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**IMAGE-BASED YAWNING DETECTION: A REAL-LIFE EVALUATION,
PROBLEMS, AND SOLUTIONS**

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Abstract In this work, we present the implementation of a yawning detection model in a real-life product, evaluate its problems, and suggest solutions for them.

Introduction. Drowsiness is one of the natural situations of the human, but the drowsiness while doing some jobs like driving or controlling the air traffic in the airport has dangerous consequences. One of the solutions to reduce such accidents is to develop a drowsiness monitoring system that can detect drowsiness situations and alert the person.

Yawning is one of the characteristics of drowsiness that appears in the person's behavior so, yawning detection is one of the methods for drowsiness detection. For drowsiness detection, it is not recommended to detect only one characteristic of drowsiness. There are other drowsiness characteristics such as slow blinking or head tilting.

In the previous work, we proposed a method that uses a Deep Neural Network for yawning detection. The method uses a classification method to classify the face of the driver and predict whether he is yawning or not. The proposed method achieved an accuracy of 95% over a dataset constructed from the open-source dataset YAWDD and records of real-life trips.

Main part. As a result of implementing our proposed method in a real-life product, multiple unexpected cases exposed some weak points of the proposed method. This work shows the problems that appeared while using our proposed method in a real-life product, discusses and classify them, presents the solution, proposed to solve these problems.

Conclusion. The importance of testing a method in real-life implementation is due to the unexpected situations that face the method and lead it to fail. The process of evaluating our proposed method helped to enhance the proposed solution to cover more specific cases and increase its generality.

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