

Yukun Yuan

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RESEARCH INTEREST

- Cyber-Physical Systems
- Control Theory
- Internet of Things
- Machine Learning
- Game Theory
- Smart City

EDUCATION

Stony Brook University Stony Brook, NY
Ph.D. in Computer Engineering May 2022 (Expected)

- Advisor: Dr. Shan Lin
- Thesis: "Social-efficient Multi-agent Urban Cyber-Physical Systems"

Shanghai Jiao Tong University Shanghai, China.
B.E. in Computer Science July 2015

PUBLICATIONS

• Conference & Journal Publications:

- [1] SAC: Solar-Aware E-Taxi Fleet Charging Coordination under Dynamic Passenger Mobility.
Yukun Yuan, Yue Zhao and Shan Lin.
 In *60th IEEE Conference on Decision and Control (CDC)*, 2021.
- [2] DeResolver: A Decentralized Negotiation and Conflict Resolution Framework for Smart City Services.
Yukun Yuan, Meiyi Ma, Songyang Han, Desheng Zhang, Fei Miao, John A. Stankovic, and Shan Lin.
 In *Proceedings of the ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS)*, 2021.
 (Acceptance rate: 26%). **Best Paper Award**
- [3] Leveraging Fine-grained Occupancy Estimation Patterns for Effective HVAC Control.
Yukun Yuan, Kin Sum Liu, Sirajum Munir, Jonathan Francis, Charles Shelton, and Shan Lin.
 In *Proceedings of the ACM/IEEE Conference on Internet of Things Design and Implementation (IoTDI)*, 2020.
 (Acceptance rate: 35.3%).
- [4] QoE Control for Dynamic Adaptive Video Streaming over HTTP at Access Point.
Yukun Yuan, Shan Lin, and Gang Zhou.
 In *Proceedings of IEEE International Conference on Industrial Internet (ICII)*, 2019.
- [5] p^2 Charging: Proactive Partial Charging for Electric Taxi Systems.
Yukun Yuan, Desheng Zhang, Fei Miao, Jiming Chen, Tian He, and Shan Lin.
 In *2019 IEEE 39th International Conference on Distributed Computing Systems (ICDCS)*, 2019.
 (Acceptance rate: 19.6%).
- [6] Dynamic Integration of Heterogeneous Transportation Modes under Disruptive Events.
Yukun Yuan, Desheng Zhang, Fei Miao, John A. Stankovic, Tian He, George Pappas, and Shan Lin.
 In *2018 ACM/IEEE 9th International Conference on Cyber-Physical Systems (ICCPS)*, 2018.
 (Acceptance rate: 30%).
- [7] eRoute: Mobility-Driven Integration of Heterogeneous Urban Cyber-Physical Systems under Disruptive Events.
Yukun Yuan, Desheng Zhang, Fei Miao, John A. Stankovic, Tian He, George Pappas, and Shan Lin.
 In *IEEE Transactions on Mobile Computing (TMC)*. (Impact factor: 5.112).

- **Under Submission:**

- [8] POET: Towards Power-System-Aware E-Taxi Fleet Coordination under Dynamic Passenger Mobility.
Yukun Yuan, Yue Zhao and Shan Lin.
under submission to IEEE Internet of Things Journal (IoT-J).
- [9] DeResolver: A Decentralized Negotiation and Conflict Resolution Framework for Smart City Services.
Yukun Yuan, Meiyi Ma, Songyang Han, Desheng Zhang, Fei Miao, John A. Stankovic, and Shan Lin.
under major revision to ACM Transactions on Cyber-Physical Systems (TCPS) (Journal extension of ICCPS'21).
- [10] Game Theoretic Analysis of Urban E-Taxi Systems: Equilibria and Efficiency.
Yukun Yuan, Yue Zhao, Lin Chen, and Shan Lin.
under submission to IEEE International Conference on Computer Communications (INFOCOM), 2022
- [11] SOURCE: Towards Solar-Uncertainty-Aware E-Taxi Coordination under Dynamic Passenger Mobility.
Yukun Yuan, Yue Zhao and Shan Lin.
under submission to 2022 American Control Conference (ACC), 2022.

