

# RAMIN HASANI

Computer Science and Artificial Intelligence Lab (CSAIL)  
Massachusetts Institute of Technology (MIT)  
32 Vassar St., 02139, Cambridge, USA  
rhasani@mit.edu  
www.raminhasani.com



## Current Position

Postdoctoral Associate, **MIT CSAIL**, Distributed Robotics Lab, PI: Daniela Rus 10/2020-Present

## Education

**Technische Universität Wien**, Austria 12/2015 – 05/2020

PhD, Computer Science – **graduation with honors**, Advisors: Radu Grosu, 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, Advisors: 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

**MIT CSAIL**, Distributed Robotics Lab, Postdoctoral Associate 10/2020 – Present

**TU Wien**, Cyber Physical Systems, Postdoctoral Associate 05/2020 – 11/2020

**TU Wien**, Cyber Physical Systems, Research Assistant 12/2015 – 05/2020

**MIT CSAIL**, Distributed Robotics Lab, Research Scholar 03/2019 – 08/2019

**MIT CSAIL**, Distributed Robotics Lab, Research Scholar 10/2017 – 12/2017

**Imperial College London**, VAS Group, Visiting Research Scholar 06/2017 – 10/2017

**OpenWorm** Foundation, Senior Contributor 09/2017 – Present

**Politecnico di Milano**, DEIB, G. Ferrari Lab, Research Assistant 10/2014 – 12/2015

**Politecnico di Milano**, DEIB, G. Bertuccio Lab, Research Intern 10/2013 – 02/2014

**e-Novia**, Research Intern 04/2013 – 08/2014

# Teaching Experience

## Guest Lectures

<i>Deep Learning</i> at Asigmo Data Science Program	27-31 Oct 2020
<i>Continuous-Time Neural Networks</i> at Mila, Dynamical Systems Group, Virtual	Jul 2020
<i>Continuous-time Neural Networks</i> at deeplearning.ai, Virtual	Jun 2020
<i>Recurrent Neural Networks</i> at Infineon Technologies AI Workshop, Villach, Austria	Sep 2018
<i>Recurrent Neural Networks for Modeling Sequences</i> at Infineon Technologies AI Workshop, Munich, Germany	Jul 2018
<i>Introduction to Deep Learning</i> IMP Austria, Zimmer Group	Dec 2017

## Teaching Assistant

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

## Invited Talks

<i>Continuous-time Neural Networks</i> <i>Complexity Science Hub Vienna</i> , Virtual	10 Sep 2020
<i>Liquid Time-constant Networks</i> <i>MIT CSAIL</i> , Virtual	22 July 2020
<i>Continuous-time Neural Networks</i> <i>Mila Dynamical Systems Group</i> , Virtual	12 June 2020
<i>Continuous-time Neural Networks</i> <i>deeplearning.ai</i> , Virtual, Keynote talk	12 June 2020
<i>Explainable AI</i> <i>Computer Futures</i> , Vienna, Austria, Keynote talk	28 Feb 2020
<i>Interpretable AI Agents</i> <i>Cognitive Vehicles</i> , Berlin, Germany, Keynote talk	5 Jun 2019
<i>A Journey Inside a Neural Network</i>	29 Jun 2019

<i>TEDxCluj</i> , Romania, TEDx talk	
Simple Brains to Govern Complex tasks	20 Oct 2018
<i>TEDxVienna</i> , Austria, TEDx talk	
Recurrent Neural Networks	25 Sep 2018
<i>Infineon AI Workshop</i> , Villach, Austria, Tutorial	
AI and Neuroscience,	19 Sep 2018
<i>The BrainStorms #3 event</i> , Vienna, Austria, Invited talk	
Recurrent Neural Networks	30-31 Jul 2018
<i>Infineon AI Workshop</i> , Munich, Germany, Tutorial	
NIPS Workshop on Worm's Neural Information Processing	Dec 2017
Long Beach, USA, organizer	
Learning with a Worm's Brain	Sep 2017
<i>Sharif Univ of Tech</i> , Tehran, Iran, Invited talk	

## Honors & Awards

TÜV Austria Wissenschaftspreis nomination	Sep 2020
Co-advisor for the winner team "TU-Fast TU Furious" at the IFAC World Congress,	Jul 2020
Berlin Grand PRX Virtual Autonomous Racing	
Doctoral degree with distinctions, Technische Universität Wien	May 2020
Google Cloud Platform (GCP) Research Credit Program (\$13,085)	Oct 2018
Startup Award at the Annual TU Wien i2c Networking Friday event	Feb 2018
Microsoft Azure for Research Award (\$13,000)	Jan 2018
Microsoft Azure for Research Award (\$10,000)	Nov 2017
NIPS 2017 Sponsor Scholar	Dec 2017
IJCAI BOOM Workshop best poster award	Aug 2017
ICML 2017 Sponsor Scholar	Aug 2017
Microsoft Azure for Research Award (\$20,000)	Jan 2017
M.Sc. Scholarship, Politecnico di Milano, Italy	2013 – 2015

## Students I Supervise/d

Jordan E. Docter – B.Sc. in Computer Science at MIT	Aug 2020 – Present
Topic: Robot learning with Transformers	
Catherine Zhang – B.Sc. in Computer Science at Harvard	Aug 2020 – Present
Topic: Reinforcement Learning with Transformers	

