

# AAMIR HASAN

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I am a 5th year PhD Student working with Prof. Katie Driggs-Campbell at the Human-Centered Autonomy Lab. My research goal is to use machine learning algorithms to improve human-autonomy communication, with a particular focus on in-car driving tasks. To this end, I incorporate human behavior modeling techniques in training downstream learning tasks using Deep Learning and Reinforcement learning that improve task efficiency as well as the human experience. These methods are tested with user studies to determine their utility.

Currently I am seeking positions to utilize similar methods and techniques in collaborative tasks.

## RESEARCH INTERESTS

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Human-Robot Interaction, Human Behavior Modeling, Machine Learning, Perception, Computer Vision, Artificial Intelligence, and Robotics

## EDUCATION

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**University of Illinois at Urbana-Champaign** *2019 - Present*  
Doctor of Philosophy in Electrical and Computer Engineering  
Overall GPA: 3.82

**University of Illinois at Urbana-Champaign** *2016 - 2019*  
Bachelor of Science in Computer Engineering  
Graduated with High Honors  
Overall GPA: 3.84

## PUBLICATIONS

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### Conference Articles

- **A. Hasan**, N. Chakraborty, H. Chen, J.-H. Cho, C. Wu, and K. Driggs-Campbell. PeRP: Personalized residual policies for congestion mitigation through co-operative advisory systems. In *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2023
- N. Chakraborty, **A. Hasan\***, S. Liu\*, T. Ji\*, W. Liang, D. L. McPherson, and K. Driggs-Campbell. Structural attention-based recurrent variational autoencoder for highway vehicle anomaly detection. In *Proceedings of the 22nd International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2023
- **A. Hasan**, P. Sriram, and K. Driggs-Campbell. Meta-path analysis on spatio-temporal graphs for pedestrian trajectory prediction. In *IEEE International Conference on Robotics and Automation (ICRA)*, 2022
- M. Bayles, T. Kadylak, S. Liu, **A. Hasan**, W. Liang, K. Hong, K. Driggs-Campbell, and W. Rogers. An interdisciplinary approach: Potential for robotic support to address wayfinding barriers among persons with visual impairments. In *Proceedings of the Human Factors and Ergonomics Society's International Annual Meeting (HFES)*, 2022
- Y. Shen, N. Wijayaratne, P. Sriram, **A. Hasan**, P. Du, and K. Driggs-Campbell. Cocatt: A cognitive-conditioned driver attention dataset. In *Proceedings of the IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2022

### Journal Articles

- **A. Hasan**, N. Chakraborty, and K. Driggs-Campbell. PAd-C-U: Personalized adaptive communication unit for drivers and their adas. In *Prep for Transactions on Intelligent Transportation Systems*, 2024

- **A. Hasan**, N. Chakraborty, H. Chen, J.-H. Cho, C. Wu, and K. Driggs-Campbell. Co-operative advisory policies for congestion mitigation. In *Prep for ACM Journal on Autonomous Transportation Systems*, 2024
- **A. Hasan**, D. L. McPherson, M. Miles, and K. Driggs-Campbell. Beyond the dashboard: Investigating driver preferences under distraction for communication with ADAS. In *Under Review for Transactions on Intelligent Transportation Systems*, 2024
- S. Liu, **A. Hasan**, K. Hong, R. Wang, P. Chang, Z. Mizarchi, J. Lin, D. L. McPherson, W. Rogers, and K. Driggs-Campbell. DRAGON: A dialogue-based robot for assistive navigation with visual language grounding. In *IEEE Robotics and Automation Letters (RA-L)*, February 2024
- Z. Huang, **A. Hasan**, K. Shin, R. Li, and K. Driggs-Campbell. Long-term pedestrian trajectory prediction using mutable intention filter and warp lstm. *IEEE Robotics and Automation Letters*, 6(2):542–549, April 2021
- Praveenkumar B. A., Srinivas A., **A. Hasan**, Anush S. K., Amogh M., Anirudh A., Devivaraprasad M., Rajashekar M., and Suresh K. A cloud-based technology solution for geo-spatial mapping of diseases among children for strategic healthcare planning in rural india. *ASCI Journal of Management*, 46:77 – 88, 2017

