Haoyu (Marco) LIU

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EDUCATION

The Chinese University of Hong Kong, CUHK **Hong Kong SAR**
*Bachelor of Science in **Computer Science*** *Sep. 2019 - May 2023*

- CGPA: **3.793/4.0**, Major GPA: **3.872/4.0**, Dean's List of Faculty of Engineering in 2020/21, 2019/20
- Engineering Leadership, Innovation, Technology and Entrepreneurship (ELITE) Stream
- Courses: Fundamentals of AI, Intro to OS, Intro to Python, Design & Analysis of Algorithms, Data Structures, Principles of Computer Graphics (ongoing), Techniques for Data Mining (graduate course, ongoing)

The University of Melbourne **Melbourne, Australia**
Term-time Exchange Student *Feb. 2022 – June 2022*

- Weighted Average Mark: **82.25/100 (3.825/4.0)**
- Courses: Machine Learning, AI Planning for Autonomy (graduate course), Web Information Technologies

HONORS & AWARDS

Outstanding Academic Performance Award, **Top 4%**, HKD 10,000, Department of CSE, CUHK July 2022
Dr Ng Tat-Lun Memorial Scholarship, Top 15%, HKD 10,000, CW Chu College, CUHK July 2022
Reaching Out Award, HKD 10,000, Secretary for Education, HKSAR Government Mar. 2022
ELITE Stream Scholarship, HKD 16,000 (per year), Faculty of Engineering, CUHK Oct. 2021 & Oct. 2020
Yasumoto International Exchange Scholarship, Office of Academic Links, CUHK Aug. 2021
Talent Development Scholarship, HKD 10,000, Secretary for Education, HKSAR Government June 2021
The Hong Kong, China-APEC Scholarship, Secretary for Education, HKSAR Government June 2021
Liao Yuan Tung Memorial Scholarship, Top 15%, HKD 10,000, CW Chu College, CUHK June 2021
Zhiyuan Scholarship, RMB 200,000 (50,000 per year), China Soong Ching Ling Foundation Nov. 2019

PAPER IN PROGRESS

Xuebin Sun, Jingxin Du, **Haoyu Liu**, Danny Siu Chun Ng, and Shing Shin Cheng, *Cataract Surgical Instruments Segmentation Free of Motion Blur Influence* (Under review)

RESEARCH & CAPSTONE

Video Analysis and Computer Vision for AI Interview System **Hong Kong**
Graduation Thesis | *Supervisor: Professor Irwin King, CUHK* *Sep. 2022 – Present*

- Built a video processing and analysis module into an AI interview system for CUHK that provides AI assessments of interviewees in terms of their facial/body behaviors, sentiments, tone of voice, and contents
- Designed the architecture and workflow of the video module and integrated it into the system pipeline
- Conducted face detection, recognition, and analysis using Microsoft Azure and different Python libraries/frameworks such as MediaPipe and FER, and subsequently processed and analyzed the raw data to obtain higher-level information
- Designed video behavior evaluation criteria and implemented AI assessments in five domains (head, eyes, accessories, facial expressions, and hands/body)
- Established rubrics for AI comments based on module testing results for real-world interview videos
- Collaborated with back-end and front-end to ensure compatibility of the module with system requirements

Deep Learning-Based Time Series Analysis and Forecasting **Hong Kong**
Summer Research Intern & Paid Term-time Student Helper | *Supervisor: Professor Qiang Xu, CUHK* *May 2022 – Oct. 2022*

- Built a large-scale repository for time-series analysis and forecasting on GitHub, including different state-of-the-art deep learning models (https://github.com/VEWOXIC/REPO_skeleton)
- Collaborated on creating a systematic pipeline to utilize and evaluate time series prediction models, implementing unified data preprocessing procedures, model instantiation interfaces, and standardized evaluation procedures
- Reproduced and implemented various spatio-temporal traffic prediction models and dataset loaders; modified the models to be compatible with repository interfaces, configurable, and adaptable to different datasets and tasks
- Implemented model evaluations and comparisons to ensure the characteristics and the original results of the models are well preserved

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Simultaneously Deblurring and Segmentation for Cataract Surgical Instruments **Hong Kong**

Summer Research Intern | *Supervisor: Assistant Professor Shing Shin Cheng,* *June 2021 – Sep. 2021*

Surgical Robotics and Instrumentation Lab, CUHK

- Worked on a spatio-temporal information-based network for cataract surgical instrument segmentation, consisting of a deblurring module and a subsequent segmentation module, with PyTorch and TensorFlow frameworks
- Improved the performance of the segmentation network by incorporating leading-edge deep learning modules
- Designed and conducted experiments on model evaluation and comparison, successfully proved the strength of the network under different special scenarios
- Designed and constructed a cataract surgical instrument dataset for integrating both deblurring and segmentation procedures to demonstrate the holistic novelty of the network
- Investigated the background and current state of research in the field of surgical skill assessment, proposed the motivation and the future research directions for the project

SELECTED PROJECTS

Yinsh Game AI Agent *April 2022 – May 2022*

Course: AI Planning for Autonomy (graduate course)

- Implemented an autonomous agent that can play and compete in a tournament for the game Yinsh
- Applied various AI techniques, including Monte Carlo Tree Search, Alpha-beta Pruning Minimax, A Star, and Greedy BFS
- Designed heuristic functions and reward shaping on nodes expansion to enhance the performance of the agent
- Analyzed design decisions, strengths and weaknesses of different techniques, challenges, and improvements

Diabetes-Home: A Diabetes Management Web Application *March 2022 – May 2022*

Course: Web Information Technologies

- Participated in building a web application that allows diabetes patients to record health data, contact clinicians, and enable clinicians to monitor patients' data and take notes (https://diabetehome-team-nicola.herokuapp.com/)
- Worked on the front end, designed the UX/UI prototype of the web app, and made a clickable prototype using Adobe XD
- Built the back end of the website using Node.js, Express, Handlebars, JavaScript, and managed the data using MongoDB Atlas and Mongoose, and deployed the website on Heroku

Twitter Sentiment Prediction *April 2022 – May 2022*

Course: Machine Learning

- Developed a Twitter sentiment classifier based on the given dataset
- Implemented different machine learning methods, including Naïve Bayes, Logistic Regression, SVM, and Stacking Model, compared and analyzed their performances, advantages, and limitations on this task
- Implemented different data preprocessing techniques (e.g., stop-words removal, tweet tokenization, stemming, and lemmatization), feature extractors (e.g., Bag-of-Words, TFIDF, unigrams, and bigrams), and evaluation metrics; analyzed the critical factors and reasons for improving model performance
- Ranked 8th out of 343 groups in the Kaggle prediction competition of the course

Checkers AI Player Program *Nov. 2019*

Course: Problem Solving by Programming

- Developed a checkers program in C language that supports both human-human players mode and human-AI players mode
- Implemented the Alpha-beta pruning algorithm to allow AI players to execute the best strategy in 5 seconds via lab PC
- Ranked 2nd out of 45 students in the AI player tournament of the course.

SKILLS

Programming Languages: Python, C/C++, Java, HTML/CSS, JavaScript, PDDL

Platforms & Toolkits:

Machine Learning: TensorFlow, PyTorch, Anaconda, Docker, Scikit-Learn, Pandas

Cloud Computing: Microsoft Azure

Web Development: Adobe XD, Handlebars, Node.js/Express, MongoDB, Heroku, Netlify, Jekyll

Others: OpenGL, Linux, Git, LaTeX, Markdown, Adobe Illustrator, Premiere Pro, Photoshop

Languages: Mandarin Chinese (Native), English