AI & Data Science bootcamp T5

# OUR VOICE

# صوتُنا

## SSLR

(Saudi Sign Language Recognition)

# CONTENT

# PROBLEM AND SOLUTION

**Problem**: People with Hearing Disabilities (PWHD) face significant communication challenges in healthcare due to limitations in spoken and written methods.

**Solution**: Developing an AI model that translates sign language into words aims to bridge the communication gap between People with Hearing Disabilities (PWHD) and medical staff.

# IMPACT ON SAUDI 2030 VISION

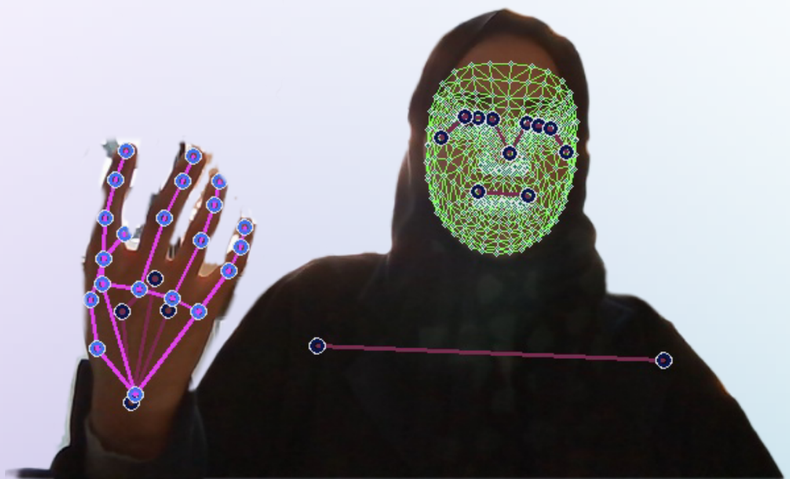
- The Ministry of Health has initiated the "We Are With You" campaign to support people with hearing disabilities.

- Our AI model empowers those with hearing disabilities, contributing to this campaign.

# DATA

- **Data collection :**
  - We recorded the dataset by the team members.
  - Each word is recorded 30 times to capture variations.
  - Every Video of the recorded words splitted into  30 frames.

**SIGN:PAIN**



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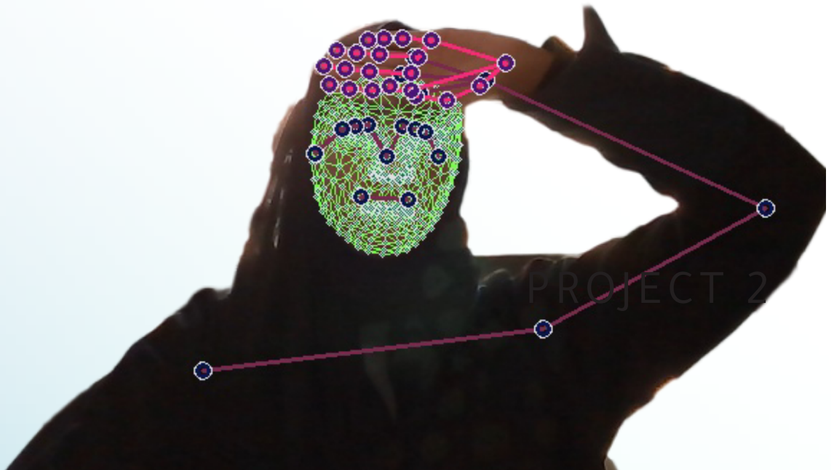
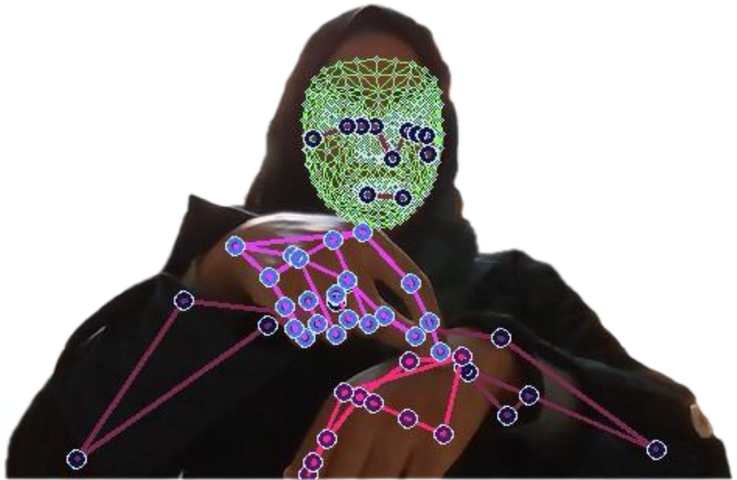


