Driver Drowsiness Detection System with Multi-Modal Data Fusion

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IIITV-ICD

Problem

Developing an effective Driver Drowsiness Detection System is vital for road safety. Challenges include:

- Dynamic Facial Appearance: Variations in lighting and expressions.
- Obstructions and Environment: Occlusions and complex conditions.
- Real-time Responsiveness: Swift detection beyond standard framerates.

Method

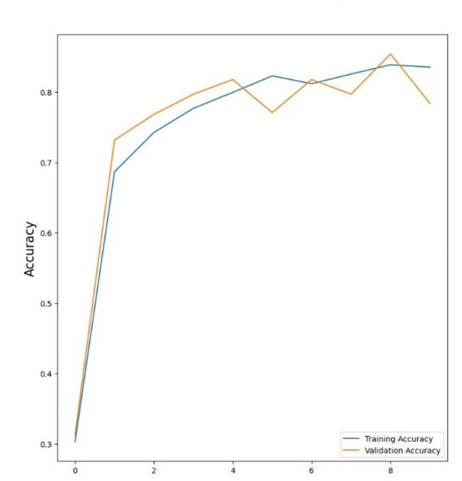
- **Automotive Safety Integration:**
  - In-car safety systems enhancement.
  - Fleet management for commercial vehicles.
- **Transportation and Public Safety:**
  - Implementing in public transportation systems.
  - Meeting potential regulatory compliance standards.
- **Healthcare and Well-being:**
  - Adapting for healthcare use in monitoring patients.
  - Implementing in industries to manage fatigue.

Contributions

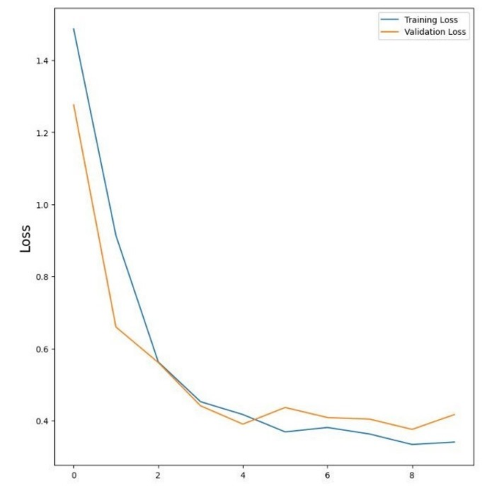
Our groundbreaking project Revolutionizing road safety: Advanced Drowsiness Detection Algorithms fuse facial landmarks, physiology, and behavior. Holistic Multi-Modal Integration ensures accurate early detection. Real-Time Vigilance issues life-saving alerts, surpassing technical milestones. Adaptable Customizations offer diverse scenario responses, enhancing road safety and driver well-being.

Accuracy of the Model

Graph Accuracy



Graph Loss



The training process involve images from the dataset as they were divided into four category there are open eye, closed eye, yawn, noyawn. The architecture of the CNN model which we have developed for the purpose of drowsiness detection is shown in the below figure. Accuracy: 0.8392 Loss: 0.3308

