images taken by low-resolution cameras

**2**

Detect hands gestures irrespective of hand size, skin color, background

**3**

Execute the component's results lively

# COMPONENT METHODOLOGY

- The hand sign is detected from a live input stream.

- Using the pre-built TensorFlow model, the hand gesture is detected

- A bounding box and an accuracy level is shown in the output.

- The detected image is sent to the next component for classification

# SYSTEM OVERVIEW DIAGRAM
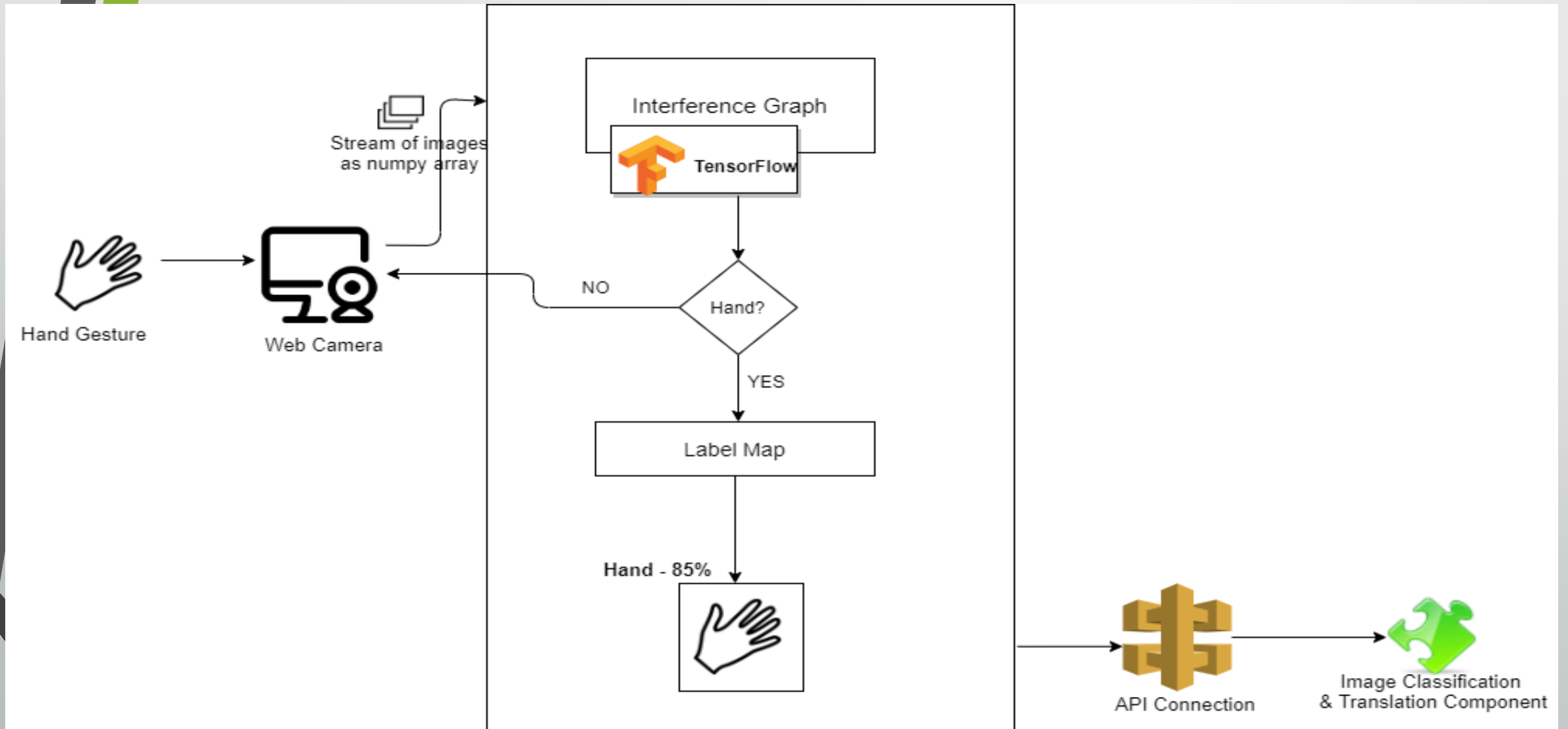
# Achievement
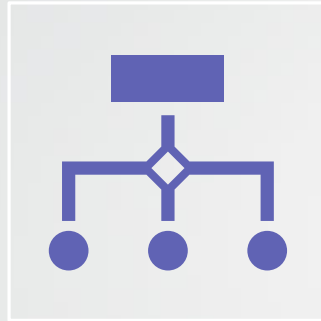
## Nearly 90% Complete!

