YuChung Lee (Paul)

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Education

University of Illinois Urbana-Champaign *Jan 2023 – Present*
Master of Computer Science (Data Science) GPA: 4.0/4.0 *Urbana, IL, USA (Online)*

University of Hong Kong *Sep 2014 – Aug 2019*
Bachelor of Engineering (Electrical Engineering, Minor in Computer Science) *Hong Kong*
Second Class Honors (Upper Division)

Work Experience

Cornerstone Robotics Limited *April 2022 - Dec 2024*
Software Engineer (Robotics)

- Core developer of the new advanced single-port surgical robot and co-authored multiple core patents
- Designed and developed the robot software architecture, robotics control, and robot behavior; Scopes including system integration, kinematics, teleoperation, virtual fixture, haptics, user interaction, and 3D graphics
- Implemented customized kinematics toolbox in **modern C++** specialized for surgical robots with improved design patterns, code quality, and numerical computation performance

Multi-Scale Medical Robotics Center *Oct 2021 – Mar 2022*
Research Assistant

- Developed an articulated drilling robot's software and control framework with admittance control for various bone surgeries using optimization-based approaches; Co-authored two peer-reviewed publications [Video]

Precision Robotics Limited *July 2019 – Sep 2021*
Software Engineer

- Developed the first-gen software for the robotics 3D flexible endoscope and single-port surgical systems. The SIRIUS endoscope system won the 2021 Red Dot Design Award and 2021 Geneva Inventions Gold Medal

Publications

1. Y. Wang*, S. Chen*, **YC. Lee**, H. Zheng, Russell H Taylor, KW. Samuel Au, "A Cooperative Robotic Steerable Drilling System With Dual Force/Torque Sensors and a Quadratic-Programming-Based Control Framework," Transactions on Mechatronics (Under Review). *Equal Authorship Contribution
2. Y. Wang, H. Zheng, **YC. Lee**, Catherine PL. Chan, Jason YK. Chan, Russell H Taylor, KW. Samuel Au, "A Shared-Control Dexterous Robotic System for Assisting Transoral Mandibular Fracture Reduction: Development and Cadaver Study," IROS 2023. [Link]

Patents

Six co-authored China patents were filed with topics on surgical robot software, control methods, haptics, and user interaction methods

1. **YC. Lee**, Z. Wang, "Robot System, Control Method and Medium Thereof", China Patent, Application No. CN202411053910.6, filed Aug 2024.
2. **YC. Lee**, Z. Wang, "Robot System, Operation Mode Switching Method of Robot System, and Storage Medium", China Patent, Application No. CN202411062641.X, filed Aug 2024.
3. **YC. Lee**, HC. Kwok, Y. Wang, "Joint Motion Method of Surgical Robot System Layout", China Patent, Application No. CN202411589206.2, filed Nov 2024.
4. SW. Yao, **YC. Lee**, et al., "Surgical Robot System and Its Control Method", China Patent, Application No. CN202411855159.1, filed Dec 2024.
5. KW. Ng, **YC. Lee**, et al., "Surgical Robot System and Its Control Method", China Patent, Application No. CN202411863796.3, filed Dec 2024.
6. **YC. Lee**, Z. Wang, "Surgical Tool Installation Method, Surgical Robot System and Related Devices", China Patent, Application No. CN202411923602.4, filed Dec 2024.

Other Engineering Experience

UIUC MCS Coursework *2023 - 2024*

- NLP Course Project: Impact of Modeling Methods and Pre-training Tasks on Transformer-based Language Models [Report]
- Deep Learning for Healthcare Reproducibility Project: Graph Convolution Transformer on Electronic Health Record [Report][Code][Video]
- Statistical Learning Course Projects: Ames Housing Price Prediction (Ridge Regression, XGBoost), Walmart Store Sales Forecasting (SVD, OLS), Movie Review Sentiment Analysis (BERT, word embeddings), Movie Recommender (Item-Based Collaborative Filtering)
- Technologies: **PyTorch**, Transformer Network, CNN, PyHealth, Scikit-learn

Visual-based autonomous robotics arm grasping by deep learning *2018 - 2019*

Final Year Project

- Setup the physics simulation environment in PyBullet with training tasks and conducted sim-to-real training
- Trained pick and place action using reinforcement learning and CNN for object segmentation

HKU M2 Robocon Studio, Team Leader and Software Team Lead *2016 - 2019*

2019 Autonomous Driving Quadruped Robot [Video]

- Led both team Sapientia and Virtus for 2019 Contest with 20+ engineering students from various functional teams, including mechanical design, embedded system, software and control team
- Led team Sapientia won the 1st runner-up in the 2019 Hong Kong Contest
- Programmed and designed an 8DOF quadruped robot, including kinematics, gait trajectory design, actuators, and sensory system integration

Skills

Programming Languages: C++, C, Python, SQL, MATLAB, Simulink, QML, LaTeX

Software: ROS, Linux, Git, CI/CD, Real-Time System, Embedded System, MySQL, MongoDB, MapReduce

Libraries: C++ (DDS, Eigen, Pinocchio, OSQP, Qt), Python (PyTorch, Pandas, scikit-learn)

Communication Protocol: ROS, DDS, TCP/IP, UDP, CAN, EtherCAT, Serial (UART, I2C, SPI)

CS Coursework: Deep Learning, Statistical Learning, Natural Language Processing, Scientific Visualization, Cloud Computing, Database System, Operating Systems, Algorithms, Computer Vision

EE Coursework: Robotics, Control Systems, Numerical Methods, Optimization, Embedded Systems, Analog & Digital Circuit Design, Power Electronics, Electric System (Electric Motors, Vehicle, Railway)

Languages: English, Chinese (Cantonese, Mandarin)