

CoLight: Learning Network-level Cooperation for Traffic Signal Control



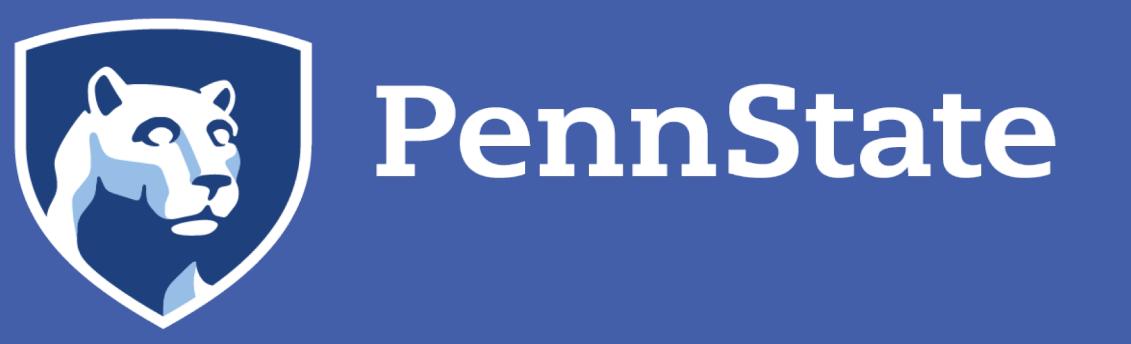
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Reinforcement Learning for Traffic Signal Control

Website: <https://traffic-signal-control.github.io>

Single Intersection

IntelliLight [1] (KDD'18)

- How to formulate the traffic signal control problem?

LIT [2] (in submission)

- What is the best reward and state for single intersection?

FRAP[3] (CIKM'19) , DemoLight[4] (CIKM'19)

- How to learn faster for RL-based signal control?

Multiple Intersections

PressLight[5] (KDD'19)

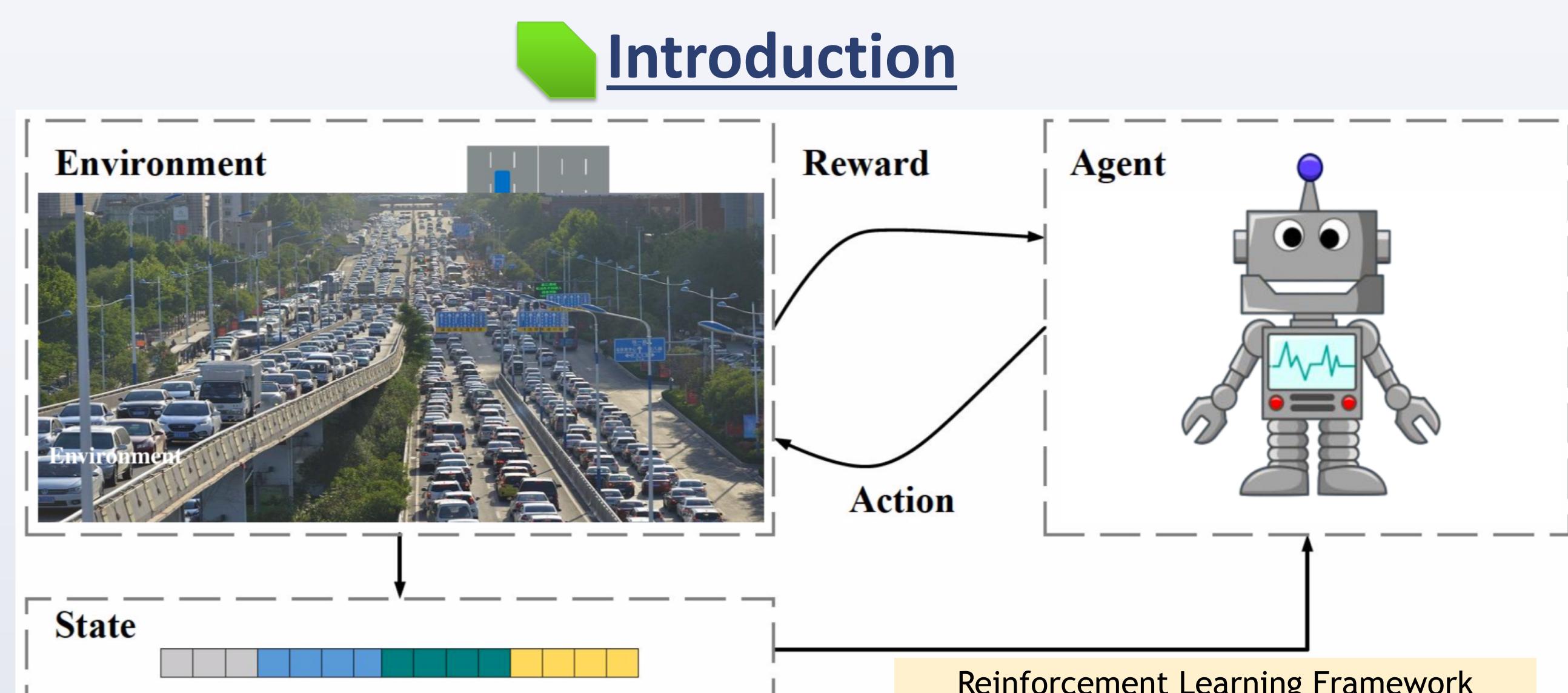
- What is the best reward and state design for coordination?

