Grant Stagg

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Education

Brigham Young University Sep. 2021 – Apr. 2026
Ph.D. in Electrical Engineering *Provo, UT*

- GPA: 4.0/4.0
- Utah NASA Space Grant Consortium Fellowship - Precision Mapping and Strategic Path Planning for UAV Navigation in Adverse Conditions
- **Relevant coursework**: Linear System Theory, Nonlinear System Theory, Robotic Localization and Mapping, Multi-agent Systems, Robotic Vision, Stochastic Processes, High Performance Computing, Theory of Predictive Modeling, Autonomous Vehicles

Brigham Young University Sep. 2017 – Apr. 2021
BS in Electrical Engineering *Provo, UT*

- *magna cum laude,* GPA: 4.0/4.0

Research Experience

Graduate Research Intern (NSF–AFRL INTERN Program) Oct. 2025 – Apr. 2026
Air Force Research Laboratory (AFRL) *Dayton, OH*

- Selected for NSF–AFRL INTERN fellowship; internship beginning Oct. 2025 will focus on UAV guidance algorithms in contested environments.

Graduate Research Assistant Apr. 2021 – Present
BYU Multiple Agent Intelligent Coordination and Control (MAGICC) Lab *Provo, UT*

- **Level Set Estimation:** Developed a decentralized multi-agent framework to map environmental boundaries between safe and unsafe regions. Leveraged differential flatness to enforce vehicle dynamics, spline-based trajectory parameterization for efficient optimization, and a custom objective function to reduce uncertainty near the boundary. Applied block coordinate ascent to decentralize planning across agents and integrated a decentralized sparse Gaussian process regression (GPR) model to estimate the environmental variable of interest. Validated the approach in simulation and hardware with mobile ground robots, using light intensity (via a custom Arduino sensor) as a surrogate for hazardous environmental conditions.
- **Radar Exploration & Path Planning:** Designed cooperative UAV frameworks for contested environments with enemy radar threats. Low-priority scouting agents detected emitters and estimated their position and effective radiated power (ERP). A high-value agent then planned probabilistically safe trajectories using these uncertain estimates, embedding radar detection constraints that accounted for parameter uncertainty. Demonstrated robust mission success in large-scale simulations.
- **Probabilistic Engagement Zones (PEZs):** Extended pursuit–evasion differential game theory by developing engagement-zone models that explicitly account for uncertainty in both evader (self) and pursuer parameters. Applied uncertainty propagation techniques to classical engagement zones, first for pursuers with infinite turn rate and then for finite turn-rate (Dubins) pursuers. Developed path planning algorithms that leveraged PEZs to generate probabilistically safe trajectories for evaders under pursuer parameter uncertainty. Introduced sacrificial "decoy" agents to probe and infer unknown adversary parameters from intercept vs. survival outcomes.

Undergraduate Research Assistant Jan. 2018 – Apr. 2021
BYU Nanofluidics Research Group *Provo, UT*

- Fabricated nanofluidic pumps in the BYU Integrated Microfabrication Lab using photolithography, thin-film deposition (furnace, E-beam evaporator, PECVD), and plasma/chemical etching.
- Designed and developed nanofluidic devices, including photolithography masks in Cadence, and devised new nanofilm deposition techniques.
- Built and tested devices with custom circuitry and Raspberry Pi–based systems.

Other Experience

Cleanroom Machine Manager – E-beam Evaporator May 2019 – Apr. 2021
BYU Integrated Microfabrication Lab *Provo, UT*

- Performed maintenance and troubleshooting of the e-beam evaporator, ensuring reliable operation and minimal downtime.
- Trained 22 new operators on safe, effective thin-film deposition practices.

Student Coordinator Jun. 2018 – Aug. 2020
BYU Chip Camp *Provo, UT*

- Coordinated six three-day STEM camps, engaging 500+ middle school students in hands-on engineering activities.
- Managed and trained a team of 62 volunteers, preparing them as counselors and mentors.
- Delivered real-time logistical and instructional support to ensure smooth camp operations.

Publications (selected)

- Grant Stagg and Cameron K Peterson. Probabilistic weapon engagement zones. In *2025 American Control Conference (ACC)*, pages 2888–2894. IEEE, 2025
- Grant Stagg and Cameron K. Peterson. Multi-agent path planning for level set estimation using B-splines and differential flatness. *IEEE Robotics and Automation Letters*, 2024
- Tanner Norton, Grant Stagg, Derek Ward, and Cameron K. Peterson. Decentralized sparse gaussian process regression with event-triggered adaptive inducing points. *Journal of Intelligent & Robotic Systems*, 108(4):72, 2023
- Jimin Choi, Grant Stagg, Cameron K Peterson, and Max Z Li. Bi-level route optimization and path planning with hazard exploration. *arXiv preprint arXiv:2503.24044*, 2025. Accepted for presentation at the IEEE Conference on Decision and Control (CDC) 2025

Technical Skills

Programming: Python, C++, C, MATLAB, CUDA, JAX (autodiff, JIT, parallelization), Linux development, Git

Robotics & Autonomy: ROS/ROS2, Multi-Agent Systems, Path Planning, Trajectory Optimization, Flight Control Stacks (Betaflight, INAV)

Algorithms: Nonlinear Optimization, Uncertainty Quantification, Probabilistic Modeling, Automatic Differentiation