

RoadVisor



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Overview

RoadVisor

What is RoadVisor?

- RoadVisor is an innovative augmented reality navigation application enhancing driver experience by making journeys safer and more efficient.

Goal of RoadVisor:

- To democratize access to advanced safety features and amenities typically found only in luxury vehicles.

How to achieve the goal?

- Harnessing the power of Augmented Reality (AR), Machine Learning (ML), Cloud Computing

RoadVisor: Your trusted companion on the road.

RoadVisor's Main Features

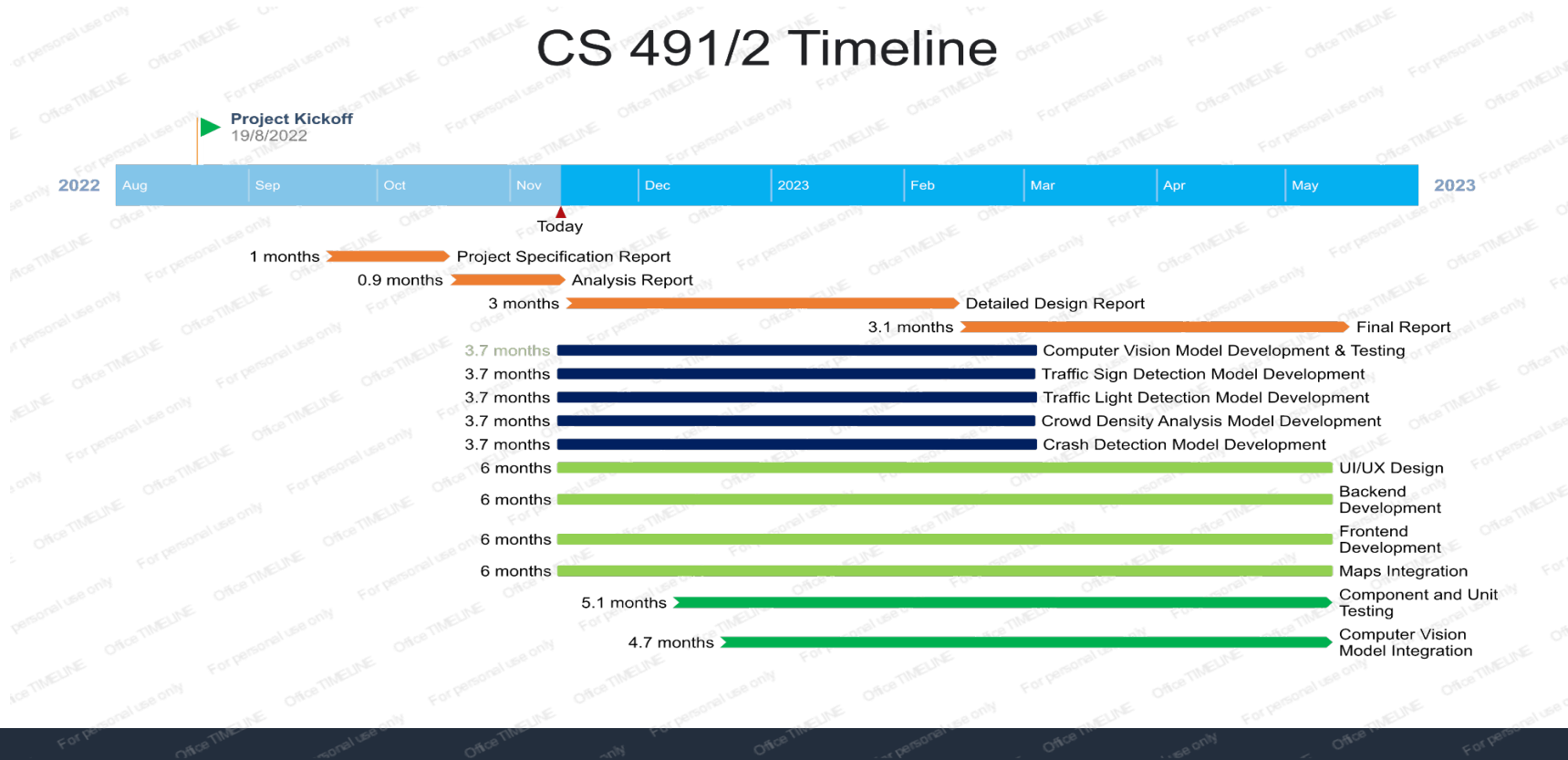
- AR based Navigation
- Traffic Sign Detection
- Traffic Light and Pedestrian Detection
- Emergency Assistance



Figure 1. Directions in AR-based navigation.

