

Fatigue and focus detection with computer vision

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DMS

Driver Monitoring System

What are the most dangerous factors during driving?

1. Distracted driving

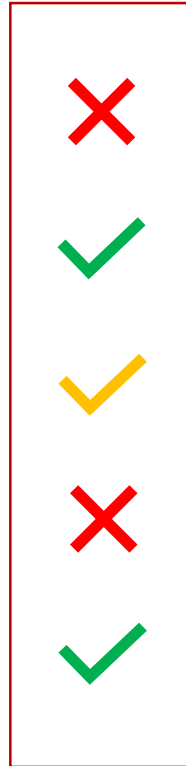
2. Alcohol/drug influence

3. Fatigue

4. Strong emotional state

5. Fever

Sensor



1. Distracted driving

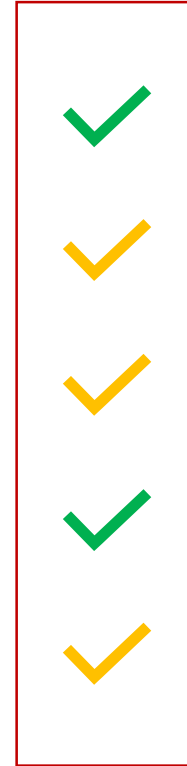
2. Alcohol/drug influence




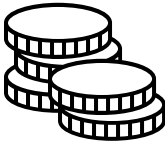








3. Fatigue

4. Strong emotional state

5. Fever

AI



	Sensor		AI	
		1. Distracted driving		
		2. Alcohol/drug influence		
		3. Fatigue		
		4. Strong emotional state		
		5. Fever		

