

# Mengyu FU

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## EDUCATION

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

Aug. 2017 - May 2022

Ph.D. in Computer Science

**Harbin Institute of Technology, Harbin, China**

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

M.Eng. in Control Science and Engineering

GPA 95.49%, rank 1/182

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

GPA 94.43%, rank 2/192

## 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. “A Semi-Autonomous Medical Robot for Enhanced Lung Access.” (**In preparation**)
- [17] **M. Fu**, K. Solovey, O. Salzman, and R. Alterovitz. “Toward Certifiable and Optimal Motion Planning for Medical Steerable Needles.” submitted to *The International Journal of Robotics Research (IJRR)* (**Under review**)
- [16] **M. Fu**, A. Kuntz, O. Salzman, and R. Alterovitz. “Asymptotically-optimal inspection planning via efficient near-optimal search on sampled roadmaps.” submitted to *The International Journal of Robotics Research (IJRR)* (**Under review**)
- [15] J. Hoelscher, I. Fried, **M. Fu**, M. Patwardhan, M. Christman, J. Akulian, R. J. Webster, and R. Alterovitz. “A New Metric to Find Robust Start Poses for Medical Steerable Needle Automation.” in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Kyoto, Japan, October 2022. (**To appear**)
- [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 (RAL)*, 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.

## EXPERIENCES

<b>Graduate Research Assistant, Computational Robotics Research Group</b>	Chapel Hill, NC
<b>Advisor:</b> Prof. Ron Alterovitz	2017 - 2022
<b>Thesis:</b> Efficient Motion and Inspection Planning for Medical Robots with Theoretical Guarantees Designed and implemented robot <b>motion planning</b> and <b>inspection planning</b> algorithms with theoretical guarantees for surgical robots ( <b>C++</b> and <b>templates</b> ). 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 ( <b>ROS</b> , medical-image segmentation, registration). Played major role in writing an NSF-funded proposal.	
<b>Journal and Conference Reviewer:</b> TRO, RAL, IROS 2019-2022, ICRA 2019-2022, ISER 2018	
<b>Machine Learning Intern, Nuro Inc.</b>	Mountain View, CA
<b>Manager:</b> Wei Liu, Qiuyu Peng	Summer 2021, Summer 2020, Summer 2019
Applied deep learning techniques ( <b>C++</b> , <b>Python</b> , <b>TensorFlow</b> , <b>GCP</b> , <b>k8s</b> ) to solve problems related to autonomous vehicles, focused on <b>behavior prediction</b> and <b>ego-vehicle planning</b> .	
<b>Graduate Research Assistant, Space Control and Inertial Technology Center</b>	Harbin, China
<b>Advisor:</b> Prof. Changhong Wang and Prof. Zhenshen Qu	2015 - 2017
Master thesis: deep-learning-based video action recognition ( <b>Caffe</b> ). Bachelor thesis (outstanding thesis, top 2%): semi-physical simulation system with vision & IMU data fusion ( <b>LabVIEW</b> ).	
<b>Undergrad Research Assistant, Research Institute of Intelligent Control and System</b>	Harbin, China
<b>Advisor:</b> Prof. Huijun Gao	2014 - 2015
Studied data-driven classification and fault diagnosis based on Support Vector Machines (SVMs).	

## AWARDS

<b>Best Paper Finalist</b> , Robotics: Science and Systems (RSS)	2021
<b>Best Student Paper Finalist</b> , ASME Dynamic Systems and Control Conference (DSCC)	2020
<b>First Class Scholarship</b> , China Aerospace Science and Technology Corporation	2016
<b>Outstanding Undergraduate Thesis (top 2%)</b> , Harbin Institute of Technology	2015
<b>National Scholarship (top 1.5%)</b> , Ministry of Education of China	2012-2013, 2013-2014

## SKILLS

<b>Languages &amp; Operating systems</b>	C++ (Advanced), Python, C, and Java. Linux and macOS.
<b>Tools</b>	TensorFlow, Google Cloud Platform (GCP), Kubernetes (k8s), MATLAB (& Simulink), CMake, Robot Operating System(ROS), Caffe, LabVIEW, Git, Vim, and $\LaTeX$ .
<b>Libraries</b>	The Open Motion Planning Library (OMPL), OpenCV, Flexible Collision Library (FCL), and Insight Toolkit (ITK).