



# Securo Drive

Ankush Jain (aj2885)

Darshan Solanki (das968)

Smit Sheth (shs257)

Vishnu Thakral (vvt223)

# MOTIVATION

20% car crashes caused by fatigue<sup>[1]</sup>



Drowsy driving caused 100,000 car crashes in USA as per 2019 statistics.<sup>[2]</sup>



Steps by companies like Volvo to detect if person is departing from lane.<sup>[3]</sup>



Crash can be dangerous for an innocent person who was at the wrong place wrong time.

Sources:

[1. Virginia Tech study](#)

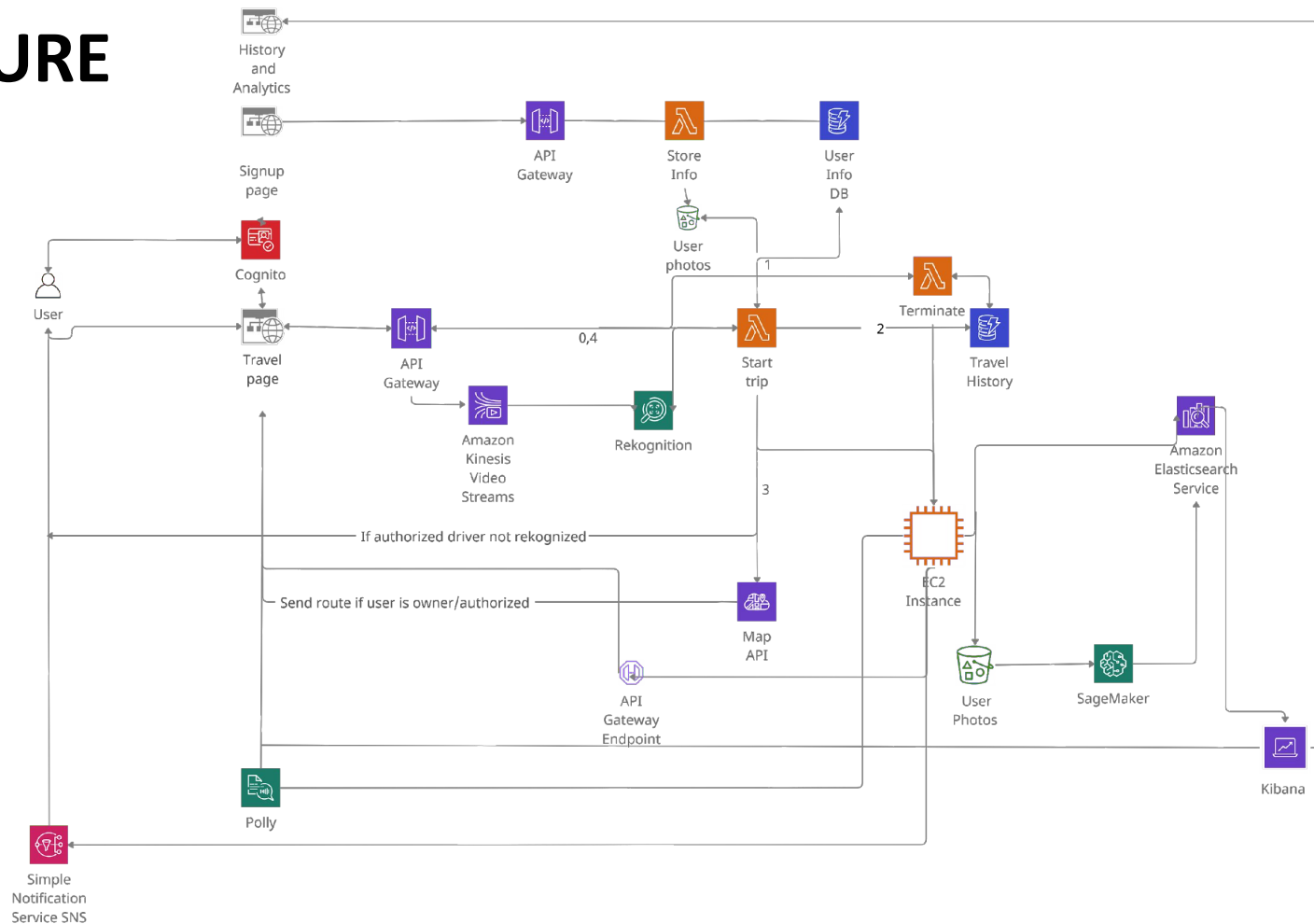
[2. CDC study](#)

[3. Volvo driver alert](#)

# KEY AWS SERVICES

- **AWS Rekognition:** Recognizes the authenticity of user behind the wheel.
- **AWS Kinesis Video Stream:** Uploads live stream of user for drowsiness monitoring.
- **EC2:** Performs model training on live kinesis video streams (core of the project)
- **ElasticSearch:** Stores user's trip data points in real-time for kibana visualization
- **Kibana:** Shows users in-progress summary along with aggregated graphs on the UI
- **Polly:** Alert User with audio recommendation to ensure user is awake and focused
- **WebSocket API Gateway:** Establish bidirectional workflow for sending alerts of drowsiness to front-end
- **SageMaker:** Responsible for training on user video frames to supplant current model in existence in future.

