

# Rohan Chandra

✉ rchandra@utexas.edu • 📄 rohanchandra30.github.io/

Rohan Chandra is currently a postdoctoral research fellow in Texas Robotics, advised by Dr. Joydeep Biswas and Dr. Peter Stone, at the University of Texas, at Austin. His research focuses on algorithms and systems for enabling robots to navigate safely and efficiently among humans, like humans.

## Education

### Ph.D. in Computer Science

Advisor: Dr. Dinesh Manocha

Dissertation: *Towards Autonomous Driving in Dense, Heterogeneous, and Unstructured Traffic*

Dissertation Committee: Dr. Dinesh Manocha, Dr. Yiannis Aloimonos, Dr. Pratap Tokekar, Dr. Mac Schwager, Dr. Derek Paley

University of Maryland, College Park

August 2018 - May 2022

### M.S. in Computer Science

University of Maryland, College Park

August 2016 - May 2018

### Bachelor of Technology (B.Tech) in ECE

Delhi Technological University, New Delhi

August 2012 - May 2016

## Employment

### University of Texas, Austin

Postdoctoral Research Fellow

Conducting research at the intersection of multi-agent systems, robotics, and control theory.

Austin, TX

June 2022 - Present

### NVIDIA

Applied Research Intern, Autonomous Driving (Prediction)

Worked on ego-vehicle trajectory and behavior prediction via ego-goal conditioning, helping navigation in hard cases like U-turns and left turns.

Santa Clara, CA

Summer'21 (Remote)

## Scholarships, Awards, and Honors

- (2023) Won the **Seoul National University (SNU) Ph.D. Talk Award** at the IROS 2023 Workshop on Advances in Multi-Agent Learning - Coordination, Perception, and Control.
- (2023) Finalist for the **Charles A. Caramello Distinguished Dissertation Award**. A university level award by The University of Maryland, College Park across all graduate disciplines.
- (2023) Selected as one of 10 speakers for the **Microsoft Future Leaders in Robotics and AI**, a joint University of Maryland and Microsoft Robotics and Diversity Initiative, sponsored by Microsoft DC Metro Engineering Site.
- (2023) (declined) Selected for the **Rising Stars in AI Symposium 2023** Speaker Series at KAUST, geared towards young researchers who have recently published significant works at leading AI venues.
- (2022) Finalist for **UMD Innovation of the Year Award** by Innovate UMD for our work on DeepFake Detection.
- (2022) Selected as one of 30 **RSS Pioneers** at the Robotics: Science and Systems (RSS) conference, held in New York.
- (2021) Finalist for **UMD Innovation of the Year Award** by Innovate UMD for our work on Multimodal and Context-Aware Emotion Perception.
- (2021) Selected as one of 30 participants for the 3-semester **Future Faculty Fellow** program at the University of Maryland to prepare doctoral students to achieve career-long success in academia.
- (2020) Awarded the **Summer Research Fellowship** by The Graduate School at The University of Maryland, College Park.

## Publications

### 2023

1. Xiyang Wu, **Rohan Chandra**, Tianrui Guan, Amrit Singh Bedi, Dinesh Manocha. "iPLAN: Intent-Aware Planning in Heterogeneous Traffic via Distributed Multi-Agent Reinforcement Learning." Conference on Robot Learning (**CoRL**), 2023 (oral).
2. **Rohan Chandra**, Rahul Maligi, Arya Anantula, Joydeep Biswas. "SOCIALMAPF: Optimal and Efficient Multi-Agent Path Finding with Strategic Agents for Social Navigation." IEEE/RSJ Robotics and Automation Letters/International Conference on Intelligent Robots and Systems (**RA-L/IROS**), 2023.
3. **Rohan Chandra**, Xijun Wang, Mridul Mahajan, Rahul Kala, Rishitha Palugulla, Chandrababu Naidu, Alok Jain, Dinesh Manocha. "METEOR: A Massive Dense & Heterogeneous Behavior Dataset for Autonomous Driving." IEEE Conference on Robotics and Automation (**ICRA**), 2023.

