FENGJUN YANG

fengjun@seas.upenn.edu ◇ Philadelphia, PA, 19104 ◇ fjyang96.github.io

EDUCATION

Ph.D. in Computer Science	Univerity of Pennsylvania	Sept. 2020 - May 2026
M.Sc. in Aerospace Engineering	Stanford University	Sept. 2018 - Jun. 2020
B.A. in Computer Science	Swarthmore College	Sept. 2014 - May 2018

RESEARCH EXPERIENCE

Differential Flatness Under Unmodeled Dynamics *2024 - Present*
Collaborators: Jake Welde, Dr. Nikolai Matni *Philadelphia, PA*

- Investigated the robustness of **differential flatness** to unmodeled dynamics in pure-feedback systems and derived a sufficient condition under which flatness is preserved despite perturbations.
- Developed (1) a data-driven algorithm for learning residual dynamics while maintaining flatness, and (2) a distributed control method enabling action computation using only local information for suitable additive coupling.

Controller-Aware Trajectory Planning *2022 - Present*
Collaborator: Anusha Srikanthan, Mentor: Dr. Igor Spasojevic, Dr. Nikolai Matni *Philadelphia, PA*

- Co-developed methods to tightly integrate **trajectory planning** and tracking control to improve the dynamic feasibility of planned trajectories by learning to regularize the planning problem.
- Implemented and analyzed the approach in both supervised and **reinforcement learning** settings; validated in simulation and on hardware quadrotors.

Distributed Control of Networked Systems using Graph Neural Networks *2020 - 2022*
Mentor: Dr. Nikolai Matni *Philadelphia, PA*

- Developed a graph-neural-network-based algorithm for co-designing distributed controllers with their communication network. Implemented the algorithm in **PyTorch** and showed that our method achieves good control performance with sparser communication than traditional methods.
- Theoretically analyzed the performance of linear graph filter controllers on graph-symmetric systems. Designed and implemented (in **cvxpy**) an algorithm that sparsifies communication networks while maintaining performance guarantees.

Coordination of Multi-Agent Systems *2019–2020*
Mentor: Dr. Negar Mehr, Dr. Mac Schwager, Dr.Marco Pavone Stanford, CA

- Combined **model predictive control** with a learned heuristics to reduce the planning horizon of controlling robot-taxi fleets. Showed, in an in-house simulator, that the RL-learned heuristics can reduce the planning horizon by 40% while maintaining equal level of performance.
- Designed a **game-theoretic** algorithm for **role allocation** in robotic teams. Implemented and demonstrated the effectiveness of the algorithm on a collaborative transport problem.

Efficient Representation and Analysis of Large Symmetric Games *2016–2018*
Mentor: Dr.Bryce Wiedenbeck, Dr. Michael Wellman Swarthmore, PA

- Applied **Gaussian process regression** to learn the pure-strategy payoff function of a large symmetric game from sparse samples. Derived a closed-form expression for evaluating expected payoffs of mixed-strategies from the GP, thereby circumventing expensive sampling-based evaluation.
- Designed a subclass of action graph games (AGG) and showed that our method outperformed state-of-the-art methods on all AGG test cases for finding Nash equilibria.

INDUSTRY EXPERIENCE

Multi-Robot Task Allocation using Graph Neural Networks Summer 2024
Honda Research Institute *Ann Arbor, MI*

- Investigated joint task allocation and path planning for multi-robot systems.
- Proposed and implemented an algorithm that learns a graph neural network policy for task execution along with an associated value function, which is used to guide high-level planning.

Integrating Language Models with the Boston Dynamics Spot Robot Summer 2023
Boston Dynamics AI Institute *Cambridge, MA*

- Worked with a team of three other interns to design and implement a software stack that turned a Boston Dynamics Spot robot into a tour guide of the company space. Users can converse with the robot via a microphone and ask the robot to take them to various pre-specified locations.
- Integrated the OpenAI GPT backend to translate natural language input to commands for the robot to perform. Contributed to the company **ROS2** codebase.

COURSEWORK AND SKILLS

Coursework: Mobile Robotics, Optimal Control, Model Predictive Control, Convex Optimization, Probability Theory, Computer Vision, Machine Learning, Reinforcement Learning, Multi-robot control
Skills: Python, C, C++, Matlab, OCAML **Languages**: Chinese, English, Japanese (JLPT N1)