CoLight[6] (CIKM'19)

- How to learn faster for coordinating traffic signals?

Large-scale application[7] (AAAI'20)

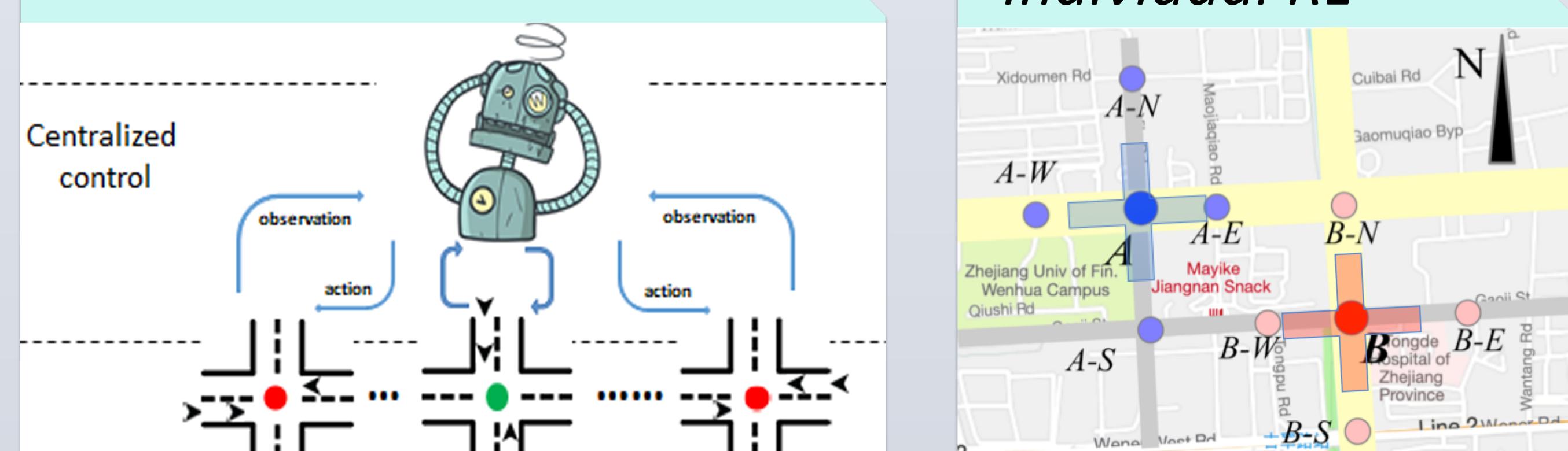
- How to implement the large-scale control?