William Chen – B.Sc. in Computer Science at MIT Topic: End-to-end Multi-agent Drone navigation	Aug 2020 – Present
Charles Vorbach – B.Sc. in Computer Science at MIT Topic: Learning continuous-time neural controllers for drone navigation	Jul 2020 – Present
Stefan Sietzen – M.Sc. in Visual Computing at TU Wien Thesis Topic: Robustness analysis in deep learning models	Jan 2020 – Present
Mathias Lechner – M.Sc. in Computer Engineering at TU Wien Thesis Title: Brain-inspired Neural Control <i>Won the Best Thesis Award at TU Wien's Faculty of Informatics</i> Now: Ph.D. student in Machine Learning at IST Austria	Oct 2016 – Oct 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	Feb 2018 – Nov 2018
David Lung – M.Sc. in Computer Engineering at TU Wien Thesis title: OpenWorm: Design and Evaluation of Neural Circuits on the Virtual Worm, <i>C. elegans</i> Now: Ph.D. student in bio-inspired machine learning at TU Wien	Jan 2017 – Dec 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	Nov 2018 – Oct 2019
Magdalena Fuchs - M.Sc. in Biomedical Engineering at TU Wien Thesis Title: Principles of Learning and Memory in the Nervous System of <i>C. elegans</i> Now: Product Development Engineer at Lohmann & Rauscher	Jan 2017 – Jun 2018
Ondrej Balún – M.Sc. in Computer Engineering, TU Wien Thesis Title: Towards Distributed Controllers Based on <i>C. elegans</i> Locomotory Neural Network Now: IAM Expert Group Lead at Ventum Consulting	Dec 2015 - Jan 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	Jul 2018 – Oct 2018.

Julian Posch – B.Sc. in Physics, Universität Wien

Mar 2019 – Sep 2019

Internship Project: What happens inside a Neural network

Now: Machine Learning M.Sc. student in University of Amsterdam

Benjamin Kulnik – B.Sc. in Electrical Eng. at TU Wien.

Oct 2017 – Feb 2018

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

## Academic Publications

[19] Mathias Lechner, **Ramin Hasani**. Learning Long-Term Dependencies in Irregularly-Sampled Time Series, Accepted to the *Advances in Neural Information Processing Systems (NeurIPS)*, 2020.

[18] Mathias Lechner\*, **Ramin Hasani\***, Alexander Amini, Thomas Henzinger, Daniela Rus, Radu Grosu. Neural Circuit Policies Enabling Auditable Autonomy, Accepted to the **Nature Machine Intelligence**, Sep, 2020.

[17] **Ramin Hasani\***, Mathias Lechner\*, Alexander Amini, Daniela Rus, Radu Grosu. Liquid Time-constant Networks, *Arxiv Preprint*, 2020, [link]

[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 Association for the Advancement of 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] Pdraig 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, Pdraig 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 at the 31st Neural Information Processing Systems (NIPS) Conference*, 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.

## Workshop Papers

Mathias Lechner\*, **Ramin Hasani**\*, and Radu Grosu. Interpretable Neuronal Circuit Policies for Reinforcement Learning Environments. *IJCAI/ECAI Workshop on Explainable AI (XAI)*, 2018

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. *NIPS Workshop on Worm's Neural Information Processing*, 2017.

**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*, 2017.

David Lung, Stephen Larson, Andrey Palyanov, Sergey Khayrulin, Pdraig Gleeson, Manuel Zimmer, Radu Grosu and **Ramin Hasani**. A Simplified Cell Network for the Simulation of *C. elegans*' Forward Crawling. *NIPS Workshop on Worm's Neural Information Processing*, 2017.

**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.

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*. *18<sup>th</sup> International High-Level Design Validation and Test Workshop (HLDVT)*, pp. 170-177, 2016.

**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.

## Professional Activity

### Organization and Membership

<i>NIPS Workshop on Worm's Neural Information processing (WNIP)</i>	Dec 2017
Main Organizer, Program chair, Long Beach, CA, USA	
<i>Simple-AI KG</i>	Jan 2019 – present
Co-Founder. Interpretable Machine Learning solutions, Headquarter: Vienna, Austria	
<i>OpenWorm Foundation</i> , Senior Contributor	Oct 2017 - Present
<i>IEEE-IES Subcommittee</i> on Computer Vision and Human-Machine Interaction	Nov 2016 – Present

in Industrial and Factory Automation, Member

*IEEE, Member*

2012 – Present

### **Paper Reviewing**

Neural Information Processing Systems (NeurIPS) 2019, 2020

International Conference on Machine Learning (ICML) 2020

International Conference on Learning Representations (ICLR) 2021

Association for the Advancement of Artificial Intelligence (AAAI) 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

## **Selected Interviews and Press Coverage**

### **INTERVIEW**

Neural Networks – interview with Dr. Ramin Hasani

03 Jul 2020

Nicole Kirowitz, Digital Society

To control complex systems with a simple brain – the interview with Ramin Hasani

12 Nov 2018

Vera Steiner, TEDxVienna

AI researcher: Understand current learning systems better,  
instead of developing new fancy algorithms

18 Oct 2018

Jakob Steinschaden, Trending Topics

Das menschliche Gehirn als Vorbild für vertrauenswürdige künstliche Intelligenz

19 Oct 2018

Marco Di Lorenzo, FutureZone

### **PRESS**

Watch an AI Modeled After a Worm's Brain Park a Tiny Car Like Pro

05 Nov 2018

By Jordan Pearson, Motherboard VICE

How to control robots with brainwaves and hand gestures

20 Jun 2018

Adam Conner-Simons, MIT Computer Science & Artificial Intelligence Lab

Artificial Intelligence: Parking a Car with only 12 Neurons

22 Oct 2018

Florian Aigner, Featured by TU Wien, Eurek-Alert AAAS, TechXplore, Science Daily,



DerStandard, Oe24

Worm Uploaded to a Computer and Trained to Balance a Pole

06 Feb 2018

Florian Aigner, Featured by TU Wien, ACM Tech-News, Phys.org, ORF.at, IDW