



Xinciao Xu
Chongqing University

Email
neard.ws@gmail.com

Homepage
me.neardws.com

Phone
+86-13678430450

GitHub
[neardws](https://github.com/neardws)

Address
Chongqing, China

Xinciao Xu

Ph.D. Student of Computer Science

About Me I am currently pursuing a Ph.D. degree in computer science at Chongqing University, advised by Prof. Kai Liu. My research interests include vehicular networks, V2X communications, and edge computing. I have published more than 10 papers, including 5 SCI papers with over 90 citations in Google Scholar. I expect to graduate in June 2023.

Education

2017 - 2023, Chongqing University

Ph.D. in Computer Science (Successive Master-Doctor Program)

2013 - 2017, North University of China

BS in Network Engineering

Projects

Digital Twin

- Derive a cooperative sensing model and a heterogeneous information fusion model for digital twin views
 - Propose a multi-agent deep reinforcement learning based on a difference reward credit allocation mechanism
 - Realize the dynamic adjustment of information sensing frequency, upload priority, and bandwidth resources to maximize view quality
1. **Xinciao Xu, et al.**, Cooperative Sensing and Heterogeneous Information Fusion in VCPS: A Multi-agent Deep Reinforcement Learning Approach, Submitted to *IEEE Trans. Intell. Transp. Syst.*, under review. (SCI Q1) (*Top Journal in Intelligent Transportation*)
 2. **Xinciao Xu, et al.**, Age of View: A New Metric for Evaluating Heterogeneous Information Fusion in Vehicular Cyber-Physical Systems, *IEEE ITSC'22*, Macau, October 8-12, 2022. (*Top Conference in Intelligent Transportation*)
 3. **Xinciao Xu, et al.**, A Control Plane View Construction Method for Software-Defined Vehicular Networks, *Invention Patent* (Granted)

Resource Allocation

- Derive a problem to jointly offload tasks and allocate communication/computation resources to maximize the service ratio
 - Implement a multi-agent D4PG to achieve the Nash equilibrium of task offloading potential game
 - Propose an optimal resource allocation solution based on a gradient-based iterative method and KKT condition
1. **Xinciao Xu, et al.**, Joint Task Offloading and Resource Optimization in NOMA-based Vehicular Edge Computing: A Game-Theoretic DRL Approach, Submitted to *J. Syst. Archit.*, under review. (CCF B)
 2. **Xinciao Xu, et al.**, Channel Allocation Method for Vehicle Edge Computing Based on Potential Game, *Tien Tzu Hsueh Pao/Acta Electron. Sin.*, (49) 5, 851-860, 2021. (CCF A)
 3. **Xinciao Xu, et al.**, Potential Game-based Distributed Channel Allocation in Vehicular Fog Computing Environments, *CWSN'20*, Dunhuang, September, 18-21, 2020. (Best Paper Candidate)



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Collision Warning

- Derive a packet transmission delay fitting model based on the Stable distribution to estimate the V2I communication latency
 - Design a collision warning algorithm based on the packet transmission delay fitting model and a packet loss detection mechanism
 - Implement a non-light-of-sight collision warning system based on DSRC devices in the real world ([Demo Video](#))
1. **Xinciao Xu**, *et al.*, Vehicular Fog Computing Enabled Real-time Collision Warning via Trajectory Calibration, *Mob. Netw. Appl.*, 25 (6), 2482-2494, 2020. (SCI Q3)
 2. **Xinciao Xu**, *et al.*, Design and Implementation of a Fog Computing Based Collision Warning System in VANETs, **Xinciao Xu**, Kai Liu, Ke Xiao, *et al.*, *IEEE ISPC-CN'18*, Hong Kong/Shengzhen, December 5-7, 2018. (Best Paper Award)
 3. Liu Kai, Zhang Lang, **Xinciao Xu**, *et al.*, An Edge Computing Based Collision Warning Method for Vehicles in Blind Areas, *Invention Patent* (ZL201910418745.2), 2021.

