Fei Liu

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Research Focus

Robotic autonomy in system modeling, control, dynamics, physical-based simulation, constrained optimization, haptics and mechatronics, in particular integrated real-time systems and hardware/software platforms, with applications in unstructured environments (biomedical, manufacturing, industrial, natural, household etc).

Bio

Fei Liu is a postdoctoral researcher at the Contextual Robotics Institute at University of California San Diego (UCSD). He is currently working on robotic autonomy for manipulation, surgical and biomedical applications, with semantic modeling, real-to-sim simulation, and advanced control techniques. Before that, he served as a research associate and postdoctoral scholar both at the Biorobotics Institute at Scuola Superiore Sant'Anna (SSSA), and the Center for Micro-BioRobotics at Italian Institute of Technology (IIT) in Italy. He finished his Ph.D. at Laboratory Ampère at INSA de Lyon, a top French grande école and engineering university. Right after his PhD dissertation, he also worked for a start-up company (ROBO Medical Co., Ltd.), as a senior control engineer and project manager for the creation of a robot for endoscopic submucosal dissection (ESD) surgery. During the last few years, he has experiences in several robotic areas, including modeling, control, dynamics, planning, simulation, and optimization. I also have knowledge of sensor perception, signal processing, and computer vision. He has authored more than 20 top journal and conference papers in robotics that have advanced and impacted on both the academic and industrial worlds.

Education

Institut National des Sciences Appliquées de Lyon (INSA de Lyon) **Sep. 2013 – Sep. 2016**
Ph.D. in Robotics *Lyon, France*

- Thesis title : Dual-user Haptic Training System
- Supervisors : Prof. Arnaud Lelevé, Prof. Tanneguy Redarce, Dr. Damien Eberard

Institut National des Sciences Appliquées de Lyon (INSA de Lyon) **Sep. 2012 – Aug. 2013**
Master of Science in Robotics *Lyon, France*

- Thesis title : Teleoperation System Using Port-Hamiltonian Approach
- Supervisor : Prof. Arnaud Lelevé

Northwestern Polytechnical University (NWPU, 985 & 211 Rank) **Sep. 2008 – Jul. 2012**
Bachelor of Science in Automation *Xi'an,China*
Speciality: Automation and Inertial Navigation

Working Appointments

Postdoctoral Scholar **Dec. 2019 – present**
Advanced Robotics and Controls Lab, University of California San Diego *San Diego, CA, USA*
Advisor: Prof. Michael Yip

Senior Research Engineer **Apr. 2019 – Nov. 2019**
Biorobotics Institute, Scuola Superiore Sant'Anna *Pisa, Italy*
Advisor: Prof. Filippo Cavallo

Research Engineer/Postdoc **Mar. 2018 – Mar. 2019**
Center for Micro-BioRobotics, IIT@SSSA, Italian Institute of Technology *Pisa, Italy*

Senior Control Engineer & Project Director **Oct. 2016 – Feb. 2018**
ROBO Medical Technology Co., Ltd *Shenzhen, China*

Publications

Dissertation and Thesis:

- [PhD] **Fei Liu**, Dual-user Haptic Training System, [PDF], Ph.D. Dissertation, INSA de Lyon, 2017.
- [Master] **Fei Liu**, Cooperative Haptic Hands-on Minimally Invasive Surgery (MIS) Trainer, M.Sc. Thesis, INSA de Lyon, 2013.

Preprints (⋆ shares the first author)