Cam



RGB



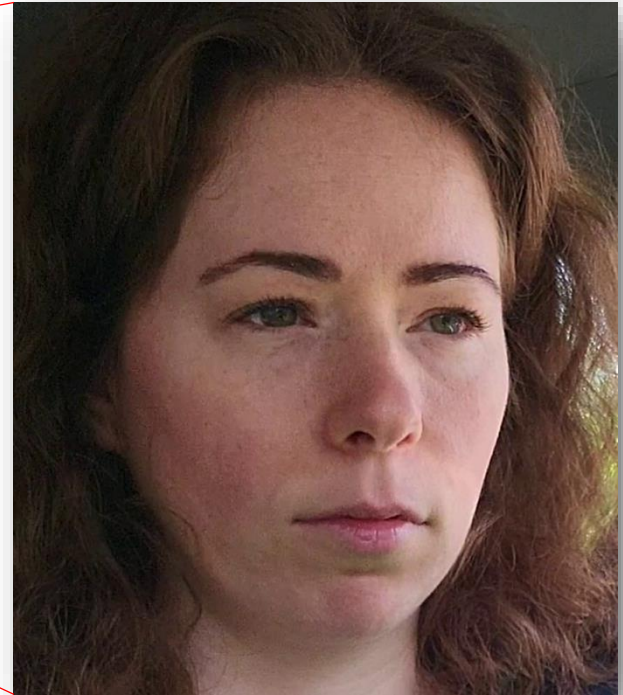
IR

Telemetry

Acceleration
Gyro

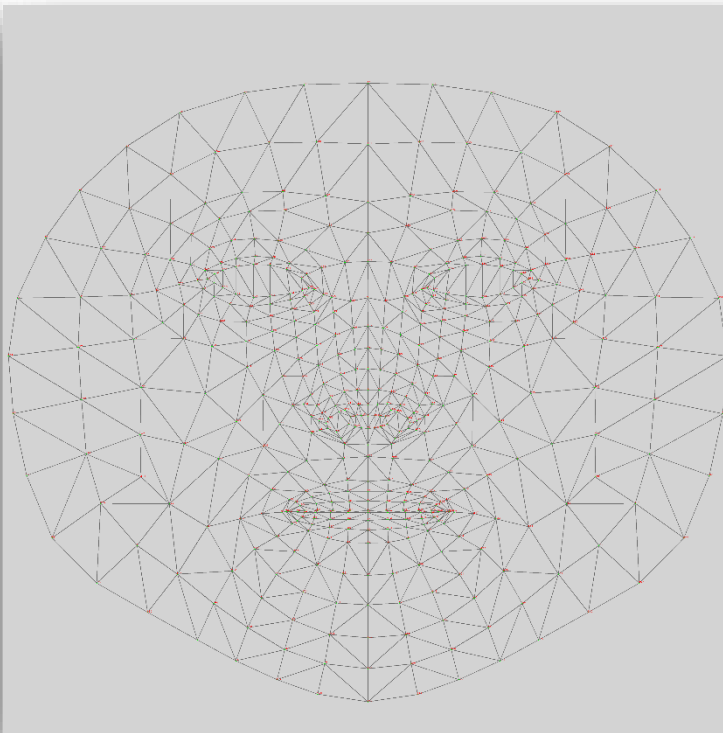
Pipeline

Face detection



