XINSONG FENG

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EDUCATION

University of California, Los Angeles *Los Angeles, USA*
Master of Science in Electrical and Computer Engineering *2023/9-2025/6 (Expected)*
- GPA: 4.00/4.00
- Relevant Courses: Modern Wireless Communication, Convex Optimization, Advanced Neural Networks and Deep Learning

Chongqing University *Chongqing, China*
Bachelor of Engineering in Communication Engineering *2019/9-2023/6*
- Major GPA: 3.94/4.00 (Rank: 1/116)
- Relevant Courses: Signals and Systems, Digital Communications, Digital Signal Processing, Communication Networks

RESEARCH INTERESTS

Wireless Communication: Machine Learning for Wireless Communication, Information Theory, Joint Communication and Sensing
Artificial Intelligence: Reinforcement Learning, Generative AI, Graph Neural Networks, AI Theory

PUBLICATIONS

[1] **X. Feng** and I. P. Roberts. "Adaptive Cell Range Expansion in Multi-Band UAV Communication Networks," submitted to *IEEE International Symposium on Information Theory*, 2025. arXiv preprint *arXiv*:2411.18123, 2024.

[2] **X. Feng**, Z. Yu, Y. Xiong, and H. Chen. "Sequential Stochastic Combinatorial Optimization Using Hierarchical Reinforcement Learning," under review, *International Conference on Learning Representations*, 2025. Link: https://xfeng01.github.io/ssco.pdf.

[3] B. Zhou, **X. Feng**, X. Guo, F. Gao, H. Chen, and Z. Wang. "Statistical Localization of Electromagnetic Signals in Disordered Time-Varying Cavity," *Physical Review A* (in press). arXiv preprint *arXiv*:2407.21023, 2024.

[4] B. Zhou, **X. Feng**, E. Wu, F. Gao, H. Chen, and Z. Wang. "Susceptibility Invariance and Duality-Matching Condition for Perpendicular-Motion Metasurface," *Advanced Physics Research*, p. 2400073, 2024.

[5] Y. Wei, L. Liang, B. Zhou, and **X. Feng**. "A Modified Blockchain DPoS Consensus Algorithm Based on Anomaly Detection and Reward-Punishment," *International Conference on Communication Software and Networks*, Chongqing, China, 2021, pp. 283-288.

RESEARCH EXPERIENCE

Graduate Student Researcher, Wireless Lab, University of California, Los Angeles (UCLA)
Advisor: Ian P. Roberts, Assistant Professor, wireless.ee.ucla.edu *2024/3-2024/9*

Project I: Adaptive Cell Range Expansion in Multi-Band UAV Communication Networks
- Developed a stochastic geometry-based framework to model and analyze multi-band UAV communication system performance.
- Introduced a high-accuracy UAV antenna pattern approximation and proposed an association scheme with an adaptive bias factor, which is based on standardized received power and spectral efficiency.
- Conducted extensive simulations, demonstrating that the proposed framework and schemes increase coverage range by up to 38% and spectral efficiency by 16% compared to state-of-the-art approaches.

Graduate Student Researcher (Remote), Data-Driven Decision Intelligence Lab, William & Mary
Advisor: Haipeng Chen, Assistant Professor, haipeng-chen.github.io *2023/1-Present*

Project I: Sequential Stochastic Combinatorial Optimization Using Hierarchical Reinforcement Learning
- Pioneered the definition and formulation of the generic class of sequential stochastic combinatorial optimization problems, which involve making sequential decisions under uncertainty with combinatorial action spaces.
- Formulated hierarchical Markov decision processes for sequential stochastic combinatorial optimization, particularly defining the state and the reward in the lower layer and introducing a novel null action concept.
- Proposed a wake-sleep option framework with wake-sleep training procedures and layer-wise learning method selection to stabilize the training process while ensuring computational efficiency.
- Demonstrated superior performance over traditional methods in adaptive influence maximization and route planning problems, achieving an average improvement of 20%, with strong generalization to larger graphs.

Project II: Effective Consistency Trajectory Policy for Maximum Entropy Reinforcement Learning (In Progress)
- Innovated the use of the consistency trajectory model to optimize the trade-off between expressivity and efficiency in diffusion-based policies, enhancing the model's overall performance.
- Exploring methods to further improve computational efficiency and ensure stable training across various learning tasks.
- Conducting extensive experiments on the D4RL dataset to benchmark the model's performance against existing methods.

Project III: A Unified Framework for Hierarchical Reinforcement Learning and Stackelberg Games via Shared-Objective Bi-Level Optimization (In Progress)
- Proposed a hierarchical learning framework using policy iteration to solve shared-objective bilevel optimization problems, such as hierarchical reinforcement learning and Stackelberg games.
- Conducted comprehensive case studies to validate the framework's adaptability and demonstrate the equivalence between hierarchical reinforcement learning and Stackelberg games.
- Exploring the proposed algorithm's application in both theoretical and practical scenarios, demonstrating its versatility and impact.