## 2022

1. Nilesh Suriyarachchi, **Rohan Chandra**, John S Baras, Dinesh Manocha. "GAMEOPT: Optimal Real-time Multi-Agent Planning and Control at Dynamic Intersections." IEEE Conference on Intelligent Transportation Systems (**ITSC**), 2022.
2. Tianrui Guan, Jun Wang, Shiyi Lan, **Rohan Chandra**, Zuxuan Wu, Larry Davis, Dinesh Manocha. "M3DeTR: Multi-representation, Multi-scale, Mutual-relation 3D Object Detection with Transformers." IEEE/CVF Winter Conference on Applications of Computer Vision (**WACV**), 2022.
3. Tianrui Guan, Divya Kothandaraman, **Rohan Chandra**, Dinesh Manocha. "GANav: Group-wise Attention Network for Classifying Navigable Regions in Unstructured Outdoor Environments." IEEE/RSJ Robotics and Automation Letters/International Conference on Intelligent Robots and Systems (**RA-L/IROS**), 2022.
4. **Rohan Chandra**, Dinesh Manocha. "GamePlan: Game-Theoretic Multi-Agent Planning with Human Drivers at Intersections, Roundabouts, and Merging." IEEE Robotics and Automation Letters/International Conference on Robotics and Automation (**RA-L/ICRA**), 2022.
5. **Rohan Chandra**, Mingyu Wang, Mac Schwager, Dinesh Manocha. "Game-Theoretic Planning for Risk-Aware Human Drivers." IEEE Conference on Robotics and Automation (**ICRA**), 2022.
6. Angelos Mavrogiannis, **Rohan Chandra**, Dinesh Manocha. "B-GAP: Behavior-Guided Action Prediction for Autonomous Navigation." IEEE/RSJ Robotics and Automation Letters/International Conference on Intelligent Robots and Systems (**RA-L/IROS**), 2022.

## 2021

1. **Rohan Chandra**, Aniket Bera, Dinesh Manocha. "Using Graph-Theoretic Machine Learning to Predict Human Driver Behavior." *IEEE Transactions on Intelligent Transportation Systems*, (**ITS**) 2021.
2. Divya Kothandaraman, **Rohan Chandra**, Dinesh Manocha. "BoMuDA: Boundless Multi-Source Domain Adaptive Segmentation in Unconstrained Environments." IEEE/CVF International Conference on Computer Vision (**ICCV**), 2021.
3. Divya Kothandaraman, **Rohan Chandra**, Dinesh Manocha. "SS-SFDA: Self-Supervised Source-Free Domain Adaptation for Road Segmentation in Hazardous Environments." IEEE/CVF International Conference on Computer Vision (**ICCV**), 2021.

## 2020

1. Trisha Mittal, Pooja Guhan, Uttaran Bhattacharya, **Rohan Chandra**, Aniket Bera, Dinesh Manocha. "EmotiCon: Context-Aware Multimodal Emotion Recognition using Frege's Principle." IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**), 2020.
2. Uttaran Bhattacharya, Trisha Mittal, **Rohan Chandra**, Tanmay Randhavane, Aniket Bera, Dinesh Manocha. "STEP: Spatial Temporal Graph Convolutional Networks for Emotion Perception from Gaits." Association for the Advancement of Artificial Intelligence (**AAAI**), 2020.
3. Trisha Mittal, Uttaran Bhattacharya, **Rohan Chandra**, Aniket Bera, Dinesh Manocha. "M3ER: Multiplicative Multimodal Emotion Recognition Using Facial, Textual, and Speech Cues." Association for the Advancement of Artificial Intelligence (**AAAI**) (oral), 2020.
4. Uttaran Bhattacharya, Christian Roncal, Trisha Mittal, **Rohan Chandra**, Aniket Bera, Dinesh Manocha. "Take an Emotion Walk: Perceiving Emotions from Gaits Using Hierarchical Attention Pooling and Affective Mapping." European Conference on Computer Vision (**ECCV**), 2020.
5. Trisha Mittal, Uttaran Bhattacharya, **Rohan Chandra**, Aniket Bera, Dinesh Manocha. "Emotions Don't Lie: An Audio-Visual Deepfake Detection Method Using Affective Cues." *ACM Multimedia* (**(MM)**), 2020.
6. AJ Sathyamoorthy, Jing Liang, Utsav Patel, Tianrui Guan, **Rohan Chandra**, Dinesh Manocha. "Denseavoid: Real-time navigation in dense crowds using anticipatory behaviors." IEEE Robotics and Automation Letters/International Conference on Robotics and Automation (**RA-L/ICRA**), 2020.
7. **Rohan Chandra**, Uttaran Bhattacharya, Trisha Mittal, Xiaoyu Li, Aniket Bera, Dinesh Manocha. "GraphRQI: Classifying Driver Behaviors Using Graph Spectrums." IEEE Conference on Robotics and Automation (**ICRA**), 2020.
8. **Rohan Chandra**, Uttaran Bhattacharya, Trisha Mittal, Aniket Bera, Dinesh Manocha. "RoadTrack: Tracking Road Agents in Dense and Heterogeneous Environments." IEEE Conference on Robotics and Automation (**ICRA**), 2020.
9. **Rohan Chandra**, Tianrui Guan, Srujan Panuganti, Trisha Mittal, Uttaran Bhattacharya, Aniket Bera, Dinesh Manocha. "Forecasting Trajectory and Behavior of Road-Agents using Spectral Clustering in Graph-LSTMs." IEEE/RSJ Robotics and Automation Letters/International Conference on Intelligent Robots and Systems (**RA-L/IROS**), 2020.
10. **Rohan Chandra**, Uttaran Bhattacharya, Trisha Mittal, Aniket Bera, Dinesh Manocha. "CMetric: A Driving Behavior Measure Using Centrality Functions." IEEE/RSJ Conference on Intelligent Robots and Systems (**IROS**), 2020.

