

# Chang Shi

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## EDUCATION

### Carnegie Mellon University

Master of Robotics System Development

Pittsburgh, PA

May 2021

Selected Coursework: Probabilistic Graphical Models; Medical Image Analysis; Deep RL; Multimodal ML; Robot Autonomy; Computer Vision

### Renmin University of China

Bachelor of Engineering in Computer Science

Beijing, China

June 2019

Selected Coursework: Web Game development; Introduction to Parallel Computing; Algo. Design and Analysis; Computer Networks; Data Structure

## RESEARCH EXPERIENCE

### Biomedical Image Guidance Lab, CMU

Research Assistant (Advisor: Prof. John Galeotti)

Pittsburgh, PA

May 2020 - present

- Tuned customized calibration on Realsense D430 to get point cloud data for dermatological tissue samples 15cm away from the camera
- Operated iterative optimization of bidirectional blob matching and thin plate spline warping for 2D non-rigid registration on images of tissue with artificial pigment markers
- Fusing 2D non-rigid registration with 3D point cloud to construct a deformation model of tissue before and after slicing and cryostat freezing

### Biorobotics Lab, CMU

MRSD project (Advisor: Prof. Howie Choset)

Pittsburgh, PA

Sept 2019 - Present

- Designed a stiffness-based automatic tumor localization system for minimally invasive surgery on da Vinci Surgical System
- Used PCA and FFT for liver motion estimation, processed point cloud from depth camera and laser sensor to get organ surface information
- Developed customized dVRK robot control code with limited workspace and wrist constraints
- Merged motion compensation with robot control to avoid collisions during robot surgery
- Designed an intelligent palpation planner based on history stiffness feedbacks, successfully achieved 100% recall on tumor identification and only 1.69% of healthy tissue misclassification within 5min 27s

### ENB CTO Innovation Labs, Cisco

Research Intern

San Jose, CA

Sept 2018 - July 2019

- Implemented an ios phone SDK to get phone IMU sensor data and location estimation from Access Point(AP) signals while ensuring user information security based on access control
- Developed novel fusion algorithms to combine AP data with phone IMU data to do path-matching for Connected Mobile Experiences (CMX) Indoor Location, improved indoor localization accuracy
- Set up hardware chips, simulation environment and light-weighted real-time data pipelines to get TB magnitudes of data on physical layer of wireless data transmission
- Designed a deep learning model deepPHY, to surpass Bit and Package Error Rate(BER & PER) of 802.11ax PHY baseline from traditional channel estimation methods, especially on low SNR cases

### James Carter PIC Lab, UCLA

Research Assistant (Advisor: Prof. Andrea Bertozzi) | CSST Research Program

Los Angeles, CA

June 2018 - Sept 2018

- Optimized feature extraction and change point detection based on video motion on LAPD body-worn camera videos
- Introduced Uncertainty Quantification for graph-based semi-supervised multi-class classification problems, designed a human-in-the-loop system to improve classification accuracy

### Mathematical Intelligence Application Lab, Renmin University

Research Assistant (Advisor: Prof. Xinqi Gong)

Beijing, China

Feb 2017 - Dec 2017

- Applied cluster analysis and neural networks to hot spot prediction of multimeric protein binding site

## ACADEMIC EXPERIENCE

### Multimodal Graph-structured Trajectory Prediction based on Spatio-temporal Attention Mechanism

Carnegie Mellon | Fall 2020

- Explored Trajectron++ model on NuScenes autonomous vehicle trajectory prediction task, proposed improvements by fusing Lidar data, LaneGCN and Spatial-temporal attention Mechanism

### RLBench Simulation for Autonomous Bin Picking

Carnegie Mellon | Spring 2020

- Implemented a state-machine for both forward and resetting process of moving objects between containers for bin picking. Used GQCNN for optimal grasping pose prediction, and RRT for trajectory planning.

### Arduino Car Based Auto Tracking & Guidance System for The Blind

Renmin University | Fall 2017

- Build a small Arduino car with functionality of voice control, obstacle avoidance and path tracking using real-time video processing, voice recognition and stereo system

## PUBLICATIONS

Yiling Qiao, **Chang Shi**, Chenjian Wang, Hao Li, Matt Haberland, Xiyang Luo, Andrew M. Stuart and Andrea L. Bertozzi, "Uncertainty quantification for semi-supervised multi-class classification in image processing and ego-motion analysis of body-worn videos", Electronic Imaging, 2019.

**Chang Shi**, Dustin P DeMeo, Emma L. Larson, John M. Galeotti, Bryan T. Carroll, Non-rigid cutaneous tissue deformation estimation with iterative RANSAC and TPS from digital images over semi-ambiguous artificial markings. Computer Assisted Radiology and Surgery (CARS), 2021.

## SKILLS

- **Programming Languages:** Proficient - Python, C/C++, MATLAB; Intermediate - Javascript; Basic - Shell, Scala
- **Frameworks& Libraries:** Proficient - PyTorch, Keras, OpenCV, ROS; Intermediate - TensorFlow, Scikit-Learn
- **Others& Tools:** Docker, Git, Scrapy, Django, Arduino, Raspberry Pi