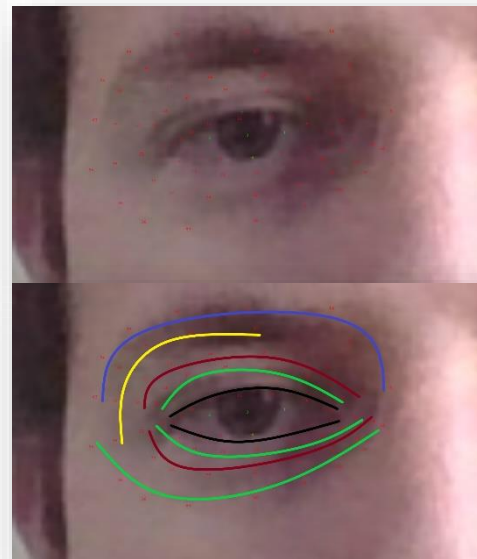
Pipeline

Landmark detection



5-1000

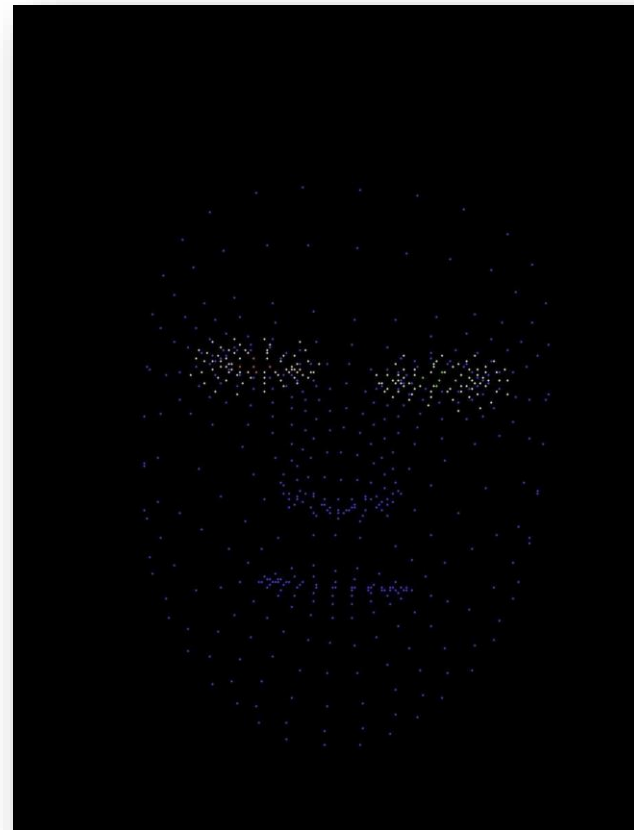
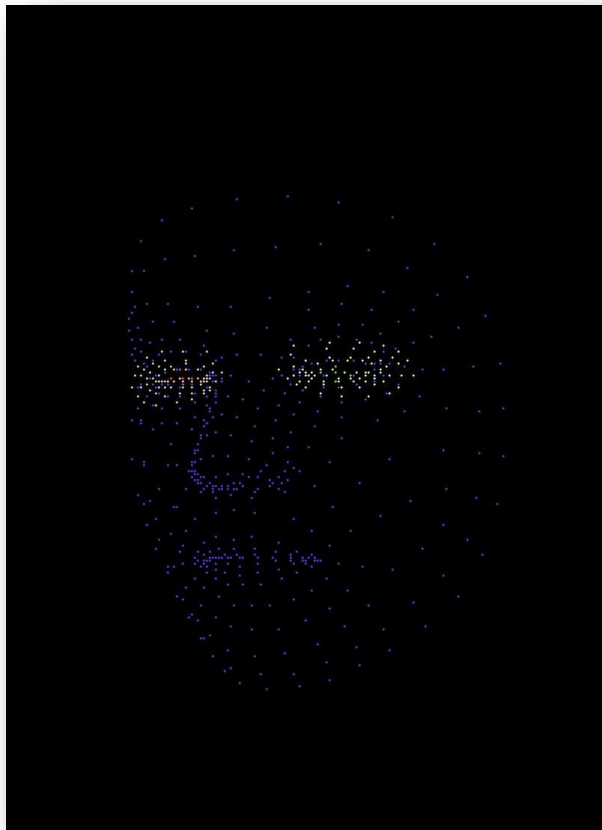
2D/3D coordinates



