

Towards pedestrian-AV interaction: method for elucidating pedestrian preferences*

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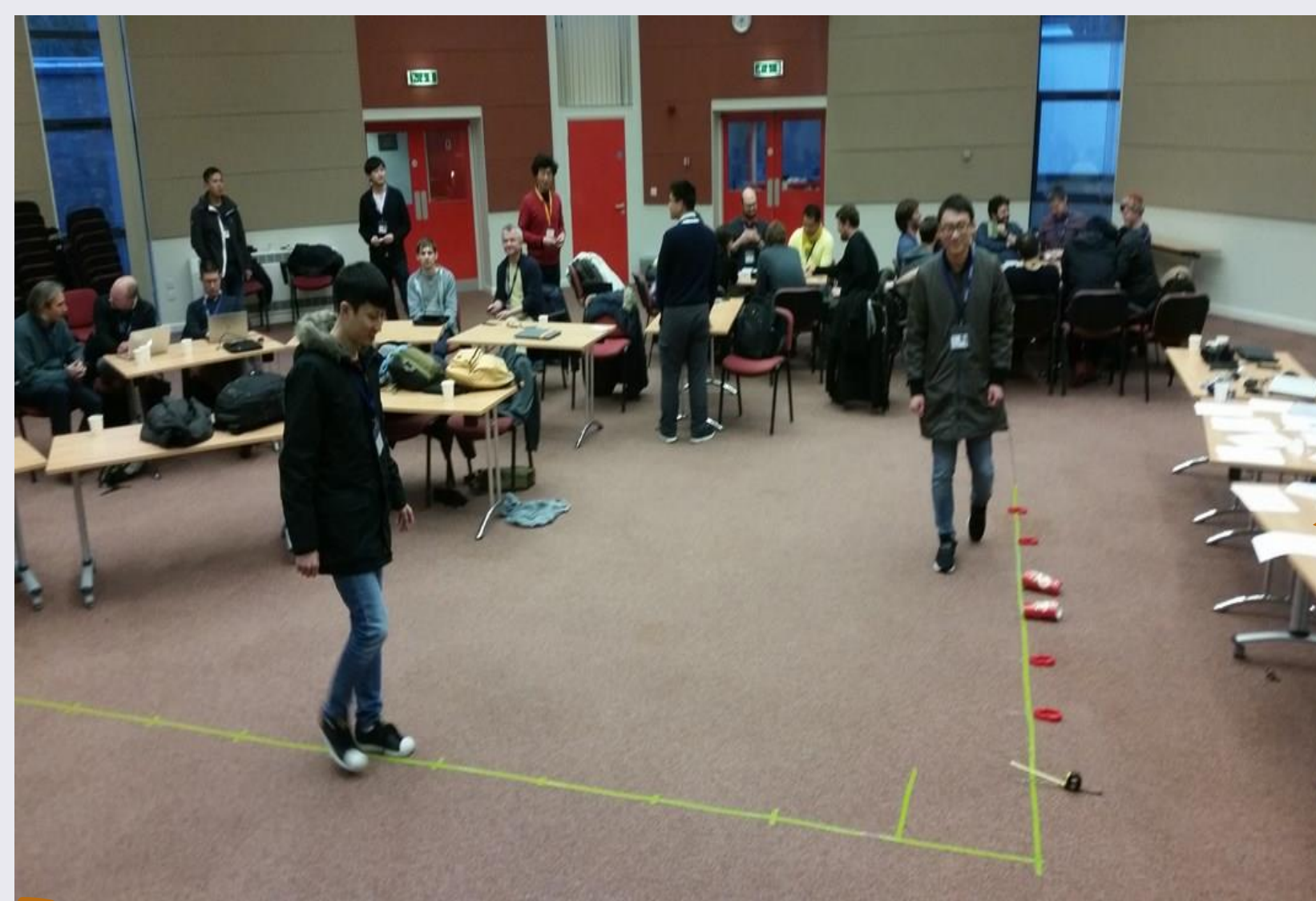
Proposed Method