Progress of RoadVisor

CS 491/2 Timeline



RoadVisor's Current Status

RoadVisor Health Card:

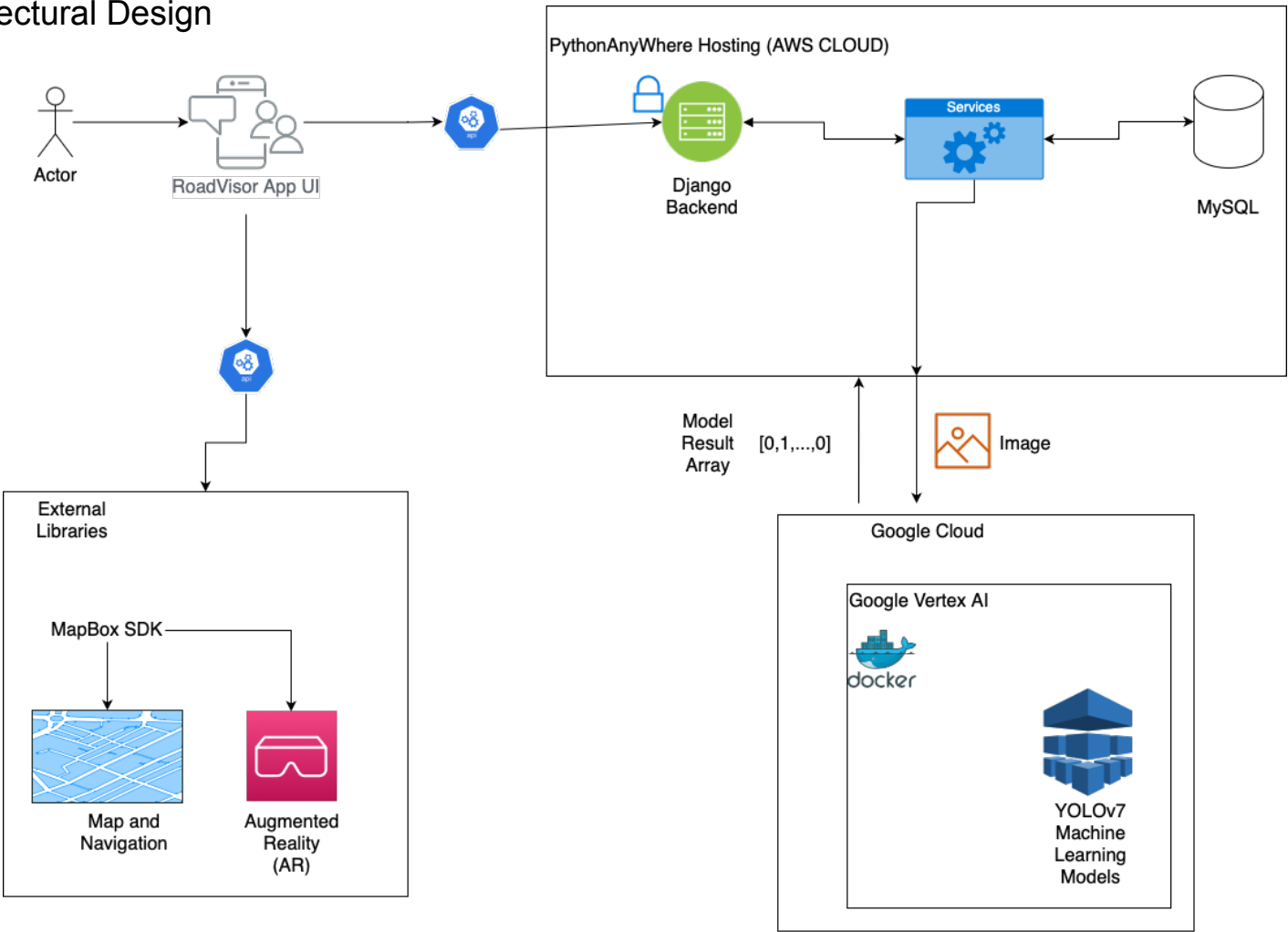
Status

1. Project Specification Report - Complete
2. Analysis Report - Complete
3. Detailed Design Report - Complete
4. Final Report - Complete
5. Computer Vision Model Development & Testing - Complete
6. Traffic Sign Detection Model Development - Complete
7. Traffic Light Detection Model Development - Complete
8. Pedestrian Detection Model Development - Complete
