

# Mengyu FU

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## EDUCATION

### University of North Carolina at Chapel Hill, NC

Ph.D. in Computer Science

Aug. 2017 - Mar 2022

### Harbin Institute of Technology, Harbin, China

M.Eng. in Control Science and Engineering

B.Eng. in Automation, Honors School (top 5%)

Sep. 2011 - Jul. 2015, Sep. 2015 - Jul. 2017

GPA 95.49%, rank 1/182

GPA 94.43%, rank 2/192

## EXPERIENCES

### Software Engineer, Google

**Team:** YouTube Shorts Discovery

Develop the recommendation system for short-form videos, focusing on video ranking and packing.

Mountain View, CA

June 2022 - present

### Graduate Research Assistant, Computational Robotics Research Group

**Advisor:** Prof. Ron Alterovitz

**Thesis:** Efficient Motion and Inspection Planning for Medical Robots with Theoretical Guarantees

Designed and implemented robot **motion planning** and **inspection planning** algorithms with theoretical guarantees for surgical robots (**C++** and **templates**). These algorithms allow the robots to successfully navigate around complex environments or patient anatomy using multimodal sensor data. Experimented with both simulation and physical robot systems (**ROS**, medical-image segmentation, registration). Played a major role in writing an NSF-funded proposal.

**Journal and Conference Reviewer:** T-RO, RA-L, ICRA, IROS, ISER

Chapel Hill, NC

2017 - 2022

### Machine Learning Intern, Nuro Inc.

**Manager:** Wei Liu, Qiuyu Peng

Applied deep learning techniques (**C++**, **Python**, **TensorFlow**, **GCP**, **k8s**) to solve problems related to autonomous vehicles, focused on **behavior prediction** and **ego-vehicle planning**.

Mountain View, CA

Summer 2021, Summer 2020, Summer 2019

### Graduate Research Assistant, Space Control and Inertial Technology Center

**Advisor:** Prof. Changhong Wang and Prof. Zhenshen Qu

Master thesis: deep-learning-based video action recognition (**Caffe**).

Bachelor thesis (outstanding thesis, top 2%): semi-physical simulation system with vision & IMU data fusion (**LabVIEW**).

Harbin, China

2015 - 2017

### Undergrad Research Assistant, Research Institute of Intelligent Control and System

**Advisor:** Prof. Huijun Gao

Studied data-driven classification and fault diagnosis based on Support Vector Machines (SVMs).

Harbin, China

2014 - 2015

## SKILLS

### Languages & Operating systems

#### Tools

#### Libraries

C++ (Advanced), Python, C, and Java. Linux and macOS.

TensorFlow, Google Cloud Platform (GCP), Kubernetes (k8s), MATLAB (& Simulink), CMake, Robot Operating System (ROS), Caffe, LabVIEW, Git, Vim, and  $\LaTeX$ .

The Open Motion Planning Library (OMPL), OpenCV, Flexible Collision Library (FCL), and Insight Toolkit (ITK).

