**Optimal passenger-seeking strategy of taxi drivers with E-hailing**

**Introduction**

- Taxi drivers usually have to spend 35-60 percent of their time on cruising to find the next potential passenger.

**MDP for e-hailing drivers**

- State $s = (l, t, I)$
  - Grid index
  - Time
  - Indicator $I \in \{0, 1\}$

- Action $\pi$:
  - stay
  - wait

- State transition (by a numerical example)

**Data description**

- GPS traces collected in Beijing on weekdays during Nov. 1st to Nov. 30th
- 53,673 e-hailing vehicles and 7,711,820 e-hailing orders
- 3-hour time intervals: morning peak (7AM, 10AM), off peak (10PM, 3PM), and evening peak (5PM, 8PM)
- Hexagonal grid setup with the length of the diagonal of a hexagon approximately 700 meters

**Results**

- Markov Decision Process (MDP)
  - Initial state
  - State transition matrix
  - State transition matrix
  - Policy $\pi$: a mapping from a state $s$ and an action $a$ to the probability $\pi(a|s)$
  - Value $V_{\pi}(s) = E \left[ \sum_{k=0}^{\infty} \gamma^k r_{t+k+1} | s_t = s \right]$
  - Objective
    - Maximize driver’s profit within the time interval

**Acknowledgements**

This research was funded by Didichuxing under the contract No. University of Michigan/DiDi 17-PAF07456.