**SIGN:DOCTOR**



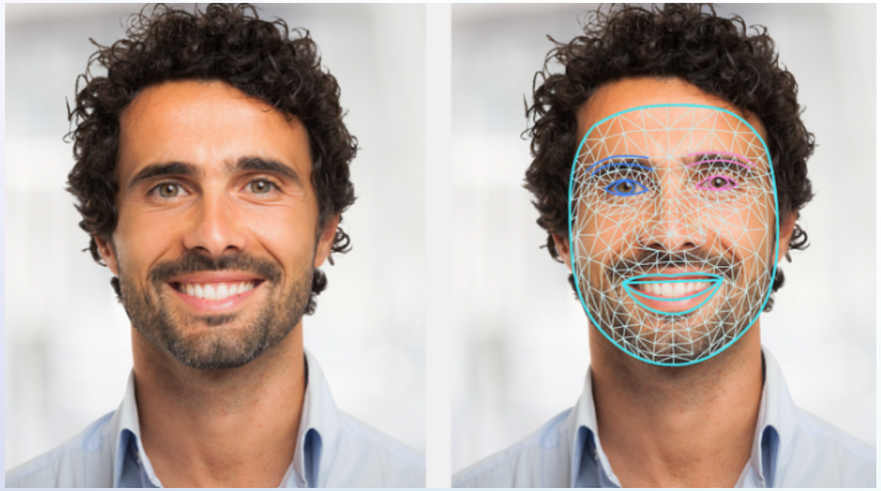
# DATA

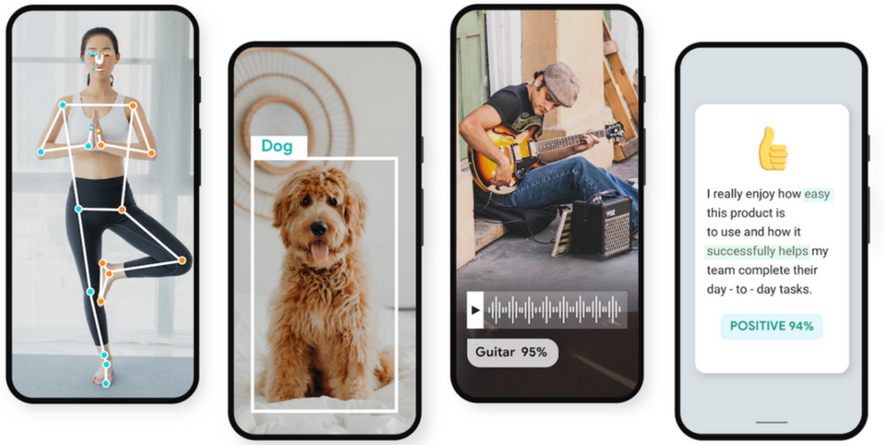
- **Data preprocessing & and features extracting:**
    - Used The Mediapipe model to extract features from frames for both left and right hands, pose, and face.
    - Each frame is saved as a numpy array, a data structure used for scientific computing.
    - Numpy arrays allow efficient storage and manipulation of multi-dimensional data.
    - By saving frames as numpy arrays, it becomes easier to perform further analysis and processing on the extracted features.

