

Ramin Hasani

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CURRENT POSITION

Massachusetts Institute of Technology, Cambridge, MA 10/2020 - Present
Postdoctoral Associate, CSAIL Distributed Robotics Lab, PI: Prof. Daniela Rus

EDUCATION

Technische Universität Wien, Austria 12/2015 - 5/2020
Ph.D., Computer Science – 5.0/5.0 Summa cum Laude, Supervisors: Radu Grosu (TU Wien), Daniela Rus (MIT)
Thesis: Interpretable Recurrent Neural Networks in Continuous-time Control Environments

Politecnico di Milano, Italy 09/2012 - 12/2015
M.Sc. in Electronic Engineering, Supervisors: Giorgio Ferrari, Enrico Prati
Thesis: Design of silicon neurons for noise-assisted computations in spiking neural networks

Ferdowsi University of Mashhad, Iran 09/2007 - 01/2012
B.Sc. in Electrical Engineering – Electronics

RESEARCH EXPERIENCE

CSAIL MIT, Postdoctoral Associate, CSAIL Distributed Robotics Lab, PI: Prof. Daniela Rus 10/2020 - Present
TU Wien, Postdoctoral Associate, Cyber Physical Systems, PI: Prof. Radu Grosu 5/2020 – 11/2020
TU Wien, Research Assistant, Cyber Physical Systems 12/2015 – 5/2020
CSAIL MIT, Research Scholar, Distributed Robotics Lab 3/2019 – 8/2019
CSAIL MIT, Research Scholar, Distributed Robotics Lab 10/2017 – 12/2017
Imperial College London, Visiting Research Scholar, VAS Group, PI: Prof. Alessio Lomuscio 6/2017 – 10/2017
OpenWorm Foundation, Senior Contributor 9/2017 – Present
Politecnico di Milano, DEIB, Prof. G. Ferrari Lab, Research Assistant 10/2014 – 12/2015
Politecnico di Milano, DEIB, Prof. G. Bertuccio Lab, Research Intern 10/2013 – 2/2014

HONORS AND AWARDS

TÜV Austria Wissenschaftspreis nomination (Top 3 out of 80 Dissertations) 9/2020
Co-advisor for the Champion team at the IFAC World Congress, Berlin Grand PRX Virtual Autonomous Racing 7/2020
Doctoral degree with distinctions from Technische Universität Wien 5/2020
Google Cloud Platform (GCP) Research Credit Program (\$13,085) 10/2018
Startup Award at the Annual TU Wien i2c Networking Friday event 2/2018
Microsoft Azure for Research Award (\$13,000) 1/2018
Microsoft Azure for Research Award (\$10,000) 11/2017
NeurIPS 2017 Sponsor Scholar 12/2017
IJCAI BOOM Workshop best poster award 8/2017
ICML 2017 Sponsor Scholar 8/2017
Microsoft Azure for Research Award (\$20,000) 1/2017
M.Sc. Scholarship, Politecnico di Milano, Italy 2013 – 2015

RESEARCH GRANTS AND PROPOSALS I CONTRIBUTE/D TO THEIR WRITE-UP

NSF EFRI- Grant proposal on Brain-Inspired Dynamics for Engineering Energy-Efficient AI (BRAID) 2022-2023
Boeing and the Office of Naval Research (ONR) Grant N00014-18-1-2830. Topic: Explainable AI for Control 1/2020-7/2022
European Research Council Horizon-2020 ECSEL Project grant No. 783163 (iDev40). Topic: Safe AI 2017/2021

PROFESSIONAL ACTIVITY

Grant Reviewing

US Air Force Office of Scientific Research - AFOSR's Computational Cognition & Machine Intelligence Program 2022

Editorial

Associate Editor (AE) for the IEEE Robotics and Automation Society for (ICRA) 2021

Reviewing

Neural Information Processing Systems (NeurIPS) 2019, 2020, 2021

International Conference on Machine Learning (ICML) 2020, 2021

International Conference on Learning Representations (ICLR) 2021, 2022

International Conference on Robotics and Automation (ICRA) 2021

AAAI Conference on Artificial Intelligence (AAAI) 2021

Conference on Computer Vision and Pattern Recognition (CVPR) 2022

Robotics, Systems and Sciences (RSS) 2021

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021

ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS) 2019

Tools and Algorithms for the Construction and Analysis of Systems (TACAS) 2016, 2019