9. Emergency Assistance Development - Complete
10. UI/UX Design - Complete
11. Backend Development - Complete
12. Frontend Development - Complete
13. Maps Integration - Complete
14. Component and Unit Testing - Complete
15. Computer Vision Model Integration - Incomplete

Risks

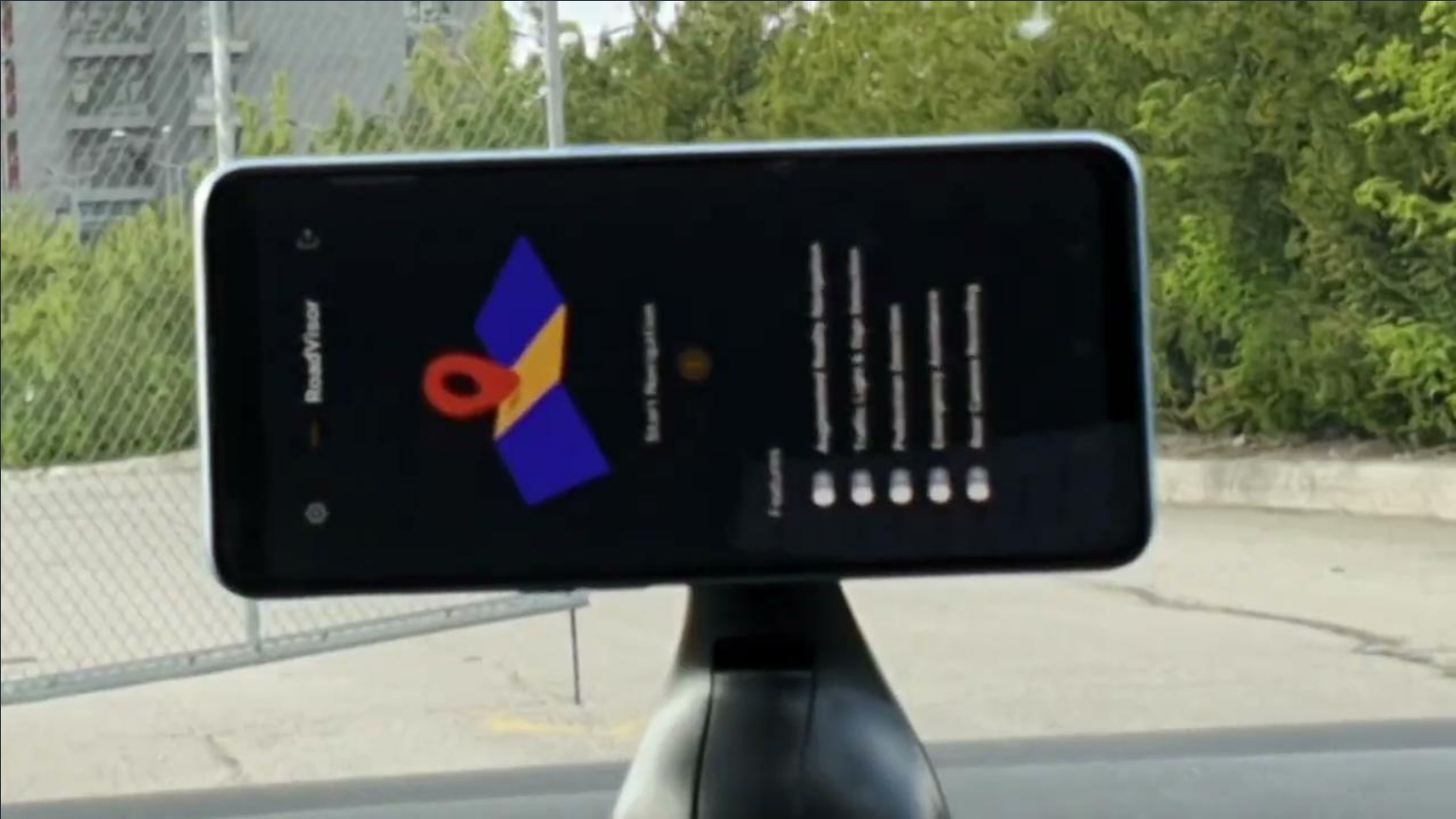
- Hardware Limitations of the Mobile Phones
- Connection with the Maps Application API
- Accuracy of the Models in Different Conditions
- Phone Placement and Camera Quality