Motivation

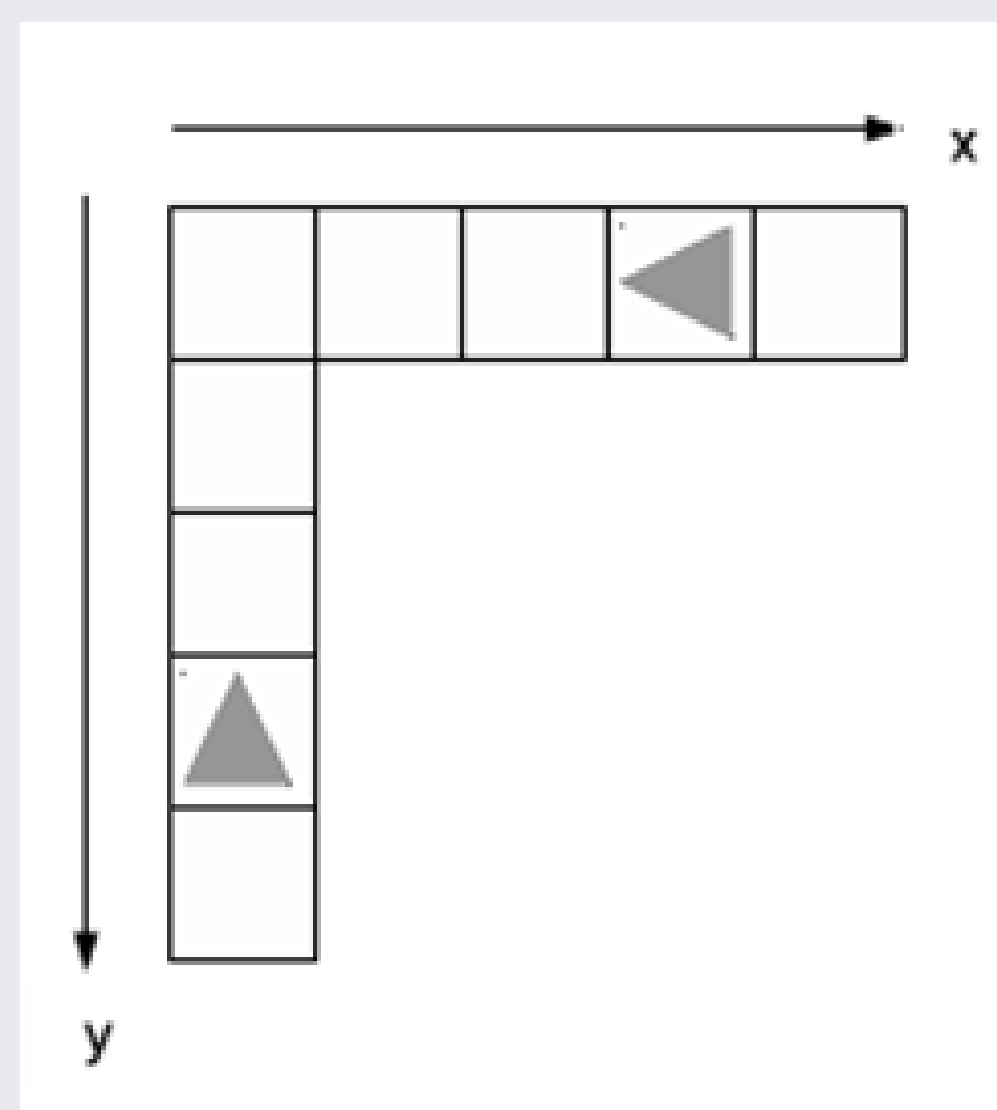
Understanding pedestrian behavior for interactions with Autonomous Vehicles (AVs) using game theory and tracking