Detect images in real-time

Identify hands gestures irrespective of hand size, skin color, background
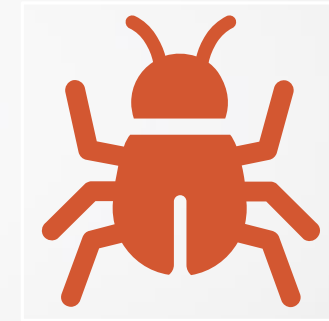
## What is remaining 10%?

Integrate component with final product

More testing and Bug Fixing!!

# IT17032766 | K. Bavanraj

Software Engineering

# Sign recognition & Translation

- Background/Research Gap

- Research Question

- Specific and Sub Objectives

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# Background

- Image classification is more important in sign language related developments.

- Each letter and words have different signs.

- How about using a classification API for different sign languages.

# Research Gap

- Existing systems are focused on single sign language.

- Optimizing the recognition and translation processes of a detected hand gesture immediately in real-time application.

- Don't need to record videos.

# Research question

- How to classify images in real time?

- How to build an API which can accept different kind of sign languages?

- How to implement for Sri Lankan context?

# Research Solution

- Introducing **EasyTalk** translation machine.

  - Building a machine learning model for classification using CNN.

  - Able to translate hand gesture images into letters immediately.

  - API can be used in similar developments.

# Objectives

- Prepare an optimal dataset to create the effective data model.

- Apply a proper ML algorithms for translation.

- Optimize the overall model to real-time translating.

- Build an effective API using ML model.

# Component Methodology

- This component makes use of convolutional neural network.

- ASL dataset has been used to train the CNN model.

- Building API using the model to accept dataset and sign images.

# System Overview Diagram
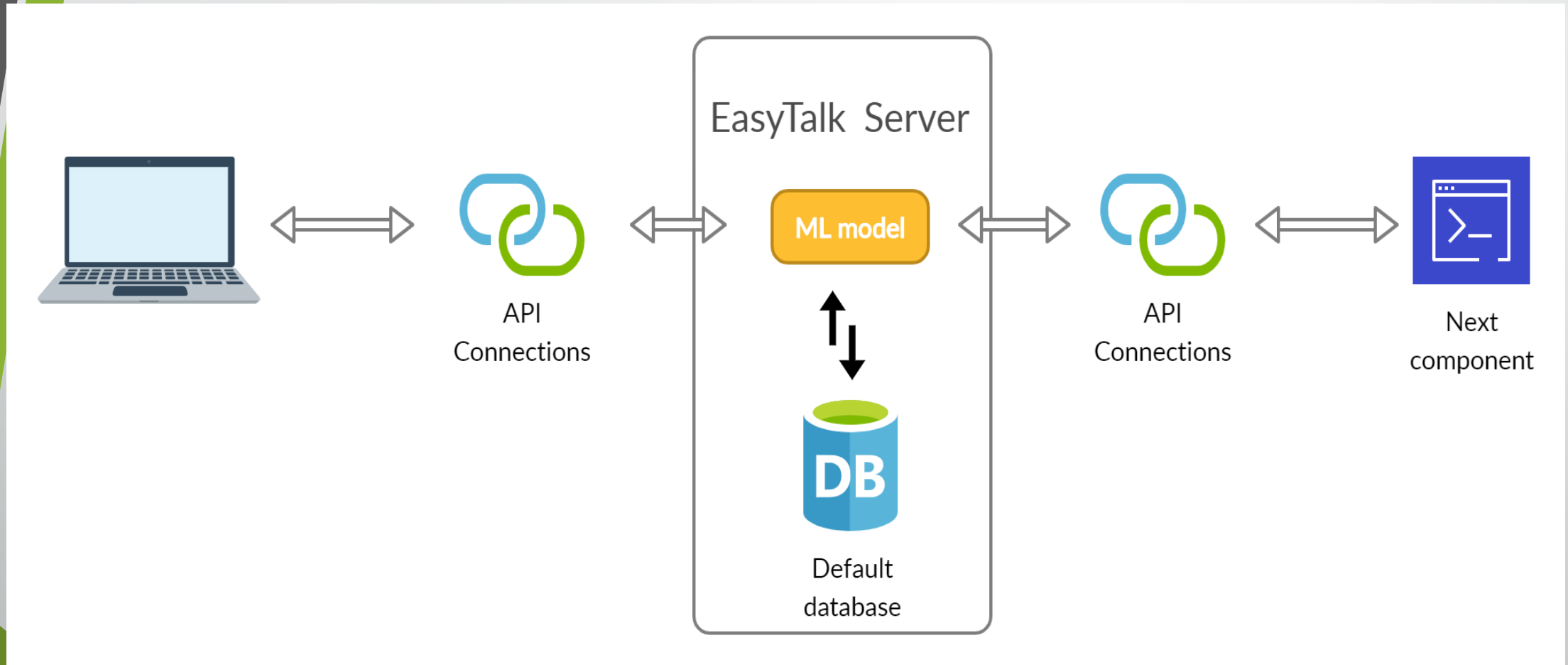
# Achievement
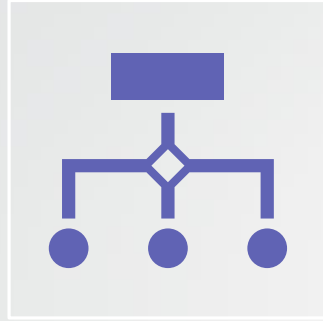
## Works upto now!

