7th ABC Challenge

BeyondSmile

A Challenge on Detecting Depression through Facial Behavior and Head Gestures

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STEVENS INSTITUTE OF TECHNOLOGY

IEEE Advancing Technology for Humanity

Agenda

- Introduce challenge goal and background
- Data collection app and its working mechanism
- Challenge tutorial
- Challenge pipeline
- Challenge evaluation guidelines
- Q&A

Challenge Goal

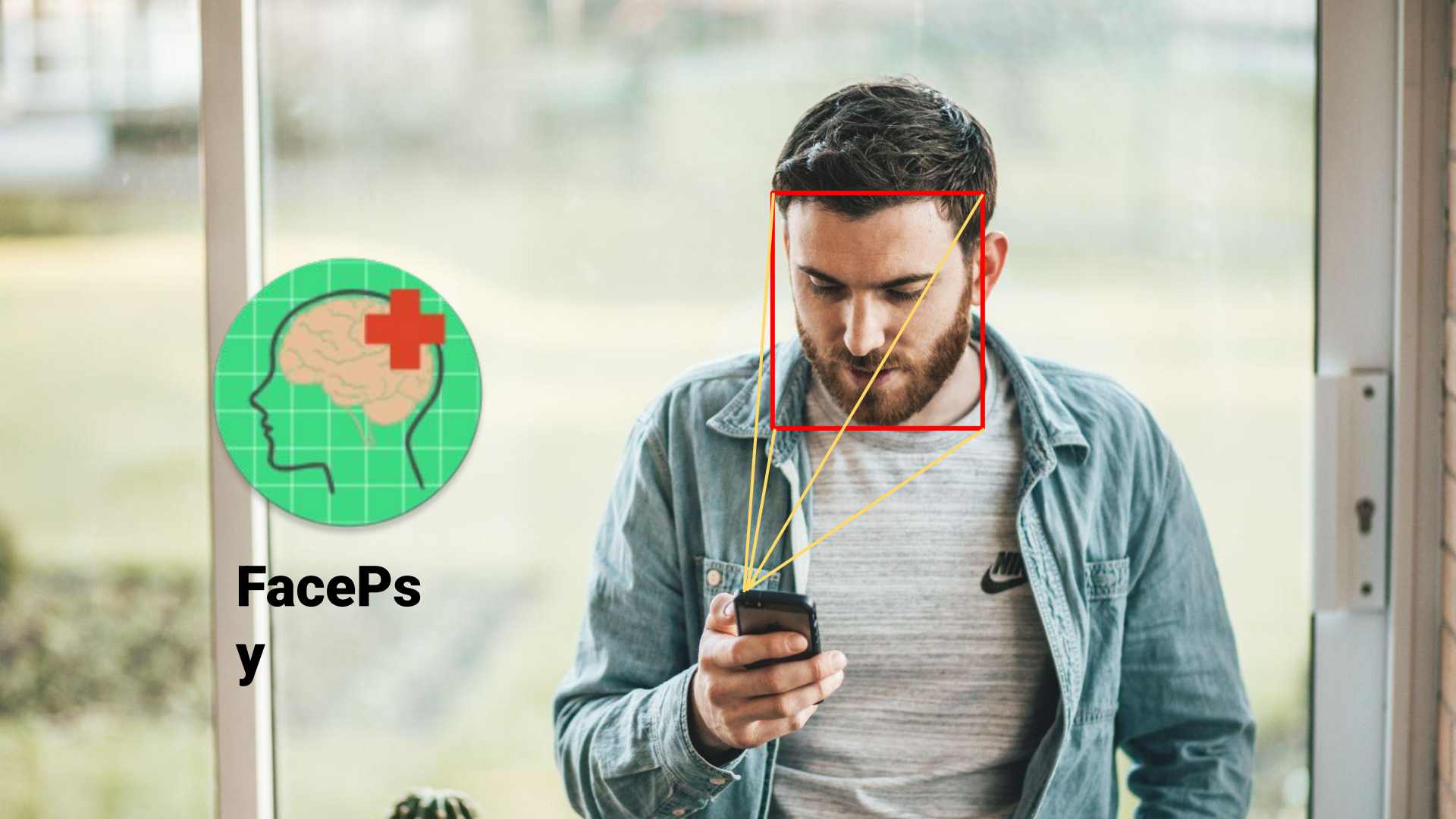
To Detect Depressive Episode with Facial Behavior and Head Gesture

