Chang Shi

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Education

Carnegie Mellon University — Pittsburgh, PA
Master of Robotics System Development | GPA: 3.97/4.33 — *May 2021*

Selected Coursework: Probabilistic Graphical Models; Medical Image Analysis; Deep RL; Multimodal ML; Robot Autonomy; Manipulation & Control

Renmin University of China — Beijing, China
Bachelor of Engineering in Computer Science | GPA: 3.66/4.0 | Major GPA: 3.79/4.0, top 10% — *June 2019*

Selected Coursework: Computer Vision; Computer Graphics; Electrotechnics and Circuit; Algo. Design and Analysis; Game Theory; Bayesian Statistics

Research Experience

Biomedical Image Guidance Lab, CMU — Pittsburgh, PA
Research Assistant (Advisor: Prof. John Galeotti) — *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 — Pittsburgh, PA
MRSD project (Advisor: Prof. Howie Choset) — *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 — San Jose, CA
Research Intern — *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 — Los Angeles, CA
Research Assistant (Advisor: Prof. Andrea Bertozzi) | CSST Research Program — *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 — Beijing, China
Research Assistant (Advisor: Prof. Xinqi Gong) — *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|Spring 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. (Submitted to 2021 Computer Assisted Radiology and Surgery(CARS))

Awards

- Meritorious Winner in Mathematical Contest in Modeling, COMAP, Apr 2017
- 1st Prize in National Mathematical Modeling Contest, China Capital Areas, Oct 2017

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