## AWARDS

**Best Paper Finalist**, Robotics: Science and Systems (RSS)

2021

**Best Student Paper Finalist**, ASME Dynamic Systems and Control Conference (DSCC)

2020

**First Class Scholarship**, China Aerospace Science and Technology Corporation

2016

**Outstanding Undergraduate Thesis (top 2%)**, Harbin Institute of Technology

2015

**National Scholarship (top 1.5%)**, Ministry of Education of China

2012-2013, 2013-2014

## PUBLICATIONS

- [18] A. Kuntz, M. Emerson, T. E. Ertop, I. Fried, **M. Fu**, J. Hoelscher, M. Rox, J. Akulian, E. A. Gillaspie, Y. Z. Lee, F. Maldonado, R. J. Webster, and R. Alterovitz. "Autonomous Medical Needle Steering In Vivo." in *Science Robotics* 8, eadf7614(2023).
- [17] **M. Fu**, A. Kuntz, O. Salzman, and R. Alterovitz. "Asymptotically-optimal inspection planning via efficient near-optimal search on sampled roadmaps." in *The International Journal of Robotics Research (IJRR)*, 2023;42(4-5):150-175. doi:10.1177/02783649231171646
- [16] **M. Fu**, K. Solovey, O. Salzman, and R. Alterovitz. "Toward Certifiable Optimal Motion Planning for Medical Steerable Needles." in *The International Journal of Robotics Research (IJRR)*, 2023;42(10):798-826. doi:10.1177/02783649231165818
- [15] J. Hoelscher, I. Fried, **M. Fu**, M. Patwardhan, M. Christman, J. Akulian, R. J. Webster, and R. Alterovitz. "A Metric for Finding Robust Start Positions for Medical Steerable Needle Automation." in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 9526-9533, Kyoto, Japan, October 2022.
- [14] **M. Fu**, K. Solovey, O. Salzman, and R. Alterovitz. "Resolution-Optimal Motion Planning for Steerable Needles." in *IEEE/RSJ Int. Conf. on Robotics and Automation (ICRA)*, pp. 9652-9659, Philadelphia, US, May 2022.
- [13] **M. Fu**, O. Salzman, and R. Alterovitz. "Toward Certifiable Motion Planning for Medical Steerable Needles." in *Robotics: Science and Systems (RSS)*, held virtually, July 2021. **[Best Paper Finalist]**
- [12] **M. Fu**, O. Salzman, and R. Alterovitz. "Computationally-Efficient Roadmap-based Inspection Planning via Incremental Lazy Search." in *IEEE/RSJ Int. Conf. on Robotics and Automation (ICRA)*, pp. 7449-7456, Xian, CN, May 2021.
- [11] I. Fried, J. Hoelscher, **M. Fu**, M. Emerson, T. Efe Ertop, M. Rox, J. Granna, A. Kuntz, J. A. Akulian, R. J. Webster III, and R. Alterovitz. "Design Considerations for a Steerable Needle Robot to Maximize Reachable Lung Volume." in *IEEE/RSJ Int. Conf. on Robotics and Automation (ICRA)*, pp. 1418-1425, Xian, CN, May 2021.
- [10] J. Hoelscher, **M. Fu**, I. Fried, M. Emerson, T. Efe Ertop, M. Rox, A. Kuntz, J. A. Akulian, R. J. Webster III, and R. Alterovitz. "Backward Planning for a Multi-Stage Steerable Needle Lung Robot." in *IEEE Robotics and Automation Letters (RA-L)*, vol. 6, no. 2, pp. 3987-3994, April 2021.
- [9] M. Rox, M. Emerson, T. Efe Ertop, I. Fried, **M. Fu**, J. Hoelscher, A. Kuntz, J. Granna, J. Mitchell, M. Lester, F. Maldonado, E. A. Gillaspie, J. Akulian, R. Alterovitz, and R. J. Webster III. "Decoupling Steerability from Diameter: Helical Dovetail Laser Patterning for Steerable Needles." in *IEEE Access* 8 (2020): 181411-181419.
- [8] T. Efe Ertop, M. Emerson, M. Rox, J. Granna, F. Maldonado, E. Gillaspie, M. Lester, A. Kuntz, C. Rucker, **M. Fu**, J. Hoelscher, I. Fried, R. Alterovitz, and R. J. Webster III. "Steerable Needle Trajectory Following In The Lung: Torsional Deadband Compensation And Full Pose Estimation With 5DOF Feedback For Needles Passing Through Flexible Endoscopes." in *ASME Dynamic Systems and Control Conference (DSCC)*, held virtually, October 2020. **[Best student paper finalist]**
- [7] A. Kuntz, **M. Fu**, et al. "Planning High-Quality Motions for Concentric Tube Robots in Point Clouds via Parallel Sampling and Optimization." in *IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*, pp. 2205-2212, Macau, CN, November 2019.
- [6] **M. Fu**, A. Kuntz, O. Salzman, and R. Alterovitz. "Toward Asymptotically-Optimal Inspection Planning via Efficient Near-Optimal Graph Search." in *Robotics: Science and Systems (RSS)*, Freiburg im Breisgau, DE, June 2019.
- [5] **M. Fu**, A. Kuntz, R. J. Webster III, and R. Alterovitz. "Safe Motion Planning for Steerable Needles using Cost Maps Automatically Extracted from Pulmonary Images." in *IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*, pp. 4942-4949, Madrid, ES, October 2018.
- [4] Z. Qu, S. Yu, and **M. Fu**. "Motion Background Modeling Based on Context-Encoder." in *International Conference on Artificial Intelligence and Pattern Recognition (AIPR)*, pp. 32-36, Lodz, PL, September 2016.
- [3] Z. Qu, X. Chu, **M. Fu**, X. Liu, W. Xie, and C. Wang. "Design of Real-Time Measurement System with Vision/IMU for Close-Range Semi-Physical Rendezvous and Docking Simulation." in *IEEE Chinese Guidance, Navigation and Control Conference (CGNCC)*, pp. 2292-2298, Nanjing, CN, August 2016.
- [2] **M. Fu**, Y. Tian, and F. Wu. "Step-Wise Support Vector Machines for Classification of Overlapping Samples." in *Neurocomputing*, Vol 155, pp. 159-166, May 2015.
- [1] Y. Tian, **M. Fu**, and F. Wu. "Steel Plates Fault Diagnosis on The Basis of Support Vector Machines." in *Neurocomputing* Vol 151, pp. 296-303, March 2015.