Depression Prevalence

According to the World Health Organization (WHO), about **280 million** people worldwide suffer from depression, making it one of the leading causes of disability globally

Impact of Depression on Society

Source: Therapy Den

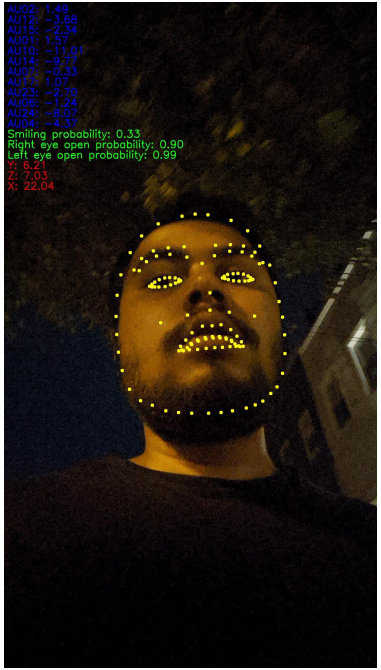

FacePs
y

How FacePsy Collects Data?

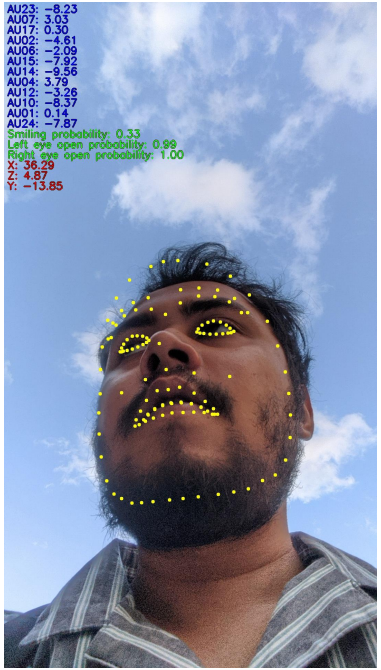
- ➔ FacePsy runs on user device in background once installed
- ➔ Triggers data collection when users **unlock phones** or **use apps**.
- ➔ Data is collected for only for first 10 seconds when the trigger initiated
- ➔ Unobtrusively captures **facial behavior primitives** during natural smartphone interactions
- ➔ Features Collected: 12 AU, 1 Smile, 2 Eye open, 3 Pose, and 133 landmark points