Game of Chicken



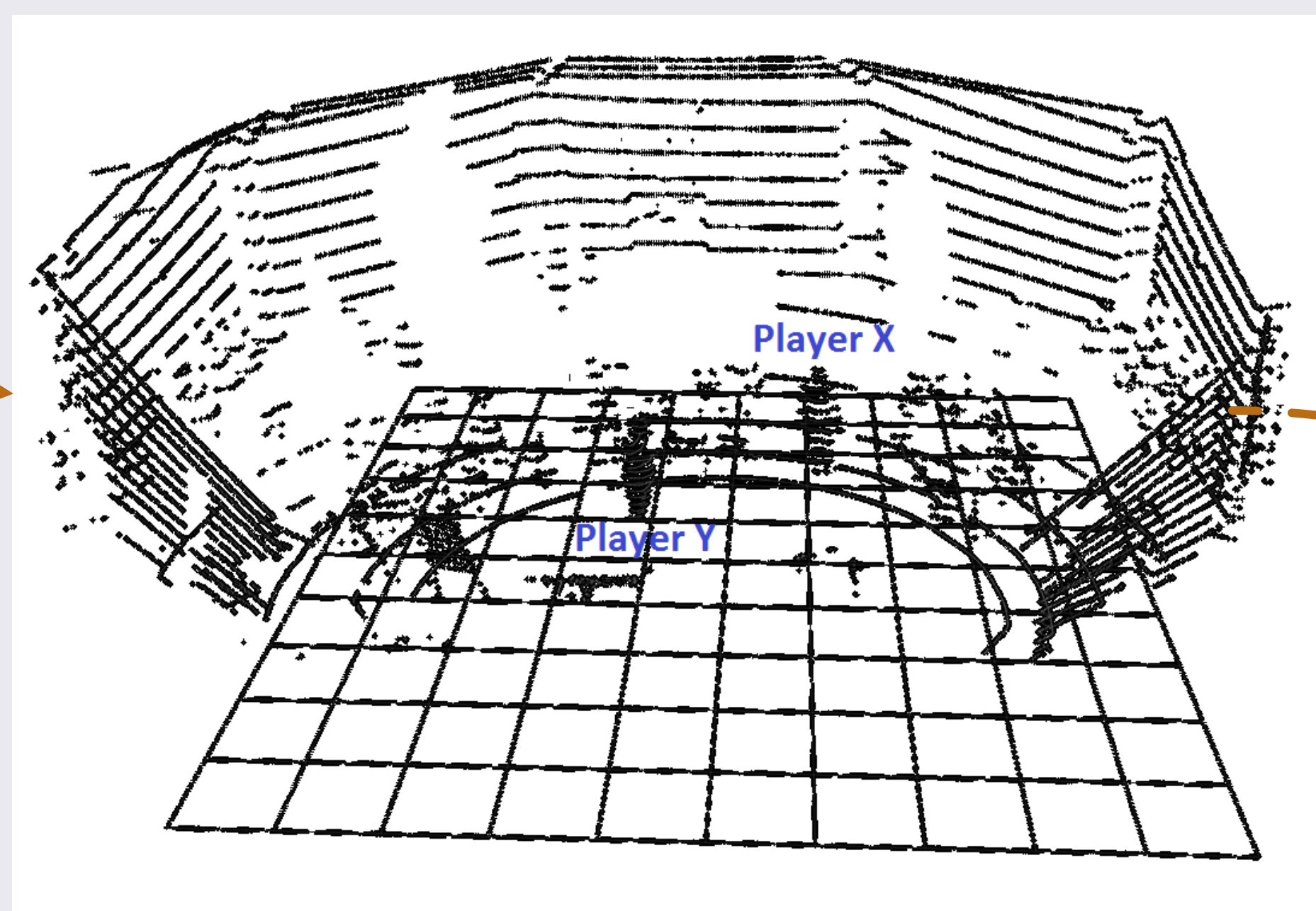
Chicken Game Human Experiment



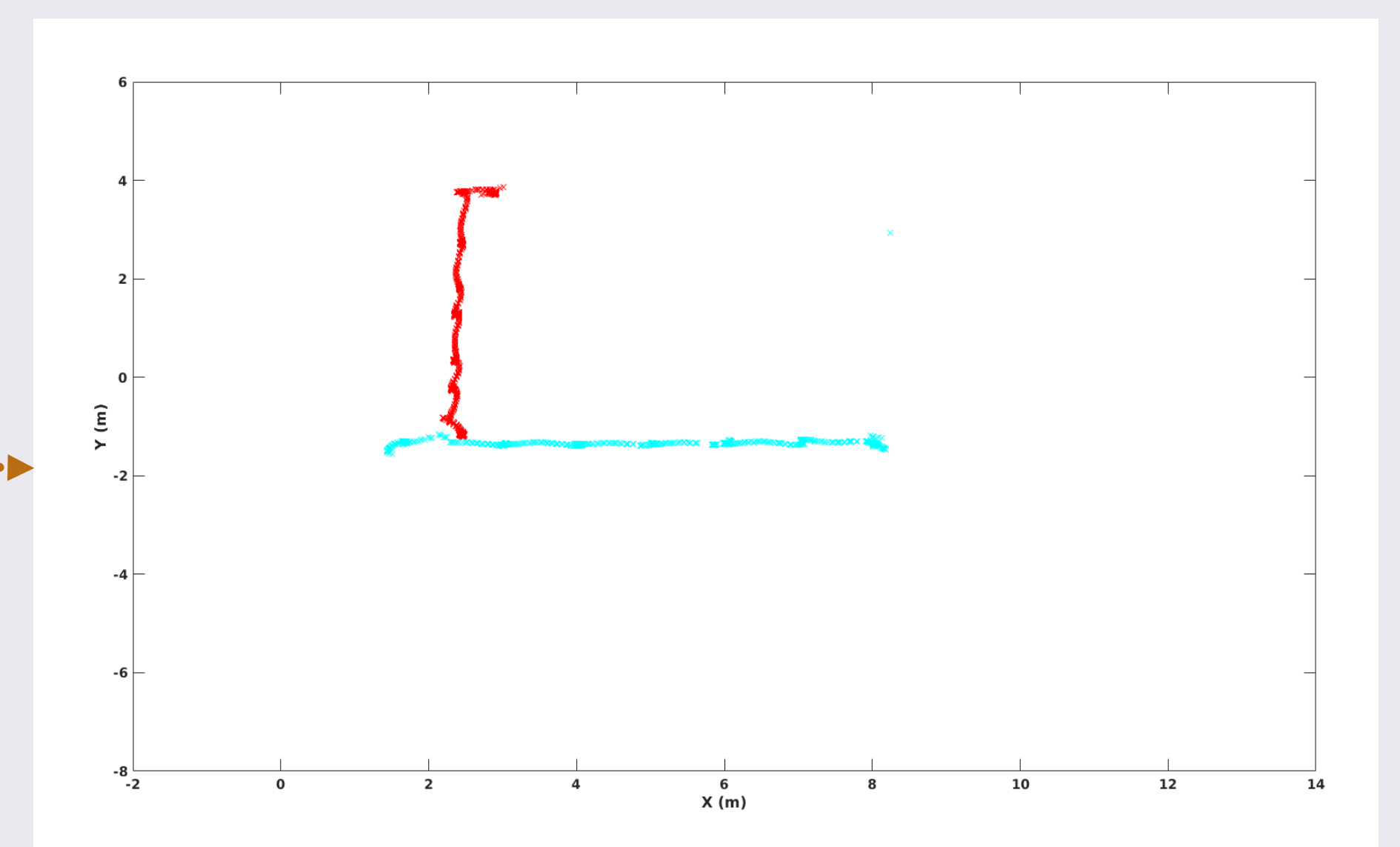
Sequential Chicken Game (Ref. 1)

Sequential Chicken Model

- Discrete version of the chicken game
- 2 players with the same utility
- 2 speeds: 1 or 2
- Goal: being the first to cross over the intersection as quickly as possible while avoiding a collision



