MINGYUAN LI

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EDUCATION

Xi'an Jiaotong-Liverpool University *Suzhou, China*   Sept/2021-Jul/2025

Major: Information and Computing Science (Bachelor of Science) **WES GPA**: 3.77/4.0 | **Major GPA**: 3.82/4.0

Won the Excellent Poster Prize and School Winner in SURF 2024 ***Top 5%***	Oct/2024
Won the Global Impact Grants 2023-24 (**£1000**) from Advance HE ***Top 15***	May/2024
Won the 3rd Prize (**3000RMB**) in the IEEE CyberC 2023 Data Analysis Competition ***Top 3***	Nov/2023
Won the 2nd Award (**1000RMB**) at the 2023 XJTLU Student Research-Oriented Learning Summit	Nov/2023
Won the Honorable Mention for MCM/ICM ***Top 21%***	May/2023

PUBLICATIONS

Mingyuan Li; Duan Wang; Erick Purwanto; Thomas Selig; Qing Zhang; Hai-Ning Liang, *VisualCodeMOOC: A Course Platform for Algorithms and Data Structures Integrating a Conversational Agent for Enhanced Learning Through Dynamic Visualizations,* Submitted to *SoftwareX (IF: 2.8)* [Under Review: Nov. 2024]

Erick Purwanto; Na Li; Qing Zhang; Thomas Selig; Yihong Wang; Teng Ma; Filbert Juwono; Pengfei Fan, (student member) **Mingyuan Li** and Duan Wang, *Chatbot-Powered Learning for Sustainable Education in Programming*, advance-he.ac.uk/knowledge-hub/global-impact-grants-2024-education-sustainable-development-and-building-future

Mingyuan Li; Yichuan Wang; Junfeng Huang; Erick Purwanto; Ka Lok Man, *Patch-Based Multi-Level Attention Mechanism for Few-Shot Multi-Label Medical Image Classification*, Published in *The 15th International Conference on Cyber-Enabled Distributed Computing and Knowledge Discovery*, 2023, pp. 84-91, doi: 10.1109/CyberC58899.2023.00024

Doyeon Kim; Xujia Ning; Kaicheng Liang; Yi Ni; Duan Wang; **Mingyuan Li**; Yichuan Wang; Erick Purwanto; Ka Lok Man, *Cervical Spine Fracture Detection Through Two-Stage Approach of Mask Segmentation and Windowing Based on Convolutional Neural Network,* Published in *International Conference on Platform Technology and Service (PlatCon)*, 2023, pp. 1-6, doi: 10.1109/PlatCon60102.2023.10255157

RESEARCH EXPERIENCES

GenAI-Powered ChatBot in Programming and Algorithm Education   Sept/2023-Dec/2024

Supervisor: Dr. Erick Purwanto; Dr. Yihong Wang; Dr. Thomas Selig; Research Assistant (Team of Two)

Phase 1: Created a programming tutor bot based on open-source projects for programming and algorithm

- Utilized Prompt Engineering to call OpenAI APIs, creating an educational chatbot with eight different topics.
- Implemented Chain of Thought and Moderation designed language interaction pipeline, customized for beginners.
- Test our bot with an Indonesian student across four topics with two languages, achieving a 91% effectiveness rate, demonstrating its pedagogical value and multilingual capabilities.

Phase 2: Developed algorithm visualization modules based on bot responses to aid teaching.

- Created seven algorithm visualizations using d3.node, including for loops and array sorting lessons.
- Refactored the backend logic of a React-based TypeScript project to synchronize bot responses with dynamic visualizations, leading to the development of VisualCodeChat, a teaching-focused chatbot platform.
- Developed a pilot MOOC with VisualCodeChat and further integrated our chatbot into an existing mature platform to create VisualCodeMOOC.
- Conducted 2 controlled experiments consecutively with 16 preA high school students and 88 non-programming background students from the CPT206 course. Reliable questionnaire results (Cronbach's alpha: 0.891) and a high average score of 4.18, supported by qualitative coding, demonstrate our bot met all evaluation criteria.

Phase 3: Researched the effectiveness of our design compared to standard GPT in teaching graph algorithms.

- Iterated three graph algorithm visualizations using d3. force, including DFS-based cycle and connectivity checks, and BFS-based connected components check; added data recording and user-friendly guidance modules.
- Conducted 8 controlled experiments to verify its effectiveness: experiments involved 330 students from the CPT204 course; one group used our bot, while the other group used AI-based tool on the original GPT. Ours outperforms ChatGPT across all dimensions, with T-test p-values below 0.05, confirming statistically significant improvements in usability, effectiveness, and engagement.
- (In progress) Authoring a manuscript for *BJET (IF: 6.7)*, with an anticipated abstract submission by the 1st Jan. 2025.
- (In progress) Iterating VisualCodeChat to version 2.0, incorporating multimodal capabilities for experimental validation in multimodal-powered education.
- (In progress) Evaluating code quality and algorithm visualization quality of GPT-4o-powered VisualCodeChat 2.0.