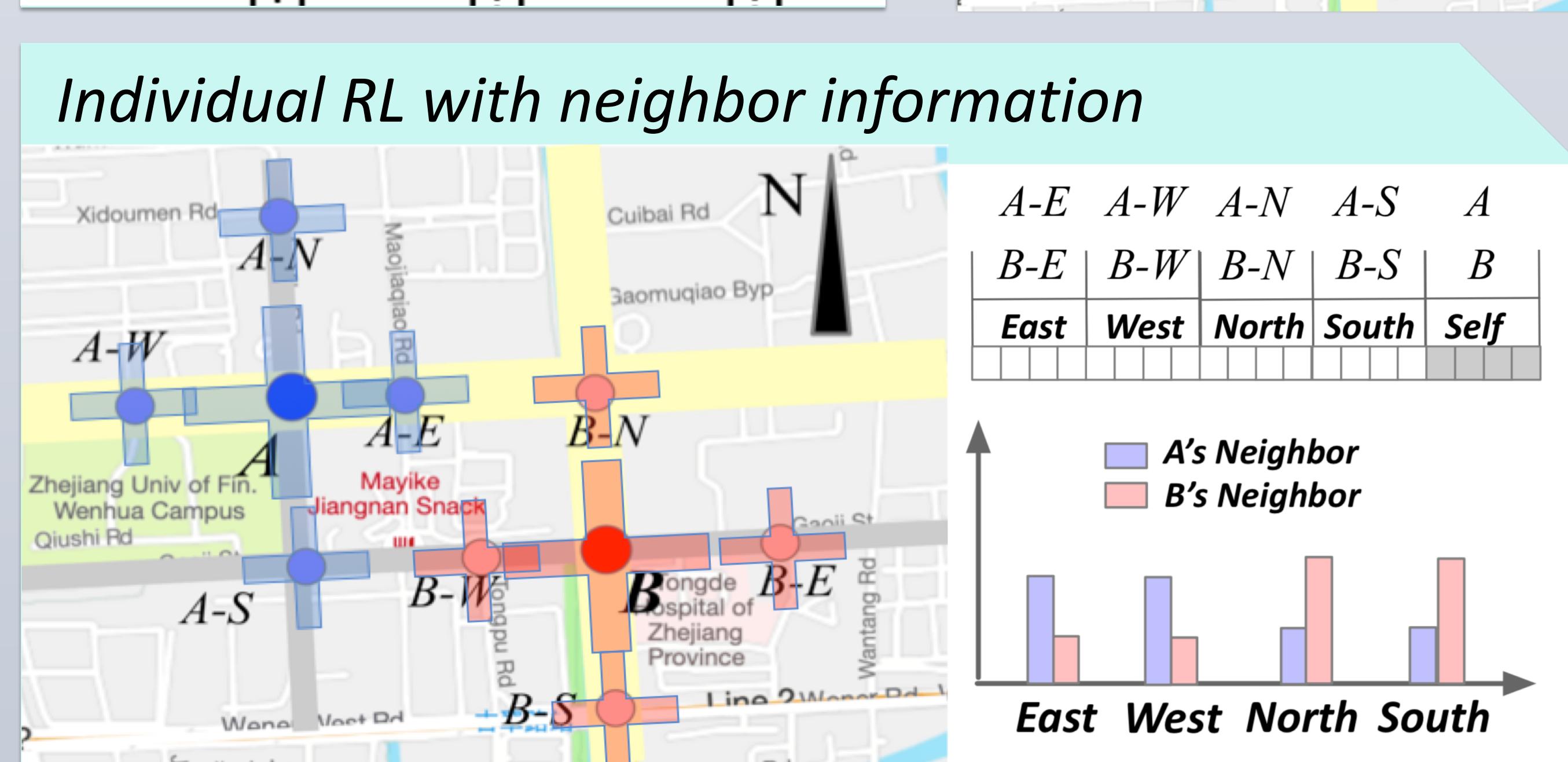
Urban traffic signals need cooperation.