### Workshop Submissions

- **A. Hasan**, N. Chakraborty, C. Wu, and K. Driggs-Campbell. Towards co-operative congestion mitigation. In *Proceedings of the ‘Shared Autonomy in Physical Human-Robot Interaction: Adaptability and Trust Workshop’ at the IEEE International Conference on Robotics and Automation (ICRA)*, 2022
- **A. Hasan\***, S. Liu\*, K. Hong, C. Yao, J. Lin, W. Liang, M. Bayles, W. Rogers, and K. Driggs-Campbell. Designing a wayfinding robot for people with visual impairments. In *Proceedings of the ‘Intelligent Control Methods and Machine Learning Algorithms for Human-Robot Interaction and Assistive Robotics’ Workshop at the IEEE International Conference on Robotics and Automation (ICRA)*, 2022

### Undergraduate Thesis

- **A. Hasan**. Meta-path analysis for community detection in heterogeneous graphs with ground truth labels. May 2019

## RESEARCH

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My research can be broadly classified as Applied Machine Learning for Human-Autonomy Communication. I have been working with Prof. Katie Driggs-Campbell as a graduate research assistant since August 2019.

### Co-operative Advisory Systems for Eco-Driving 2021 - Present

- Developing co-operative systems using learning based techniques to advise drivers on how to drive to reduce traffic congestion and CO2 emissions.

### Wayfinding for the Visually Impaired 2021 - Present

- Building a robot way-finding assistant to aid visually impaired persons in navigating new indoor environments.

### Modeling Communication between Drivers and Intelligent Vehicles 2021 - Present

- Analysing and developing systems to model the modes of communication between Drivers and Advanced Driver Assistance Systems (ADAS).
- This work was presented at the CSL Student Conference and at the Transportation Review Board Annual Meeting 2024.

### **In-Car Gesture Generation**

2022 - Present

- Generating a diverse set of (possible new) gestures for in-car gesture based communication through learning based methods and existing gesture datasets.

### **Meta-path Analysis on Spatio-Temporal Graphs for Trajectory Prediction** 2020 - 2021

- Analysing meta-path based features on spatio-temporal graphs combined with a structural RNN structure to predict agent trajectories in autonomous scenes. Model achieved a boost of atleast 32% over all baselines. Published in the proceedings of ICRA 2022.

### **Meta-path Analysis for Community Detection in Heterogeneous Graphs with Groundtruth Labels** 2018 - 2019

- Exploited meta-path based features by modifying the GeneMAPR algorithm to perform community detection of General Knowledge Graphs.

### **A Cloud-based Technology Solution for Geo-spatial Mapping of Diseases Among Children for Strategic Healthcare Planning in Rural India** 2015 - 2016

- Developed an Android Application for Data Collection and a Web Application for Data Collection and Analysis for better visualization of disease spread in children living in rural India. The results were utilised by the Government of India to improve the lives of those affected.

## **EXPERIENCE**

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### **Google LLC**

*Software Engineering Intern*

May 2022 - August 2022

*Mountain View, CA*

- Developed a pipeline to generate descriptions of businesses from advertiser's webpages with the use of internal large language models.
- Analyzed and compared the results of summarization NLP models on web-data to find the formats best suited to be processed into business descriptions.
- Experimented with various large language models such as T5X, MUM, and other internal models on their abilities to generate descriptions.
- Fine-Tuned above described models on custom curated data to enhance the accuracy and legibility of the generated descriptions.