- [C19] **Fei Liu**⋆, Yutong Zhang⋆, Xiao Liang, Michael C. Yip. Achieving Autonomous Cloth Manipulation with Optimal Control via Differentiable Physics-Aware Regularization and Safety Constraints. *IEEE International Conference on Robotics and Automation (ICRA), 2024.* ***Under Review***
- [C18] **Fei Liu**⋆, Xiao Liang⋆, Yutong Zhang, Yuelei Li, Shan Lin, Michael C. Yip. Real-to-Sim Deformable Object Manipulation: Optimizing Physics Models with Residual Mappings for Robotic Surgery. *IEEE International Conference on Robotics and Automation (ICRA), 2024.* ***Under Review***
- [C17] Shan Lin, Albert Miao, Ali Alabiad, **Fei Liu**, Kaiyuan Wang, Jingpei Lu, Florian Richter, Michael C. Yip. SuPerPM: A Large Deformation-Robust Surgical Perception Framework Based on Deep Point Matching Learned from Physical Constrained Simulation Data. *IEEE International Conference on Robotics and Automation (ICRA), 2024.* ***Under Review***
- [C16] Christopher D'Ambrosia, Florian Richter, Zih-Yun Chiu, Nikhil Shinde, **Fei Liu**, Michael C. Yip. Robust Surgical Tool Tracking with Pixel-based Probabilities for Projected Geometric Primitives. *IEEE International Conference on Robotics and Automation (ICRA), 2024.* ***Under Review***
- [J9] **Fei Liu**, Mingen Li, Jingpei Lu, Entong Su, Michael C. Yip. Parameter Identification and Motion Control for Articulated Rigid Body Robots Using Differential Position-based Dynamics. *IEEE Transactions on Robotics (T-RO), 2023.* ***In revision (check for PDF preview)*** [arXiv]
- [J8] **Fei Liu**, Florian Richter, Fei Yin, Chong He, Cédrec Girerd, Michael C. Yip. Continuum Robot Shape Reconstruction and Tracking from Monocular Endoscopic Image Sequences. *IEEE Robotics and Automation Letters (RAL).* ***Hold on submission for patent application***
- [J7] Zhaowei Yu, Dimitri A. Schreiber, **Fei Liu**, Alexander M. Grant, Michael C. Yip. An Underwater Remote Teleoperation Robot Arm with Rolling Diaphragm Actuation and End Effector Force Reconstruction. *IEEE/ASME Transactions on Mechatronics (T-MECH).* ***Hold on submission for patent application (check for PDF preview)*** [PDF]

Journal Articles

- [J6] **Fei Liu**⋆, Entong Su⋆, Jingpei Lu, Mingen Li, Michael C. Yip. Robotic Manipulation of Deformable Rope-like Objects Using Differentiable Compliant Position-based Dynamics. *IEEE Robotics and Automation Letters (RAL), 2023.* [DOI]

- [J5] Xiao Liang, Shan Lin, **Fei Liu**, Dimitri Schreiber, Michael C. Yip. ORRN: An ODE-based Recursive Registration Network for Deformable Respiratory Motion Estimation with Lung 4DCT Images. *IEEE Transactions on Biomedical Engineering (T-BME)*, 2023. [PDF]
- [J4] Florian Richter, Shihao Shen, **Fei Liu**, Jingbin Huang, Emily K. Funk, Ryan K. Orosco, Michael C. Yip. Autonomous Robotic Suction to Clear the Surgical Field for Hemostasis Using Image-Based Blood Flow Detection. *IEEE Robotics and Automation Letters (RAL)*, 2021. [DOI] **Nominated for Best Paper Award at ICRA**
- [J3] Sarmad Mehrdad*, **Fei Liu***, Minh Tu Pham, Arnaud Lelevé, S. Farokh Atashzar. Review of Advanced Medical Telerobots. *Applied Sciences*, 2020. [DOI]
- [J2] Angel R. Licona, **Fei Liu**, David Pinzon, Ali Torabi, Pierre Boulanger, Arnaud Lelevé, Richard Moreau, Minh Tu Pham, Mahdi Tavakoli, Troy McDaniel. Applications of Haptics in Medicine. *Haptic Interfaces for Accessibility, Health, and Enhanced Quality of Life*, Nov. 2019. [DOI]
- [J1] **Fei Liu**, Angel Ricardo Licona, Arnaud Lelevé, Damien Eberard, Minh Tu Pham, Tanneguy Redarce. An Energy-Based Approach for n-dof Passive Dual-user Haptic Training Systems. *Robotica*, 2019. [DOI]

