

# RAMIN HASANI

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**I design interpretable machine learning and deep learning algorithms, for the modeling of dynamical systems, autonomous vehicles and robots. My TEDx talks can be viewed at:**

TEDxCluj 2019      [A Journey Inside A Neural Network](#)

TEDxVienna 2018      [Simple Brains to govern Complex Tasks](#)

## Work Experiences

**03/2019 – 08/2019**

**Machine Learning Research Scholar**

**DRL, CSAIL, Massachusetts Institute of Technology (MIT), USA**

Developing Interpretable machine learning algorithms for autonomous systems

**12/2015 - Present**

**Machine Learning PhD Research Assistant**

**CPS Research Division, TU Wien, Austria**

Interpretable Machine Learning

**10/2017 – 11/2017**

**Machine Learning Visiting Research Scholar**

**DRL, CSAIL, Massachusetts Institute of Technology (MIT), USA**

Interpretable machine learning technologies for autonomous driving and robot manipulation.

**06/2016 – 10/2016**

## **Machine learning Visiting Research Scholar**

**VAS Group, Imperial College London, UK**

Recurrent nets for modeling complex analog integrated circuits

<http://vas.doc.ic.ac.uk/people/>

## **Education**

**12/2015 – Present (expected graduation date: March 2020)**

### **PhD in Computer Science**

**TU Wien, Austria**

Thesis: Interpretable Recurrent Neural Networks for Modeling Dynamic Systems

**09/2012 – 12/2015**

### **M.Sc. in Electronic Engineering**

**Politecnico di Milano, Italy**

Thesis: Design of CMOS silicon neurons for noise-assisted computations in spiking neural networks

**09/2007 – 01/2012**

### **B.Sc. in Electrical Engineering – Electronics (TOP 5)**

**Ferdowsi University of Mashhad, Iran**

## **Invited Talks**

[Keynote talk 5<sup>th</sup> Jun 2019] "Interpretable AI Agents", Cognitive Vehicles, Berlin, Germany

[TEDx talk 29<sup>th</sup> Jun 2019] "AI and Neuroscience", TEDxCluj, Romania

[TEDx talk 20<sup>th</sup> Oct 2018] "Simple Brains to Govern Complex tasks", TEDxVienna, Austria

[Tutorial 25<sup>th</sup> Sep 2018] "Recurrent Neural Networks", Infineon AI Workshop, Villach, Austria

[Invited talk 19<sup>th</sup> Sep 2018] "AI and Neuroscience", The BrainStorms #3 event, Vienna, Austria

[Tutorial 30<sup>th</sup>-31<sup>st</sup> Jul 2018] "Recurrent Neural Networks", Infineon AI Workshop, Munich, Germany

[Moderator Dec 2017] "Worm's Neural Information Processing Workshop", Long Beach, USA

[Invited talk Sep 2017] "Learning with a Worm's Brain", Sharif Univ of Tech, Tehran, Iran

## **Publications**

## 2020

### **Gershgorin Loss Stabilizes the Recurrent Neural Network Compartment of an End-to-end Robot Learning Scheme**

Mathias Lechner\*, Ramin Hasani\*, Daniela Rus, Radu Grosu

Accepted to the IEEE International Conference on Robotics and Automation (**ICRA**), Paris, France, 2020

\*equal contributions

## 2019

### **Designing Worm-inspired Neural Networks for Interpretable Robotics Control**

Mathias Lechner\*, Ramin Hasani\*, Manuel Zimmer, Thomas Henzinger, Radu Grosu

the IEEE International Conference on Robotics and Automation (**ICRA**), Montreal, Canada, 2019

\*equal contributions

### **Response Characterization for Auditing Cell Dynamics in Long Short-term Memory Networks**

Ramin Hasani\*, Alexander Amini\*, Mathias Lechner, Felix Naser, Radu Grosu, Daniela Rus

the IEEE 32<sup>nd</sup> International Joint Conference on Neural Networks (**IJCNN**), 2019

\*equal contributions

### **A Machine Learning Suite for Machine Components' Health-Monitoring**

Ramin Hasani\*, Guodong Wang\*, and Radu Grosu

Proceedings of the Association for the Advancement of Artificial Intelligence (**AAAI**), Honolulu, Hawaii, USA, 2019

\*equal contributions

### **Plug-and-Play Supervisory Control Using Muscle and Brain Signals for Real-Time Gesture and Error Detection**

Joseph DelPreto, Andres Salazar-Gomez, Stephanie Gil, Ramin Hasani, Frank Guenther, Daniela Rus

Under revision at the **Journal of Autonomous Robots (AURO)**, 2019

### **A generative neural network model for the quality prediction of work in progress products**

Wang Guodong, Anna Ledwoch, Ramin Hasani, Radu Grosu, and Alexandra Brintrup, **Journal of Applied Soft Computing** (2019): 105683.