Runtime Verification (RV) Conference, 2016, 2018, 2020

International Conference on Computational Methods in Systems Biology (CMSB) 2018

Organization and Membership

Simple-AI KG, Co-Founder. Interpretable Machine Learning solutions, Headquarter: Vienna, Austria

1/2019 – present

NeurIPS Workshop on Worm's Neural Information processing (WNIP), Program Chair, Long Beach, CA

12/9/2017-12/10/2017

OpenWorm Foundation, Senior Contributor

10/2017 - Present

PUBLICATIONS

*Equal Contributions

Peer-Reviewed Publications

- 24 Lucas Liebenwein*, Ramin Hasani*, Alexander Amini, Daniela Rus. Sparse Flows: Pruning Continuous-depth Models, Accepted to the Conference on Neural Information Processing Systems (**NeurIPS**), 2021
- 23 Charles Vorbach*, Ramin Hasani*, Alexander Amini, Mathias Lechner, Daniela Rus. Causal Navigation by Continuous-time Neural Networks, Accepted to the Conference on Neural Information Processing Systems (**NeurIPS**), 2021
- 22 Mathias Lechner, Ramin Hasani, Radu Grosu, Daniela Rus, Thomas Henzinger. Adversarial Training is Not Ready for Robot Learning, Accepted to the IEEE International Conference on Robotics and Automation (**ICRA**), 2021
- 21 Sophie Gruenbacher, Mathias Lechner, Ramin Hasani, Daniela Rus, Thomas Henzinger, Scott Smolka, Radu Grosu. GoTube: Scalable Stochastic Verification of Continuous-Depth Models, Accepted at the AAAI Conference on Artificial Intelligence **AAAI**, 2022
- 20 Ramin Hasani*, Mathias Lechner*, Alexander Amini, Daniela Rus, Radu Grosu. Liquid Time-constant Networks, AAAI Conference on Artificial Intelligence (**AAAI**), 2021.
- 19 Zahra Babaei, Ramin Hasani, Mathias Lechner, Daniela Rus, Radu Grosu. On-Off Center-Surround Receptive Fields for Accurate and Robust Image Classification. accepted to the International Conference on Machine Learning (**ICML**), 2021.
- 18 Mathias Lechner*, Ramin Hasani*, Alexander Amini, Thomas Henzinger, Daniela Rus, Radu Grosu. Neural Circuit Policies Enabling Auditable Autonomy, **Nature Machine Intelligence**, 2020.
- 17 Sophie Grünbacher, Ramin Hasani, Mathias Lechner, Jacek Cyranka, Scott A. Smolka, Radu Grosu. On the Verification of Neural ODEs with Stochastic Guarantees, AAAI Conference on Artificial Intelligence (**AAAI**), 2021.
- 16 Ramin Hasani. Interpretable Recurrent Neural Networks in Continuous-time Control Environments, PhD Thesis, Technische Universität Wien, 05.05.2020.
- 15 Ramin Hasani*, Mathias Lechner*, Alexander Amini, Daniela Rus, Radu Grosu. The Natural Lottery Ticket Winner: Reinforcement Learning by Ordinary Neural Circuits. International Conference on Machine Learning (**ICML**), 2020.
- 14 Mathias Lechner*, Ramin Hasani*, Daniela Rus, Radu Grosu. Gershgorin Loss Stabilizes the Recurrent Neural Network Compartment of an End-to-end Robot Learning Scheme. International Conference on Robotics and Automation (**ICRA**), 2020.