Conference Proceedings

- [C15] **Fei Liu***, Michael C. Yip. Shape Reconstruction of Soft, Continuum Robots using Differentiable Rendering with Geometrical Shape Primitive. *IROS Workshop on Integrated Perception, Planning, and Control for Physically and Contextually-Aware Robot Autonomy, 2023.*
- [C14] Xiao Liang*, **Fei Liu***, Yutong Zhang, Yuelei Li, Michael C. Yip. Bridging Real-to-Sim Gaps through Online Material Property Optimization with Perception-Enabled Residual Mapping. *IROS Workshop on Integrated Perception, Planning, and Control for Physically and Contextually-Aware Robot Autonomy, 2023.*
- [C13] Jingpei Lu*, **Fei Liu***, Michael C. Yip. Image-based Pose Estimation and Shape Reconstruction for Robot Manipulators and Soft, Continuum Robots via Differentiable Rendering. *IEEE International Conference on Robotics and Automation (ICRA)*, 2023. [arXiv]
- [C12] Neelay Joglekar, **Fei Liu**, Ryan Orosco, Michael C. Yip. Suture Thread Spline Reconstruction from Endoscopic Images for Robotic Surgery with Reliability-driven Keypoint Detection. *IEEE International Conference on Robotics and Automation (ICRA)*, 2023. [arXiv]
- [C11] **Fei Liu***, Zihan Li*, Yuhai Han, Jingpei Lu, Florian Richter, Michael C. Yip. Real-to-Sim Registration of Deformable Soft-Tissue with Position-Based Dynamics for Surgical Robot Autonomy. *IEEE International Conference on Robotics and Automation (ICRA)*, 2021. [DOI]
- [C10] Jingbin Huang*, **Fei Liu***, Florian Richter, Michael C. Yip. Model-Predictive Control of Blood Suction for Surgical Hemostasis using Differentiable Fluid Simulations. *IEEE International Conference on Robotics and Automation (ICRA)*, 2021. [DOI]
- [C9] Yunhai Han, **Fei Liu**, Michael C. Yip. A 2D Surgical Simulation Framework for Tool-Tissue Interaction. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Workshop on Cognitive Robotic Surgery*, 2020. [arXiv]
- [C8] Jacob J. Johnson, Linjun Li, **Fei Liu**, Ahmed H. Qureshi, Michael C. Yip. Dynamically constrained motion planning networks for non-holonomic robots. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020. [DOI]
- [C7] Sajiv Shah, Ayaan Haque, **Fei Liu**. Simulated Data Generation Through Algorithmic Force Coefficient Estimation for AI-Based Robotic Projectile Launch Modeling. *The 6th Asia-Pacific Conference on Intelligent Robot Systems (ACIRS)*, 2021. [DOI]

- [C6] Angel Ricardo Licona Rodriguez, **Fei Liu**, Arnaud Lelevé, Damien Eberard, Minh Tu Pham. Collaborative Hands-on Training on Haptic Simulators. *7th International Conference on Mechatronics and Control Engineering*, Nov. 2018. [DOI]
- [C5] **Fei Liu**, Arnaud Lelevé, Damien Eberard, Tanneguy Redarce. An Energy Based Approach for Passive Dual-user Haptic Training Systems. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2016. [DOI]
- [C4] **Fei Liu**, Arnaud Lelevé, Damien Eberard, Tanneguy Redarce. A Dual-user Teleoperation System with Online Authority Adjustment for Haptic Training. *37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Aug. 2015. [DOI]
- [C3] **Fei Liu**, Arnaud Lelevé, Damien Eberard, Tanneguy Redarce. A Dual-user Teleoperation System with Adaptive Authority Adjustement for Haptic Training. *4th International Workshop on Medical and Service Robots*, Jul. 2015. [DOI]
- [C2] **Fei Liu**, Yinan Sang, Jie He, Jie Fan, Ruichao Li, Xiongyi Cui, Haoyu Li, Jie Chen. Northwestern Polytechnical University Team Entry for the 2012 AUVSI International Aerial Robotics Competition. *International Aerial Robotics Competition (IARC) Symposium*, Aug. 2012. [PDF]
- [C1] **Fei Liu**, Haoyu Li, Li Li. Modeling of the Snowboard Course, International Mathematical Contest in Modeling (MCM) Symposium, Apri. 2011

Selected Patents (part of)