## 2019

1. **Rohan Chandra**, Uttaran Bhattacharya, Aniket Bera, Dinesh Manocha. "TraPHic: Predicting Trajectories of Road-Agents in Dense and Heterogeneous Traffic." IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**), 2019.
2. **Rohan Chandra**, Uttaran Bhattacharya, Aniket Bera, Dinesh Manocha. "DensePeds: Pedestrian Tracking in Dense Crowds Using Front-RVO and Sparse Features." IEEE/RSJ Conference on Intelligent Robots and Systems (**IROS**), 2019.
3. **Rohan Chandra**, Uttaran Bhattacharya, Christian Roncal, Aniket Bera, Dinesh Manocha. "RobustTP: End-to-End Trajectory Prediction for Heterogeneous Road-Agents in Dense Traffic with Noisy Sensor Inputs." *ACM Computer Science in Cars Symposium* (**ACM CSCS**), 2019.

## Professional Activities

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- **Workshop Chair/Co-Chair:**
  - RSS'23: Workshop on Multi-Agent Planning and Navigation in Challenging Environments.
  - IROS'23: The 2nd Workshop on Social Robot Navigation: Advances and Evaluation.
  - IROS'22: Behavior-driven Autonomous Driving in Unstructured Environments.
- **Program Committee:**
  - **Publicity and Social Media Chair** for the International Symposium on **Multi-Robot & Multi-Agent Systems 2023**.
  - ICCV'21 Workshop on Multi-Agent Interaction and Relational Reasoning.
  - Chaired the **Computer Vision for Autonomous Driving** session at **AAAI'23**.
  - Co-chaired the **Intelligent Transportation** session at **ICRA'22**.
- **Appointments:**
  - Associate Editor, RA-L (2023 - Present)
  - Reviewer, CVIU'18 -'20, IJCAI'19, CoRL'19, CVPR'20 -'21, AAAI'20 -'21, ICRA'20 -'21, IROS'19 -'20, RA-L'20 -'21, NeurIPS'20, ICLR'21, ICML'21, ICCV'21, RSS'22.
- **Graduate Admissions Committee:**
  - 2022-2023: UT Austin CS.
  - 2017-2018: UMD CS

## Invited Talks

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- (2023) **"Human-like Mobility to Deploy Autonomous Vehicles... Everywhere!"** at IAVVC'23: Workshop on Scenario and Behavior Diversity in Simulation for Autonomous Vehicle Validation (Keynote)
- (2023) **"SocialGym 2.0: Simulator for Multi-Agent Social Robot Navigation in Shared Human Spaces"** at IROS'23: The 2nd Workshop on Social Robot Navigation: Advances and Evaluation.
- (2023) **"Human-like Mobility to Deploy Robots... Everywhere!"** at IROS'23: Workshop on Integrated Perception, Planning, and Control for Physically and Contextually-Aware Robot Autonomy.
- (2022) **"Autonomous Driving in Unstructured Traffic Environments"** at IIIT-Hyderabad, IIIT-Delhi, IIT-Delhi.
- (2022) **"Autonomous Driving in Unstructured Traffic Environments"** at WACV'22: Hazard Perception in Intelligent Vehicles (HPIV) Workshop.
- (2021) **"Human Driver Behavior Modeling in Dense Urban Traffic with Applications to Planning and Navigation"** at RSS'21: Perception and Control for Autonomous Navigation in Crowded, Dynamic Environments Workshop.
- (2021) **"Modeling Human Driver Behavior in Dense Urban Traffic Environment Using Graph Theory"** at the 2021 Maryland Robotics Center Student Seminar.