ASL dataset has been used.

Dataset can be visualized.

Helper functions are defined to check accuracy.
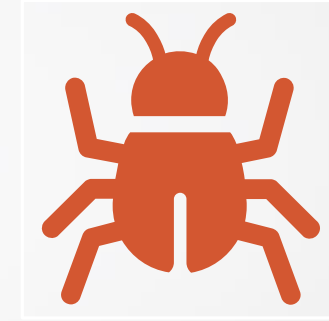
## What is remaining?

Integrate component with final product

More testing and Bug Fixing!!

# IT17068192 | S. Thavananthan

Software Engineering

# Text & Audio output generation

- Background/Research Gap

- Research Question

- Specific and Sub Objectives

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# Background

- When translating SSL into verbal language it is important the delivery mode of the output.

- This delivery mode should be well-understandable to the targeted community.

- Therefore, this delivery mode should understandable for Sri Lankan ordinary people.

- So, it is better to have a delivery mode in textual & audible manner as well as delivery should happen in three languages.

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# Research Gap

- Existing translators are based on only one output mode – either textual-format or audible-format

- The textual-format outputs have spelling errors due to poor language translations

- The audible-formats are only based on English language

# Research Question

- How to convert array of alphabetical letters into a meaningful sentence/word?

- How to build an API to check for the spelling mistakes in a sentence/word?

# Research Solution

- Introducing **EasyTalk** translation machine
  - Able to convert the definition of the detected hand gesture into meaningful textual format with less spelling mistakes
  - Able to translate the definition into audible-format as per user preference

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# Specific Objective

*Provide an understandable way to the users to identify the definitions of a detected hand gestures*

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# Sub Objectives

**1**

Convert the identified array of alphabetical letters into readable textual-format

**2**

Check the spelling mistakes in the converted text

**3**

Translate textual-format definition into audible-format

# Component Methodology

- Receive each alphabet from the previous component and make the English sentences from the collection of alphabets, integrate them.

- Check these sentences are correct or incorrect with the dictionary. If correct give textual output.

