

EXPERTISE

Artificial Intelligence | Robotics | Reinforcement Learning | Planning & Predictions

WORKEXPERIENCE

- **Apple Special Projects Group**, *Senior Researcher* (Aug '22 - Present)
 - Behavior planning and predictions in multi-agent social robotics & autonomous systems.
- **Honda Research Institute, US**, *Postdoctoral Researcher* (Jul '21 - Jun '22)
 - Applications of deep reinforcement learning in prediction & planning for robotics and particularly autonomous driving, reporting to division director & chief scientist **Dr. Behzad Dariush**.
- **Mercedes-Benz R&D North America**, *Research Engineer* (May '19 - Jan '20)
 - Worked at the Autonomous Driving department in ML Behavior Planning team.
 - Designed & implemented the *Scene Understanding* software package in C++. Developed algorithms for inter-agent reasoning in the *Athena Robo-taxi* project ([news article](#)) which led to 2 patents.
- **Ford Motor Company R&D**, *Research Intern* (May '18 - Aug '18)
 - Outcomes of my research work on scalability studies of Cellular Vehicle-to-Everything (C-V2X) contributed to SAE J3161 standard. I designed & performed performance analysis on Qualcomm OBUs.

SKILLS

- **Software:** C++, Python (+TensorFlow, Keras, Torch, OpenCV, OpenAI Gym), MATLAB, Git, ROS, CARLA, NS3, Agile Software Development (CI/CD, SCRUM, TDD, GoogleTest), Kubernetes, Docker

ACADEMICTRAINING

- **Ph.D. Researcher**
 - **Stanford University**, CA (2020-2021)
Visiting researcher hosted by **Dr. Dorsa Sadigh** at Stanford ILIAD Lab with a focus on applications of Multi-agent Deep Reinforcement Learning in [cooperative behavior planning for autonomous vehicles](#).
- **Ph.D. Electrical Engineering**
 - **University of Central Florida**, FL (2017-2021)
Dissertation title: Cooperative Autonomous Driving in Mixed-autonomy Environments
- **B.Sc. Electrical Engineering**
 - **Sharif University of Technology**, Tehran, Ir (2011-2016)

HONORS &AWARDS

- **Graduate Researcher of the Year** (2019)
 - Awarded as the *Graduate Research MVP (Most Valuable Player)* among ~9,000 graduate students, UCF College of Graduate Studies, Orlando, FL
- **ORC Doctoral Fellowship** (2017)
 - Fellowship for doctoral studies with 4-year full financial support UCF ECE department, Orlando, FL
- **1st Place Award - Sharif Cup Robotic League** (2012)
 - 2-wheel path-finder robots competition, Sharif University of Technology
- **Silver Medal - International Science Olympiad** (2010)
 - Member of the Iran national science olympiad team participating in the International Olympiad on Astrophysics (IOAA) *among teams from 25 countries*, Beijing, China
- **Gold Medal - National Science Olympiad** (2010)
 - Gold medal and absolute winner (best-result award) in the National Astrophysics Olympiad held by the Young Scholars Club (YSC) in a competition with *more than 10,000 students nation-wide*.

PATENTS

- Y. P. Fallah, B. Toghi, R. Valiente, D. Sadigh, R. Pedarsani "Social Coordination and Altruism in Autonomous Driving. Cooperative Autonomous Vehicles that Sympathize with Human Driver", [US Patent filed by UCF on Apr 1, 2022]
- B. Toghi, S. Antol, D. Petrich, G. Hayrapetyan "Predicting the Behavior of a Vehicle using Agent-to-agent Relations to Control an Autonomous Vehicle", [Patent Application 2016157.6 filed by Daimler AG in Great Britain on Oct 12, 2020]
- B. Toghi, D. Chen "A Method for Generating at Least One Alternative Utterance to an Initial Utterance, as Well as a Semantic Analyzer Module", [Patent Application 2009185.6 filed by Daimler AG in Great Britain on Jun 17, 2020]

