Yuetai Li

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EDUCATION

University of Electronic Science and Technology of China (UESTC) Chengdu, China
Joint degree with the **University of Glasgow (UofG)**, Expected First Honor Degree Glasgow, United Kingdom
Bachelor of Engineering, Communication Engineering 2019/09 - Expected 2023/06
Major GPA: 3.98/4.00 (94/100), **Ranking:** 2/209

- **Major Coursework and Grades:** Probability Theory and Mathematical Statistics (96), Linear Algebra (100), Circuit Analysis and Design (99), Signals and Systems (94), Communication Principles and Systems (99), Stochastic Signal Analysis (100), Information Theory (96), Digital Signal Processing (94)
- **Scholarships:** James Watt Innovative Talent Scholarship (10/ 500), Academic Scholarship, UESTC (Top 5%)

PUBLICATIONS

- Zhangchen Xu, **Yuetai Li**, Chenglin Feng, Lei Zhang, "Voting Validity: Exact Fault-tolerant Consensus", Accepted by the 37th IEEE International Parallel & Distributed Processing Symposium (IPDPS), December 2022
- **Yuetai Li**, Yixuan Fan, Lei Zhang, Jon Crowcroft, "RAFT Consensus Reliability in Wireless Networks: Probabilistic Analysis", submitted to IEEE Internet of Things Journal, May 2022, under review
- **Yuetai Li**, Zhangchen Xu, Lei Zhang, "A Modularized Framework of Communication in Consensus and Consensus Network Reliability Analysis", ready to submit
- Dachao Yu, Yao Sun, **Yuetai Li**, Lei Zhang, "Communication Resource Allocation of Raft in Wireless Network", submitted to Elsevier Digital Communications and Networks, November 2022, under review
- **Yuetai Li**, Tong Tong, Benhao Pan, Huajun Yang, Ping Jiang, Weinan Caiyang, "Three-mirror system design for shaping the elliptical beam of a laser diode", Published in Elsevier Optik, Volume 264, 2022
- **Yuetai Li**, Xinbin Chen, Jiale Wang, Tao Zhan, Huajun Yang, Weinan Caiyang, Ping Jiang, "Shaping and transmitting elliptical beam from laser diode by off-axis quadric reflective mirrors", Published in Elsevier Optics Communications, Volume 493, 2021

RESEARCH INTERESTS

Explore the fundamental connections among three different consensus theories well-known in distributed computer systems, dynamic control, and social phycology, to make group intelligence more cognitive and reliable in future distributed computing and cooperative control. My previous work aimed to apply consensus of computers into distributed intelligent systems and considered communications and decision-making. For my future research, my research proposal is shown Here .

RESEARCH EXPERIENCES

Wireless Blockchain and Consensus Network Team, University of Glasgow Online/Chengdu, China
RAFT Crash Fault Tolerant Consensus Reliability in Wireless Networks: Probabilistic Analysis
Research Assistant, Advisor: Professor Lei Zhang, University of Glasgow 2021/03-2022/02

- Collaborated with Jon Crowcroft to submit a first-author paper to *IEEE Internet of Things Journal*.
- Proposed a node and link probabilistic failure model using the first-order Markov property to analyze the probability density function and mean of RAFT consensus network reliability.
- Defined the Reliability Gain and Tolerance Gain formally for the first time, which indicate the logarithmic linear relationship between the consensus reliability and two fundamental network parameters
- Derived analytical results demonstrating that the number of deterministic failure nodes in the network will linearly increase the order of magnitude of consensus failure rate.
- Submitted further research on heuristic algorithms of wireless resource allocation to achieve optimal RAFT consensus network reliability to *Elsevier Digital Communications and Networks.*

A Modularized Framework of Communication in Consensus and Consensus Network Reliability Analysis
Research Assistant, Advisor: Professor Lei Zhang, University of Glasgow 2021/11-Present

- Drafted a theoretical paper consisting of 36 pages as first author, aiming for submission to *ACM Transactions on Computer System* or *ACM/IEEE Transactions on Networking*.
- Proposed a generic and unified framework based on bipartite graphs and state machine to model and analyze the communication process of different fault tolerant consensus algorithms such as Paxos, PBFT and Hotstuff.
- Extended the analytical result of RAFT to other Crash/ Byzantine Fault Tolerant consensus protocols with arbitrary communication process based on first-order and high-order Markov properties.
- Proposed and analyzed the reactivation mechanism quantitatively, which causes higher-order Markov property, providing insights for consensus protocols design to gain a high reliability under possible link loss.

Voting Validity: Exact Fault-tolerant Consensus for Preference Aggregation
Research Assistant, Advisor: Professor Lei Zhang, University of Glasgow 2021/12-2022/06

- Accepted by *IEEE IPDPS* (CORE Ranking: A) and among the highest-quality submissions (Merit: 5, 4, 4, 3 with the Range: 1-5).
- Proposed the Voting Validity, which concentrates on multivalued consensus, decision-making and the aggregation of preferences under Byzantine malicious attacks.
- Proposed the tight lower bounds of system tolerance to achieve Voting Validity, and designed practical consensus algorithms, proving algorithms' Termination, Agreement, and Voting Validity.
- Considered the initial system entropy generated by different preferences and analyzed the increase and decrease of system entropy after introducing Byzantine malicious nodes.

Optical Information and Nanophotonics Team, UESTC Chengdu, China
Optical Design: Shaping and Transmitting Elliptical Beam from Laser Diode by Off-axis Quadric Mirrors
Research Assistant, Advisor: Professor Ping Jiang, UESTC 2019/12-2020/12

- Published a first author paper in *Elsevier Optics Communications*, which earned the Outstanding Award in the Innovation Training Program, UESTC.
- Published a further design with a smaller size and better shaping performance in *Elsevier Optik* as first author.
- Proposed an off-axis transmitting antenna consisting of only two parabolic mirrors, which shaped and collimated laser beams with asymmetric divergence angles generated by laser diodes.
- Designed the system with easy-processed continuous mirrors to avoid the discontinuity in stepped mirrors and lack of explicit math expressions in freeform mirrors. Reduced the number of mirrors to two for the first time in a quadric mirror system.

PROJECT EXPERIENCES

MIT Online Project: Semantic Segmentation of Cityscape online/ Chengdu, China
Team Leader, Course Design 2022/01-2022/02

- Performed semantic segmentation of cityscape images for a given dataset, part of CityScapes; led a team to design a light-level U-Net with CPU to obtain 87% recognition accuracy.
- Analyzed the aleatoric and epistemic uncertainty of the proposed model and further discussed an innovative design with sufficient GPU resources.

Car Robot Patrol Based on OpenMV Visual Recognition Chengdu, China
Team Member, Course Design 2022/03-2022/05

- Designed and implemented a patrolling car robot with control, visual recognition, and wireless communication modules.
- Field-tested the car, gave speeches, and wrote reports.

PERSONAL SKILLS

Languages: English (fluent), Chinese (native)
Computers: MATLAB, LaTeX, Python, C
Hobbies: drawing, opera, musicals, desserts