Basic Architectural Design



DEMO TIME!

Augmented Reality Navigation - Daytime



Augmented Reality Navigation - Night



Sign Detection - Daytime



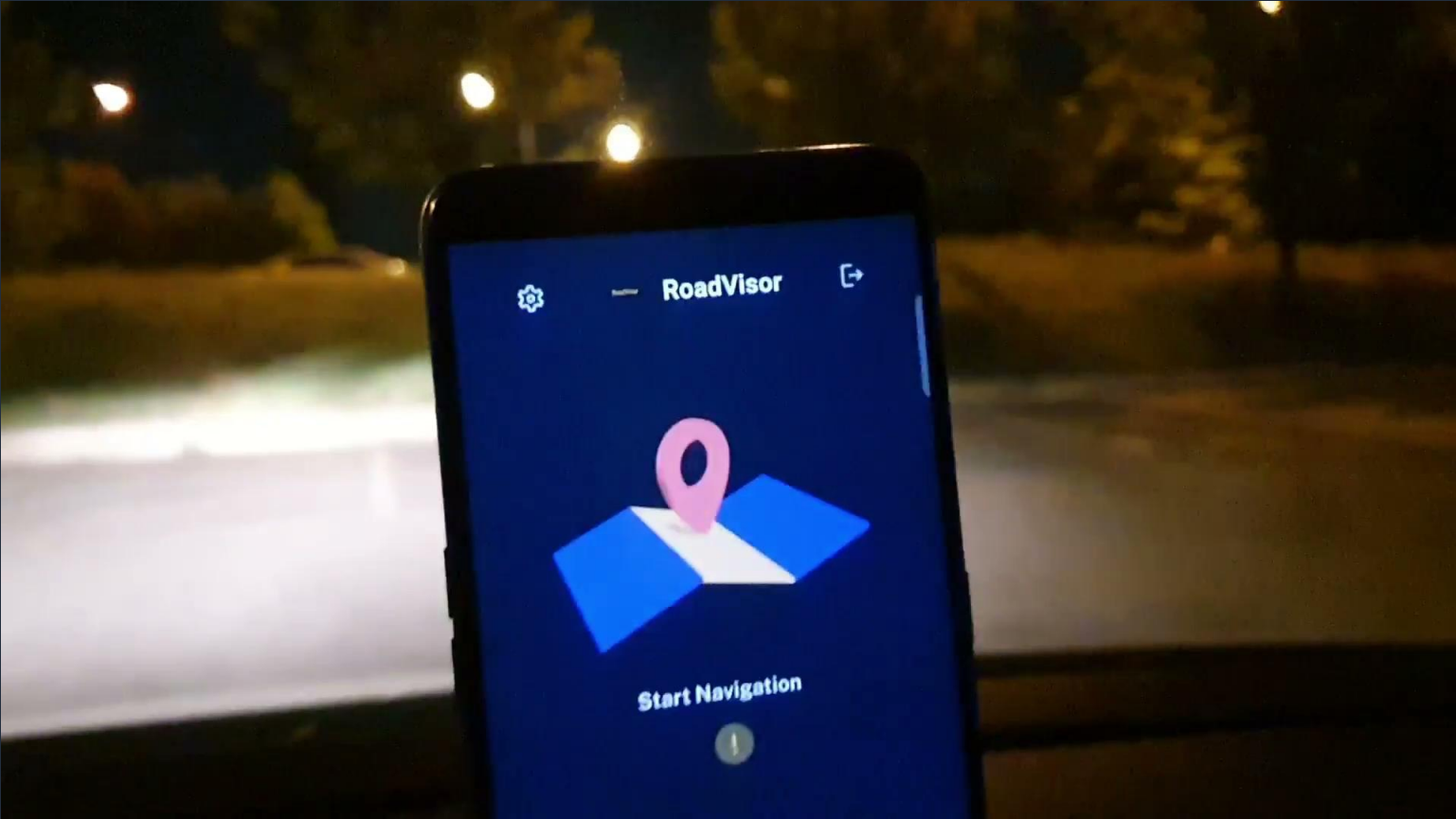
Sign Detection - Night



Pedestrian Detection and Alert - Night



Emergency Assistance



Conclusion

- Modifications in frontend libraries choice due to performance.
- Geospatial API, Google Maps Api replaced with MapBox API.
- Microsoft Azure replaced with Amazon cloud service.
- Road boundary detection model was not necessary.
- High inference time for ML models on Android.

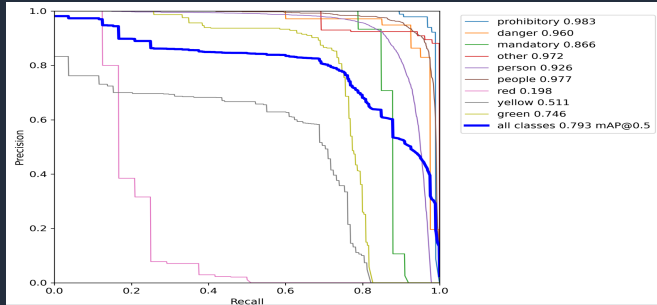
Conclusion

- The computational limitations of Android limit restrict ML use.
- Cloud computing was used to overcome the limitations.
- Google Vertex AI provides optimized way of deploying models.