PUBLICATIONS

- B. Toghi, R. Valiente, D. Sadigh, R. Pedarsani, Y. P. Fallah "Cooperative Autonomous Vehicles that Sympathize with Human Drivers", *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021)*, Prague, Czech Republic
- B. Toghi, R. Valiente, D. Sadigh, R. Pedarsani, Y. P. Fallah "Altruistic Maneuver Planning for Cooperative Autonomous Vehicles Using Multi-agent Advantage Actor-Critic", *2021 ADP3 workshop at IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR 2021)*
- B. Toghi, R. Valiente, D. Sadigh, R. Pedarsani, Y. P. Fallah "Social Coordination and Altruism in Cooperative Autonomous Driving", *IEEE Transactions on Intelligent Transportation Systems (IEEE T-ITS)* [submitted]
- B. Toghi, R. Valiente, R. Pedarsani, Y. P. Fallah "Towards Learning Generalizable Driving Policies from Restricted Latent Representations", *IEEE Transactions on Intelligent Transportation Systems (IEEE T-ITS)* [submitted]
- R. Valiente, B. Toghi, R. Pedarsani, Y. P. Fallah "Robustness and Adaptability of Reinforcement Learning based Cooperative Autonomous Driving in Mixed-autonomy Traffic", *IEEE Open Journal of Intelligent Transportation Systems (IEEE OJ-ITS)*
- B. Toghi *et al.* "A Maneuver-based Urban Driving Dataset and Model for Cooperative Vehicle Applications", *IEEE CAVS 2020*, Victoria, B.C., Canada
- Md Saifuddin, M. Zaman, B. Toghi, Y. P. Fallah, J. Rao "Performance Analysis of Cellular-V2X with Adaptive and Selective Power Control", *IEEE CAVS 2020*, Victoria, B.C., Canada
- B. Toghi *et al.* "Analysis of Distributed Congestion Control in Cellular Vehicle-to-everything Networks", *IEEE Vehicular Technology Conference (VTC-Fall 2019)*, Honolulu, HI
- B. Toghi *et al.* "Spatio-temporal Dynamics of Cellular V2X Communication in Dense Vehicular Networks", *IEEE CAVS 2019*, Honolulu, HI
- G. Shah *et al.* "Real-Time Hardware-In-the-Loop Emulation Framework for DSRC-based Connected Vehicle Applications", *IEEE CAVS 2019*, Honolulu, HI
- H. N. Mahjoub, B. Toghi, SM O. Gani, Y. P. Fallah "V2X System Architecture Utilizing Hybrid Gaussian Process-based Model Structures", *IEEE Systems Conf. (SysCon 2019)*, Orlando, FL
- B. Toghi *et al.*, "Multiple Access in Cellular V2X: Performance Analysis in Highly Congested Vehicular Networks", *IEEE Vehicular Networking Conference (VNC 2018)*, Taipei, Taiwan
- H. N. Mahjoub, B. Toghi, Y. P. Fallah, "A Stochastic Hybrid Framework for Driver Behavior Modeling Based on Hierarchical Dirichlet Process", *IEEE Vehicular Technologies Conference (VTC-Fall 2018)*, Chicago, IL
- H. N. Mahjoub, B. Toghi, Y. P. Fallah, "A Driver Behavior Modeling Structure Based on Non-parametric Bayesian Stochastic Hybrid Architecture", *IEEE Vehicular Technologies Conference (VTC-Fall 2018)*, Chicago, IL

PRESENTATIONS

- **Workshop presentation:** "Altruistic Maneuver Planning for Cooperative Autonomous Vehicles", CVPR Workshop Autonomous Driving: Perception, Prediction and Planning - 2021
- **Invited talk:** "Connected Cars and Cellular Vehicle-to-everything Communication", Annual Graduate Fellows Symposium, University of Central Florida, Orlando, FL - 2018
- **Keynote speaker:** "The Future of Autonomy in Mass Transportation & Fleet Vehicles", Work Fleet Forum, Jacksonville, FL - 2017

ACTIVITIES

- Professional rally racing driver (2010-2016) supported by Sony & GoPro, won 5 national championships.
- Mountaineering, Rock Climbing, Snowboarding, Wakeboarding, Astrophotography.

REFERENCES

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