Results

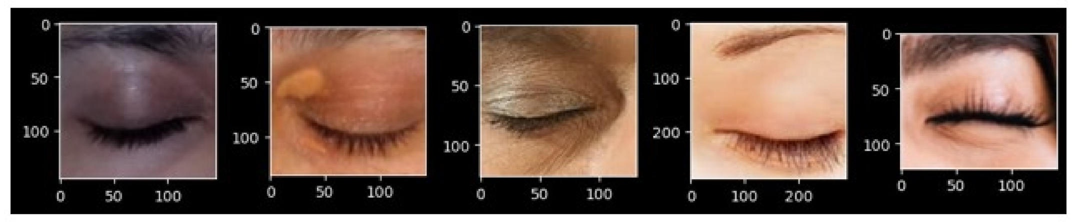


Fig. 1: Image of closed Eye

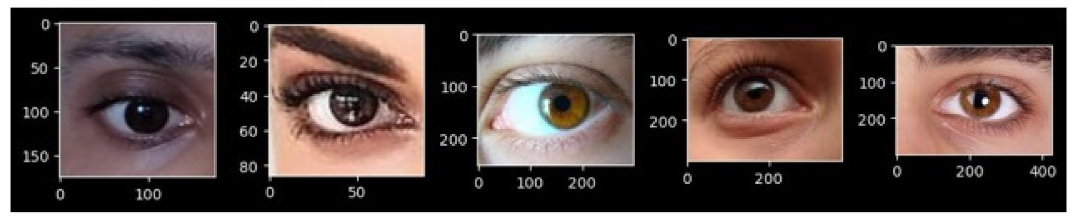


Fig. 2: Image of Open Eye

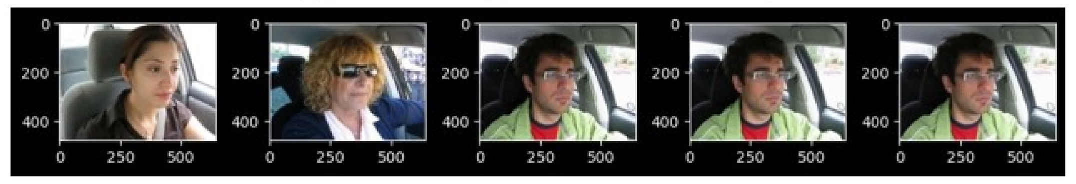


Fig. 3: Image of No yawn

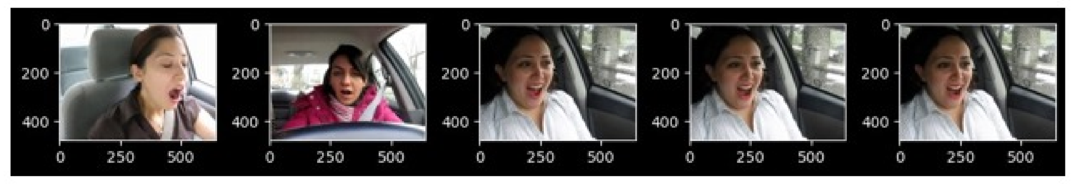


Fig. 4: Image of yawn

Figure 1: Dataset Used

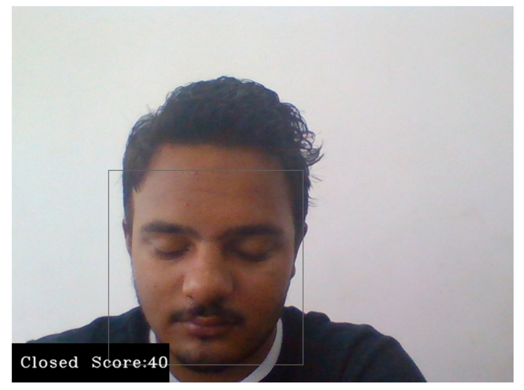


Figure 2: Eye Blinking Detection

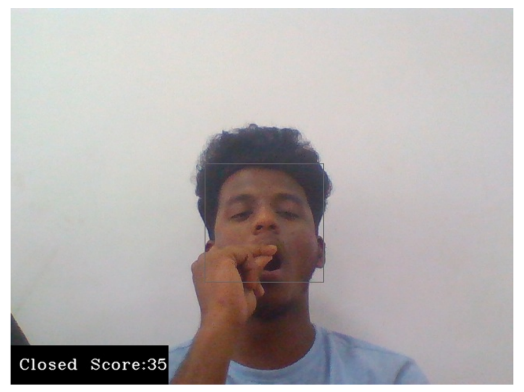


Figure 3: Yawning Detection

References

[1] Albadawi, Y., Takruri, M., Awad, M. (2022). A Review of Recent Developments in Driver Drowsiness Detection Systems. Sensors, 22(5), 2069. https://www.mdpi.com/1424-8220/22/5/2069

[2] Park, S., Pan, F., Kang, S., Yoo, C. D. (2017). Driver Drowsiness Detection System Based on Feature Representation Learning Using Various Deep Networks. https://link.springer.com/book/10.1007/978-3-319-11535-8

Future Direction

Could we leverage a background model not just for patch appearances but also to discern what the patch doesn't resemble in the entire frame?

Can we optimize its use to identify suitable tracks, even when part of it might be better explained by tracking another point?

Applications

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