Examples of Feature Visualization Collected from FacePsy

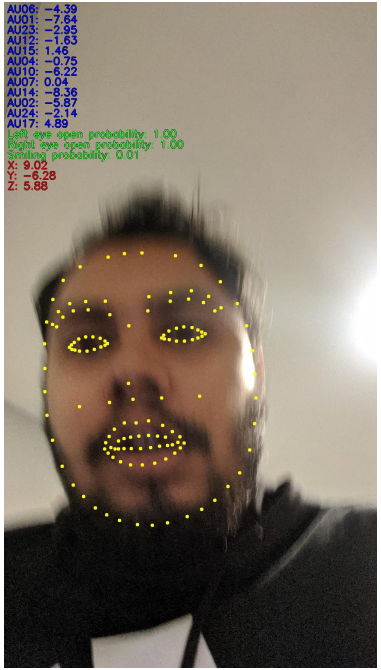
Indoor, Bright light, Seated



Outdoor, Night, Low lighting, Walking



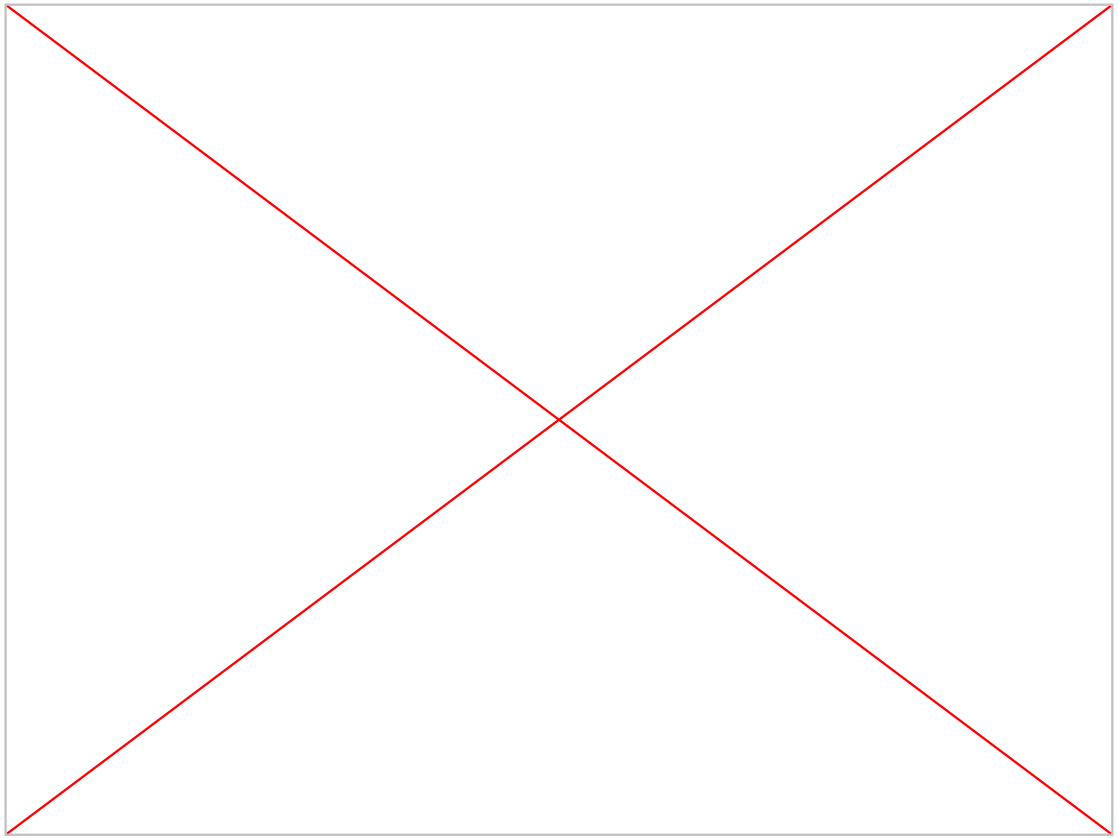
Outdoor, Day, Walking



Indoor, Blurred, Changing position

Tutorial

Visualization of Data Collection in a Session (identified by seq_id)



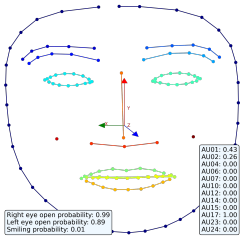
Dataset Structure

No. of Participants: 25, **Age Range**: 18 - 48 years

```
dataset/
├── data/
│   ├── P08.json
│   ├── P10.json
│   ├── ...
│   └── P38.json
├── groundtruth/
│   └── phq9.csv
```

Challenge Pipeline

Sensing ❯ **Feature Engineering** ❯ **Label** ❯ **Machine Learning** ❯ **Validation**



FacePsy running in the background

Upon app use or unlock, 10 second photo burst data collection, features extracted

You are here

Your Proposed Feature Engineering

Features Available
12 AU, 1 Smile, 2 Eye open, 3 Pose, 133 landmark points and others