- [P1] **Fei Liu**, Michael C. Yip, Florian Richter. Real-to-Simulation Matching of Deformable Soft Tissue and Other Objectss with Position-based Dynamics for Robot Control. PCT/US22/22820. 2022. *Submitted for application.*
- [P2] Jialin Yang, Qinghao Hu, Jianxiao Chen, **Fei Liu**, Fei Long. Flexible Mechanical Arm and Surgical Equipment. CN 215651505 U. 2021. *Active.*
- [P3] Jialin Yang, Qinghao Hu, Jianxiao Chen, **Fei Liu**, Fei Long, Luchen Shen, Liyang Lin. Main Hand Control Unit and Auxiliary Robot for Digestive Tract Operation. CN 216603056 U. 2021. *Active.*
- [P4] Jialin Yang, Qinghao Hu, Jianxiao Chen, **Fei Liu**, Fei Long, Luchen Shen, Liyang Lin. Main Operator and Force Feedback Device. CN 215273291 U. 2021. *Active.*
- [P5] Jialin Yang, Qinghao Hu, Jianxiao Chen, **Fei Liu**, Fei Long, Luchen Shen, Liyang Lin. Operation Executor. CN 114129228 A. 2021.
- [P6] Jialin Yang, Qinghao Hu, Jianxiao Chen, **Fei Liu**, Fei Long, Luchen Shen, Liyang Lin. Operation Executor. CN 114176660 A. 2021.
- [P7] Junjie Gao, **Fei Liu**, Shunzheng Meng, Sihao Zuo, Jialin Yang. A Kind of Flexible Joint Mechanism. CN 209713128 U. 2018. *Active.*
- [P8] Jialin Yang, Xilong Hou, Lijuan Yao, **Fei Liu**. Lifting Operation Instrument. CN 209574762 U. 2018. *Active.*

Research Experience

Advanced Robotics and Controls Lab, UCSD **Dec. 2019 – present**
PostDoc, *ARCLab* *San Diego, CA, USA*

- Develop for the unified modeling, simulation, and control of deformable, rigid, articulated, fluid object using position-based dynamics (PBD), in particular for articulated manipulation (impedance control, trajectory optimization, rope shape control etc) and surgical applications (soft tissue, membrane, blood and tools).

- Differentiability for the PBD simulation using adjoint method based on chain-rule and Autodiff tools.
- Simulation framework using NVIDIA-Flex, PBD, and self-written constrained based solver.
- Real-to-sim transfer techniques using non-rigid perception, registration, and tracking.
- Closed-loop controller design, motion planning and validation using field robots, such as da Vinci Reseach Kit (DVRK), 7-dof Baxter Robotic Arm, 7-dof Franka Panda Arm, a catheter robot, a non-holonomic mobile robot, a hydraulic-driven underwater robotic arm, haptic device etc.
- **Continuum Robot Project**: Shape reconstruction using projection of geometrical primitives (cylinders, circles etc.), differentiable rendering and perform visual servoing control.

Biorobotics Institute, Scuola Superiore Sant'Anna **Apr. 2019 – Nov. 2019**
Senior Research Engineer, *Assistive Robotics Lab* *Pisa, Italy*

- Simultaneous localization and mapping (SLAM) of mobile robotic platform under ROS.
- Autonomous initialization through computer vision approaches using aruco markers (QR codes).
- Autonomous navigation of the mobile robot including path planning, obstacle avoidance.
- Shared control theory development and implementation of the mobile platform.
- Design of PHP/HTML-based web user interface.
- Experimental tests in Verona, Italy.

Center for Micro-BioRobotics IIT@SSSA **Mar. 2018 – Apr. 2019**
Research Engineer/Postdoc, *Istituto Italiano di Tecnologia* *Pisa, Italy*

- Modeling and control KUKA LWR4+ robotic arm using ROS and Gazebo : motion control, trajectory planning, master-slave
- Modeling and control of flexible continuum surgical tool : static tension-deflection model, Euler-Lagrange dynamics, port-Hamiltonian based control.
- Analysis of several continuum structure prototypes : variation of design (notches, single-backbone, articulated).
- Develop teleoperation framework using haptic devices (Sigma.7).
- Preliminary study of simulation platform for flexible surgical tools using SOFA (Simulation Open Framework Architecture).

