Houhao Liang

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SUMMARY

Highly motivated and detail-oriented data science professional with a Ph.D. in Civil Engineering and a focus on Machine Learning and Vision-based techniques for Building and Infrastructure Condition and Operations Management. Strong foundation in math and statistics, and completed coursework in machine learning, neural networks, data mining, and computer vision. Experience in creating AI solutions for construction management enabled me to understand complex industry problems and translate research to practical applications, with the ability to bridge the gap between academic theory and practical implementation.

EDUCATION

National University of Singapore (Singapore)   Aug. 2019 – Expected Dec. 2023

Ph.D. Candidate in Construction Management

- Ph.D. thesis on "Unmanned Ground Vehicle-Driven Indoor Monitoring: Enhancing Routine Data Acquisition And On-Site Deployment", programming a ground robot as a decision tool to intelligently track the construction progress
- Implemented a learning-based method to detect and remove transit construction objects from video frames, resulting in a more robust navigation map for UGV in the construction industry and increased data acquisition efficiency
- Developed a deep learning-based method to semantically segment building objects at the point level leveraging a 2D-3D fusing approach. Increased the 3D point cloud segmentation accuracy by up to 20%
- Proposed a perspective alignment method for improving the localization accuracy of UGV by matching cross modality images, resulting in reduced angle and distance errors and enhanced confidence in progress inference
- Dynamically optimized image acquisition tasks using Genetic Algorithm, given the specific goals and timepoints, for efficient on-site implementation of UGV and avoiding the collection of redundant data
- Presented research results and insights at local and international scientific meetings

University of Illinois at Urbana-Champaign (USA)   Aug. 2017 – May. 2019

M.S. in Construction Management

- Research study on "Visual Sensing for Civil Infrastructures", conducting learning-based image data analysis to automatically recognize construction activities and quantify the project progress
- Created an extensive image dataset related to construction activities, with the intention of analytic and prediction
- Relevant Coursework: Machine Learning; Data Mining; Computer Vision; Virtual Design and Construction
- Overall GPA: 3.78/4.0

Central South University (China)   Sep. 2014 – Jun. 2018

B.S. in Civil Engineering

- Relevant Coursework: Fundamental of Computer Science; Construction Economics; Project Management
- Overall GPA: 88.72/100, Rank: 34/497 (Top 7%)

PROFESSIONAL EXPERIENCE

Intern, China Construction Fifth Engineering Division Corp, China   Apr. 2017 – Jun. 2017

- Investigated the methods of collecting project progress data and participated in the weekly monitoring
- Consolidated and produced reports for staff to be used for project delay analysis and control improvement

TEACHING AND SUPERVISORY EXPERIENCE

Teaching Assistant, National University of Singapore   Aug. 2019 – Dec. 2022

- Teaching assistant for NUS undergraduate courses ranging in size from 30-150 students. Courses included: Computer Applications in Civil Engineering, Construction Project Management, Principles & Practice in Infrastructure and Environment
- Prepared course material including tutorials, practice problems, and course projects
- Led weekly tutorial and/or problem-solving and discussion sections for groups of 15-30 students

Advisor, National University of Singapore   Jan. 2021 – Dec. 2021
- Co-supervised two final-year undergraduate research students in developing a simulated Gazebo platform to monitor construction progress, and automated data filtering for façade defect inspection. Provided guidance on literature survey, experimental techniques, thesis writing, and edited drafts
- Coached 5 undergraduates and 1 master student, convened monthly meetings to track research progress, and advised students' transitions into consulting, and Ph.D. program

TECHNICAL SKILLS AND LANGUAGES

- Computer Skills: Python, MATLAB, C++, Primavera
- Language: Mandarin, English

SELECTED PUBLICATIONS

1. Houhao Liang, Justin K.W. Yeoh

   Accurate matching between BIM-rendered and real-world images. *Proceedings of the 1st Future of Construction Workshop at the International Conference on Robotics and Automation (ICRA 2022).* DOI: 10.22260/icra2022/0009

2. Houhao Liang, Justin K.W. Yeoh, David K.H. Chua

   Progress-Oriented Waypoint Sampling for Unmanned Ground Vehicle Mission Planning. *Proceedings of the 22nd International Conference on Construction Applications of Virtual Reality (CONVR2022)*

3. Houhao Liang, Justin K.W. Yeoh, David K.H. Chua

   UGV Perspective Alignment in BIM Through Sequential Registration in Indoor Environments. *Automation in Construction.* (Under Revision)

4. Houhao Liang, Justin K.W. Yeoh, David K.H. Chua

   Material augmented semantic segmentation of point clouds. *Computer-aided Civin and Infrastructure Engineering.* (Under Review)

AWARDS AND SCHOLARSHIPS

- National University of Singapore Research Scholarship   2019 – Present
- Dean's List, Central South University   2018
- Central South University Scholarship   2014 – 2017

PROFESSIONAL MEMBERSHIP

- Reviewer, ASCE Journal of Construction Engineering and Management   2023 – Present
- Reviewer, ASCE Journal of Computing in Civil Engineering   2023 – Present
- Student Member, American Society of Civil Engineers (ASCE)   2017 – Present
- BIM Modeller, China Graphics Society   2017 – Present
- General Associate, Leadership in Energy and Environmental Design (LEED)   2019 – 2021