- 13 Joseph DelPreto, Andres Gomez, Stephanie Gil, Ramin Hasani, Frank Guenther, Daniela Rus. Plug-and-Play Supervisory Control Using Muscle and Brain Signals for Real-Time Gesture and Error Detection, *The Journal of Autonomous Robots (AURO)*, 2020.
- 12 Mathias Lechner*, Ramin Hasani*, Manuel Zimmer, Thomas Henzinger, Radu Grosu. Designing Worm-inspired Neural Networks for Interpretable Robotics Control. *International Conference on Robotics and Automation (ICRA)*, 2019
- 11 Ramin Hasani*, Guodong Wang*, and Radu Grosu. A Machine Learning Suite for Machine Components' Health-Monitoring. *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*, 2019.
- 10 Wang Guodong, Anna Ledwoch, Ramin Hasani, Radu Grosu, and Alexandra Brintrup. A generative neural network model for the quality prediction of work in progress products. *Journal of Applied Soft Computing*:105683, 2019.
- 9 Ramin Hasani*, Alexander Amini*, Mathias Lechner, Felix Naser, Radu Grosu, Daniela Rus. Response Characterization for Auditing Cell Dynamics in Long Short-term Memory Networks. *32nd International Joint Conference on Neural Networks (IJCNN)*, 2019.
- 8 Padraig Gleeson, David Lung, Radu Grosu, Ramin Hasani, Stephen Larson. c302: a multiscale framework for modelling the nervous system of *C. elegans* *Philosophical Transactions of the Royal Society B* 373 (1758), 20170379, 2018.
- 7 Gopal P Sarma, Chee Wai Lee, Tom Portegys, Vahid Ghayoomie, Travis Jacobs, Bradly Alicea, Matteo Cantarelli, Michael Currie, Richard C Gerkin, Shane Gingell, Padraig Gleeson, Richard Gordon, Ramin Hasani, Giovanni Idili, Sergey Khayrulin, David Lung, Andrey Palyanov, Mark Watts, Stephen D Larson. OpenWorm: overview and recent advances in integrative biological simulation of *C. elegans*. *Philosophical Transactions of the Royal Society B* 373 (1758), 20170382, 2018.
- 6 Joseph DelPreto, Andres F. Salazar-Gomez, Stephanie Gil, Ramin Hasani, Frank H. Guenther, Daniela Rus. Plug-and-Play Supervisory Control Using Muscle and Brain Signals for Real-Time Gesture and Error Detection. *14th Robotics: Science and Systems (RSS)*, 2018.
- 5 Mathias Lechner, Radu Grosu, Ramin Hasani. Worm-level Control through Search-based Reinforcement Learning. *Deep Reinforcement Learning Symposium (Deep RL)* at the 31st Conference on Neural Information Processing Systems (*NeurIPS*), 2017.
- 4 Ramin Hasani, Dieter Haerle, Christian F. Baumgartner, Alessio R. Lomuscio and Radu Grosu. Compositional Neural-Network Modeling of Complex Analog Circuits. *30th International Joint Conference on Neural Networks (IJCNN)*, IEEE, 2017.
- 3 Ramin Hasani, Guodong Wang, and Radu Grosu. Towards Deterministic and Stochastic Computations with Izhikevich Spiking Neuron Model. *14th International Work-Conference on Artificial Neural Networks (IWANN)*, Springer, 2017.
- 2 Konstantin Selyunin, Ramin Hasani, Denise Ratasich, Ezio Bartocci, and Radu Grosu. Computing with Biophysical and Hardware-efficient Neural Models. *14th International Work-Conference on Artificial Neural Networks (IWANN)*, Springer, 2017.
- 1 Ramin Hasani, Dieter Haerle, and Radu Grosu. Efficient Modeling of Complex Analog Integrated Circuits Using Neural Networks. *12th IEEE Conference on PhD Research in Microelectronics and Electronics (PRIME)*, 2016.

Preprints and Papers Under Review

- 9 Ramin Hasani, Mathias Lechner, Alexander Amini, Lucas Liebenwein, Aaron Ray, Max Tschaikowski, Gerald Teschl, Daniela Rus. Closed-form Continuous-depth Models, 2022
- 8 Wei Xiao, Ramin Hasani, Xiao Li, Daniela Rus. BarrierNet: Differentiable Control Barrier Functions, 2022
- 7 Mathias Lechner, Alexander Amini, Ramin Hasani, Johnson Wang, Daniela Rus. Do Patch-based Vision Models Generalize Better Than CNNs in Closed-loop?, 2022
- 6 Mathias Lechner, Ramin Hasani, Zahra Babaiee, Radu Grosu, Daniela Rus, Thomas Henzinger, Sepp Hochreiter. Entangled Residual Mappings, 2022
- 5 Markus Böck, Julien Malle, Daniel Pasterk, Hrvoje Kukina, Ramin Hasani, Clemens Heitzinger. Superhuman Performance for Sepsis Treatment by Distributional Reinforcement Learning, 2022
- 4 Axel Brunnbauer*, Luigi Berducci*, Andreas Brandstätter*, Mathias Lechner, Ramin Hasani, Daniela Rus, Radu Grosu. Model-based versus Model-free Reinforcement Learning for Autonomous Racing Cars, 2022.
- 3 Mathias Lechner, Ramin Hasani. Learning Long-Term Dependencies in Irregularly-Sampled Time Series, 2022.