- (In progress) Conducting 10 experiments, demonstrating its effectiveness in producing satisfactory code quality, effective algorithm visualization, and valid multimodal-powered test case education.
- (In progress) Authoring a manuscript for *IEEE TSE (IF: 7.4)*, with an anticipated submission by the end of 2024.

IEEE CyberC 2023 Data Analysis Competition   Sept-Oct/2023

Supervisor: Dr. Erick Purwanto; Team leader and presenter in a team of three
- Simulated a stock market environment by utilizing the data of 30 major stocks in 2018-2021 and implementing deep reinforcement learning with the Soft Actor-Critic algorithm.
- Achieved a 1.27 times cumulative return on an initial capital of 1 mil in the 2022-2023 stock market, 3rd place winner.

Few-Shot Multi-Label Medical Image Classification Research   Jul-Sept/2023

Supervisor: Dr. Erick Purwanto; Research Fellow
- Trained a few-shot classification model using the VPT with a backbone of Swin-transformer.
- Evaluated robustness using 3 datasets: ChestDR (chest X-ray), Endo (genuine colonoscopy), and Colon (colon cells).
- Developed multi-level attention patch-based preprocessing technique for the model, enhancing the model's ability to detect minute details, e.g., overlapping information.
- Improved mAP (1.2%-1.7%) and AUC (4.1%-5.2%) on two datasets (ChestDR, and Endo), compared to the baseline.

Replication and Improvement of the Cervical Spine Fracture Detection Research   Jun-Jul/2023

Supervisor: Dr. Erick Purwanto; Research Fellow
- Implemented advanced pre-processing techniques, e.g., windowing, image cropping with Yolov5, and voxel clipping, to enhance image quality and prepare data for analysis.
- Developed a two-stage approach for cervical spine CT scan analysis, achieving a combined accuracy of 94.9%, and a BCE logits coefficient of 0.20 ± 0.01.
- Utilized UNet-EfficientNet in Stage 1 for precise CT image segmentation, attaining an accuracy of 99.91%.
- Applied CrackNet-LSTM in Stage 2 for accurate cervical spine fracture detection, achieving an accuracy of 94.9%.

COURSEWORK, PRESENTATION AND SEMINAR

Presented SURF research results: VisualCodeChat: Dynamic Programming Tutor with Visual and Personalized Feedback in 2024 SURF Poster Fair	Oct/2024
Presented AI Chatbots for Learning Computer Programming (AI-based ChatBot in Programming Education research project) by Dr. Thomas Selig	May/2024
Presented AI-based ChatBot in Programming Education project at EdVenture: Exploring Innovative Practices in Higher Education by Dr. Thomas Selig	May/2024
Introduction to Computer Networking: Developed a client application for user authorization and file transfer using Python Sockets; simulated SDN network traffic control with Mininet.	Oct-Dec/2023
Software Engineering Group Project: Led an 8-member team to develop a sports center booking system based on the MVC, completing full-stack development of two admin modules.	Mar-May/2024
Human-Centric Computing: Collaborated on requirement analysis, design, prototyping, and evaluation in a team, leading to a presentation, report, poster, and an Honorable Mention (1 of 8).	Mar-May/2024
Advanced OO Programming: Developed a BFS-based multi-agent pathfinding game with a graphical interface, demonstrating algorithm superiority through interactive validation.	Mar-May/2024

INTERNSHIP

Guangzhou Hehui Technology Co. *Java Software Engineer Intern*   Mar-Jun/2023

Supervisor: Xiaolan Zhou
- Contributed to the development of a pharmaceutical ordering system.
- Optimized the code structure with a low coupling design principle to ensure maintainability and scalability.
- Effectively managed MySQL databases, and designed database structures that adhere to the Third Normal Form.

EXTRACURRICULAR ACTIVITIES

Audiovisual Media Analysis Discussion Group*; 3h/w*   May-Oct/2022
- Performed frame-by-frame analysis of diverse screen medias, and illustrated cinematic language, lighting and color design, narrative structure, etc., to the public.

PROFESSIONAL SKILLS

Programming Languages: Python (2yrs+), Java (3yrs+), MySQL (3yrs+), C++ (1yr+), TypeScript (1yr+), LaTeX

Developer Tools: VS Code (3yrs+), IntelliJ IDEA (3yrs+), PyCharm (3yrs+), Google Colab (2yrs+)

Framework: React (1yr+), Next.js(1yr+), Spring Boot (1yr+)

Library: MMCV, OpenCV, PyCOCO, ultralytics, PyTorch, scikit-learn, D3.js