HONORS & AWARDS

- **Best Paper Award,** ICCPS 2021
- **IEEE CSS Student Travel Support,** CDC 2021
- **Student Travel Award,** ICDCS 2019, IFIP Networking 2020
- **Professional Development Award,** Stony Brook University

RESEARCH EXPERIENCE

Electric Taxi Fleets Coordination

- **p^2 Charging [ICDCS 2019]** proposed a **proactive partial charging strategy** for electric taxis. It was the first one to design a charging coordination algorithm for enhancing electric taxis' service quality.
- **SAC [CDC 2021]** was the first work to reduce the **negative effects** on the reliability and stability of power systems that are introduced by **renewable energy** generated at charging stations, while ensuring e-taxi service quality.
- **SOURCE** designed a **stochastic control method** to address the challenge of using **inaccurate prediction** of future solar power to determine the e-taxi behaviors in advance.
- **POET** analyzed the **costs of power systems** given different **charging strategies of e-taxis** with real dataset on more than 10,000 taxis and power networks in NYC. It achieves the co-optimization of e-taxi service quality and operational costs of power networks by cross-system optimization.

Game Theoretic Analysis of Urban E-Taxi Systems

- This work analyzed the **Nash Equilibrium** strategy of e-taxi drivers in a non-cooperative environment and showed the **inefficiency** of collective social outcome of competing e-taxis.
- This work designed a **pricing scheme** for the e-taxi system managers to induce the NE of competing e-taxis to be socially efficient, and it achieved **94.1% approximated price of anarchy** after applying the pricing scheme in the data-driven simulation.

Resolution Framework of Conflicts across Services

- DeResolver [ICCPS 2021] proposed a **decentralized negotiation-based framework** to resolve conflicts across services.
- DeResolver designed a **learning-based automated negotiation module** for an individual service, and proved that the agreement through the multi-phase negotiation is **Pareto-optimal**.

Heterogeneous Urban CPS Coordination

- eRoute [ICCPS 2018 & TMC] developed a two-level receding horizon control framework to **dynamically reroute, reschedule, and reallocate** integrated heterogeneous transportation systems, i.e., subway, bus, and taxi, under **disruptive events**.

PROPOSALS & GRANTS

[1] Socially Informed Services Conflict Governance through Specification, Detection, Resolution and Prevention.

NSF S&CC: Smart and Connected Communities, SCC-IRG Track 1, Funded in 2020

– Participated in the draft of the proposal

PATENTS

[1] HVAC Control using Fine-grained Occupancy Pattern Estimation.

Yukun Yuan, Kin Sum Liu, Sirajum Munir and Shan Lin. Patent Application No: US 16/850,860.

Filing date: 04/16/2020.

PROFESSIONAL SERVICE

- **Journal and Conference Reviewer:**

- ACM Transactions on Sensor Networks (TOSN)
- IEEE Global Communications Conference (GLOBECOM 2021)
- ACM/SIGAPP Symposium on Applied Computing (SAC 2021)
- IEEE International Conference on Computer Communications (INFOCOM 2017, 2018, 2021, 2022)
- IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS 2017)

PROFESSIONAL TALK

- SAC: Solar-Aware E-Taxi Fleet Charging Coordination under Dynamic Passenger Mobility CDC'21.
- DeResolver: A Decentralized Negotiation and Conflict Resolution Framework for Smart City Services ICCPS'21.
- Leveraging Fine-grained Occupancy Estimation Patterns for Effective HVAC Control IoTDI'20.
- QoE Control for Dynamic Adaptive Video Streaming over HTTP at Access Point ICII'19.
- p^2 Charging: Proactive Partial Charging for Electric Taxi Systems ICDCS'19.
- Dynamic Integration of Heterogeneous Transportation Modes under Disruptive Events. ICCPS'18.

 TEACHING EXPERIENCE

- **Guest Lecturer:**

- ESE 534: Cyber Physical Systems (Graduate level) November 2021
- ESE 343: Mobile Cloud Computing (Undergraduate level) April 2019

- **Teaching Assistant:**

- ESE 211: Electronics Laboratory A (Undergraduate level, 50 students) Fall 2017, Fall 2018 - Fall 2020
- ESE 343: Mobile Cloud Computing (Undergraduate level, 57 students) Spring 2018

 MENTORING

- Honglei Liu (Master Student) Fall 2020
Social-Aware Service Requests Data Analysis
- Xiao Jiang (Master Student) Fall 2020
Results: An electric taxi charging simulator
- Reuben Mulholland (Master Student) Summer, 2019
Occupancy-aware Building HVAC Control
- Xianzi Shi (Master Student) Spring, 2019
Heterogeneous Urban Transportation Systems Integration

 REFERENCES

Shan Lin,
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