# System Overview Diagram
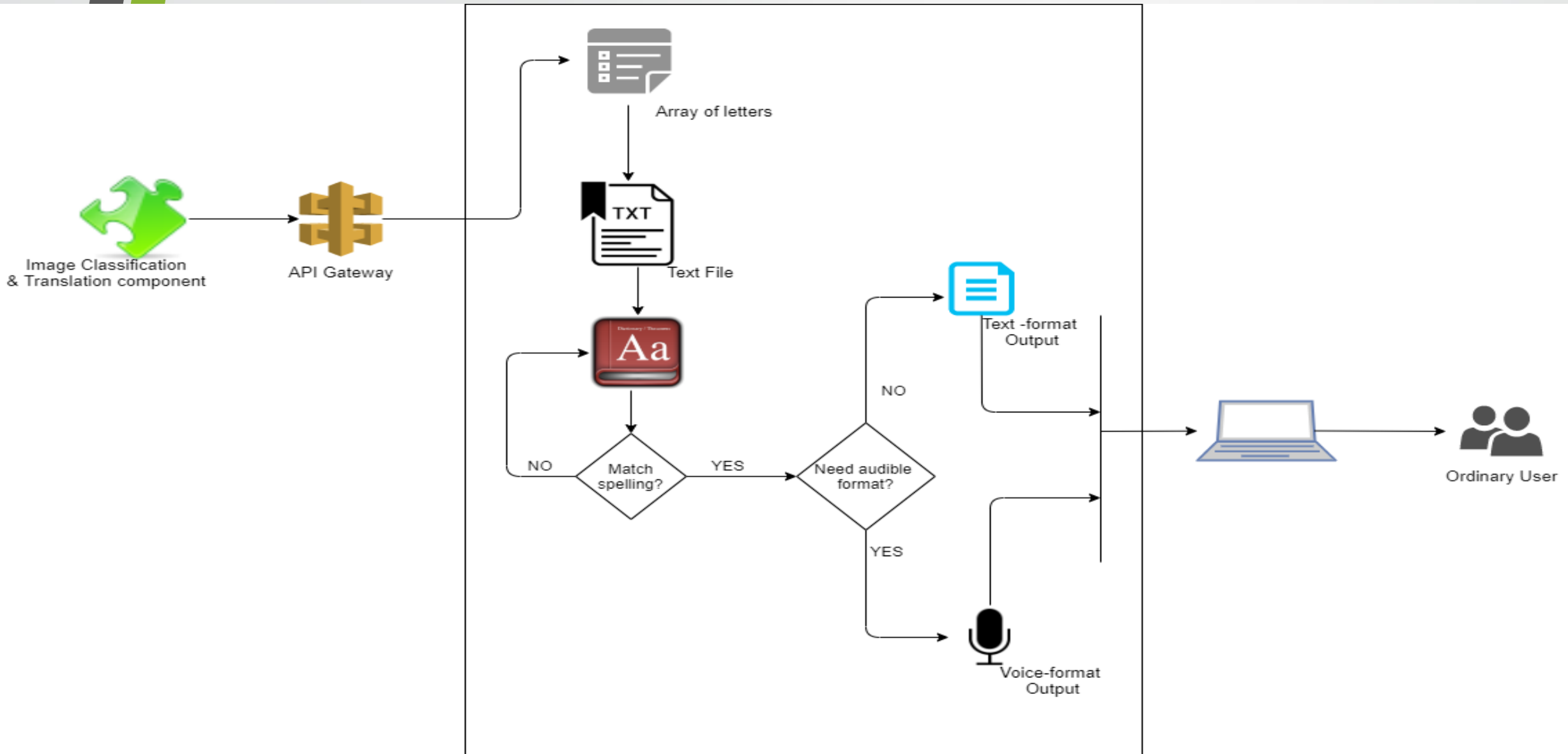
# Achievement
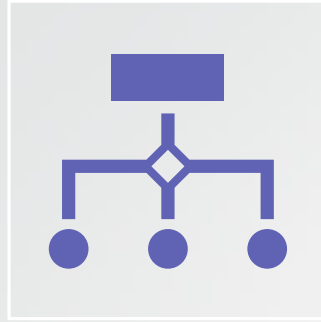


## Nearly 90% Complete!

Get the array of identified letters

Convert the letters array into readable text-format

Check for the spelling mistakes

Convert the text-format into voice-format
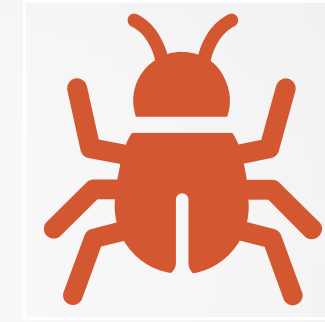


## What is remaining 10%?

Integrate component with final product

More testing and Bug Fixing!!

# IT17143950 | G.M. Amashi S. Bastiansz

Software Engineering

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# Text to Sign Language Conversion

- Background/Research Gap

- Research Question

- Specific and Sub Objectives

# Background

- Ordinary people use verbal language for communication

- English language is the commonly used language among Sri Lankans

- So it is better to implement a translation machine based on simple English hence everyone can understand

- This component is initially integrated for translate the words used for basic communication into SSL

- The system provides a GIF image to each word for better understanding & attraction manner

# Research Gap

- No enough translators that can translate Verbal language to SSL

- Existing translators contain with the images of hand signs – not very understandable

- Ordinary people refuse to communicate with hearing-impaired & articulates due to:
  - ✓ Having less knowledge in Sri Lankan sign language
  - ✓ Having less sign language translators in Sri Lanka
  - ✓ Do not get a proper education regarding Sri Lankan sign language

# Research Question

What is the best way to implement an assistant to translate simple English format into Sri Lankan sign language to reduce the communication gap?

