NINGHAN ZHONG

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EDUCATION

B.S. in Computer Science | **University of Illinois at Urbana-Champaign**   Aug 2018 - May 2022
Graduated with the Highest Honors   GPA: 3.97 / 4.0

MASc in Electrical and Computer Engineering | **University of Waterloo**   Aug 2023 - Aug 2025
                                                                                  GPA: 87 / 100

COURSEWORK

Robot Perception & Manipulation, Machine Learning, Computer Vision, Algorithms & Data Structures

SELECTED PUBLICATIONS

- "Attentiveness Map Estimation for Haptic Teleoperation of Mobile Robot Obstacle Avoidance and Approach"
    - **Zhong, N.** and Hauser, K.
    - IEEE RA-L 2024 [paper]

- "Hierarchical Intention Tracking for Robust Human-Robot Collaboration in Industrial Assembly Tasks"
    - Huang, Z.*, Mun, Y. J.*, Li, X.[†], Xie, Y.[†], **Zhong, N.**[†], Liang, W., Geng J., Chen, T., and Driggs-Campbell, K.
    - ICRA 2023 [paper]

- "Seamless Interaction Design with Coexistence and Cooperation Modes for Robust Human-Robot Collaboration"
    - Huang, Z.*, Mun, Y. J.*, Li, X.[†], Xie, Y.[†], **Zhong, N.**[†], Liang, W., Geng, J., Chen, T., and Driggs-Campbell, K.
    - IEEE CASE 2022 [paper]

- "Creating TikToks, Memes, Accessible Content, and Books from Engineering Videos? First Solve the Scene Detection Problem"
    - Angrave, L., Li, L., and **Zhong, N.**
    - ASEE 2022 (Oral Presentation) [paper]

RESEARCH EXPERIENCE

Autonomous System Lab | Obstacle avoidance, planning under uncertainty   **Sept 2023 - Present**
Advisor: Prof. Stephen L. Smith   *Department of Electrical and Computer Engineering, UWaterloo*

- Researching learning-based path planning in dense obstacle fields considering both obstacle avoidance and collision impact minimization
- Developing a hierarchical path planner by leveraging differentiable physics and deep learning
- Preliminary study shows the current framework reduced kinetic-energy-based collision loss by 26%

Intelligent Motion Lab | Mobile robot navigation, haptic control, perception   **May 2022 - Aug 2023**
Advisor: Prof. Kris Hauser   *Department of Computer Science, UIUC*

- Presented a potential field haptic control framework for humanoid robot teleoperation
- Proposed a real-time human spatial attentiveness estimation model by uniquely combining visual saliency detection with computational working memory models to optimize haptic feedback
- Experiments showed the proposed framework reduced teleoperation task completion time by 11%, human control effort by 19%, and obstacle collisions by 16%
- Work published in IEEE RA-L 2024

Human-Centered Autonomy Lab | Human-intention predictions, perception   **Aug 2021 - May 2022**
Advisor: Prof. Katherine Driggs-Campbell   *Electrical and Computer Engineering Department, UIUC*

- Assisted with developing a robot control framework with hierarchical human-intention predictions for industrial assembly tasks
- Implemented an algorithm to localize target assembly parts in the robot workspace based on vision input from the robot wrist camera
- Work published in ICRA 2023

ClassTranscribe Development | *Machine Learning, HCI, Vision*   **Dec 2020 - Dec 2021**
Advisor: Prof. Lawrence Angrave   *Department of Computer Science, UIUC*

- Proposed a novel scene change detection model for lecture videos using a Support Vector Machine, where features are extracted and processed by a combination of Optical Character Recognition and Multi-Task Cascaded Convolutional Neural Network. The model achieves a 97% accuracy in detecting scene changes
- Researched to improve speech-to-text recognition by supplying technical keywords
- Developed a keyphrase extraction model, which greatly improves domain-specific word recognition accuracy, and increases overall speech-to-text accuracy by 9%
- Work published in ASEE 2022

INTERNSHIP

Golden Ridge Robotics | **Computer Vision & Algo. Intern** - *C++, ROS, OpenCV, PCL*   **May 2021 - Jul 2021**
- Researched and implemented an obstacle-detection model for self-driving vehicles that combines UV disparity algorithms and point cloud projection to locate all presenting obstacles and estimate their dimensions. The model achieves an accuracy of less than 30% relative error in obstacle dimension estimations and less than 12% relative error in distance estimations
- Developed a 3D obstacle and virtual fence marking program that allows users to mark obstacles and driving areas with any shape in point clouds for self-driving vehicles. The marking program can mark an area as large as 25 km^2 with a decimeter-level accuracy

HONORS

- UWaterloo International Master's Award of Excellence CAD 12,500   **Nov 2023**
- UIUC Dean's List (7 Semesters)   **Fall 2018 - Spring 2020, Spring 2021 - Spring 2022**
- James Scholars (2 Semesters)   **Fall 2021, Spring 2022**

PROFESSIONAL SKILLS

Software/Tools   ROS, Mujoco, OpenAI Gym, Rviz, OpenCV, PyTorch
Programming Languages   C++, C, Python, JavaScript, Java, C#
Web Development   Node.js, ReactJS, HTML/CSS

TEACHING EXPERIENCE

- Undergraduate Teaching/Lab Assistant   **Principles of Safe Autonomy, Spring 2022**