Publications

Journal

1. Channel Allocation Method for Vehicle Edge Computing Based on Potential Game, **Xinciao Xu**, Kai Liu*, Chunhui Liu, *et al.*, *Chinese J. Electron.*, (49) 5, 851-860, 2021. (CCF A)
2. A Hierarchical Architecture for the Future Internet of Vehicles, Kai Liu*, **Xinciao Xu**, Mengliang Chen, *et al.*, *IEEE Commun. Mag.*, 57 (7), 41-47, 2019. (SCI Q1)
3. Vehicular Fog Computing Enabled Real-time Collision Warning via Trajectory Calibration, **Xinciao Xu**, Kai Liu*, Ke Xiao, *et al.*, *Mob. Netw. Appl.*, 25 (6), 2482-2494, 2020. (SCI Q3)
4. Efficient Fog-assisted Heterogeneous Data Services in Software Defined VANETs, Ke Xiao, Kai Liu, **Xinciao Xu**, *et al.*, *J. Ambient Intell. Humaniz. Comput.*, 12 (1), 261-273, 2021. (SCI Q2)
5. Cooperative Coding and Caching Scheduling via Binary Particle Swarm Optimization in Software Defined Vehicular Networks, Ke Xiao, Kai Liu, **Xinciao Xu**, *et al.*, *Neural. Comput. Appl.*, 33 (5), 1467-1478, 2021. (SCI Q2)
6. RtDS: Real-time Distributed Strategy for Multi-period Task Offloading in Vehicular Edge Computing Environment, Chunhui Liu, Kai Liu, Hualing Ren, **Xinciao Xu**, *et al.*, *Neural. Comput. Appl.*, to appear, doi: 10.1007/s00521-021-05766-5. (SCI Q2)

Conference

1. Age of View: A New Metric for Evaluating Heterogeneous Information Fusion in Vehicular Cyber-Physical Systems, **Xinciao Xu**, Kai Liu, *et al.*, *IEEE ITSC'22*, Macau, October 8-12, 2022.
2. Potential Game-based Distributed Channel Allocation in Vehicular Fog Computing Environments, **Xinciao Xu**, Yi Zhou, Kai Liu, *et al.*, *CWSN'20*, Dunhuang, September, 18-21, 2020.
3. Design and Implementation of a Fog Computing Based Collision Warning System in VANETs, **Xinciao Xu**, Kai Liu, Ke Xiao, *et al.*, *IEEE ISPC-CN'18*, Hong Kong/Shengzhen, December 5-7, 2018.



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4. Real-time Task Offloading for Data and Computation Intensive Services in Vehicular Fog Computing Environments, Chunhui Liu, Kai Liu, **Xincao Xu**, et al., *IEEE MSN'20*, Tokyo, December 17-19, 2020.
5. Multi-period Distributed Delay-sensitive Tasks Offloading in a Two-layer Vehicular Fog Computing Architecture, Yi Zhou, Kai Liu, **Xincao Xu**, et al., *NCAA'20*, Shenzhen, July 3-6, 2020.
6. Distributed Scheduling for Time-Critical Tasks in a Two-layer Vehicular Fog Computing Architecture, Yi Zhou, Kai Liu, **Xincao Xu**, et al., *IEEE CCNC'20*, Las Vegas, January 11-14, 2020.

Communication Skills

2022, Oral Presentation (Online), IEEE 25th International Conference on Intelligent Transportation Systems

Presented recent research on Age of View.

2018, Oral Presentation, IEEE International Symposium on Product Compliance Engineering-Asia

Presented a vehicular collision warning system implemented in VEC.

Patents

1. A Control Plane View Construction Method for Software-Defined Vehicular Networks, **Xincao Xu**, Kai Liu, Dong Li, Chinese Invention Patent (2021105918221), to appear.
2. An Edge Computing Based Collision Warning Method for Vehicles in Blind Areas, Liu Kai, Zhang Lang, **Xincao Xu**, et al., Chinese Invention Patent (ZL201910418745.2), 2021.
3. A Fog Computing-based Information Acquisition, Computing, and Transmission Architecture, Ren Hualing, Liu Kai, Chen Mengliang, Zhou Yi, **Xincao Xu**, Chinese Invention Patent (ZL201910146357.3), 2021.

Technologies

Methods

- Multi-agent DRL
- Game Theory
- Convex Opt.

Programming

- Python
- C++
- Matlab
- PyTorch
- TensorFlow
- Git

Awards

2018, Best Paper Award, IEEE ISPCE-CN'18

Awarded to the best paper in the conference, and only one this year.

2020, Best Paper Candidate, CWSN'20

Awarded to the top 10 papers in the conference.

2020, Best Paper Candidate, NCAA'20

2017-2018, A-Class Academic Scholarship, Chongqing University