Self-Driving Cars in Conversation: The AI Systems on Our Roads

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Big Picture: AI self-driving vehicles are growing in abundance and popularity in the world today. As these vehicles operate more and more on our roads, the impacts of these vehicles are to be studied. We are conducting a simulation study to explore the consequences of these AI-to-AI interactions in this media ecosystem.

Phenomena of interest: AI self-driving vehicles that send signals between one another in a road system (V2V communication)

- They can share data on road conditions, surroundings, and analytics
- We are studying the emergent behaviours that arise from this phenomenon
- Potential positive (reduced collisions) and negative (bugs) consequences

Agent #1: Social Bot

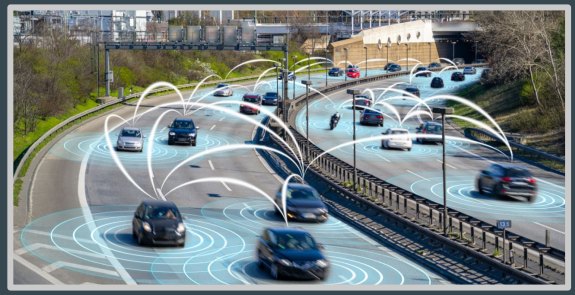
- AI operated vehicle
- 360 degree sensors and communicate with all other AI Vehicles

Agent #2: Human

- Human operated vehicles
- Human error since perception is limited relative to AI

Key Dynamics

- Media ecosystem trophic structure consisting of producers and consumers
- Sociotechnical co-production going on with this technology



Study Summaries:

- Xu et al. (2020): Wireless AI in smart cars enhances real-time decision-making using deep learning, edge computing, and V2X communication while addressing safety and privacy concerns.
  Xu, Q., Wang, B., Zhang, F., Regani, D. S., Wang, F., & Liu, K. J. R. (2020). Wireless AI in Smart Car: How Smart a Car Can Be? IEEE Access, 8, 1–1. https://doi.org/10.1109/ACCESS.2020.2978531

- Ali et al. (2019): V2V communication improves traffic safety, efficiency, and perception, reducing collisions, manoeuvre time, and congestion while enabling smarter decision-making.
  Ali, A., Jiang, L., Patil, S., Li, J., & Heath, R. W. Jr. (2019). Vehicle-to-vehicle communication for autonomous vehicles: Safety and maneuver planning. IEEE. https://ieeexplore.ieee.org/document/8690946

Relevant Mesa Examples:

- **Boid Flocking Model** - Simulates movement based on alignment, cohesion, and separation
- **Epstein Civil Violence Model** - Demonstrates agent decision-making based on a grid environment

Agent Roles

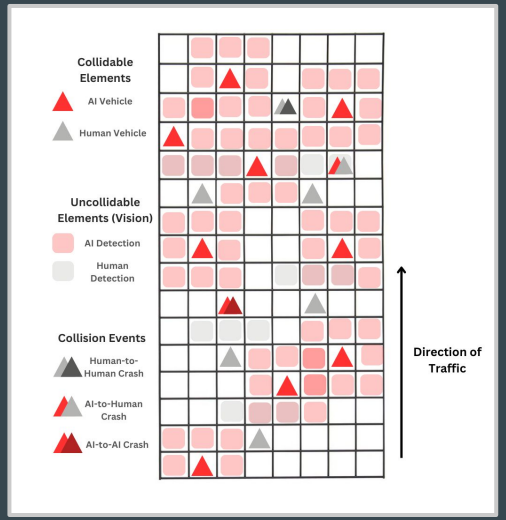
- AI Vehicles: Move forward, change lanes, adjust speed, detect surroundings
- Human Vehicles: Similar actions but with limited perception compared to AI
- AI's ability to detect and react mimics emergent behaviours from Mesa models

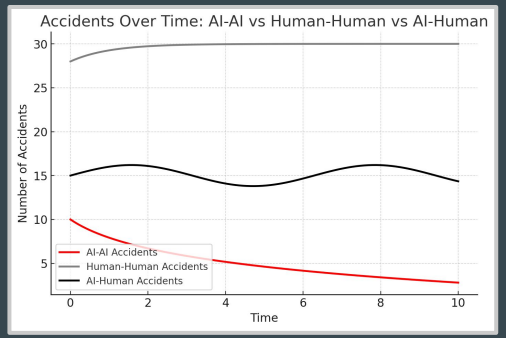
Affordances

- AI cars scan surroundings & coordinate movements
- Boid Flocking principles ensure AI vehicles avoid collisions
- Human agents have limited affordances due to perception differences

Algorithms

- AI follows proximity, influence, and group dynamics, similar to Boid Flocking
- AI operates in a grid-based system like the Epstein model
- AI evaluates traffic, nearby vehicles, and road conditions before making decisions





Our simulation would be a bird's eye view of a highway system that includes AI vehicles and human vehicles, all interacting with each other.