RL for traffic signal control cooperation

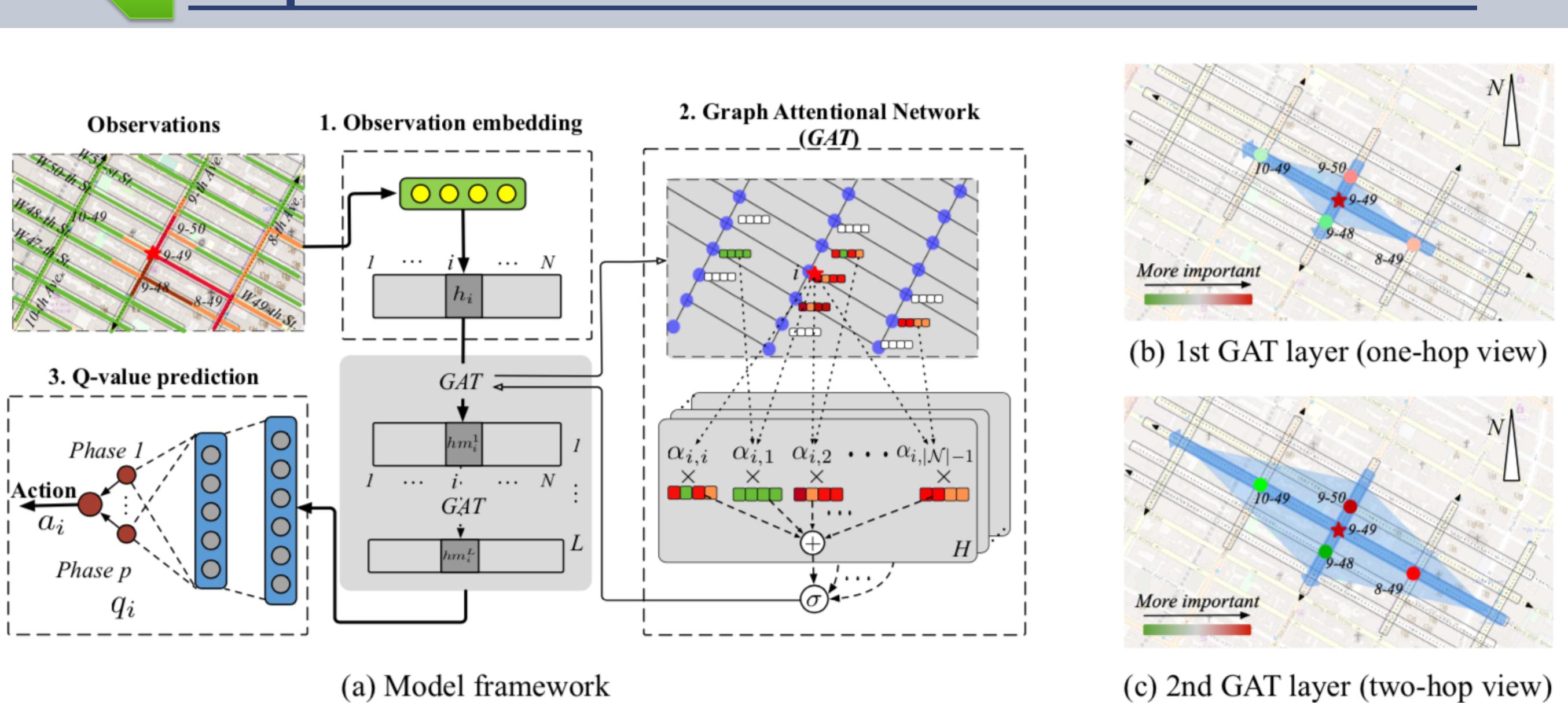
Centralized coordination