- Places model was also deployed.



Fig 2. Ski resort prediction by places dataset.

Machine learning



- False alarm rate for red and individual person class due false background predictions.

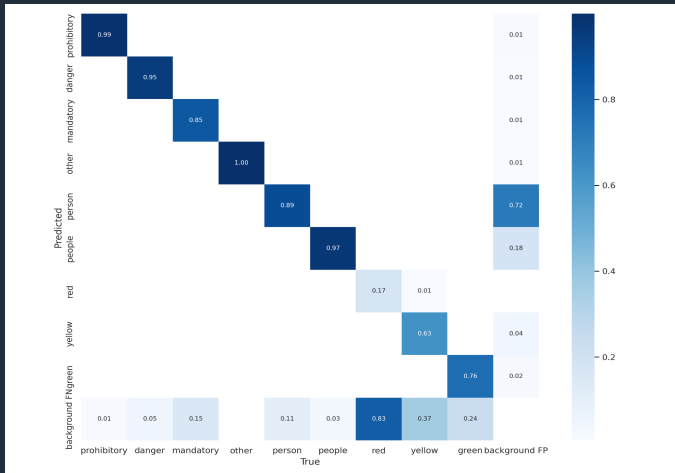


Fig 4. Confusion matrix for the detection model.

- Couldn't be fixed by increasing the confidence level.
- Issue with false positives for pedestrians and

Conclusion

- Traffic lights and pedestrians detection model was trained, deployed, and tested.
- Places model for the extra music feature was also deployed and tested.
- Road boundary model was also created, but ultimately not used.
- Frontend had issues with capturing images of road and calling the endpoints.



Fig 5. Traffic light detections by trained detector.



Fig 6. Pedestrian and sign detections by trained detector.