- 2 Jordan Docter, Catherine Zeng, Alexander Amini, Igor Gilitschenski, Ramin Hasani, Daniela Rus. Dreaming with Transformers, 2022
- 1 Daniel Pasterk*, Ramin Hasani*, Mathias Lechner, Daniela Rus, Clemens Heitzinger. Cached-kNN Reinforcement Learning, 2022

Workshop Papers

- 7 Mathias Lechner*, Ramin Hasani*, and Radu Grosu. Interpretable Neuronal Circuit Policies for Reinforcement Learning Environments. IJCAI/ECAI Workshop on Explainable AI (XAI), 2018
- 6 Magdalena Fuchs, Manuel Zimmer, Radu Grosu and Ramin Hasani. Searching for Biophysically Realistic Parameters for Dynamic Neuron Models by Genetic Algorithms from Calcium Imaging Recording. NeurIPS Workshop on Worm’s Neural Information Processing, 2017.
- 5 Ramin Hasani, Victoria Bener, Magdalena Fuchs, David Lung, and Radu Grosu. SIM-CE: An Advanced Simulation Platform for Studying the brain of *C. elegans*. ICML Workshop on Computational Biology (WCB), 2017.
- 4 David Lung, Stephen Larson, Andrey Palyanov, Sergey Khayrulin, Padraig Gleeson, Manuel Zimmer, Radu Grosu and Ramin Hasani. A Simplified Cell Network for the Simulation of *C. elegans*’ Forward Crawling. NeurIPS Workshop on Worm’s Neural Information Processing, 2017.
- 3 Ramin Hasani, Magdalena Fuchs, Victoria Bener, Radu Grosu. Modeling a Simple Non-Associative Learning Mechanism in the Brain of *C. elegans*. IJCAI International Workshop on Biomedical Informatics with Optimization and Machine Learning, 2017. (Best Poster Award)
- 2 Islam, Ariful, Qinsi Wang, Ramin Hasani, Ondrej Balun, Edmund Clarke, Radu Grosu, and Scott Smolka. Probabilistic Reachability Analysis of the Tap-Withdrawal Circuit in *C. elegans*. 18th International High-Level Design Validation and Test Workshop (HLDVT), pp. 170-177, 2016.
- 1 Ramin Hasani, Lukas Esterle, and Radu Grosu. Investigations on the Nervous System of *Caenorhabditis elegans*. 39th German Conference on Artificial Intelligence (KI 2016) – Current AI Research in Austria Workshop (CAIRA), 2016.

PHD STUDENTS I CO-ADVISE/D, AND WORK/ED WITH

Makram Chahine – PhD Student, Computer Science, CSAIL MIT. Topic: Understanding Memory in Deep Learning	9/2021 – Present
Tsun-Hsuan Wang – PhD Student, Computer Science, CSAIL MIT. Topic: Liquid Networks for Causality and Interactions in Multi-agent Systems	11/2020 – Present
Aaron Ray – PhD Student, Computer Science, CSAIL MIT. Topic: Liquid Networks for End-to-end Causal Navigation	3/2021 – Present
Lucas Liebenwein – PhD Student, Computer Science, CSAIL MIT. Topic: Understanding Continuous-Depth Neural Models	1/2020 – Present
Alexander Amini – PhD Student, Computer Science, CSAIL MIT. Topic: Liquid Networks for End-to-end Autonomy	1/2018 – Present
Mathias Lechner – PhD Student, Computer Science, IST Austria. Topic: Liquid Networks and Understanding Recurrent Neural Networks	10/2017 – Present
Zahra Babaei – PhD Student, Computer Science, TU Wien. Topic: Brain-inspired Deep Learning Architectures	1/2020 – Present
Daniel Pasterk – PhD Student, Computer Science, TU Wien. Topic: Learning with Convergence Guarantees	1/2020 – Present
Sophie Gruenbacher – PhD Student, Computer Science, TU Wien. Topic: Verification of Continuous-time Neural Models	1/2020 – Present
Luigi Berducci – PhD Student, Computer Science, TU Wien. Topic: Model-based Deep RL for Autonomous Racing	5/2020 – 11/2020
Axel Brunnbauer – PhD Student, Computer Science, TU Wien. Topic: Model-based and Model-free Deep RL for Autonomous Racing	4/2020 – 11/2020

