REAL-TIME FACIAL EMOTION RECOGNITION WITH ONNX AND OPENCV

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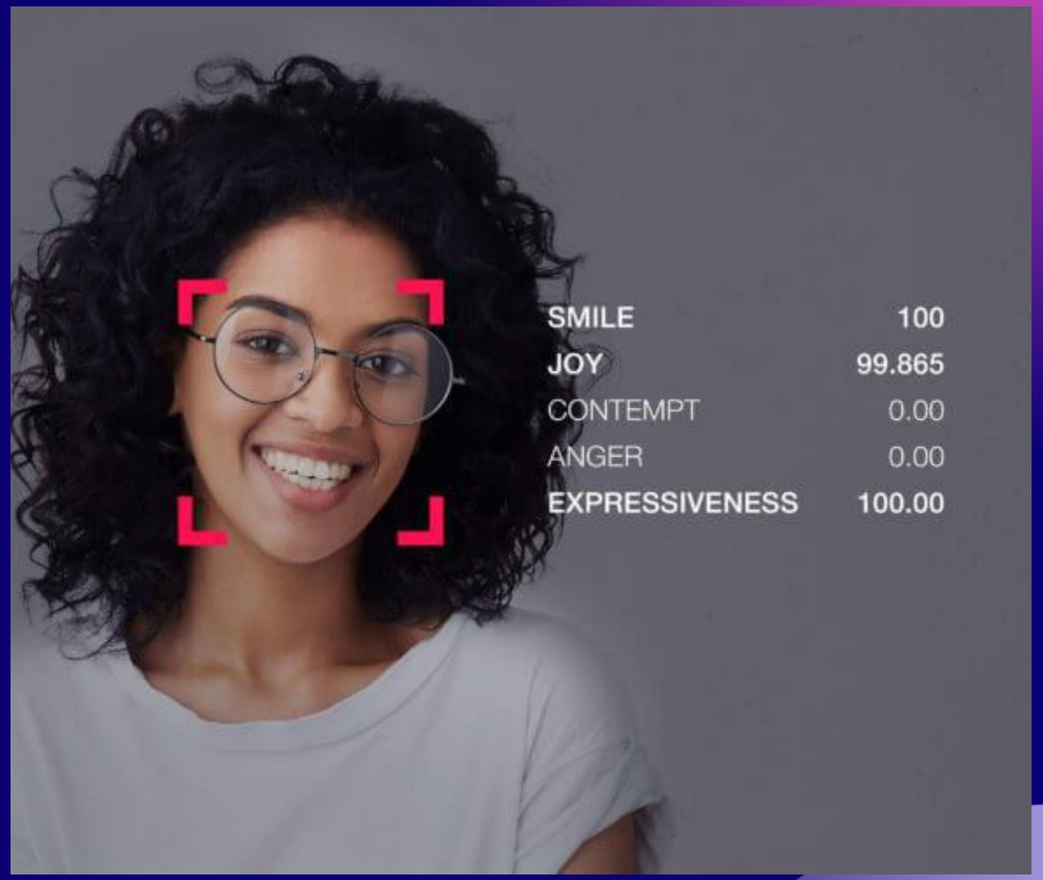
INTRODUCTION

Facial emotion recognition (FER) is vital for HCI, mental health, and adaptive interfaces. This project implements a C++-based FER system using a lightweight CNN model (Mini-Xception), OpenCV, and ONNX.



RELATED WORK

DACL (Deep Attentive Center Loss): improves class separability with attention.
SD-CNN: leverages synthetic data to enhance emotion differentiation.
CNN + SVM Hybrid: combines deep and traditional models for high accuracy.

PROPOSED SOLUTION

- Use Haar cascades for face/eye detection.
- Preprocessing: grayscale, alignment, resize (64x64).
- CNN (Mini-Xception) inference with OpenCV DNN.
- Enhancements: Test-Time Augmentation (TTA), Temporal Smoothing, Confidence Filtering.

ENHANCEMENTS

- TTA: Flip + rotation improves robustness
- Temporal smoothing: Buffer + majority vote
- Confidence filter: If confidence < 0.2 → “Uncertain”
- Overlay predictions on video + save to CSV

RESULTS & EVALUATION

Configuration	**Accuracy (%)**
Baseline (Grayscale + Resize)	18.7
+ Normalization + Center Crop	25.2
+ Face Alignment	50.4
+ TTA + Smoothing + Filtering	61.6

LIVE DEMO (OR SCREENSHOTS)

CONCLUSION

- Real-time, modular system with ONNX + OpenCV
- TTA + smoothing = higher accuracy and stability
- Future work: mobile app, larger datasets, vision transformers

THANK YOU