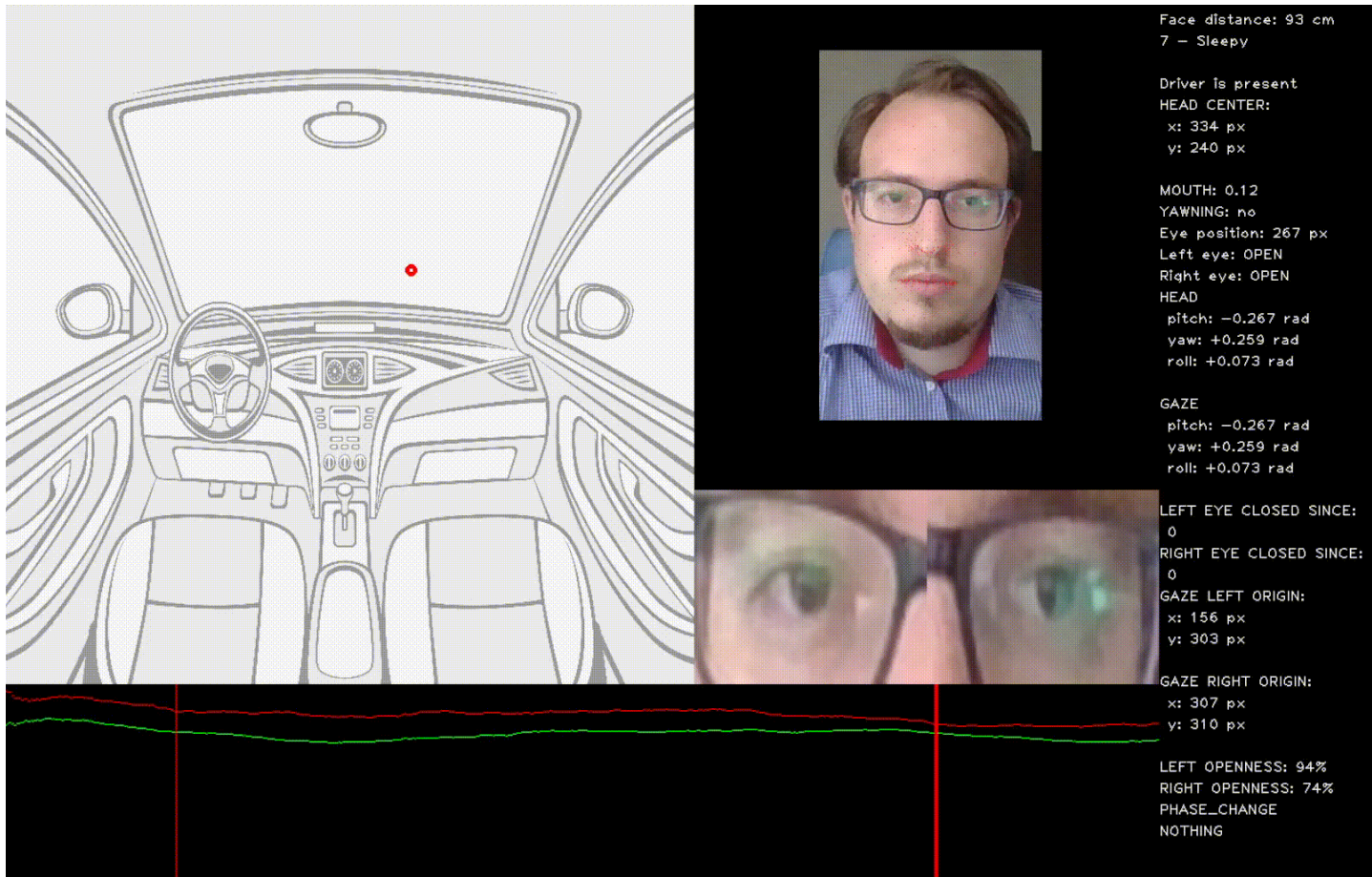
Pipeline

Feature extraction

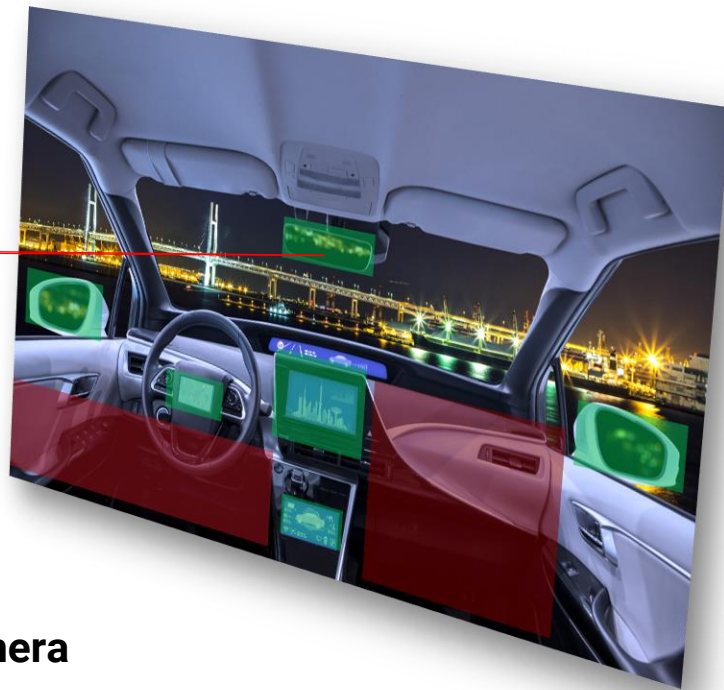
- Absolute position
- Relative position
- Difference to raw coords
- Pitch, yaw, roll
- Rotational matrix
- Pattern recognition
- Distances from each other
- Speed of movement
- Confidence



Pipeline



Focus



- **Distance from camera**
- **Calibration**
- **Allowed/denied areas**

Fatigue

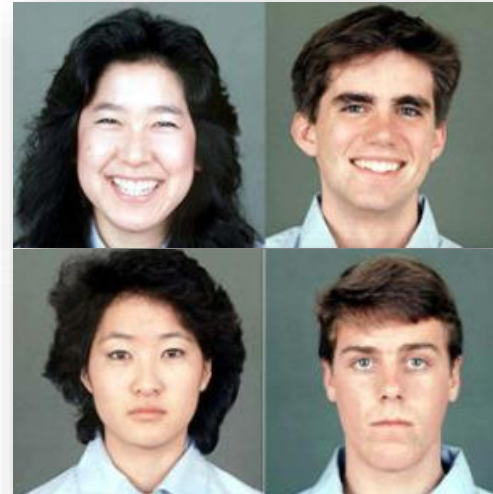
Easy

- Closed eyes
- Pitching head



Hard

- Nuances are different for everyone
- Different types of faces
- Image resolution
- EEG



