INTOXICATION DETECTION SYSTEM

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1. Abstract

Drug intoxication significantly affects a person's behavior, balance, and decision-making ability, creating serious risks in public safety, transportation, and workplaces. Traditional methods of detecting intoxication are manual, time-consuming, and often inaccurate. The objective of this project is to develop an automated intoxication detection system using facial image analysis. The proposed system utilizes deep learning techniques, specifically a MobileNetV2-based model, to classify individuals as intoxicated or sober. The system involves dataset collection, image preprocessing, feature extraction, and classification. The processed image is analyzed by the trained model to detect patterns associated with intoxication. The results are displayed in a user-friendly interface, providing quick and reliable predictions. Experimental results show that the system achieves high accuracy and reduces human effort, making it an efficient solution for real-time intoxication detection.

Keywords

Deep Learning, Image Processing, MobileNetV2, Intoxication Detection, Web Application, Python

2. Introduction

Intoxication due to drugs or alcohol has become a major concern in modern society, affecting road safety, workplace productivity, and public health. Detecting intoxication at an early stage is crucial to prevent accidents and ensure safety. Traditional detection methods rely on manual observation or medical tests, which are not always practical or quick.

With the advancement of artificial intelligence and computer vision, automated systems can now analyze facial features and behavioral patterns to detect intoxication. This project focuses on developing a smart system that uses facial image analysis to identify whether a person is intoxicated or sober.

The main objectives of this project are to build a deep learning-based classification model, preprocess image data effectively, and develop a user-friendly interface for real-time detection.

3. Literature Review

Several studies have explored intoxication detection using image processing and machine learning techniques. Traditional systems relied on physical sensors or manual observation, which often lacked accuracy and efficiency. Some research works used basic image processing techniques such as thresholding and feature extraction, but these methods struggled with varying lighting conditions and facial expressions.

Recent advancements include the use of deep learning models such as Convolutional Neural Networks (CNNs) for facial analysis. These models can automatically learn complex patterns and provide better accuracy. However, existing systems still face challenges such as limited datasets, lack of real-time implementation, and difficulty in handling diverse facial conditions.

Therefore, there is a need for a robust, accurate, and real-time intoxication detection system using advanced deep learning techniques.

4. Proposed System / Methodology

The proposed system is an automated intoxication detection application that uses facial images as input. The system processes the image through multiple stages, including preprocessing, feature extraction, and classification.

System Architecture:

Input Image → Preprocessing → MobileNetV2 Model → Classification → Output

Tools & Technologies Used:

- Programming Language: Python
- Deep Learning: TensorFlow, Keras
- Model: MobileNetV2
- Libraries: NumPy, OpenCV, Scikit-learn
- Web Interface: Streamlit

Algorithm Used:

- Transfer Learning using MobileNetV2
- Image Classification (Binary: Sober vs Intoxicated)

The system ensures fast processing and accurate classification by leveraging pre-trained deep learning models.

5. Implementation

The system is developed in multiple modules:

Module 1: Dataset Collection & Model Training

A dataset of facial images is collected and labeled as intoxicated or sober. The images are preprocessed and used to train a deep learning model.

- Dataset includes variations in lighting, facial expressions, and angles
- Data augmentation techniques like flipping, rotation, and zooming are applied
- Images are resized and normalized for consistency
- Dataset is split into training and validation sets (80:20 ratio)
- MobileNetV2 model is trained using transfer learning
- Fine-tuning is applied to improve model performance
- Model is evaluated using accuracy, precision, and recall metrics
- Final trained model is saved for prediction use

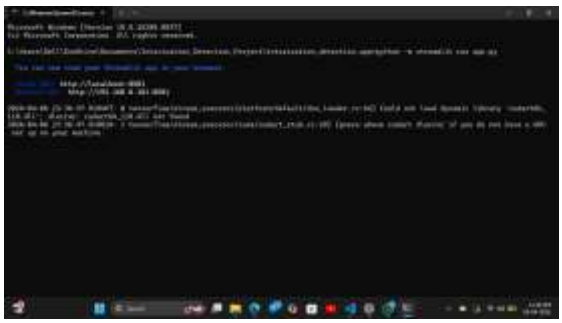
Module 2: Image Upload & Preprocessing

Users upload images, which are validated, resized, normalized, and processed to extract relevant facial features.

- System checks image quality and format before processing
- Face detection is applied to extract only the facial region
- Background noise is reduced to improve clarity
- Image is converted into required input shape for the model
- Pixel values are normalized for better prediction accuracy
- Preprocessing ensures consistency with training dataset
- Improves reliability and reduces prediction errors

Module 3: Model Integration & Result Display

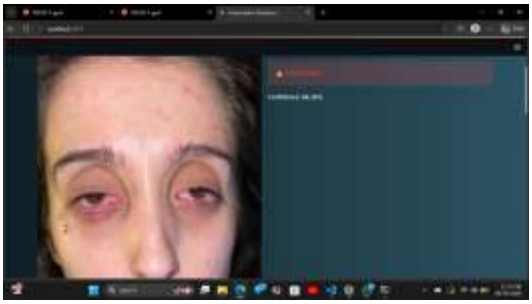
The processed image is given to the trained model, which predicts the result. The system displays whether the person is intoxicated or sober.



- Preprocessed image is passed to the trained MobileNetV2 model
- Model calculates probability scores for both classes
- Threshold-based classification is used for final decision
- Output is displayed clearly as “Sober” or “Intoxicated”
- Confidence level of prediction can also be shown
- Integrated with Streamlit for real-time user interaction
- Ensures smooth communication between modules
- System is tested for accuracy and performance before deployment

6. Results and Discussion

The system achieved high classification accuracy (approximately 90%+). The model successfully distinguishes between intoxicated and sober individuals using facial features. The confusion matrix and evaluation metrics indicate balanced performance.



Advantages:

- Fast and real-time detection
- High accuracy
- Reduces human effort
- Easy to use interface
- Reliable results

7. Conclusion

The Intoxication Detection System successfully demonstrates how deep learning and image processing can be used to detect intoxication efficiently. The system provides accurate, fast, and reliable results, reducing manual effort and improving safety. It proves that AI-based solutions can be effectively applied in real-life scenarios such as transportation and workplace monitoring.

Future Enhancements:

- Real-time detection using live camera
- Mobile application development
- Integration with vehicle safety systems
- Use of larger datasets for improved accuracy

8. References (IEEE Format)

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