

Keyvan Majd

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ACADEMIC BACKGROUND

Arizona State University Aug. 2019 - Expected Dec. 2023
Doctor of Philosophy in Computer Science - GPA: 4/4

- Focus area: certifiably safe human-robot control & interaction, verification and repair of Deep Neural Networks (DNNs).

North Carolina A&T State University Jan. 2017 - Jun. 2019
Master of Science in Electrical Engineering - GPA: 4/4

- Thesis topic: kinematic-based trajectory planning framework for autonomous ground vehicles.

Ferdowsi University of Mashhad Jan. 2011 - Jun. 2015
Bachelor of Science in Electrical Engineering - GPA: 3.56/4

SKILLS

- **Programming:** Python, C/C++, MATLAB.
- **Machine Learning/AI/Statistics Tools:** TensorFlow, Keras, PyTorch, R, SAS (Statistical Analysis System), OpenAI Gym.
- **Simulation Tools:** SVL/Apollo, Gazebo/ROS.
- **Optimization Tools/Libraries:** Gurobi, Pyomo, CPLEX, YALMIP.

RESEARCH EXPERIENCES & PROJECTS

Graduate Research Assistant Aug. 2019 - Present
Arizona State University, Tempe, AZ

- **Imitation Learning:** Integrating imitation learning and neural network repair to derive provably safe policies in various robot learning scenarios, specifically on robot collision avoidance and lower-leg prosthesis applications.
- **Informative Planning:** Developing a joint communication and motion planning framework to take into account the human's imperfect perception about the robot movements.
- **Deep Neural Networks - Repair & Verification:** Developing a neural network repair framework for training policies with safety guarantees using Mixed-integer Programming (MIP).
- **Autonomous Vehicle (AV) Simulators:** Comparing the technical suitability of AV simulators: SVL, Carla, and Webots in the context of requirements driven adversarial testing, *Collaboration with Toyota TRI-NA*.
- **Risk-bounded Control:** Developing a probabilistic risk-bounded motion planner for the Toyota's HSR robot in confined dynamic environments using Control Barrier Functions, *Collaboration with Toyota TRI-NA*.

Course Project
Arizona State University, Tempe, AZ

Aug. 2019 - Present

- Loop Subdivision: Implementing loop subdivision algorithm in Python on triangular meshes represented by Halfedge data structure, *Advanced Computer Graphics course*.
- AI in Battleship: Comparing the performances of a random agent, a Deep Q-Learning Agent, and a Particle Filtering Agent in finishing the game of Battleship with the minimum number of shots, *Planning and Learning Methods in AI course*.
- Storm Event Application: Designing an application in C for the storm event data management using max-heap, hash table, and binary search tree data structures, *Algorithms and Data Structure course*.
- Graph Algorithms: Representing sea ice concentration as a graph and captured small-world graph through capturing the high degree of local clusters and the small number of long-range connections (programmed in C), *Algorithms and Data Structure course*.

Graduate Research Assistant
North Carolina A&T State University, Greensboro, NC

Jan. 2017 - Jun. 2019

- Kinematic-based Trajectory Planning: Proposing a globally exponentially stable optimal analytical solution to the classical car-like robot kinematic model trajectory tracking and control problem.

Course Project
North Carolina A&T State University, Greensboro, NC

Jan. 2017 - Jun. 2019

- Fuzzy-logic Controller: Employing a Generalized Sugeno controller to approximate an optimal control law by learning from a family of optimal trajectories, *Fuzzy Logic with Applications course*.
- Lane Detection and Tracking: Lane detection by converting the images into a bird-eye plot using the prospective analysis, segmentation, and feature extraction, and then testing on the prerecorded image and video data, *Digital Image Processing course*.
- Robust Model Predictive Control (MPC): Designing a Constrained Robust MPC for the classical angular positioning problem with uncertainty on the system model, *Model Predictive Control course*.

RELEVANT COURSES

- **AI, Machine Learning, & Robotics:** Neural Networks, Statistical Machine Learning, Advances in Robot Learning, Planning\Learning Methods in AI, Topics in RL.
- **Probability and Statistics:** Probability and Stochastic Processes, Multivariate Statistics.
- **Algorithm and Complexity:** Theory of Computation, Data Structure and Algorithms, Combinatorial Algorithms.
- **Control Systems:** Model Predictive Control, Optimal Control, Nonlinear Control, Adaptive Control.

