

# 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.<sup>†</sup>, Xie, Y.<sup>†</sup>, **Zhong, N.<sup>†</sup>**, 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.<sup>†</sup>, Xie, Y.<sup>†</sup>, **Zhong, N.<sup>†</sup>**, 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
- Developed a CNN-based classification framework to recognize the state of the localized assembly parts for the robot to carry out subsequent processing tasks
- 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<sup>2</sup> 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**