Alexander Amini

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EDUCATION

Massachusetts Institute of Technology (MIT) — Cambridge, MA
Doctor of Philosophy (PhD); Electrical Engineering and Computer Science — Aug. 2017 – Present

Massachusetts Institute of Technology (MIT) — Cambridge, MA
Master of Science (SM); Electrical Engineering and Computer Science — Aug. 2017 – Jun. 2018

Massachusetts Institute of Technology (MIT) — Cambridge, MA
Bachelor of Science (SB); Major: Computer Science, Minor: Mathematics — Aug. 2013 – Jun. 2017

Castleknock College — Dublin, Ireland
Leaving Certification; Honours Concentration in Mathematics and Science — Aug. 2010 – Jun. 2012

EXPERIENCE

Distributed Robotics Laboratory — CSAIL, MIT
Graduate Researcher — Aug. 2017 - Present
My research focuses on machine learning algorithms for end-to-end control (i.e., perception to actuation) of autonomous systems and formulating provable guarantees for these deep learning algorithms.

NVIDIA Coorporation — Holmdell, NJ
Deep Learning Researcher — Jun. 2017 - Aug. 2017
Worked with NVIDIA's end-to-end driving team to design and develop novel confidence measures for estimating the uncertainty of deep neural networks. My work was deployed on full-scale self-driving vehicles.

MIT 6.S191: Introduction to Deep Learning — EECS, MIT
Organizer and Lecturer — Jan. 2018, 2019
I am one of the lecturers and organize the course from scratch; including developing the curriculum, handling sponsorship from industrial partners, teaching the lectures, and publishing the content online.

International Business Machines (IBM) Research — Yorktown Heights, NY
Summer Internship — Jun. 2016 - Sep. 2016
Developed methods for training end-to-end control models in an online and adaptive setting, using a distributed collection of embedded devices thus accounting for vastly greater numbers of possible conditions a vehicle encounters.

Robot Locomotion Group — CSAIL, MIT
SuperUROP Researcher — Aug. 2015 - Jun. 2016
Pushed the limits of autonomous vehicle control in terms of speed, precision, and handling by developing models derived from real world driving conditions and a physical vehicle to provide a more realistic simulation.

Laboratory for Information & Decision Systems — CSAIL, MIT
UROP Researcher — Jun. 2015 - Sep. 2015
Evaluated state-of-the art gradient based optimization techniques on non-convex deep architectures, and also presented new variant combo optimization algorithms utilizing variance reduction techniques.

CLARITY Research — Dublin, Ireland
Internship Scholarship — Jun. 2011 - Sep. 2011
Developed analytical and learning algorithms for big data from adaptive sensor technologies. Collected 400 GB of tennis sensor data, developed software tools to extract features, and trained, evaluated and deployed models.

AWARDS

National Science Foundation (NSF) Graduate Research Fellowship
Graduate Fellow — 2017-2022

European Union Young Scientist
Grand Prize Winner — 2011
Top prize winner in the 23rd European Union Young Scientist competition for project: *Tennis Sensor Data Analysis: An Automated System for Macro-motion Refinement*; which included the development of mathematical models and algorithms for detecting the subtle differences in motion to automatically classify and provide corrective feedback.

BT Young Scientist and Technologist
Grand Prize Winner — 2011
Top prize winner in in Ireland's national science competition with project: Tennis Sensor Data Analysis.

KEY SKILLS

- **Programming**: Tensorflow; Python; Matlab; Java; Unix Scripting; Android/Mobile; SQL; HTML; C/C++
- **Machine Learning/Data Analysis**: Deep Learning, including CNNs, RNNs, GANs and DBNs; Machine Learning including SVM, KNN, Fuzzy Rules, Decision Trees, Bayes; Image Processing using OpenCV, MATLAB Image Processing Toolbox

Selected Publications

1. **Amini, A.***, Soleimany, A.*, Schwarting, W., Bhatia, S., Rus, D. (2019). Uncovering and Mitigating Hidden Biases through Learned Latent Structure. Thirty-Third AAAI Conference on Artificial Intelligence (AAAI) *Under-Review*.

2. Hasani, R. M., Lechner, M., **Amini, A.**, Rus, D., Grosu, R. (2018). Re-purposing Compact Neuronal Circuit Policies to Govern Reinforcement Learning Tasks. arXiv preprint arXiv:1809.04423.

3. Hasani, R. M.*, **Amini, A.***, Lechner, M., Naser, F., Grosu, R., Rus, D. (2018). Response Characterization for Auditing Cell Dynamics in Long Short-term Memory Networks. arXiv preprint arXiv:1809.03864.

4. **Amini, A.**, Paull, L., Balch, T., Karaman, S., Rus, D. (2018, May). Learning steering bounds for parallel autonomous systems. IEEE International Conference on Robotics and Automation (ICRA) (pp. 1-8).

5. **Amini, A.** (2018). Robust end-to-end learning for autonomous vehicles (Doctoral dissertation, Massachusetts Institute of Technology).

6. **Amini, A.**, Schwarting, W., Rosman, G., Araki, B., Karaman, S., Daniela, R. (2018). Variational Autoencoder for End-to-End Control of Autonomous Driving with Novelty Detection and Training De-biasing. IEEE/RSJ International Conference on Intelligent Robots and Systems.

7. **Amini, A.**, Soleimany, A., Karaman, S., Rus, D. (2017). Spatial Uncertainty Sampling for End-to-End Control. Bayesian Deep Learing at Neural Information Processing Systems (NIPS).

8. Yoshimura, Y., **Amini, A.**, Sobolevsky, S., Blat, J., Ratti, C. (2017). Analysis of pedestrian behaviors through non-invasive Bluetooth monitoring. Applied geography, 81, 43-51.

9. **Amini, A.**, Horn, B., Edelman, A. (2016). Accelerated Convolutions for Efficient Multi-Scale Time to Contact Computation in Julia. arXiv preprint arXiv:1612.08825.

10. Yoshimura, Y., **Amini, A.**, Sobolevsky, S., Blat, J., Ratti, C. (2016). Analysis of Customers Spatial Distribution Through Transaction Datasets. In Transactions on Large-Scale Data-and Knowledge-Centered Systems XXVII (pp. 177-189). Springer, Berlin, Heidelberg.

11. **Amini, A.**, Kung, K., Kang, C., Sobolevsky, S., Ratti, C. (2014). The impact of social segregation on human mobility in developing and industrialized regions. EPJ Data Science, 3(1), 6.

12. Pei, T., Sobolevsky, S., Ratti, C., **Amini, A.**, Zhou, C. (2014). Uncovering the directional heterogeneity of an aggregated mobile phone network. Transactions in GIS, 18, 126-142.

13. **Amini, A.**, Kung, K., Kang, C., Sobolevsky, S., Ratti, C. (2013). The differing tribal and infrastructural influences on mobility in developing and industrialized regions. Mobile phone data for development-analysis of mobile phone datasets for the development of Ivory Coast. Orange D4D challenge, 339.

14. **Amini, A.** "System and method for adaptive delivery of game balls based on player-specific performance data analysis." U.S. Patent No. 8,419,560. 16 Apr. 2013.

15. **Amini, A.** "System and method for motion analysis and feedback with ongoing dynamic training orientation determination." U.S. Patent No. 13/183,306.