Control Engineer & Project Director **Oct. 2016 – Feb. 2018**
ROBO Medical Technology Co., Ltd *Shenzhen, China*

- Develop teleoperation of a single-port abdominal robotics surgical system using haptic devices (i.e., PHANTOM Omni, Novint Falcon, Omega.3) and joysticks (i.e., Logitech G Extreme 3D, Microsoft Xbox).
- Modeling and control of a tendon-driven articulated end-effector : kinematics, motion control, master-slave.
- Model-based uncertainties identification and compensation : hysteresis, friction.
- Modeling and control of a 4 DOFs positioning arm (parallel mechanisms) : kinematics, motion control, master-slave.
- Caculation of the RCM point of positioning arm.
- Modeling and control (based on gait analysis) of a powered lower limb orthosis for rehabilitation.
- SLAM algorithm (build on ROS) of autonomous mobile robots for medical transportation in hospitals.

PHD Thesis : Dual-user Haptic Training System **Sep. 2012 – Sep. 2016**
Advisors: Prof. Tanneguy Redarce, Prof. Arnaud Lelevé, Dr. Damien Eberard *INSA de Lyon, France*

- Focused on modeling and control aspects with/without time delays.
- Developed real-time experiments both with Matlab/Simulink, ROS and Chai3D.

- Published three international conference papers, and one journal paper.

Group Leader : DJI RoboMasters Mobile Manipulation Challenge **Aug. 2014**
Design of Autonomous Mobile Robot Using SLAM and Computer Vision Approach. *Shenzhen, China*
Dajiang Innovations Technology Co., Ltd (DJI)

- Developed SLAM framework for mobile robots (chariots) u on ROS.
- Implemented fast on-board object tracking and recognition algorithms.
- Developed multi-robot coordination and searching algorithms.

Master Thesis : Cooperative Haptic Hands-on MIS Trainer **Sep. 2012 – Aug. 2013**
Master Internship at Ampère Laboratory *INSA de Lyon, France*

- Designed teleoperation system using port-Hamiltonian approach.
- Implemented control algorithms with haptic devices (PHANTOM Omni).
- Developed real-time experiments using Matlab/Simulink.

Team Leader : International Aerial Robotics Competition (IARC) **Aug. 2012**
A Low Cost Autonomous Quadrotor UAV-Icarus *Peking, China*

- Mathmatical modeling of a self-made low cost laser rangefinder based on geometric caculation for environment mapping.
- Autonomous control of the quadrotor using environment mapping and detection algo- rithm (wall and window detection using point cloud analysis).
- Awarded **Innovative Design**.

Undergraduate Internship **Sep. 2011 – Jun. 2012**
Image Meta-data Feature Extraction for Content-Context Based Image Retrieval *NPU, Xi'an, China*

- Implemented image processing and classification algorithms.

Team Leader : International Mathematical Contest in Modeling (MCM) **Feb. 2012**
Optimal Design of U-shaped Snowboard Course *NPU, Xi'an, China*

- Awarded **Meritorious Winner** (First Prize Mention).

Team Leader : Robocup 3D Simulation Group **Sep. 2010 – Jun. 2012**
Robocup Soccer Center of NPU, Simulation Robots of Robocup Soccer *NPU, Xi'an, China*

- Designed gait algorithm of NAO (Humanoid) robot.
- Developed control strategies for simulated soccer competition under linux platform.
- Awarded **Third Prize** in China Open 2011.

Project Leader : Student Project of Chinese Ministry of Education **Nov. 2011 – Jun. 2012**
Mining Methods for Gene Expression Profile Classification *NPU, Xi'an, China*

- Implemented statistical and computing algorithms related to data mining.

Project Leader : Student Project of Chinese Ministry of Education **Nov. 2010 – Jun. 2011**
Path Planning of Mobile Robot *NPU, Xi'an, China*

- Implemented path planning algorithms of mobile robot ($A^\star$, genetic algorithm, fuzzy control etc.

