Minghan Wei

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Education

University of Minnesota, Twin Cities, USA **08/2016 - 01/2022**
- Ph.D. in Computer Science; GPA: 3.85/4.00
- Advisor: Prof. Volkan Isler
- Thesis: Energy Mapping and Energy-aware Path Planning for Field Robots

Australian National University, Australia **07/2014 - 12/2014**
- Exchange program, Computer Science

Nanjing University of Science and Technology **09/2012 - 07/2016**
- Bachelor of Engineering in Computer Science; GPA**:** 3.79/4.0

Professional Experience

Florida Atlantic University **08/2023 - Present**
Assistant Professor *Boca Raton, FL*
- Research interests
  - Robotics perception, mapping, planning, and control
  - Geometric optimization in robotics applications
  - Autonomous robots for precision agriculture and environmental monitoring

Google LLC **06/2022 - 06/2023**
Software Engineer *Mountain View, CA*
- Developed methods to improve the localization and tracking algorithms for Google's Augment Reality products.

iRobot **01/2022 - 06/2022**
Senior Robotics Software Engineer *U.S. Remote*
- Developed and implemented mapping, navigation solutions for indoor robots
- Improved the navigation efficiency of existing vacuum cleaning and mopping robots

3M Company **06/2021 - 08/2021**
Data Science intern *St Paul, MN*
- Worked in a research team to build machine learning models for predicting the future status of some chemical or biological processes

Samsung Research America Inc **06/2021 - 08/2021**
Research Intern *New York, NY*
- Implemented basic functionalities for a ground robot platform, including odometry, occupancy mapping, closed-loop navigation control.
- Conducted the research project: Occupancy map inpainting for robot online navigation
  - Used deep learning to predict the occupancy of unseen parts of a map for robot navigation
  - Tested the network prediction performance with both simulated and real data
  - Applied the prediction network to robot navigation and demonstrate shorter paths to goals
  - Published the results as an academic paper.

Publications

- C. Peng, **M. Wei**, and V. Isler, 'Stochastic Travelling Salesperson Problem with Neighborhoods for Object Detections', IEEE International Conference on Robotics and Automation (ICRA), 2023.
- **M. Wei**, and V. Isler, 'Predicting Energy Consumption of Ground Robots on General Terrains', IEEE Robotics and Automation Letters, 2021.

- **M. Wei**, D. Lee, V. Isler, and Daniel. D. Lee, 'Occupancy Map Inpainting for Online Robot Navigation', IEEE International Conference on Robotics and Automation, 2021.
- **M. Wei**, and V. Isler, 'Building Energy-Cost Maps from Aerial Images and Ground Robot Measurements with Semi-Supervised Deep Learning', IEEE Robotics and Automation Letters, 2020.
- **M. Wei**, and V. Isler, 'Energy-efficient path planning for ground robots by combining air and ground measurements', Conference on Robot Learning, 2019.
- **M. Wei**, and V. Isler, 'Air to ground collaboration for energy-efficient path planning for ground robots', IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2019.
- **M. Wei**, and V. Isler, 'A log-approximation for coverage path planning with the energy constraint', International Conference on Automated Planning and Scheduling (ICAPS), 2018.
- **M. Wei**, and V. Isler, 'Coverage path planning under the energy constraint', IEEE International Conference on Robotics and Automation, 2018

Selected Projects

Energy Mapping and Energy-aware Path Planning for Field Robots — 01/2017 – 01/2022

Ph.D. thesis topic

- Energy-aware Coverage Path Planning
  - Developed path planning algorithms for covering a given environment with the minimum energy consumption
- Energy-efficient Navigation for Ground Robots
  - Used deep-learning based methods to efficiently build energy-cost maps from aerial and ground robot measurements for large, field environments
  - Implemented the functionality for robots to autonomously navigate to goal positions energy-efficiently based on the energy-cost maps

Agricultural Weed Control Using Autonomous Mowers — 07/2018 - 01/2022

Sponsored by Minnesota LCCMR program

- Developed an autonomous robotic mower for agricultural pastures
- Developed a small-sized ground robot to navigate narrow corn rows for removing weeds
- Worked on the environment perception, planning, and navigation control
  - Designed algorithms to plan energy-efficient paths to cover the field
  - Implemented controllers to make the robots follow the planned paths and avoid obstacles
- Tested the system in pastures and corn fields

Raspberry Picking with a Robot Arm — 01/2018 - 05/2018

Course project of Sensing and Estimation in Robotics

- Implemented the controller for a manipulator to pick raspberries
  - Used visual inputs (camera) to move the gripper for picking
  - Closed the gripper for picking and use force feedback sensors to avoid damaging the fruit
- Demonstrated the results in class and submitted a project report.

Apple Diameter Estimation using RGB Images — 01/2017 - 05/2017

Course project of Computer Vision

- Develop a method to estimate the diameter of apples using a pair of close-up RGB images
  - Found the correspondence between two apple images based on epi-polar geometry
  - Estimation accuracy was within two centimeters.
- Presented the results in class and submitted a project report

Vehicle Detection Based on Smartphone-collected Images — 06/2015 - 09/2015

Robotics Institute Summer Scholar (RISS), Carnegie Mellon University

- Implemented vehicle detection and tracking algorithm for images taken by smartphones
  - The phones were mounted behind the windshield of a car.
- Published results at *RISS Working Papers Journals* and demonstrated in a poster session

Patent

- **M. Wei**, D. Lee, V. Isler, and Daniel. D. Lee, 'Method of predicting occupancy of unseen areas for path planning, associated device, and network training', US Patent App (US17/131,194) 2020. (pending)

Teaching

COP 3530: Data Structure and Algorithm Analysis **08/2023 – 12/2023**

- Role: Instructor at Florida Atlantic University

CSCI 2033: Elementary Computational Linear Algebra **08/2016 – 01/2017**

- Role: Teaching assistant at the University of Minnesota
- Led recitation sections; Lectured three times when the professor was not available; Grading
- Received the *Best TA award* of the department

Services

Reviewer for journals and conferences

- IEEE Robotics and Automation Letters (RAL)
- Journal of Field Robotics (JFR)
- Autonomous Robots
- IEEE Transactions on Automation Science and Engineering
- IEEE Transactions on Intelligent Transportation Systems
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Acoustics, Speech, and Signal Processing
- IEEE International Conference on Multimedia & Expo

Skills

- Programming Languages: C/C++, Python, Java, Matlab
- Deep-learning libraries: Keras, PyTorch
- Technical writing