### **Google LLC**

*Software Engineering Intern*

May 2021 - August 2021

*Mountain View, CA*

- Experimented with Pre-Training Multi-Modal BERT on unlabeled data to improve performance in extracting business titles from images
- Pre-processed data and created labels for custom pre-training tasks
- Analyzed the effect of pre-training using metrics such as train data size, training time, and improvement in precision-recall on the fine-tuning task
- Found that pre-training the model does improves performance on the fine-tuning task and that exploring other pre-training tasks would be useful.
- Culture Contribution: Organized an events for all interns on International Intern Day

### **Planbook Innovation Inc.**

*Full Stack Web Development Intern*

May 2016 - August 2016

*Bloomington, IL*

- Designed ToDo List and Sticky Note features for the company's main product, planbook.com.
- Designed a 'Period Schedule' feature for easier scheduling for teachers.
- The features designed went into production at the end of the internship and enhanced the user's experience with the website.

## TEACHING EXPERIENCE

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### Graduate Teaching Assistant

#### ECE 391 - Computer Systems Engineering

August 2019 - May 2021

- Head TA for Fall 2020 and Spring 2021.
- Taught discussion sections every week to help students with course material.
- Held supplemental sessions every week to enhance student knowledge in certain topics for the class.
- Designed and graded exam questions, and held office hours every week.
- Managed Piazza and Slack for intra-staff communication.
- Created an infrastructure for holding office hours and demos online on Discord with a fully functional bot to work around COVID-19.
- Received the 'Harold L. Oelson Undergraduate Teaching Award' for Fall 2019. Also nominated for Fall 2020 and Spring 2021.

### Undergraduate Course Assistant

#### ECE 391 - Computer Systems Engineering

August 2018 - May 2019

- Held office hours every week and assisted in grading weekly assignments and exams.

#### CS 461 - Introduction to Computer Security

January 2019 - May 2019

- Helped hold office hours, and grade and write multiple choice exams questions

#### ECE 314 - Probability in Engineering Laboratory

August 2017 - December 2018

- Grader for online Labs done on iPython Notebooks on topics related to probability and simulations

#### CS 126 - Software Design Studio

January 2017 - May 2019

- Moderated Code Reviews for students every week and gave them feedback regarding coding style and formatting to improve their skills

## COURSE WORK

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### Artificial Intelligence and Machine Learning

- ECE 448 - Artificial Intelligence
- ECE 446 - Machine Learning
- CS 598PS - Machine Learning for Signal Processing
- ECE 549 - Computer Vision
- CS 498SW - Introduction to Machine Perception

### Robotics

- ECE 470 - Introduction to Robotics
- ECE 498SM - Principles of Safe Autonomy
- ECE 598SG - Learning Based Robotics
- ECE 598HRI - Human Robot Interaction

### Signal Processing

- ECE 210 - Analog Signal Processing
- ECE 310 - Digital Signal Processing
- ECE 417 - Multimedia Signal Processing
- ECE 418 - Image & Video Signal Processing

- ECE 598PS - Machine Learning for Signal Processing

### **Theory**

- ECE 374 - Introduction to Algorithms & Models of Computation
- ECE 534 - Random Processes
- ECE 515 - Control System Theory & Design

## **HONORS AND AWARDS**

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### **Harold L. Olesen Undergraduate Teaching Award**

Fall 2019

- Awarded to graduate students to recognize an outstanding effort in undergraduate teaching.
- Nominations are done by undergraduate students and reviewed by a committee comprised of the Student Advisory Committee and the Teaching Evaluation and Awards Committee.

### **Dean's List**

2016 - 2018

- Awarded to students who are in the top 20% of their college class.

### **James Scholar Honors Program**

2016 - 2019

## **TECHNICAL SKILLS**

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<b>Languages</b>	Python, C, C++, JAVA, Javascript
<b>Packages</b>	PyTorch, TensorFlow, scikit-learn
<b>Tools</b>	Git, SVN, Vim
<b>Software</b>	Latex, CARLA, ROS - Gazebo, RViz