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 safe policies for a robotic lower-leg prosthesis device.
- 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   Aug. 2019 - Present
Arizona State University, Tempe, AZ

- 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 trough 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   Jan. 2017 - Jun. 2019
North Carolina A&T State University, Greensboro, NC

- 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   Jan. 2017 - Jun. 2019
North Carolina A&T State University, Greensboro, NC

- 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 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 Transactions on Vehicular Technology
  - 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., 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.*