WINSTON HURST

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Summary: Versatile problem solver with R&D experience in trajectory planning and decision-making for autonomous systems. Proven success in algorithm design and machine learning. Industry experience in software development and improving business operations from a position of leadership.

EDUCATION

Ph.D., Electrical Engineering - UC Santa Barbara 2021 - 2025 (Expected)
Research: Controls, mmWave Sensing/Tracking, and Communications

M.S., Electrical Engineering - UC Santa Barbara 2019 - 2021
GPA: 3.96; Controls emphasis, minor in Communications

B.S., Computer Science - Brigham Young University 2010 - 2016
GPA: 3.99; Magna Cum Laude with Honors; Full tuition academic scholarship all years

Relevant Coursework: Optimal Control, Machine Learning, Optimal Estimation & Filtering, Nonlinear Control, Optimization, Algorithm Design & Analysis, Data Structures, Software Design & Testing

RESEARCH EXPERIENCE

Graduate Student Researcher - UC Santa Barbara Santa Barbara, CA; 2019 - Present

Machine Learning and Optimization for Motion Planning in Communication Systems
- Designed and implemented motion planning algorithms using deep reinforcement learning (PPO) and mixed-integer programming to optimize mobile relay trajectories
- Accelerated training through a novel transfer learning approach across related planning tasks
- Optimized stochastic queuing systems with applications to vehicle routing and autonomous mobility
- Integrated C++ computational geometry (CGAL) into a Python-based planning framework using custom bindings for high-performance execution
- Authored comprehensive survey on planning for autonomous vehicles in 6G communication networks

Decentralized Control for Energy-Efficient mmWave Relay
- Developed auction-based crowdsourcing scheme for relay coordination using algorithmic game theory
- Regulated memory buffer length using model predictive control (MPC) and classical feedback techniques

Signal Processing for Crowd Analytics with Real-World mmWave Radar
- Developed statistical pipeline for state-of-the-art crowd size estimation using mmWave radar data
- Implemented multi-object tracking algorithms employing extended Kalman filtering on real mmWave data
- Extracted key crowd motion dynamics with novel flow-based pipeline with statistical filtering
- Validated theoretical methods with extensive, robust measurement campaigns

Hardware Design and Prototyping for Diffraction-Based Metasurface
- Accelerated iterative design process with custom object-oriented Python server for high-end EM simulator
- Manufactured cutting-edge electromagnetic metasurface capable of multi-beam beamforming

INDUSTRY EXPERIENCE

Software Team Lead - Epic Systems Madison, WI; 2017-2019

- Led team of 8 developers integrating Epic software with national health systems in European countries, coordinating across stakeholders and meeting strict timelines
- Eliminated project budget overruns through the design and rollout of a standardized estimation process

- Coached underperforming team member through weekly goal setting and evaluation

Software Engineer - Epic Systems Madison, WI; 2016-2017

- Implemented full-stack features in production environment using OOP and MVC architecture
- Streamlined patient rooming experience with physician voice assistant prototype for mobile devices
- Reduced physician administrative burden with NLP application for parsing clinical notes

SKILLS

Control & Planning: Nonlinear Control, Lyapunov Control Functions, Optimal Control, Model Predictive Control, Dynamic Programming, Deep Reinforcement Learning, Vehicle Routing Problem, Graph Search Methods (Djikstra's, A*, RRT*, Monte-Carlo Tree Search)
Optimization: Convex/Nonconvex Optimization, Stochastic Optimization, Cost Function Design, Mixed-Integer Programming, Mathematical Programming
Coding Languages: Python, C++, Matlab, Java, JavaScript, VB, MUMPS, C#
Scientific Computing Tools: SciPy, PyTorch, CVXPY, CLARABEL, CGAL, CPLEX, Gurobi
Coding Tools & Concepts: git, Linux, APIs, MVC, OOP, FSM, SQL, MongoDB
RF Sensing: TI AWR2243BOOST mmWave radar board, FMCW radar, Geometric Theory of Diffraction

PATENT

Y. Mostofi, A. Pallaprolu, B. Korany, and **W. Hurst**, "Exploiting diffraction for sensing with RF signals and/or for RF field programming," US Patent App. 18/904812, 2025.

SELECTED PUBLICATIONS

Motion Planning & Decision Making for Communication-Aware Robotics

- **W. Hurst** and Y. Mostofi, "Auction-Based Non-Cooperative Relay Coordination for a Mobile Robot," in preparation.
- **W. Hurst**, S. Evmorfos, A. Petropulu, and Y. Mostofi, "Uncrewed Vehicles in 6G Networks: A Unifying Treatment of Problems, Formulations, and Tools," Proceedings of the IEEE, special issue on 6G, 2025.
- **W. Hurst** and Y. Mostofi, "Relay Incentive Mechanisms Using Wireless Power Transfer in Non-Cooperative Networks, " Transactions on Wireless Communications, 2025.
- **W. Hurst** and Y. Mostofi, "Optimal Dynamic Trajectories for UAVs in Mobility-Enabled Relay Systems," IEEE Conference on Decision and Control, 2023.
- **W. Hurst** and Y. Mostofi, "Optimization of Mobile Robotic Relay Operation for Minimal Average Wait Time," IEEE Transactions on Wireless Communications, 2023.
- **W. Hurst**, H. Cai, and Y. Mostofi, "Communication-Aware RRT*: Path Planning for Robotic Communication Operation in Obstacle Environments," IEEE International Conference on Communications, 2021.

mmWave Radar for Crowd Analytics

- A. Pallaprolu, **W. Hurst**, and Y. Mostofi, "mmFlux: Crowd Flow Analytics with Commodity mmWave MIMO Radar," npj Wireless Technology, under review.
- A. Pallaprolu, P. Peng, S. Sandhu, **W. Hurst**, and Y. Mostofi, "Crowd Analytics with a Single mmWave Radar," 30th International Conference on Mobile Computing and Networking, 2024.

RF Field Programming and Sensing

- A. Pallaprolu, **W. Hurst**, and Y. Mostofi, "Embracing Diffraction: A Paradigm Shift in Wireless Sensing and Communication," Submitted to IEEE Journal of Selected Topics in Electromagnetics, Antennas and Propagation, 2025.
- A. Pallaprolu, **W. Hurst**, S. Paul, and Y. Mostofi, "I Beg to Diffract: RF Field Programming With Edges," 29th Annual International Conference on Mobile Computing and Networking, 2023.