Individual RL



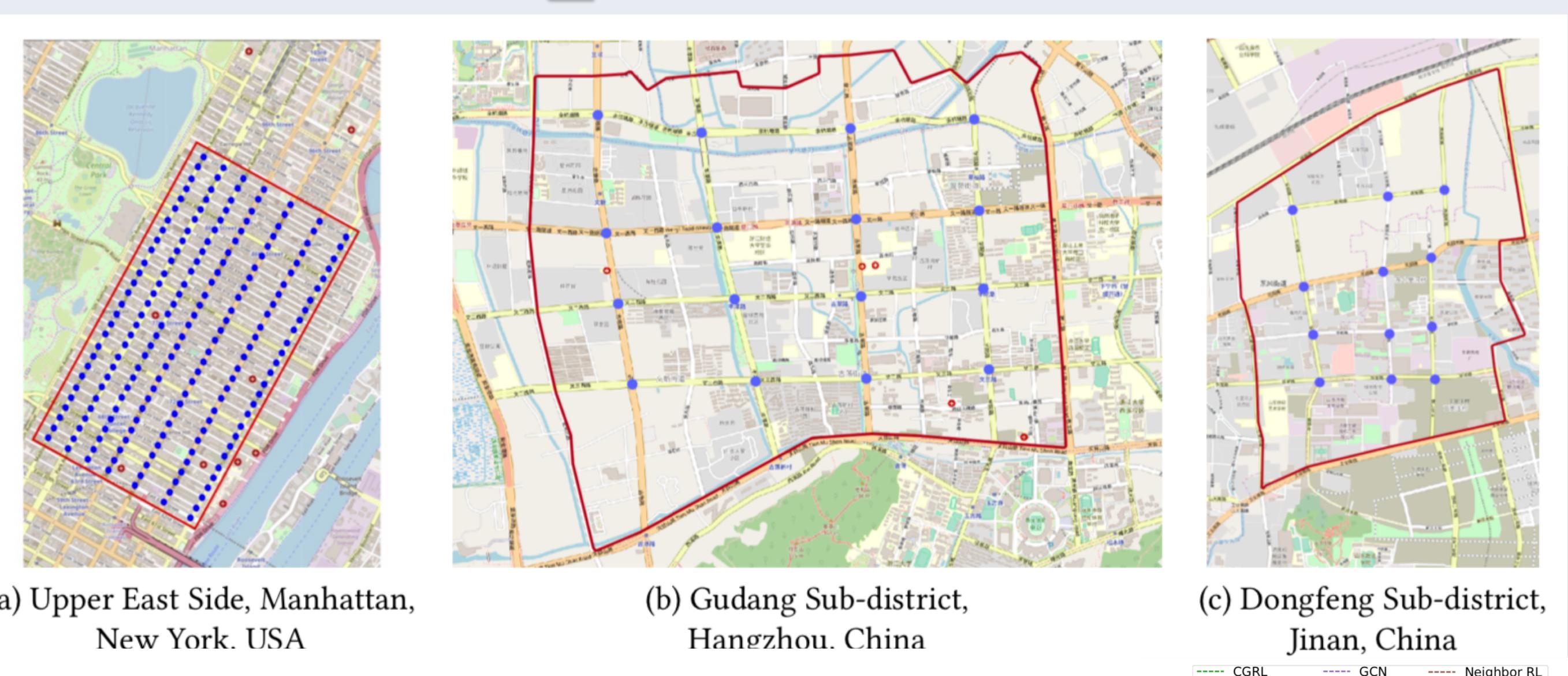
Graph Attentional Networks for Communication