SPECIAL ACHIEVEMENTS

Awards

- *Received a Best Paper Award*, NeurIPS'22 Robot Learning Workshop. (2022)
- *CIDSE Doctoral Fellowship Award*, Arizona State University. (2020)
- *CIDSE Doctoral Fellowship Award*, Arizona State University. (2020)
- *Dean of University Award*, Ferdowsi University of Mashhad. (2016)
- *Dean of College of Engineering Award*, Ferdowsi University of Mashhad. (2015)

Professional Activities

- Session chair of “*Motion and Path Planning VI*” in 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). (2021)
- Member of Toyota Human Support Robot (HSR) Developer Community. (2019 - Present)
- Conference/Journal Reviewer (selection):
 - IEEE Conference on Decision and Control (CDC)
 - International Conference on Robotics and Automation (ICRA)
 - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
 - American Control Conference (ACC)
 - IEEE Robotics and Automation Letters (RA-L)
 - IEEE Transactions on Intelligent Vehicles
 - IEEE Transactions on Vehicular Technology
 - IEEE Transactions on Visualization and Computer Graphics
 - IET Radar, Sonar & Navigation
- President of Iranian Student Association in Greensboro, NC. (2017-2018)

PROFESSIONAL & ACADEMIC EXPERIENCE

- Research assistant at Arizona State University. (2019 - Present)
- Teaching assistant for *Introduction to Theoretical Computer Science* at Arizona State University. (2020)
- Teaching assistant for *Introduction to Mobile Robotics* at Arizona State University. (2019)
- Research assistant at North Carolina A&T State University. (2017-2019)
- Teaching assistant for *Stochastic Process and Random Variables* at North Carolina A&T State University. (2017)
- Summer internship at *MONIRAN* power engineering consultant company, Iran. (2014)

PUBLICATIONS

Under review & Preprints

1. Majd K., Fainekos G., and Ben Amor A. (2023). “Safety-aware Neural Network Repair for Robotic Systems with Predictive Models.”
2. Majd K., Clark G., Fainekos G., and Ben Amor A. (2023). “Safety-aware Predictive State-action Estimation in Assistive Devices through Behavioral Cloning and Neural Network Repair.”
3. Majd K., Zhou S., Ben Amor H., Fainekos G., and Sankaranarayanan S. (2021). “Local Repair of Neural Networks Using Optimization,” [arXiv:2109.14041](#).

Conferences & Workshops

1. [NeurIPS’22] Majd K., Clark G., Khandait T., Zhou S., Sankaranarayanan S., Fainekos G., and Ben Amor H. (2022). “Certifiably-correct Control Policies for Safe Learning and Adaptation in Assistive Robotics,” *Neural Information Processing Systems (NeurIPS) - Robot Learning Workshop*. **(Received a Best Paper Award)**
2. [CoRL’22] Majd K., Clark G., Khandait T., Zhou S., Sankaranarayanan S., Fainekos G., and Ben Amor H. (2022). “Safe Robot Learning in Assistive Devices through Neural Network Repair,” *Conference on Robot Learning (CoRL)*.
3. [ICRA’21] Dadvar M., Majd K., Oikonomou E., Fainekos G., and Srivastava S. (2021). “Joint Communication and Motion Planning for Cobots,” *IEEE International Conference on Robotics and Automation (ICRA)*.
4. [IROS’21] Majd K., Yaghoubi S., Yamaguchi T., Hoxha B., Prokhorov D., and Fainekos G. (2021), “Safe Navigation in Human Occupied Environments Using Sampling and Control Barrier Functions,” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*.
5. [IV’18] Majd K., Razeghi-Jahromi M., and Homaifar A. (2018), “Optimal Kinematic-based Trajectory Planning and Tracking Control of Autonomous Ground Vehicle Using the Variational Approach,” *Intelligent Vehicles Symposium (IV)*.

Journals

1. [L-CSS’20] Yaghoubi S., Majd K., Fainekos G., Yamaguchi T., Prokhorov D., and Hoxha B. (2020), “Risk-bounded Control using Stochastic Barrier Functions,” *IEEE Control Systems Letters*.
2. [IEEE-JAS’19] Majd K., Razeghi-Jahromi M. and Homaifar A. (2019), “A stable analytical solution method for car-like robot trajectory tracking and optimization,” *IEEE/CAA Journal of Automatica Sinica*.