MSC & BSC STUDENTS I SUPERVISE/D

Patrick Kao – M.Eng. in Computer Science at MIT. Topic: Decision-making with Continuous Depth Models	9/2021 – Present
Ryan Shubert – M.Eng. in Computer Science at MIT. Topic: Multi-agent RL with Continuous-Depth Models	6/2021 – Present
Nicole Stiles – B.Sc. in Computer Science at MIT. Topic: Density Estimation with Neural ODEs	2/2021 – 10/2021
Catherine Zhang – B.Sc. in Computer Science at Harvard. Topic: Reinforcement Learning with Transformers	8/2020 – 11/2021
Charles Vorbach – B.Sc. in Computer Science at MIT. Topic: Causal Navigation by Continuous-time Neural Networks	7/2020 – 7/2021
Axel Brunnbauer – M.Sc. in Computer Engineering at TU Wien. Thesis: Real-world Model-based Reinforcement Learning	7/2020 – 7/2021
Jordan E. Docter – B.Sc. in Computer Science at MIT. Topic: Robot Learning with Transformers	8/2020 – 4/2021
William Chen – B.Sc. in Computer Science at MIT. Topic: End-to-end Multi-agent Drone navigation	8/2020 – 3/2021
Hannes Barntner – M.Sc. in Computer Engineering at TU Wien. Thesis: Learning long-term dependencies by continuous-time deep models.	10/2020 – 3/2021
Stefan Sietzen – M.Sc. in Visual Computing at TU Wien. Thesis: Robustness analysis in deep learning models	1/2020 – 12/2020
Mathias Lechner – M.Sc. in Computer Engineering at TU Wien Thesis Title: Brain-inspired Neural Control. Won the Best Thesis Award at TU Wien's Faculty of Informatics. Now: Ph.D. student in Machine Learning at IST Austria	10/2016 – 10/2017
Marc Javin – M.Sc. in Computer Engineering at TU Wien Thesis Title: A Hybrid Optimization suite for Biologically-inspired Neuronal Circuits Now: Deep Learning Engineer at emotion3D	2/2018 – 11/2018
David Lung – M.Sc. in Computer Engineering at TU Wien Thesis title: OpenWorm: Design and Evaluation of Neural Circuits on the Virtual Worm, C. elegans Now: Ph.D. student in bio-inspired machine learning at TU Wien	1/2017 – 12/2018
Bernhard Müllner – M.Sc. in Computer Engineering, TU Wien Thesis title: Better end-to-end object detection in low SNR environments with Time-of-Flight Cameras Now: Software Engineer at BECOM Systems GmbH	11/2018 – 10/2019
Magdalena Fuchs - M.Sc. in Biomedical Engineering at TU Wien Thesis Title: Principles of Learning and Memory in the Nervous System of C. elegans Now: Product Development Engineer at Lohmann & Rauscher	1/2017 – 6/2018
Ondrej Balún – M.Sc. in Computer Engineering, TU Wien Thesis Title: Towards Distributed Controllers Based on C. elegans Locomotory Neural Network Now: IAM Expert Group Lead at Ventum Consulting	12/2015 - 1/2017
Zahra Babaei – B.Sc. in Computer Engineering at Sharif University of Technology. Internship Project: Deep learning for brain data, Now: Ph.D. student at TU Wien	7/2018 – 10/2018
Julian Posch – B.Sc. in Physics, Universität Wien Internship Project: What happens inside a Neural network Now: Machine Learning M.Sc. student in University of Amsterdam	3/2019 – 9/2019
Benjamin Kulnik – B.Sc. in Electrical Eng. at TU Wien. Thesis Title: A Grid-Search Algorithm for Selecting the Optimal Structure in Deep Neural Networks Now: Master student at TU Wien, AI Engineer at Infineon Austria	10/2017 – 2/2018