## 2018

### **c302: a multiscale framework for modelling the nervous system of *C. elegans***

Padraig Gleeson, David Lung, Radu Grosu, Ramin M. Hasani, Stephen Larson

**Phil. Trans. Royal Society B** 373 (1758), 20170379, 2018

### **OpenWorm: overview and recent advances in integrative biological simulation of *C. elegans***

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 M Hasani, Giovanni Idili, Sergey Khayrulin, David Lung, Andrey Palyanov, Mark Watts, Stephen D Larson

**Phil. Trans. Royal Society B** 373 (1758), 20170382, 2018

### **Plug-and-Play Supervisory Control Using Muscle and Brain Signals for Real-Time Gesture and Error Detection**

Joseph DelPreto, Andres F. Salazar-Gomez, Stephanie Gil, Ramin Hasani, Frank H. Guenther, Daniela Rus

14th Robotics: Science and Systems (**RSS**) Conference, Pittsburg, USA, 2018

### **Interpretable Neuronal Circuit Policies for Reinforcement Learning Environments**

Mathias Lechner\*, Ramin Hasani\*, and Radu Grosu \*equal contributions

**IJCAI/ECAI** Workshop on Explainable Artificial Intelligence (**XAI**), Stockholm, Sweden, 2018

## **2017**

### **Worm-level Control through Search-based Reinforcement Learning**

Mathias Lechner, Radu Grosu, Ramin Hasani.

Deep Reinforcement Learning Symposium at the 31st Neural Information Processing Systems (**NIPS**) Conference, 2017.

### **A Simplified Cell Network for the Simulation of *C. elegans*' Forward Crawling**

David Lung, Stephen Larson, Andrey Palyanov, Sergey Khayrulin, Padraig Gleeson, Manuel Zimmer, Radu Grosu and Ramin Hasani.

Workshop on Worm's Neural Information Processing at the 31st Neural Information Processing Systems (**NIPS**) Conference, 2017.

### **Searching for Biophysically Realistic Parameters for Dynamic Neuron Models by Genetic Algorithms from Calcium Imaging Recording**

Magdalena Fuchs, Manuel Zimmer, Radu Grosu and Ramin Hasani.

Workshop on Worm's Neural Information Processing at the 31st Neural Information Processing Systems (**NIPS**) Conference, 2017.

### **Compositional Neural-Network Modeling of Complex Analog Circuits**

Ramin Hasani, Dieter Haerle, Christian F. Baumgartner, Alessio R. Lomuscio and Radu Grosu.

30th International Joint Conference on Neural Networks (**IJCNN** 2017), IEEE, 2017.

### **SIM-CE: An Advanced Simulation Platform for Studying the brain of *C. elegans***

Ramin Hasani, Victoria Bener, Magdalena Fuchs, David Lung, and Radu Grosu.  
Workshop on Computational Biology, 34th International Conference on Machine Learning (ICML), 2017

### **Modeling a Simple Non-Associative Learning Mechanism in the Brain of *C. elegans***

Ramin Hasani, Magdalena Fuchs, Victoria Bener, Radu Grosu.  
2nd International Workshop on Biomedical Informatics with Optimization and Machine Learning (BOOM 2017), In conjunction with 26th International Joint Conference on Artificial Intelligence (IJCAI), 2017.

### **Towards Deterministic and Stochastic Computations with Izhikevich Spiking Neuron Model**

Ramin Hasani, Guodong Wang, and Radu Grosu.  
14th International Work-Conference on Artificial Neural Networks (IWANN), Springer, 2017.

### **Computing with Biophysical and Hardware-efficient Neural Models**

Konstantin Selyunin, Ramin Hasani, Denise Ratasich, Ezio Bartocci, and Radu Grosu.  
14th International Work-Conference on Artificial Neural Networks (IWANN), Springer, 2017.

### **Control of the Correlation of Spontaneous Neuron Activity in Biological and Noise-Activated CMOS Artificial Neural Microcircuits**

Ramin Hasani, Giorgio Ferrari, Hideaki Yamamoto, Sho Kono, Koji Ishihara, Soya Fujimori, Takashi Tani, Enrico Prati.  
arXiv:1702.07426v1 [cs.NE], 2017.

## **2016**

### **Efficient Modeling of Complex Analog Integrated Circuits Using Neural Networks**

Ramin Hasani, Dieter Haerle, and Radu Grosu.  
12th IEEE Conference on PhD Research in Microelectronics and Electronics (PRIME), 2016

### **Probabilistic Reachability Analysis of the Tap-Withdrawal Circuit in *C. elegans***

Isla, Md Ariful, Qinsi Wang, Ramin Hasani, Ondrej Balun, Edmund M. Clarke, Radu Grosu, and Scott A. Smolka.  
18th IEEE International High Level Design Validation and Test Workshop (HLDVT), pp. 170-177. IEEE, 2016.