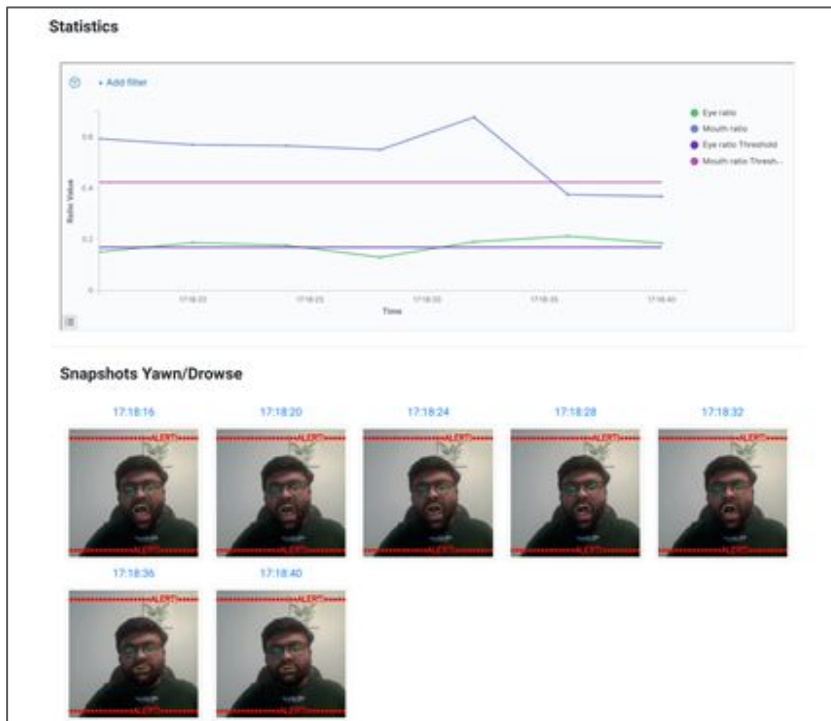
# ARCHITECTURE



# WORKFLOW

- The user signs up on the portal (with authentication) to use the Securodrive service.
- User profile picture is indexed in the collection.
- To travel, the user enters the source and destination and receives a route after user verification.
- The user is continuously monitored for signs of drowsiness (eyes blink and yawn).
- User alerted in real time with audio if the user appears to be drowsy and sent a notification to stop at a nearby rest area to refresh if the user is extremely drowsy (frequent instances detected).
- On selection a rest area, the user is guided with a route to the stop, followed by corresponding route to the actual destination.
- The user is also presented with real time personalized statistics using Kibana.
- The user is also provided snapshots of drowsing instances.

# ANALYTICAL RESULTS



- Plot for amount of Eyes and Mouth open
- Snapshots of drowse or yawn instances

- Hourly distribution of drowse alerts for the user

# SNAPSHOTS FROM LIVE VIDEO STREAM



- Snapshot of yawn



- Snapshot of closed eyes (for more than 2 seconds)

# CUSTOM TRAINED MODEL RESULTS

- Standard model of Dlib involve standard threshold to detect eye and mouth ratio.
- We trained a NN model on data/predictions generated from standard Dlib library thus making our system more robust and customized for each individual user.

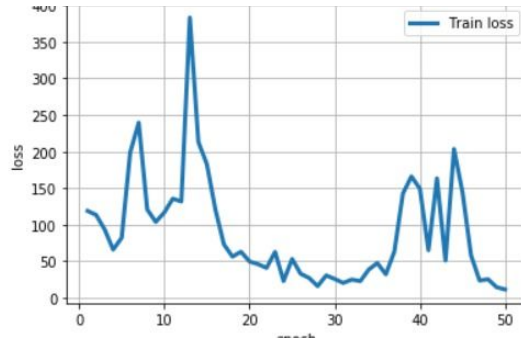


Fig 1: Loss vs Epoch

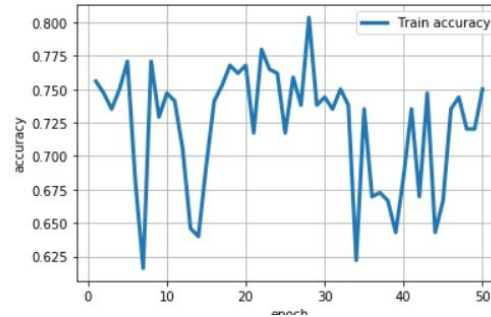


Fig 2: Accuracy vs Epoch

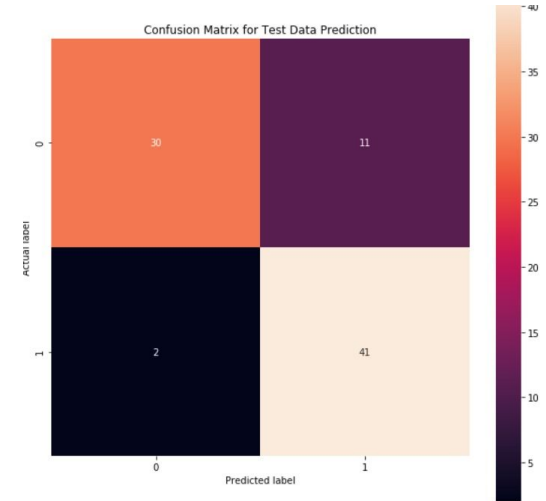


Fig 3: Confusion Matrix

## Results from Model Training

Accuracy: 0.79 | Precision: 0.78

Recall: 0.95 | F1 score: 0.86

*The custom model has a very high recall. This ensures that we rarely miss the instances in which the user was drowsy.*



# DEMO

**App Link:**

<http://project-frontend-web.s3-website-us-east-1.amazonaws.com/>

| **THANK YOU**