TEACHING EXPERIENCE

Guest Lectures

<i>Deep Learning</i> , Asigmo Data Science Program, Virtual	10/2020
<i>Continuous-Time Neural Networks</i> , Mila, Dynamical Systems Group, Virtual	7/2020
<i>Continuous-time Neural Networks</i> , deeplearning.ai, Virtual	6/2020
<i>Recurrent Neural Networks</i> , Infineon Technologies AI Workshop, Villach, Austria	9/2018
<i>Recurrent Neural Networks for Modeling Sequences</i> , Infineon Technologies AI Workshop, Munich, Germany	7/2018
<i>Introduction to Deep Learning</i> , IMP Austria, Zimmer Group	12/2017

Teaching Assistant

Autonomous Racing Cars, 191.119, TU Wien	Spring 2020
Stochastic Foundation of Cyber Physical Systems, 182.763, TU Wien	Winter 2019
Stochastic Foundation of Cyber Physical Systems, 182.763, TU Wien	Winter 2018
Logical Foundation of Cyber Physical Systems, 182.764, TU Wien	Spring 2019

INVITED TALKS

<i>Liquid Networks in Closed-Loop</i> November MDAO CoE Technical Exchange, Boeing - Aurora	11/22/2021
<i>Liquid Neural Networks</i> MIT Industrial Liaison Program (ILP)	11/2/2021
<i>Liquid Neural Networks</i> The Center for Brains, Minds and Machines (CBMM) MIT	10/5/2021
<i>Liquid Machine Learning</i> IJCAI Workshop on AI for Autonomous Driving	8/21/2021
<i>Liquid Neural Networks</i> MIT Open Learning, MIT Horizon, Cambridge, MA	4/8/2021
<i>Understanding Liquid Time-Constant Networks</i> , MIT Lincoln Laboratory Machine Learning Seminar Series	3/25/2021
<i>Liquid Time-Constant Networks</i> , Synthesis of Models and Systems Seminar at Simons Institute, UC Berkeley, CA	3/22/2021
<i>What Is a Liquid Time-Constant Network?</i> , Northeastern University, Boston, MA	3/14/2021
<i>Continuous-time Neural Networks</i> , Complexity Science Hub Vienna, Virtual	9/10/2020
<i>Liquid Time-constant Networks</i> , MIT CSAIL, Virtual	7/22/2020
<i>Explainable AI</i> , Computer Futures, Vienna, Austria, Keynote talk	2/28/2020
<i>Interpretable AI Agents</i> , Cognitive Vehicles, Berlin, Germany, Keynote talk	6/5/2019
<i>A Journey Inside a Neural Network</i> , TEDxCluj, Romania, TEDx talk	6/29/2019
<i>Simple Brains to Govern Complex tasks</i> , TEDxVienna, Austria, TEDx talk	10/20/2018
<i>AI and Neuroscience</i> , The BrainStorms 3 event, Vienna, Austria, Invited talk	9/19/2018
<i>NeurIPS Workshop on Worm's Neural Information Processing</i> , Long Beach, USA, organizer and Moderator	12/2017
<i>Learning with a Worm's Brain</i> , Sharif University of Technology, Tehran, Iran, Invited talk	9/2017

SELECTED INTERVIEWS

These neural networks know what they're doing, MIT News	10/14/2021
Data Quality in Machine Learning and Data Science, Asigmo Data Science Podcast [link]	5/14/2021
Liquid machine learning system adapts to changing conditions, MIT News	1/28/2021
Neural Networks – interview with Dr. Ramin Hasani, Nicole Kirowitz, Digital Society	7/3/2020
To control complex systems with a simple brain – the interview with Ramin Hasani, Vera Steiner, TEDxVienna	11/12/2018
AI researcher: Understand current learning systems better, Jakob Steinschaden, Trending Topics	10/18/2018
Das menschliche Gehirn als Vorbild für vertrauenswürdige künstliche Intelligenz. Marco Di Lorenzo, FutureZone	10/19/2018