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An Interactive Visual System to Interpret Pedestrian Crossing Intention Predictions

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Introduction & Background

Pedestrian Intention Prediction (PIP) models help autonomous vehicles (AV) anticipate crossing behaviour by drawing on rich behavioural signals and scene information. Understanding how these inputs shape model decisions is essential for building accountable AV systems, yet the internal mechanics driving PIP predictions remain largely unexplored. This project advances that understanding by developing an interactive dashboard that makes model reasoning transparent, enabling systematic evaluation of feature influence and model reliability across real-world traffic scenarios.

Objectives & Approach

This research work aims to develop an interactive dashboard that helps researchers interpret how PIP models learn from behavioural and scene-level digital traces. The approach involves analysing key PIP inputs, determining their relative influence on prediction accuracy, and identifying signals associated with both correct and incorrect classifications. We are prototyping visual explanations that reveal patterns across individual sequences and grouped prediction subsets, enabling clearer interpretation of model behaviour. Through iterative design, implementation and testing, the project will deliver a scalable dashboard supporting transparent evaluation and refinement of PIP models.

Relevance to Digital Footprints

The dashboard is grounded in digital footprints generated through pedestrian–vehicle interactions: trajectory, gaze direction, contextual cues and temporal indicators of pedestrian behaviour. These multimodal signals represent data captured in real traffic environments. By converting such traces into interpretable analytical views, the dashboard enables transparent exploration of how PIP models learn from human movement data.

Results

Early work has identified and categorised influential PIP features, informing initial sketches for visualising patterns through feature context and scene interactions. Multiple design iterations explore how features behave in correct or incorrect predictions and how these patterns vary across diverse traffic scenarios. This iterative process supports selection of designs that best reveal feature influence and model behaviour. These sketches are transformed into interactive plots using D3.js, a library for creating dynamic data-driven visualisations.

Conclusions & Implications

Pedestrian digital footprints, defined by behavioural data generated through movement and interaction, are transformed into clear visual explanations for the dashboard, enabling researchers to investigate how PIP models succeed or fail. The tool strengthens trust in AI-driven mobility, supports responsible PIP model refinement and provides a reusable framework for analysing pedestrian data across future transport research.

Keywords

pedestrian intention prediction, explainable AI, digital footprints, visual analytics, behaviour modelling

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