MediaPipe

# MEDIAPIPE

- Versatile framework for computer vision and machine learning tasks.
- Contains pre-built models and algorithms for various multimedia analysis tasks.
- Some tasks include: pose landmark detection, image segmentation, face detection, and object detection.





# INITIAL PROTOTYPES

- **First Prototype:**
    - Dataset: Videos recorded by team members.
    - Preprocessing: Videos split into frames.
    - Challenge: Varying number of frames in each video.
    - Accuracy: Weak performance (0.05%)due to varying frame lengths.
    - Model: RNN architecture with fixed input shape.

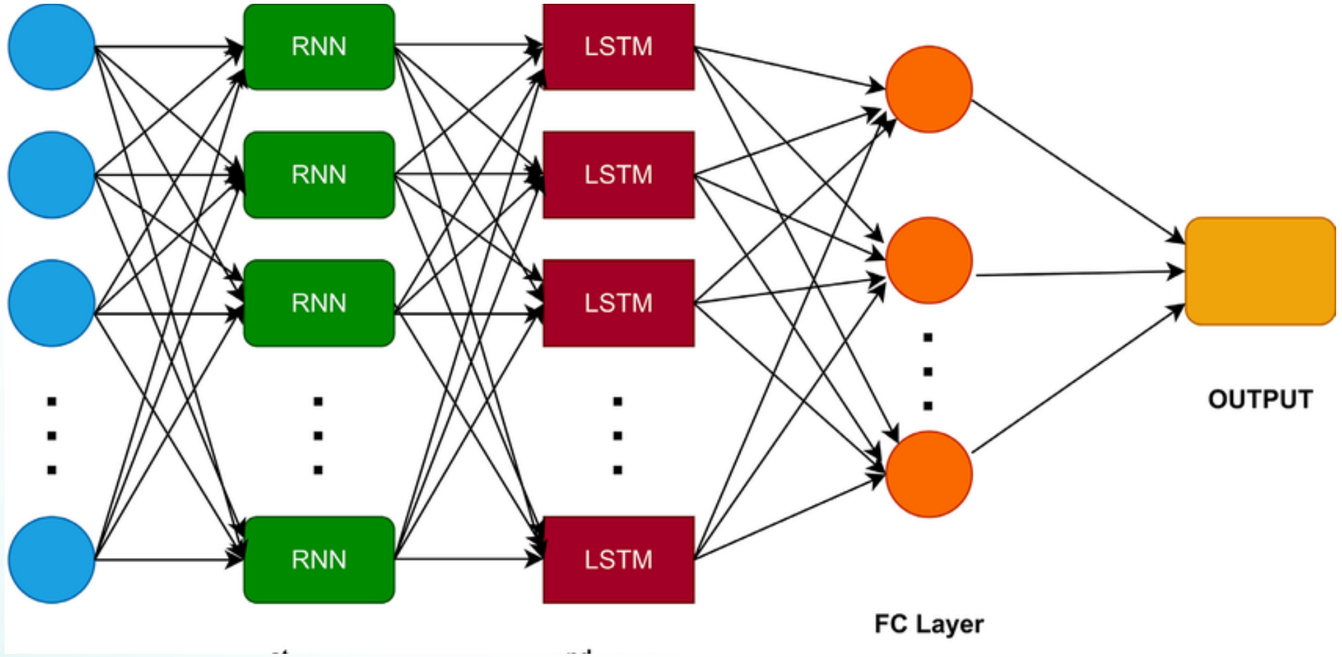
- **Second Prototype:**
    - Dataset: Videos recorded by team members.
    - Preprocessing: Videos split into frames and extracted features using Mediapipe model.
    - Training Model: GRU-RNN architecture with fixed input shape.
    - Accuracy: Weak performance (0.53%).

