Alexander Kyu

Software Tinkerer, Generative-AI Enthusiast, HCI Researcher and Designer

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PROFESSIONAL/TECHNICAL EXPERIENCES

Researcher and Software Consultant at CMU *Jan 2023 – Present*

- Evaluated past literature in the field of sensing for Hand-Pose Estimation, state-estimation filters, and biomechanical modelling.
- Designed ground-truth data acquisition systems for multiple projects using Vicon motion capture and computer vision algorithms.
- Programmed and Implemented end-to-end ML pipelines from user-study design, data acquisition, augmentation, and ML model development.
- Implemented and Evaluated edge computing capabilities for embedded implementations of ML models for hand-pose estimation.
- Evaluated quantitative improvements of state-estimation filters and biomechanical modelling on pose estimation systems.
- Bloomberg UX Engineer Consultant for software UX research and design.

Software Engineer at Intuitive Surgical *Jan – Dec 2020, May – Aug 2022*

- Designed and Improved automated testing efforts for System Tests using Pytest and PyQT frameworks.
- Integrated and programmed real-time robotic kinematic data into internal development tools for 3D system visualization using ReactJS.
- Integrated Snowflake DB real-world (anonymized) surgical robotics data to improve the accuracy of simulated surgical testing.
- Executed software protocols to ensure the quality of ISI's robotics for FDA regulatory approval.

Product Development Engineer at Asensus Surgical *May – Aug 2021*

- Designed and evaluated adapters to create compatibility between third-party endoscopes and the Senhance surgical robot.
- Designed and evaluated surgical robotic fixtures using SOLIDWORKS.
- Evaluated various ergonomics to improve the design of the surgeon interface.
- Developed several test verification protocols for sterile drape compatibility.
- Upgraded surgeon simulators to increase compatibility between the simulator and updated software on newer surgical systems.

PROJECTS

EITPose: Wearable and Practical EIT for Continuous Hand Pose Estimation

- Designed end-to-end ML pipeline for hand-pose estimation using Electrical Impedance Tomography (EIT), an indirect sensing modality.
- Collaborated with MIT HCIE Lab to improve open-source EIT-kit (electrical impedance tomography) capabilities.
- Submitted short-paper to CHI'24 proceedings.

IMU-to-Terrain Classification Neural Network

- Visualized and augmented raw IMU data from a participant's leg to improve signal characteristics.
- Designed, Implemented, and Evaluated several neural network architectures (Linear, RNNs, CNNs) to predict terrain that the user walked on based on IMU data.

Comparison of Methods for Estimating Lower-limb Joint Kinematics with Inertial Measurement Units: A Case Study of Sit-to-Stand

- Designed user study to collect lower-limb kinematics data for sit-to-stand motion using XSens IMUs and Vicon optical motion capture systems.
- Compared performance of various state-estimation filters applied to IMU data with optical motion tracking for lower-limb joint kinematics.
- Compared performance increase of biomechanical modelling using OpenSense with unconstrained IMU joint kinematics estimation.

EDUCATION

Carnegie Mellon University
School of Computer Science
Master of Human-Computer Interaction
Aug 2022 – Aug 2023
GPA 4.0/4.0
Pittsburgh, PA

North Carolina State University and **University of North Carolina at Chapel Hill**
College of Engineering
B.S. in Biomedical Engineering
Minor in Computer Science
Aug 2017 – May 2022
GPA 4.0/4.0
Raleigh, NC

Zhejiang University
Study Abroad – China: Engineering, STS, and International Studies
Summer 2018
Hangzhou, China

KEY SKILLS

- Programming languages: Python, Java, MATLAB, C, C++, C#, Unity, ReactJS
- ML frameworks: Tensorflow, Keras
- Embedded deep learning using edge TPUs like Google's Coral TPU
- Experience with RESTful APIs and database management with both NoSQL and SQL DBs.
- V&V product and systems testing
- Experience working with GitHub, SVN, and Bitbucket repositories
- Experience with quality management systems: Agile, MKS Integrity, Arena, and Jama
- PCB design with Altium and EAGLE CAD
- Mechanical design and 3D printing with SOLIDWORKS
- Frontend design with Figma and Adobe CC

RELEVANT COURSEWORK

- Neural Networks
- Computer Vision
- Machine Learning and Sensing
- Biomedical Signal Processing
- Data Structures and Algorithms
- C and Software Tools
- Operating Systems
- Programmable User Interfaces
- Wearable Health Technologies
- SmaSH Lab Independent Study
- User-Centered Research and Evaluation
- Bioinstrumentation
- Biocontrols
- Rehabilitation Robotics
- Human Physiology for Engineers