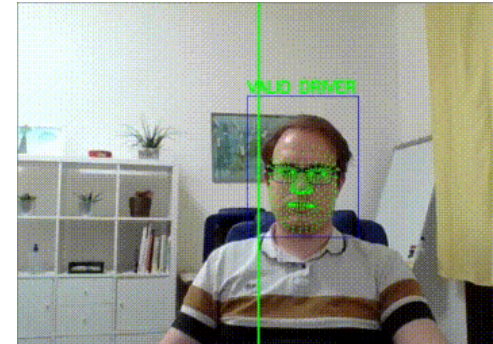
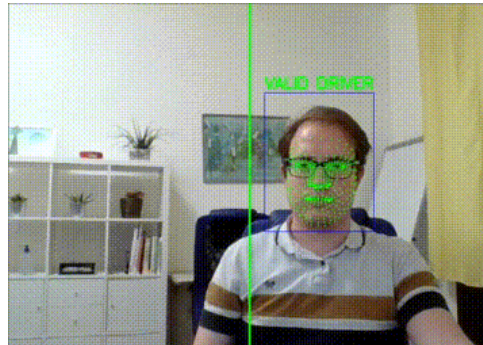
Other factors

Emotion

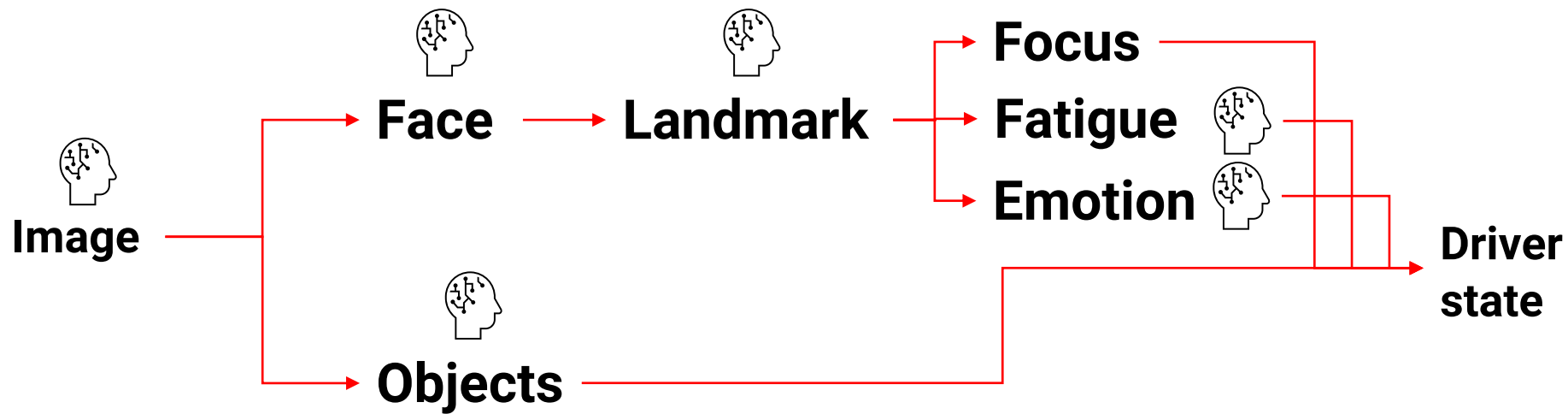
- Relative position of landmarks



Objects



Summary



Thank you

Gergely Várhelyi-Tóth