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 – May 2022 (anticipated)*
- **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 reliable and robust uncertainty estimation for these deep learning algorithms.
- **NVIDIA Corporation** — 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, 2020, 2021, 2022*
  I am a lead lecturer and organizer the course; including developing the curriculum, teaching the lectures, handling sponsorship from industrial partners, 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.
- **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

- **JP Morgan Chase Graduate Research Fellowship** *2021-2022*
- **National Science Foundation (NSF) Graduate Research Fellowship** *2017-2022*
- **Grand Prize Winner, European Union Young Scientist** *2011*
  Top prize winning project: *Tennis Sensor Data Analysis: An Automated System for Macro-motion Refinement*; which developed mathematical models for detecting the subtle differences in motion to automatically classify and provide corrective feedback.
- **Grand Prize Winner, BT Young Scientist and Technologist** *2011*
  Top prize winner in in Ireland's national science competition for: *Tennis Sensor Data Analysis.* Selected to represent the nation of Ireland at the international level, against 38 different countries, where the work again won the top grand prize.

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. Vorbach, C., Hasani, R., **Amini, A.**, Lechner, M., Rus, D. (2021). Causal Navigation by Continuous-time Neural Networks. Neural Information Processing Systems (NeurIPS).

2. Liebenwein, L.*, Hasani, R.*, **Amini, A.**, Rus, D. (2021). Sparse flows: Pruning continuous-depth models. Neural Information Processing Systems (NeurIPS).

3. Soleimany, A.*, **Amini, A.***, Goldman, S.*, Rus, D., Bhatia, S. N., Coley, C. W. (2021). Evidential Deep Learning for Guided Molecular Property Prediction and Discovery. ACS central science, 7(8), 1356-1367.

4. Liu, Z.*, **Amini, A.***, Zhu, S., Karaman, S., Han, S., Rus, D. (2021). Efficient and Robust LiDAR-Based End-to-End Navigation. IEEE International Conference on Robotics and Automation (ICRA).

5. Spielberg, A.*, **Amini, A.***, Chin, L., Matusik, W., Rus, D. (2021). Co-Learning of Task and Sensor Placement for Soft Robotics. IEEE Robotics and Automation Letters (RA-L). *Best Paper Finalist: 2.5%, Joint at RA-L & Robosoft*

6. Hasani, R., Lechner, M., **Amini, A.**, Rus, D., Grosu, R. (2021). Liquid time-constant networks. AAAI Conference on Artificial Intelligence. *Oral spotlight*

7. **Amini, A.**, Schwarting, W., Soleimany, A. and Rus, D. (2020) Deep Evidential Regression. Neural Information Processing Systems (NeurIPS).

8. Lechner, M.*, Hasani, R. M.*, **Amini, A.**, Henzinger, T., Rus, D., Grosu, R., (2020) Neural Circuit Policies Enabling Auditable Autonomy. Nature Machine Intelligence, *In press.*

9. **Amini, A.**, Gilitschenski, I., Phillips, J., Moseyko, J., Banerjee, R., Karaman, S., Rus, D. (2020) Learning Robust Control Policies for End-to-End Autonomous Driving from Data-Driven Simulation. IEEE Robotics and Automation Letters (RA-L). *Joint acceptance to RA-L & ICRA*

10. **Amini, A.***, Lipton, J.*, Daniela, R. (2020) Uncertainty Aware Texture Classification and Mapping Using Soft Tactile Sensors. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

11. Hasani, R. M., Lechner, M., **Amini, A.**, Rus, D., Grosu, R. (2020). The natural lottery ticket winner: Reinforcement learning with ordinary neural circuits. International Conference on Machine Learning (ICML).

12. **Amini, A.**, Rosman, G., Karaman, S., Rus, D. (2019). Variational end-to-end navigation and localization. IEEE International Conference on Robotics and Automation (ICRA) (pp. 8958-8964) **(Best paper finalist. 0.1% of all submissions)**. *Best Paper Finalist: 0.1%*

13. **Amini, A.***, Soleimany, A.*, Schwarting, W., Bhatia, S., Rus, D. (2019). Uncovering and Mitigating Hidden Biases through Learned Latent Structure. AAAI/ACM Conference on AI Ethics and Society (AIES).

14. Gilitschenski, I., Sahoo. R., Schwarting, W., **Amini, A.**, Karaman, S., Rus, D. (2019) Deep Orientation Uncertainty Learning based on a Bingham Loss. International Conference on Learning Representations (ICLR).

15. 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. International Joint Conference on Neural Networks (IJCNN). *Oral spotlight*

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

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

18. **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.

19. **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). *Travel award: 8% and Oral spotlight: 12%*

20. 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.

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

22. 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.

23. **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.

24. 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.

25. **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. *Oral spotlight: 16%*

26. **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.

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