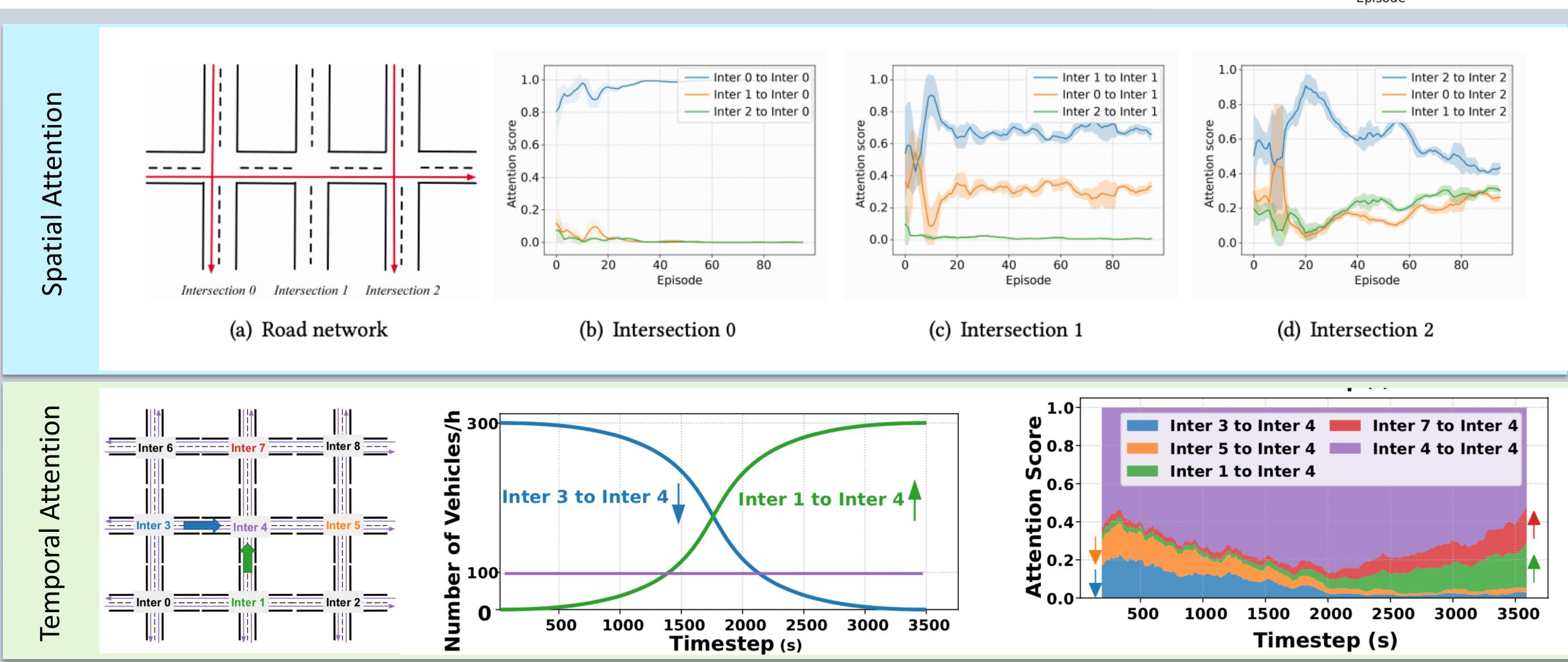
Highlights of this paper

- Cooperation through dynamic communication
- Index-free model learning with parameter sharing.
- Experiment on the large-scale road network

Experiments



Model	D _{NewYork}	D _{Hangzhou}	D _{Jinan}
Fixedtime [15]	1950.27	728.79	869.85
MaxPressure [24]	1633.41	422.15	361.33
CGRL [23]	2187.12	1582.26	1210.70
Individual RL [30]	*	345.00	325.56
OneModel [5]	1973.11	394.56	728.63
Neighbor RL [1]	2280.92	1053.45	1168.32
CoLight-node	1493.37	331.50	340.70
CoLight	1459.28	297.26	291.14



References

- [1] Wei et al., IntelliLight: A Reinforcement Learning Approach for Intelligent Traffic Light Control
- [2] Zheng et al., Diagnosing Reinforcement Learning for Traffic Signal Control
- [3] Zheng et al., Learning Phase Competition for Traffic Signal Control
- [4] Xiong et al., Learning Traffic Signal Control from Demonstrations
- [5] Wei et al., PressLight: Learning Max Pressure Control to Coordinate Traffic Signals in Arterial Network
- [6] Wei et al. , CoLight: Learning Network-level Cooperation for Traffic Signal Control