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# Research Solution

- Introducing **EasyTalk** translation machine
  - ➤ Consists with ability to translate common verbal language (English) into Sri Lankan sign language
  - ➤ Acts as a sign language self-study system

# Specific Objective

*Offer support to Sri Lankan ordinary people who use Sinhala, Tamil, English languages in their day-to-day lives to communicate with hearing-impaired and inarticulate people actively*

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# Sub Objectives

**1**

Verify the product is reliable
for any ordinary user

**2**

Introduce the application in a simple
English language

**3**

Display the identified hand sign as a GIF image

**4**

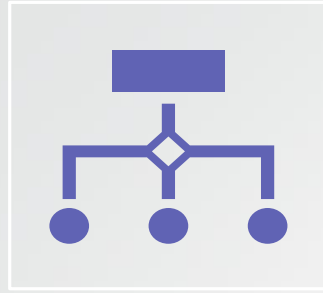Provide a self-learning system to ordinary people to study SSL

# Component Methodology

- Translates text into relevant Sri Lankan Sign Language

- Tokenizes the input and gets the relevant image for each token upon its occurrence

- The GIF image is generated from the images and sent back to the user.

# System Overview Diagram
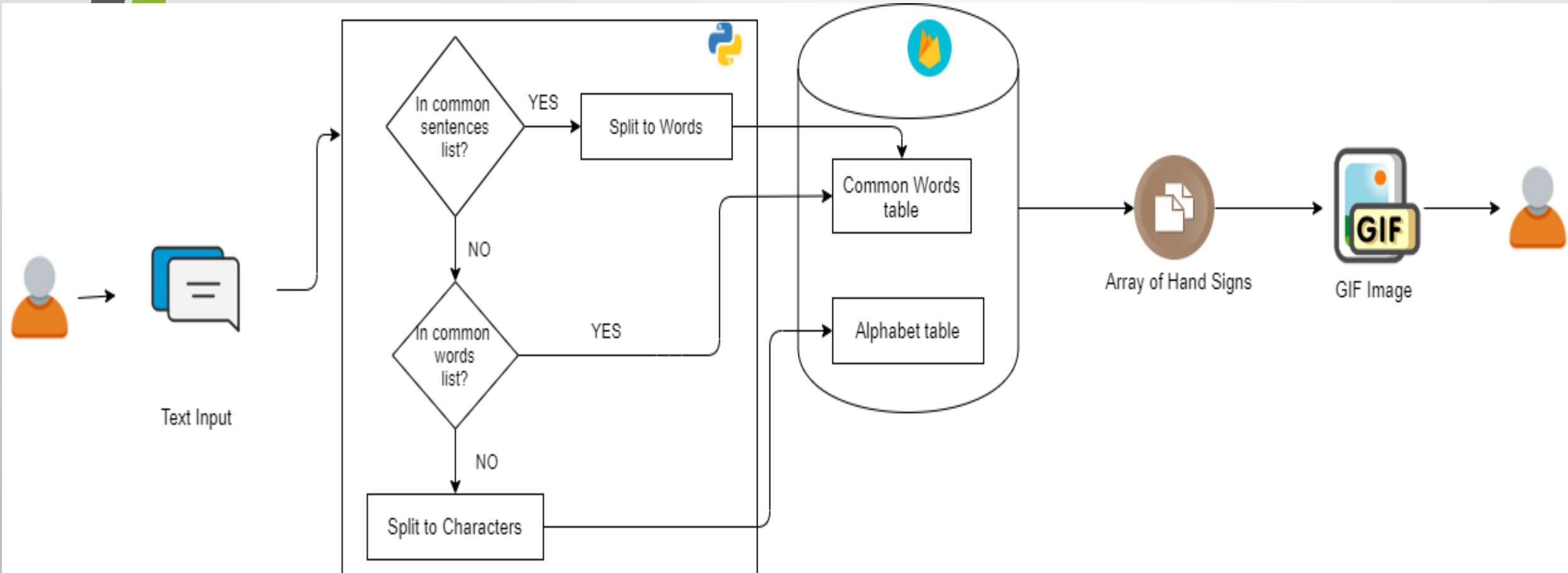
# Achievement

## Nearly 90% Complete!

Get the user input through a simple form

Tokenize the input comparing the dataset

Find relevant images of SSL hand signs

Combine images into a compressed GIF image

Display final GIF image to user

## What is remaining 10%?

Integrate component with final product

More testing and Bug Fixing!!

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# References

[1] J. S. Sonkusare, N. B. Chopade, R. Sor, and S. L. Tade, "A Review on Hand Gesture Recognition System," 2015 Int. Conf Comput. Commun. Control Autom. , pp. 790-794,2015.

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[3] Kanchan Dabre, Surekha Dholay, "Machine Learning Model for Sign Language Interpretation using Webcam Images", 2014 International Conference on Circuits, Systems, Communication and Information Technology Applications (CSCITA).

[4] Deepali Naglot, Milind Kulkarni, "Real Time Sign Language Recognition using the Leap Motion Controller", 2016 International Conference on Inventive Computation Technologies (ICICT).

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