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

COURSEWORK

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

PUBLICATIONS

- "Attentiveness Map Estimation for Haptic Teleoperation of Mobile Robot Obstacle Avoidance and Approach"
  - **Ninghan Zhong** and Kris Hauser
  - Submitted to IEEE WHC 2023 [paper]

- "Hierarchical Intention Tracking for Robust Human-Robot Collaboration in Industrial Assembly Tasks"
  - Zhe Huang, Ye-Ji Mun, Xiang Li, Yiqing Xie, **Ninghan Zhong,** Weihang Liang, Junyi Geng, Tan Chen, and Katherine Driggs-Campbell
  - ICRA 2023 (to appear) [paper]

- "Seamless Interaction Design with Coexistence and Cooperation Modes for Robust Human-Robot Collaboration"
  - Zhe Huang, Ye-Ji Mun, Xiang Li, Yiqing Xie, **Ninghan Zhong,** Weihang Liang, Junyi Geng, Tan Chen, and Katherine Driggs-Campbell
  - IEEE CASE 2022 [paper]

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

RESEARCH EXPERIENCE

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

- Researching a potential field haptic control framework for humanoid robot teleoperation
- Developing 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 that the proposed framework reduced teleoperation task completion time by 7% and human control effort by 19%
- Work submitted to IEEE WHC 2023

Human-Centered Autonomy Lab | Sensor Fusion, Reinforcement Learning, Vision **May 2022 - Present**
Advisor: Prof. Katherine Driggs-Campbell *Electrical and Computer Engineering Department, UIUC*

- Researching a parameterized deep Q-learning framework for robust policy learning under multi-modal sensor observations
- Developing a Transformer-inspired learning component for the deep Q-learning framework for interpretable multi-modal sensor fusion
- Conducting a preliminary study with a baseline Parameterized Deep Q-Network in a simulated environment where the robot arm reaches for target objects using multi-modal sensors

Human-Centered Autonomy Lab | Human-Robot Interactions, Vision **Aug 2021 - Mar 2022**
Advisor: Prof. Katherine Driggs-Campbell *Electrical and Computer Engineering Department, UIUC*

- Researched to develop 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 IEEE CASE 2022
- Revised work accepted 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 video 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

Forward Data Lab | *Database Systems, Natural Language Processing, Data Mining* **Aug 2020 - Aug 2021**
Advisor: Prof. Kevin C. Chang *Department of Computer Science, UIUC*

- Conducted a user study with 9 participants and collected 127 raw data entries to observe user action characteristics under a multi-user online SQL-Excel hybrid environment
- Surveyed and studied various learning architectures (e.g. Relational Clustering, Sequential Bayesian Updating, Probabilistic Relational Model, Logistic Regression) for possible model designs
- Designed a probabilistic learning model for the DataSpread project to ensure data integrity in multi-user online environments based on Relational Clustering and Sequential Bayesian Updating

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

- UIUC Dean's List (7 Semesters) **Fall 2018 - Spring 2020, Spring 2021 - Spring 2022**
- James Scholars (2 Semesters) **Fall 2021, Spring 2022**

TEACHING EXPERIENCE

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

PROJECTS

eduFY | **Lead Developer** - *ReactJS, JavaScript, Node.js, MySQL, MongoDB* **January 2020 - May 2020**

- Developed Node.js backend & MySQL database for a web app that optimally matches students to tutors and provides additional academic resources through a MongoDB database
- Implemented a recommendation system for tutors based on user-defined search parameters
- Lead the team to stay on track; ensure smooth team communication and efficient git management

2-D Flight Simulator | **Individual Project** - *C++* **April 2019**

- Developed an app that simulates takeoffs and landings of a Cessna 172 plane under different runway conditions, including short-field takeoffs, short-field landings, and soft-field landings
- Simulation performed multiple physics calculations a second, including aerodynamics parameters such as lift, drag, angle of attack, and wind speed

Flight Finder | **Individual Project** - *Java, Android Studio* **August 2018**

- Developed an Android App that calls a REST API to fetch real-time flight information from around the world and parses flight information from JSON to a user-friendly display format
- Implemented flight searches based on a wide range of user-defined search parameters, including airplane types, airports, dates, and times

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