### **Investigations on the Nervous System of *Caenorhabditis elegans***

Ramin Hasani, Lukas Esterle, and Radu Grosu.  
39th German Conference on Artificial Intelligence (KI 2016) – Current AI Research in Austria Workshop (CAIRA), 2016.

## **Organizations**

**Main Chair** @ NIPS 2017 1st workshop on the Worm's Neural Information processing (WNIP), Long Beach, CA, USA

## Conferences/Journals I review for

NeurIPS

ICML

Neural Networks

## Meeting Attendances

ICRA 2019, Montreal, Canada

NeurIPS 2018, Montreal, Canada

IJCAI 2018, Stockholm, Sweden

ICML 2018, Stockholm, Sweden

COLT 2018, Stockholm, Sweden

NIPS 2017, Long Beach, California, USA

Deep-Learning-Indaba 2017, Johannesburg, South Africa

IJCAI 2017, Melbourne, Australia

ICML 2017, Sydney, Australia

IWANN 2017, Cadiz, Spain

NIPS 2016, Barcelona, Spain

PRIME 2016, Lisbon, Portugal

CPS Week 2016, Vienna, Austria

## Student I Supervise/d

**Julian Posch** – B.Sc. in Physics, Universität Wien. Internship Project: "What happens inside a Neural network", Mar 2019 – Sep 2019

**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", Nov 2018 – Oct 2019

**Mathias Lechner** - M.Sc. in Computer Engineering, TU Wien. Thesis Title: "Brain-inspired Neural Control", Oct 2016 – Oct 2017 (**Won the Best Thesis Award of 2017 at the Faculty of Informatics, TU Wien**)

**Marc Javin** - M.Sc. in Computer Engineering, TU Wien. Thesis Title: " A Hybrid Optimization suite for Neuronal Circuits ", Feb 2018 – Nov 2018

**Magdalena Fuchs** - M.Sc. in Biomedical Engineering. Thesis Title: Principles of Learning and Memory in the Nervous System of *C. elegans*, TU Wien, Jan 2017 – Jun 2018

**David Lung** – M.Sc. in Computer Engineering. Thesis title: OpenWorm: Design and Evaluation of Neural Circuits on the Virtual Worm, *C. elegans*, TU Wien, Jan 2017 – December 2018

**Zahra Babaei** – B.Sc. in Computer Engineering, Sharif University of Technology. Internship Project: Deep learning for brain data, Jul 2018 – Oct 2018.

**Benjamin Kulnik** - B.Sc. in Electrical Engineering, TU Wien. Thesis Title: "A Grid-Search Algorithm for Selecting the Optimal Structure in Deep Neural Network Models" Oct 2017 – Feb 2018

**Ondrej Balún** - M.Sc. in Computer Engineering, TU Wien. Thesis Title: "Towards Distributed Controllers Based on *C. elegans* Locomotory Neural Network ", Dec 2015 - Jan 2017.

## Honors & Awards

- Google Cloud Platform (GCP) Research Credit Program (\$13,085), Oct 2018 [\[link\]](#)
- Two Awards at the Annual TU Wien i2c Networking Friday event, Feb 2018 [\[link\]](#)
- Microsoft Azure for Research Award Winner (\$13,000), Jan 2018 [\[link\]](#)
- Microsoft Azure for Research Award Winner (\$10,000), Nov 2017 [\[link\]](#)
- NIPS Award, Sponsor Scholar at the 31<sup>st</sup> Neural Information Processing Systems (NIPS) Conference, Dec 2017
- IJCAI 2017 BOOM Workshop **best poster award**, Aug 2017 [\[link\]](#)
- ICML Award, Sponsor Scholar at the 34<sup>th</sup> International Conference on Machine Learning (ICML) 2017, Aug 2017 [\[link\]](#)
- Microsoft Azure for Research Award Winner (\$20,000), Jan 2017, [\[link\]](#)
- Full-time research assistant PhD position at TU Wien. (2015- present) [\[link\]](#)
- Member of IEEE-IES Subcommittee on Computer Vision and Human-Machine Interaction in Industrial and Factory Automation, Nov 2016 – Present, [\[link\]](#)
- Full M.Sc. Scholarship from Politecnico di Milano, Italy (2013 – 2015)

## Languages

English	Persian	Italian	German
Full Proficiency	Mother tongue	Intermediate proficiency	Elementary

## Skills

1 = Elementary | 2 = Intermediate | 3=advanced | 4=Expert

Brain Modeling 4 | Machine learning 3 | Deep Learning 3 | Recurrent neural nets 3 | Interpretability of neural networks 4 | Neuromorphic systems design 3 | Nonlinear system identification 3 | Reinforcement learning 3

MATLAB 4 | Python 3 | TensorFlow 2 | Keras 3 | C/C++ 2 | IC Design Toolkits 2

## Interests

Startups | Brain-inspired technologies | Computational neuroscience | Physics | Neural Networks | Swimming | Traveling | Trading