# FINAL MODEL: RNN(LSTM) MODEL

- Dataset: Videos recorded by team members.
- Preprocessing: Videos split into frames and extracted features using Mediapipe model.
- Training Model: LSTM-RNN architecture with fixed input shape.

**RESULTS:**

- TRAINING ACCURACY 0.81
- TESTING ACCURACY 0.73



# CHALLENGES

## DATA AVAILABILITY

The only available datasets for sign language were in image format.

Creating a custom dataset and refining the optimal data format for model training was time-consuming and required significant effort.

## DATA LIMITATION

Employing video classification yielded suboptimal model accuracy due to the data limitation video classification model provided poor accuracy.

## TIME LIMITATION

Despite time constraints, we acknowledge the insufficient dataset.

We're actively exploring solutions to enhance data collection for future projects

# REAL LIFE APPLICATION

- In education, Saudi Sign Language Recognition (SSLR) can support PWHD students by providing real-time translation of sign language into written or spoken language.

- During emergency situations, SSLR can assist first responders in communicating with individuals who are PWHD

- SSLR enhances customer services, businesses  by providing real-time translation for PWHD individuals.

# FUTURE WORK

- Improving accuracy through advanced machine learning models.
- Enhancing real-time performance.
- building a wider dataset library including all sign language vocabularies.
- Introducing an enhancement to our application – the Voice-to-Text feature.
- Discussing potential integrations with emerging technologies or user feedback mechanisms for continuous improvement.(i.g. Tawakkalna, My Health).

صحتي

توكلنا
Tawakkalna

# TOOLS

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# DEMO


SDAIA
الهيئة السعودية للبيانات
والذكاء الاصطناعي
Saudi Data & AI Authority
Emergency Room without
Sign Language real time translation model

# REFERENCES


01 AVAILABLE AT: HTTPS://SSHI.SA/ .مكتبة لغة الاشارة السعودية (NO DATE) .(ACCESSED: 30 NOVEMBER 2023)

02 MEDIAPIPE | GOOGLE FOR DEVELOPERS (NO DATE) GOOGLE. AVAILABLE AT: HTTPS://DEVELOPERS.GOOGLE.COM/MEDIAPIPE (ACCESSED: 26 NOVEMBER 2023).

03 VIDEO CLASSIFICATION WITH A CNN-RNN ARCHITECTURE: HUMAN ACTIVITY RECOGNITION (2022) YOUTUBE. AVAILABLE AT: HTTPS://YOUTU.BE/EZJNYSXQDTO?SI=WFPR9MMFETKTRXJI (ACCESSED: 28 NOVEMBER 2023).

# OUR TEAM

scan QR code  to view Linkedin and GitHub

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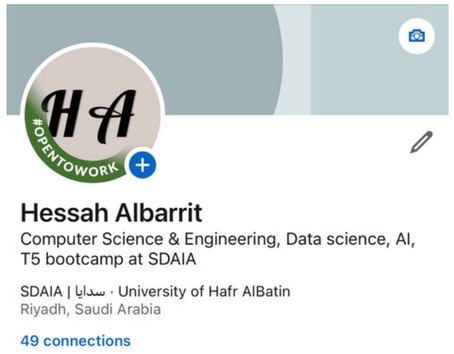
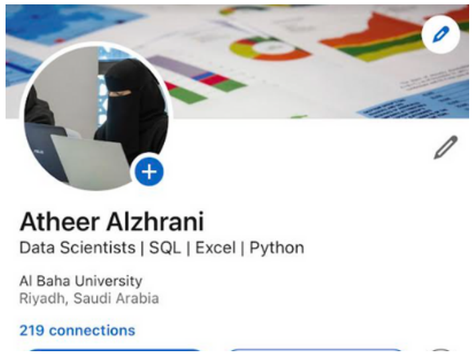



Atheer Alzhrani

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أكاديمية طويق
TUWAIQ ACADEMY

# THANK YOU