"Freescale Cup" National Smart Car Design Competition **Dec. 2010 – May. 2011**
Design and Control of an Intelligent Car for Path Following *NPU, Xi'an, China*

- Awarded **Third Prize** in NPU Open 2011.

Laboratory Research Assistant **Sep. 2009 – Jun. 2011**
Supervisor: Prof. Suilao Li, College of Automation *NPU, Xi'an, China*

- Navigation of Unmanned Aerial Vehicle (UAV) Based on Digital Map
- Design of Intelligent Vehicle and Autonomous Navigation

Professional Activities

Journal/Conference Reviewer **2016 – present**

- *IEEE Transactions on Robotics (T-RO)*
- *IEEE Transactions on Mechatronics (T-MECH)*
- *IEEE Robotics and Automation Letters (RAL)*
- *IEEE Transactions on Medical Robotics and Bionics*
- *Control Engineering Practice*
- *Robotica*
- *Journal of Mechanisms and Robotics (JMR)*
- *International Conference on Robotics and Automation (ICRA)*
- *American Control Conference (ACC)*
- *International Conference on Learning Representations (ICLR)*
- *IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control (LHMNC)*
- *IEEE RAS/EMBSConference on Biomedical Robotics and Biomechatronics (BioRob)*

Poster Presentation **2015 – 2023**

- *2023 International Conference on Robotics and Automation (ICRA), London.*
- *2021 Emerging Frontiers in Research and Innovation (EFRI) All-Teams Workshop, Virtual, USA.*
- *37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS), Milano, Italy.*

Oral Presentation **2015 – 2021**

- *2021 International Conference on Robotics and Automation, Virtual, Xi'an, China.*
- *7th Summer School on Surgical Robotics (SSSR 2015), Montpellier, France.*
- *37th EMBS Ignite Sessions, Milano, Italy.*
- *4th International Workshop on Medical and Service Robots (MESROB), Nantes, France.*

Volunteer

- *20th World Olympic Collectors Fair, Lausanne, Switzerland.* May. 2014
- *Heart++ : High School Student Course Assistance, Xi'an, Northwestern Polytechnical University.* 2018-2012

Membership **2015 – 2021**

- **IEEE Membership** 2017 – present
- **IEEE Student Membership.** 2015 – 2016
- **EMBS Membership.** 2015 – 2016

Supervision Activities

PhD Students

Yu Huan, BioRobotics Institute, Scuola Superiore Sant'Anna **Mar. 2018 - Mar. 2019**
- Topic : Design and control of flexible minature surgical tools (continuum robot)

Xiao Liang, CSE, UCSD **Sep. 2021 – present**
- Topic : Reconstruction of 4D lung motionu using neural-ODE integration

Master Students

Yutong Zhang, CSE, UCSD **Jan. 2021 – present**
- Topic : Simulator using libIGL/openGL and position-based dynamics for different objects (rigid, cloth, deformable, fluid etc)

Wangyi Liu, ECE, UCSD **July 2022 – Aug 2023**
- Topic : SE(3)-Equivariant Mappings for Data-efficient Learning of Robot Trajectory Planning

Alexander Luke, MAE, UCSD **Sep. 2021 – Jun 2023**
- Topic : Motion control and calibration of a steerable continuum robotic catheter with clinical trails

Junming Wu, ECE, UCSD **Sep. 2021 – Dec. 2022**
- Topic : Bi-manual close-loop control of dual-arm suturing using physical-based simulation

Haaris Rahman, CSE, UCSD **Sep. 2021 – Mar. 2022**
- Topic : Reconstruction of deformable soft tissue using occupancy flow

Chong He, MAE, UCSD **Sep. 2021 – Aug. 2022**
- Topic : Shape reconstruction of catheter robot using monocular images

Yunhai Han, MAE, UCSD **Jan. 2021 – Jan. 2022**
- Topic : Deformable objects simulation framework using constraints-based solver

Mingen Li, ECE, UCSD **Jan. 2021 – Jan. 2022**
- Topic : Simulation and control of articulated robots using position-based dynamics

Entong Su, ECE, UCSD **Jan. 2021 – Jan. 2022**
- Topic : Simulation and control of rope-like objects using position-based dynamics

