Pedestrian Intention Prediction

Using Computer Vision and Machine Learning

Hi-Drive Designing Automation | Enablers WP2.6 - E2.6.2.J

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Enabler Description

The Pedestrian Intention Prediction (PIP) system predicts whether a pedestrian will cross the street (up to 4 seconds in advance) by analysing their movement, visual cues, and traffic context, enabling safer automated vehicle (AV) navigation.

Will that pedestrian cross?[1]

Importance and Impact

Pedestrian intention prediction for AVs:

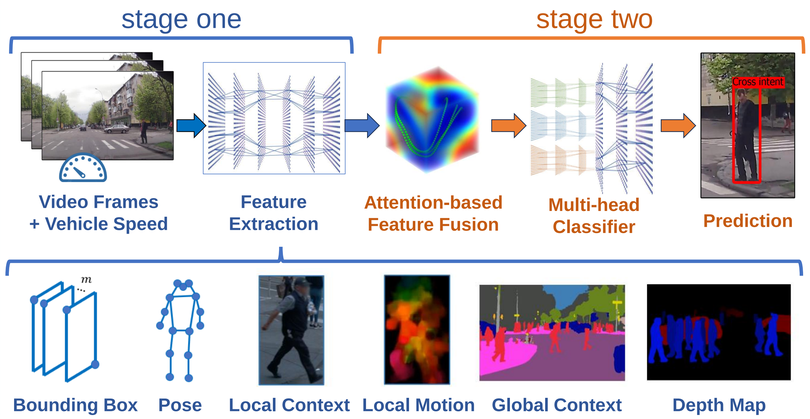
- Improved collision avoidance
- Smoother AV-Pedestrian interactions
- Optimized traffic flow
- Increased user trust and acceptance
- Handling complex and dynamic environments
- Extending operational design domain (ODD)

Challenges

- Dynamic environmental conditions
- Vehicle motion disturbance
- Abrupt motion changes
- Crowded urban areas
- Complex movements
- Jaywalking
- Occlusions

Methodology

The enabler functions in two main stages [1] [2]:

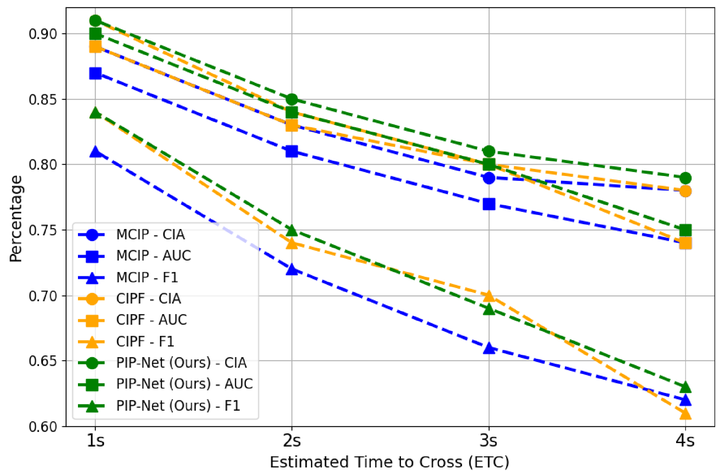


Stage 1: Combined feature extraction & analysis
Stage 2: “crossing” or “not crossing” prediction

Datasets & Experiments

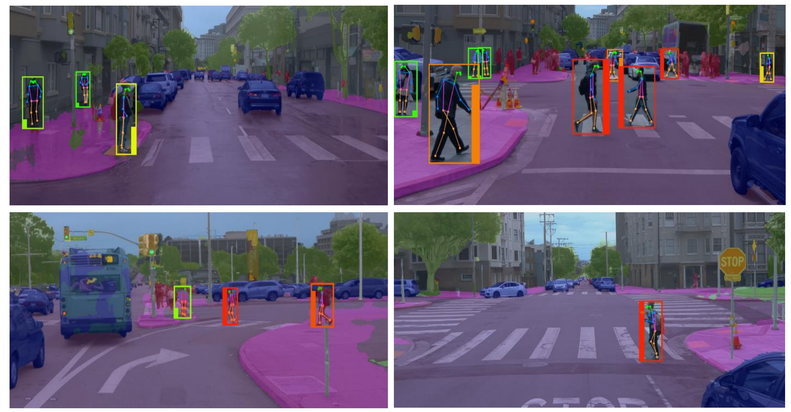
Evaluations on JAAD [6], PIE [5], and Waymo [4] datasets using ML key performance metrics.

- Over 10 hours of full HD videos
- Number of pedestrians: 5,700
- Various weather and lighting conditions
- Urban roads, intersections, junctions, midblocks.



Observational Results

Colour-coded crossing prediction visualisation:
- Green: very low crossing likelihood
- Red: very high crossing likelihood



Conclusion

PIP relies on the accurate integration of various data sources to anticipate crossing intention in real-time. Integrating a data driven methodology and multi-modal data can significantly improve the prediction accuracy, extending ODD, enhancing pedestrian safety, and reducing traffic accidents in automated vehicles.

References

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