

Fan Yang

Phone: (631) 800-6171
Email: fanyang.sbu@gmail.com

Homepage: <https://yangfan.github.io/>
Linkedin: <https://www.linkedin.com/in/fanyang-sbu/>

EDUCATION

Doctor of Philosophy, Mechanical Engineering, GPA: 3.88/4.0
Minor area: Applied Mathematics and Statistics
Stony Brook University, Stony Brook, NY 2015-2020
Advisor: Nilanjan Chakraborty
Thesis: *Algorithms for Chance-constrained Multi-robot Task Allocation*
Master of Science, Mechanical Engineering, GPA: 3.96/4.0
Stony Brook University, Stony Brook, NY 2014-2015

EXPERIENCE

Research Assistant: June 2017 – August 2020
(A brief summary of my research is provided here: <https://yangfan.github.io/research/>)

- Develop distributed algorithms for multi-robot task allocation with uncertain payoffs and resource consumption.
- Study simultaneous task allocation and path planning for multi-robot system under highly uncertain open environment.

Teaching Assistant:

- MEC 325 Manufacturing Processes Spring 2020
- MEC 411 Control System Analysis and Design Fall 2019
- MEC 203 Engineering Graphics and CAD Spring 2016, Spring 2017
- MEC 310 Introduction to Machine Design Fall 2015, Fall 2016
- MEC 410 Design of Machine Elements Spring 2016

Mentorship: Simons Summer Research Program on Novel Distributed Algorithm for Optimally Selecting Leaders in Supervisory Robotic Swarm Control. 2018

Volunteer: ICRA 2020 workshop on Foundational Problems in Multi-robot Coordination under Uncertainty and Adversarial Attacks. 2020

Review Service:

- IEEE Robotics and Automation Letters (RA-L) 2020
- IEEE International Conference on Robotics and Automation (ICRA) 2018-2021
- IEEE International Conference on Automation Science and Engineering (CASE) 2018
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2018

EXPERTISE

Programming Languages: C++, Python, Matlab.

Packages & Tools: OpenCV, Keras, Tensorflow, Simulink, Stateflow, CMake, Boost Library, Google Test.

ROS: Navigation-Stack, Slam_gmapping, m-explore, cv_bridge, robot_state_publisher, Gazebo, RViz.

Hardware: Pioneer mobile robot, Turtlebot3, Baxter Robot.

Engineering Softwares: PTC Creo, Solidworks, Abaqus, LabVIEW.

PROJECTS

(Project descriptions and source codes are provided on my website: <https://yangfan.github.io/projects/>)

Multi-robot system:

- Simulate package delivery of multiple robots in the distribution center using Simulink.
- Design a collision avoidance scheme that enables robots to avoid uncontrolled obstacles.
- Develop a task allocation system that sends commands to robots to pick up and deliver packages by state machines and flow charts in Stateflow.

Robot Operating System:

- SLAM simulation of TurtleBot3 in Gazebo using move_base and Slam_gmapping ROS packages.
- Build global occupancy grid map by merging local maps from multiple robots.
- Multi-robot navigation in Gazebo using ROS navigation stack and robot_state_publisher.

Machine Learning:

- Develop a strategy for mobile robots to avoid obstacles using deep deterministic policy gradient.
- Learn a policy for mobile robot navigating to the target pose without collision using deep reinforcement learning algorithm.

Computer Vision:

- Real-time object detection for the autonomous vehicle using YOLO model.
- Feature-based observation matching for mobile robot by the bag-of-visual-words model implemented in C++.

SLAM:

- Implement online SLAM systems using extended Kalman filter and unscented Kalman filter.
- A FastSLAM algorithm is implemented to estimate the entire path of mobile robot and compute a feature-based map based on range-bearing sensor data.
- Compute a set robot poses of mobile robot and maximum likelihood map by implementing a least-squares method that optimizes the nonlinear constraints in GraphSLAM.
- Build an occupancy grid map based on the laser rangefinder data.

Planning:

- Implement Dijkstra and A* algorithm to compute the shortest path between two cells in an occupancy grid map.

C++ Programming:

- Build a route planner that computes a path between two positions on a real-world map using OpenStreetMap data and the IO2D visualization library.
- Create a system monitor that provides the information of the Linux system, such as CPU and memory usage, processes, and system up time.
- Optimize a Chatbot code using modern C++ memory management techniques such as smart pointers and move semantics.

PUBLICATIONS

Published/Accepted

- [1] **Fan Yang** and Nilanjan Chakraborty. Chance Constrained Simultaneous Path Planning and Task Assignment with Bottleneck Objective. In *2021 IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, May 2021. Note: accepted.
- [2] **Fan Yang** and Nilanjan Chakraborty. Algorithm for multi-robot chance-constrained generalized assignment problem with stochastic resource consumption. In *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 4329-4336, Las Vegas, USA, October 2020.
- [3] **Fan Yang** and Nilanjan Chakraborty. Chance constrained simultaneous path planning and task assignment for multiple robots with stochastic path costs. In *2020 IEEE International Conference on Robotics and Automation (ICRA)*, pages 6661-6667, Paris, France, May 2020.
- [4] **Fan Yang** and Nilanjan Chakraborty. Algorithm for optimal chance constrained knapsack problem with applications to multi-robot teaming. In *2018 IEEE International Conference on Robotics and Automation (ICRA)*, pages 1043-1049, Brisbane, Australia, May 2018.
- [5] **Fan Yang** and Nilanjan Chakraborty. Algorithm for multi-robot chance-constrained linear assignment. In *2017 IEEE International Conference on Robotics and Automation (ICRA)*, pages 801-808, Singapore, May 2017.

Abstract/Poster

- [1] **Fan Yang** and Nilanjan Chakraborty. Multirobot simultaneous path planning and task assignment on graphs with stochastic costs. In *2019 International Symposium on Multi-Robot and Multi-Agent Systems (MRS)*, New Brunswick, NJ, USA, August 2019.
- [2] **Fan Yang** and Nilanjan Chakraborty. Multi-robot team formation under uncertain environment. In *Northeast Robotics Colloquium (NERC)*, New Brunswick, NJ, USA, October 2018.
- [3] **Fan Yang** and Nilanjan Chakraborty. Algorithm for optimal chance constrained knapsack with applications to multi-robot teaming. In *27th Fall Workshop on Computational Geometry (FWCG)*, Stony Brook, NY, USA, November 2017.

Under review/preparation

- [1] **Fan Yang** and Nilanjan Chakraborty. Algorithm for optimal chance constrained multi-robot task allocation with stochastic payoffs. *IEEE Transactions on Robotics*.
- [2] **Fan Yang** and Nilanjan Chakraborty. Chance constrained knapsack and related problems. *SIAM Journal on Optimization*.
- [3] **Fan Yang** and Nilanjan Chakraborty. Optimal solution of chance constrained simultaneous path planning and task assignment. *IEEE Transactions on Automation Sciences and Engineering*.

TALKS

- *Chance constrained simultaneous path planning and task assignment for multiple robots with stochastic path costs.* Virtual presentation at ICRA 2020.
- *Algorithm for optimal chance constrained knapsack problem with applications to multi-robot teaming.* Presentation at ICRA 2018, FWCG 2017.
- *Algorithm for multi-robot chance-constrained linear assignment.* Presentation at ICRA 2017.