## Students Supervised

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- Divya Kothandaraman (Ph.D. at UMD, currently Ph.D. at UMD, supervised by Dr. Dinesh Manocha)
- Tianrui Guan (M.S. at UMD, currently Ph.D. at UMD, supervised by Dr. Dinesh Manocha)
- Zayne Sprague (M.S. at UT Austin, currently Ph.D. at UT Austin, supervised by Dr. Greg Durrett)
- Xiyang Wu (Ph.D. at UMD, currently Ph.D., UMD, supervised by Dr. Dinesh Manocha)

## Grants/Proposals

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<b>Trustworthy Autonomous Systems (TAS) Hub (UK Research and Innovation)</b>	<b>£18,149.50</b>
<i>TAME Pain: Trustworthy AssessMENT of Pain - Listening Between the Lines</i>	<i>Researcher Role</i>
The UK Research and Innovation (UKRI) Trustworthy Autonomous Systems Program is the UK's flagship multi-disciplinary research program that looks to address the challenge of developing best practices for the design, operation, and governance of trusted and trustworthy autonomous systems for the benefit of society.	

## Teaching Assistant Experience

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| ◦ <b>CMSC 250: Discrete Mathematics</b><br><i>Taught by Lecturer Jason Filippou</i>    | <b>University of Maryland, College Park</b><br><i>Fall'17 and Spring'18</i> |
| ◦ <b>CMSC 131: Introduction to Programming</b><br><i>Taught by Lecturer Fawzi Emad</i> | <b>University of Maryland, College Park</b><br><i>Spring'17</i>             |
| ◦ <b>CMSC 417: Computer Networks</b><br><i>Taught by Professor Ashok Agrawala</i>      | <b>University of Maryland, College Park</b><br><i>Fall'16</i>               |

## Outreach and Community Service

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- Demonstrated Texas Robotics autonomous mobile robot navigation to 20 high school and middle school students at the **Robotics Summer Camp 2023** at UT Austin.
- **Judged** the special awards category for AAAI at the **International Science and Engineering Fair 2023**. High school students from around the world competed for nearly 9M in awards, scholarships at Regeneron ISEF 2023.
- Volunteered for **STEM Girl Day** on the UT Austin Campus: UT Austin's national award-winning STEM Girl Day gives K-8th graders a chance to explore STEM through grade-appropriate, hands-on activities hosted by scientists, engineers, astronomers, and mathematicians.
- Participated in the **Future Leaders in Robotics and AI: Celebrating Diversity and Innovation Seminar Series** as part of the University of Maryland and Microsoft Robotics and Diversity Initiative. This is a nationwide online seminar series for Ph.D. students and postdoctoral researchers, especially underrepresented minorities and women. The seminar series will highlight the latest research and innovation in the field of robotics and AI. The series is intended to provide exposure and mentorship opportunities to the speakers, build a network of innovators across the country, and support the speakers' career planning.
- **AI4ALL 2021**: Led a 2 week project for 5-6 high school students. Introduced them to various aspects of machine learning and artificial intelligence.
- **NYU AI School 2021**: Teaching basic machine learning and programming and discussing a career in machine learning research with students from underrepresented minorities.
- **AI4ALL 2020**: Teaching basic machine learning and programming and discussing a career in machine learning research with students from underrepresented minorities.

## Patents

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- Trisha Mittal, Uttaran Bhattacharya, **Rohan Chandra**, Aniket Bera, Dinesh Manocha. "System and Method for Detecting Fabricated Videos", US Patent App. 17/515,846.
- Trisha Mittal, Pooja Guhan, Uttaran Bhattacharya, **Rohan Chandra**, Aniket Bera, Dinesh Manocha. "Human emotion recognition in images or video", US Patent App. 17/349,732.
- Trisha Mittal, Uttaran Bhattacharya, **Rohan Chandra**, Aniket Bera, Dinesh Manocha. "System and method for multimodal emotion recognition", US Patent App. 17/173,018.