Depressive Episode

Classification

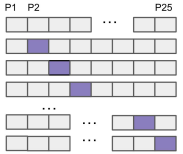
+	-
PHQ-9 ≥ 5	PHQ-9 < 5

Two-week PHQ-9 based depression labeling

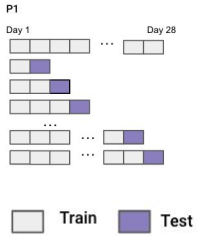
Legend: - negative class + positive class

Build your proposed depressive episode detection model

Universal model



Hybrid model



Train Test

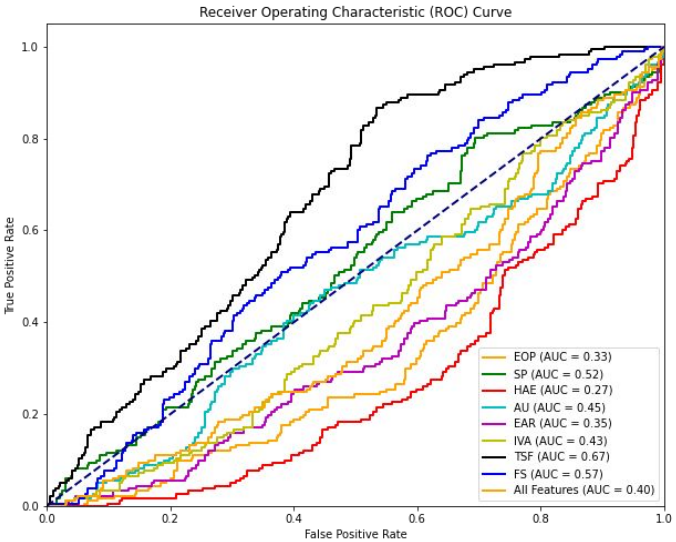
Evaluation Guidelines

The evaluation involves building models to predict depressive episodes using the dataset. There are two evaluation approaches:

1. **Universal Model**:
   - Train a single model using all participant data.
   - Use leave-one-participant-out (LOPO) cross-validation.
   - Evaluate using metrics like AUROC, Accuracy, Precision, Recall, F1 Score.
2. **Hybrid Model**:
   - Combine user-specific data with general data for training.
   - Use nested cross-validation (e.g., leave-one-participant-day-out with time-series awareness).
   - Focus on personalized depression detection while maintaining generalizability.

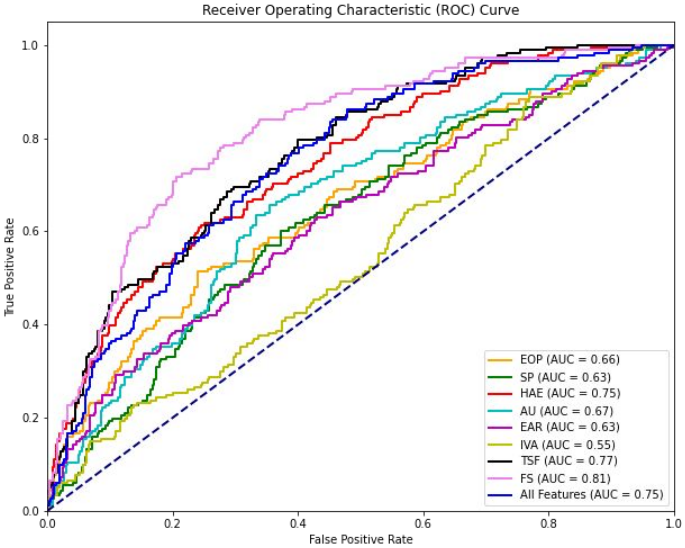
Challenge Participants Submission Evaluated on: **AUC Score**

Baseline Performance



Universal Model

Baseline model: TSF w/ 0.67 AUC



Hybrid Model

Baseline model: FS w/ 0.81 AUC

Q & A

Organizers

BeyondSmile

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Visit the BeyondSmile Challenge >>


Thank you