Harleen Singh, ECE, UCSD **Jan. 2020 – Jul. 2021**
- Topic : Modeling of the catheter continuum robot for position and orientation motor control

Zihan Li, ECE, UCSD **Jan. 2020 – Nov. 2020**
- Topic : Registration method for real-to-sim transfer applications of deformable tissue manipulation

Jingbin Huang, ECE, UCSD **Mar. 2020 – Nov. 2020**
- Topic : Modeling and control of surgical tool for suction based simulation of blood fluid

Sean Liu, ECE, UCSD **Jun. 2020 – Sep. 2020**
- Topic : Reconstruction of a catheter robot shape using projection of geometrical primitives

Undergraduate Students

Yuelei (Tina) Li, Mathematics, UCSD **Apr. 2023 – present**
- Topic : Learning an intrinsic neural mappings from mesh to point cloud for registration of soft tissue

Neelay Joglekar, ECE, UCSD **Jan. 2021 – present**
- Topic : Dynamic model of rope-like objects using cosserat rod theory and surgical thread reconstruction

Bryan Yuan, ECE, UCSD **Jan. 2021 – May 2022**
- Topic : Backward gradients computation and validation for position-based dynamics constraints

Nemanja Babic, Research Internship, University of Ottawa & INSA de Lyon **Jan. 2021 – May 2022**
- Topic : Simulation of haptic systems using CHAI3D

High School Student

Ayaan Haque, Saratoga High School, California **Jan. 2021 – Jul. 2021**
- Topic : Simulated data generation through algorithmic force coefficient estimation

Sajiv Shah, Saratoga High School, California **Jan. 2021 – Jul. 2021**
- Topic : Simulated data generation through algorithmic force coefficient estimation

Supported Grants

CAREER: Contextually Informed Autonomous Robotic Surgery
Mar. 2021 – Present, *National Science Foundation (NSF)*
Grant No. : 2045803/PI: Prof. Michael Yip
Role : Postdoc Researcher

- Topic : Modeling and simulation of soft tissue deformation and interactive robotic tool control.

EFRI C3 SoRo: Safe Medical Continuum Robots: Sensing, Control and Fabrication
Nov. 2019 – Present, *National Science Foundation (NSF)*
Grant No. : 1935329/PI: Prof. Michael Yip
Role : Postdoc Researcher

- Topic : Shape reconstruction of catheter robots using endoscopic images and visual-servoing control.

Special Foundation for Intelligent Robots: Creation and Kinematic Model of Modular Variable Stiffness Continuum Flexible Actuator
Mar. 2019 – Nov. 2019, *Ministry of Science and Technology (MOST) of China*
Grant No. : 2018YFB1307700/PI: Shenzhen Robo Medical Technology CO ltd
Role : Project Leader

- Topic : Modeling and control of a continuum flexible ESD robot using curvature-based model.

Honors and Awards

Individual Awards

2012 **Innovative Design Award** at International Aerial Robotics Competition (IARC)
2012 **First Prize** at International Mathematical Contest in Modeling (MCM)
2011 **Third Prize** in Robocup China Open 2011
2008-2012 Yearly **Distinguished Student Scholarship** of Northwestern Polytechnical University

Paper Awards

2021 Nominated for **Best Paper** at IEEE International Conference on Robotics and Automation (ICRA)

Research Techniques and Relevant Skills

Computer Languages: Python, C++, C, MATLAB/Simulink
Sofware Skill: PyTorch, Linux, LaTEX, ROS, Gazebo, MoveIt, Chai3D, SOFA, OpenCV, Open3D, NLopt, OSQP, Blender, and many more ...
Hardware Experiences: da Vinci Reseach Kit (DVRK), 7-DOF Baxter Robotic Arm, KUKA LWR 4+, NDI Electromagnetic Sensor/Aurora, Phantom Omni, Omega.3 & Sigma.7 (Force Dimension), Novint Falcon, MAXON Motors, EPOS Drivers, SICK Laser Range-finder, IMU sensors, and many more ...

Languages

Chinese: Native
English: Advanced, Fluent
French: Beginner A2
Italian: Beginner Classroom