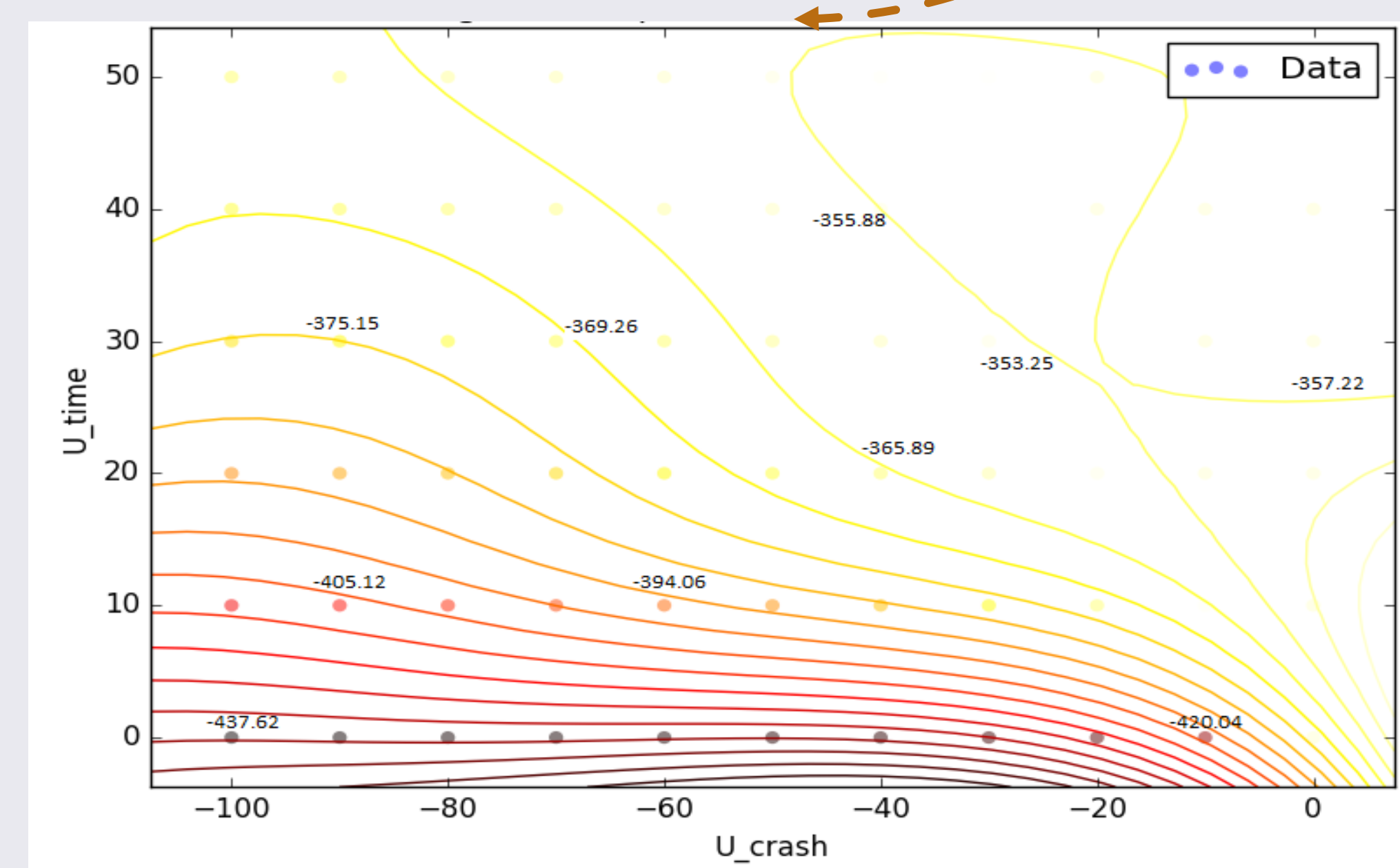
3D Velodyne LIDAR data



Filtered trajectories obtained from a Bayesian multi-target tracker (Ref. 3 & 4)

Human Experiment

- 18 participants by pair of 2 played the Sequential Chicken Game
- Track players' motion with a 3D LIDAR
- Filter and discretize obtained trajectories
- Compute the optimal solution using Gaussian Process Regression



Gaussian Process Regression (as done in Ref. 2)

$$\Theta = \frac{U_{crash}}{U_{time}} \approx \frac{-2}{3}$$

Optimal solution for this experiment

Main References:

1. Fox et al.: When should the chicken cross the road?: Game theory for autonomous vehicle - human interactions. VEHITS 2018
2. Camara et al.: Empirical game theory of pedestrian interaction for autonomous Vehicles. Measuring Behavior 2018
3. Bellotto & Hu: Computationally efficient solutions for tracking people with a mobile robot: an experimental evaluation of Bayesian Filters. Autonomous Robots 2010
4. Yan et al.: Online learning for human classification in 3d lidar-based tracking. IROS 2017