Graduate Student Researcher (Remote), College of Information Science & Electronic Engineering, Zhejiang University
Advisor: Zuojia Wang, Professor, person.zju.edu.cn/en/zuojiawang, *2023/2-2024/4*

Project I: Statistical Localization of Electromagnetic Signals in Disordered Time-Varying Cavity
- Collaborated on discovering statistical localization of transient electromagnetic signals in disordered time-varying cavities.
- Provided a mathematical proof of the normal distribution in statistical localization using Lindeberg's and Lyapunov's Theorems.
- Developed a theoretical model based on disordered space-time crystals and validated it via simulations.

Project II: Susceptibility Invariance and Duality-Matching Condition for Perpendicular-Motion Metasurface
- Developed a theoretical framework for analyzing electromagnetic interactions in perpendicular-moving metasurfaces with defining susceptibility invariance and duality-matching conditions.
- Validated the limits of moving invariance in discrete time-varying media using finite-difference time-domain simulations.

Undergraduate Researcher, School of Microelectronics & **Communication Engineering, Chongqing University**
Advisors: Liang Liang, Associate Professor (Projects I & II); Zhanye Chen, Associate Professor (Project III) *2020/6-2023/6*

Project I: Performance Analysis of UAV with Omnidirectional and Directional Antenna in 5G Networks
- Optimized UAV antenna configuration in hybrid frequency networks using stochastic geometry for maximal performance.
- Devised a general and tractable framework for analyzing antenna combinations and proposed two efficient antenna selection schemes.
- Achieved up to 30% improvement in UAV network performance compared to single antenna conventional schemes.

Project II: A Modified Blockchain DPoS Consensus Algorithm based on Anomaly Detection and Reward-Punishment
- Proposed a novel consensus algorithm for blockchain networks based on Delegated Proof of Stake (DPoS).
- Designed an adaptive anomaly detection algorithm and introduced an incentive mechanism to improve network security.
- Demonstrated a 58% reduction in malicious activity and improved scalability over traditional DPoS algorithms through simulations.

Project III: Improved Flower Pollination Algorithm based on Cross-Generational Differential Evolution
- Developed nonlinear inertia weights and a cross-generational differential evolution strategy to enhance search efficiency and precision.
- Introduced an inverse cosine acceleration factor to speed up convergence and balance global exploration with local exploitation.
- Delivered 21% faster convergence and 90% higher accuracy than traditional heuristics (e.g., PSO) via MATLAB simulations.

TEACHING EXPERIENCE

Graduate Teaching Assistant, University of California, Los Angeles (UCLA)
- Introduction to Communication Systems (Spring 2024)
  - Graded assignments and exams, providing feedback to improve students' understanding of communication systems.
  - Worked with the instructor to maintain consistency in grading standards and identify topics needing further clarification.

Undergraduate Teaching Assistant, Chongqing University
- Digital Signal Processing (Fall 2021, Fall 2022)
  - Assisted in preparing course materials, supporting lectures, leading student discussions, and answering office-hour questions.
  - Graded homework, provided detailed feedback, and contributed to a 100% course pass rate with 18.2% full grades.
- Introduction to Programming with C++ (Fall 2022)
  - Answered questions, assisted with coding and debugging during lab sessions, and graded final exams.
  - Helped 31.7% of students achieve full grades and was recognized as a "Top 10 Outstanding Teaching Assistant" at the university.

SELECTED HONORS AND AWARDS

Distinguished Student of Chongqing University (top 10 out of 266 students in the department) *2023/5*
Top 10 Outstanding Teaching Assistant of Chongqing University *2023/1*
National Scholarship for Academic Excellence (top 4 out of 266 students in the department) *2022/12*
Outstanding Graduate of Chongqing University (top 25 out of 266 students in the department) *2022/11*
First Prize in the Chinese Mathematics Competitions (top 0.2% among 220,000 participants), **twice** *2020/12,2021/12*
Second Prize for Contemporary Undergraduate Mathematical Contest in Modeling (top 2.3% among 160,000 participants) *2021/11*

PROFESSIONAL SERVICE

Peer Reviewer, *2024 IEEE Global Communications Conference: Signal Processing for Communications* *2024/6*

SKILLS

Mathematics: Game Theory, Optimization Theory, Stochastic Geometry, Matrix Analysis, Information Theory
Wireless Communication: MATLAB, Gurobi, CVX, ADS, LabVIEW, Keil, Quartus
AI & Machine Learning: Python, PyTorch, Scikit-learn, OpenAI Gym, Reinforcement Learning
Others: Git, HTML, CSS, JavaScript, Astro, C++, Java, Go