Younes Bouhadjar

PH.D. CANDIDATE

Jülich, Germany

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Education

PhD candidate

Jülich, Germany

JÜLICH RESEARCH CENTER

Since 10/2018—

- Thesis: brain inspired sequence learning algorithm and foundations of a memristive hardware implementation
- Supervisors: Dr. Tom Tetzlaff & Dr. Dirk J. Wouters
- Topics: neural plasticity, probabilistic computing, neuromorphic engineering, memristive devices

M.Sc in Micro & Nanotechnologies for integrated systems

Grenoble, France

PHELMA INP GRENOBLE

09/2016–09/2018

- Joint degree between EPFL Switzerland, PHELMA INPG France, and Politecnico di Torino Italy
- Thesis: Differentiable working memory
- Supervisors: Dr. Jayram Thathachar & Dr. Liliana Buda-Prejbeanu
- GPA: 16.18/20

B.Sc in Physics and Electronics

Grenoble, France

PHELMA INP GRENOBLE

09/2013–09/2016

- Thesis: Designed and built auto-follow drone
- GPA: 16.65/20

Work Experience

Research assistant

Jülich, Germany

JÜLICH RESEARCH CENTER

Since 10/2018—

- Developing a model for sequence learning, prediction, and generation in networks of spiking neurons
- Studying probabilistic sequence processing in networks of spiking neurons
- Studying the functional aspects of memristive devices in neuromorphic computing

Research intern

San Jose, CA, USA

IBM ALMADEN RESEARCH CENTER

03/2018–09/2018

- Developed and implemented a memory-augmented neural network model inspired by the human working memory
- Implemented psychometric tests to assess the performance of the model
- Implemented machine learning models for visual question answering (VQA)
- Designed and implemented a machine learning framework: `https://github.com/IBM/mi-prometheus`

Research intern

Yorktown Heights, NY, USA

IBM T. J. WATSON RESEARCH CENTER

06/2017–08/2017

- Developed a custom software for operating a novel optical sensor, processing the data, and applying fitting routines for noise removal

Personal Skills

MATHEMATICS

- Probability theory
- Linear algebra
- Non-linear systems
- Differential/integral calculus

PROGRAMMING

- Python, Matlab, C,C++

Scientific computing

- Simulation, data analysis and visualization with Python
- Modeling and simulation of spiking neural networks in NEST
- Training and inference of neural networks in PyTorch
- Open source development using GitHub
- Linux (Debian)

Tools

- Git, Github, Docker

Others

- Love jogging, regular participation in organized races

Publications

Journals

2022 Oberländer, J, **Bouhadjar, Y.**, and Morrison, A. (2022). Learning and Replaying Spatiotemporal Sequences: A Replication Study. Frontiers in integrative neuroscience, 113.

2022 **Bouhadjar, Y.**, Wouters, D. J., Diesmann, M., and Tetzlaff, T. (2022). Sequence learning, prediction, and replay in networks of spiking neurons. PLOS Computational Biology, 18(6), e1010233.

Preprints

2022 **Bouhadjar, Y.**, Wouters, D. J., Diesmann, M., and Tetzlaff, T. (2022). Sequence learning in a spiking neuronal network with memristive synapses. ArXiv:2211.16592.

2022 **Bouhadjar, Y.**, Wouters, D. J., Diesmann, M., and Tetzlaff, T. (2022). Coherent noise enables probabilistic sequence replay in spiking neuronal networks. ArXiv:2206.10538.

2018 Jayram, T. S.*, **Bouhadjar, Y.***, McAvoy, R. L., Kornuta, T., Asseman, A., Rocki, K., and Ozcan, A. S. (2018). Learning to remember, forget and ignore using attention control in memory. ArXiv:1809.11087.
(* shared first author)

Proceedings

2022 **Bouhadjar, Y.***, Caterina Moruzzi*, Melika Payvand*. (2022). Prediction: An Algorithmic Principle Meeting Neuroscience and Machine Learning Halfway. In Proceedings of the 3rd International Workshop on Human-Like Computing at the 2nd International Joint Conference on Learning & Reasoning (pp. 1-7).

2020 **Bouhadjar, Y.**, Diesmann, M., Wouters, D. J., and Tetzlaff, T. (2020). The speed of sequence processing in biological neuronal networks. In Proceedings of the Neuro-inspired Computational Elements Workshop (pp. 1-2).

2019 **Bouhadjar, Y.**, Diesmann, M., Waser, R., Wouters, D. J., and Tetzlaff, T. (2019). Constraints on sequence processing speed in biological neuronal networks. In Proceedings of the International Conference on Neuromorphic Systems (pp. 1-9).

Presentations

Talks

2021 **Sequence learning, prediction, and generation in networks of spiking neurons** — *Online*
NEST conference (lightning talk)

2021 **Sequence learning, prediction, and generation in networks of spiking neurons** — *Online*
Annual Neuro-Inspired Computational Elements (NICE)

2019 **Constraints on sequence processing speed in biological neuronal networks** — *Knoxville, United States*
International Conference on Neuromorphic Systems (ICONS)

2019 **Constraints on sequence processing speed in biological neuronal networks** — *Jülich, Germany*
INM-ICS retreat

Posters

2022	**Sequence learning in a spiking neural network with memristive synapses** Materials, devices and systems for neuromorphic computing (MatNeC), **best poster prize**	*Groningen, Netherlands*
2021	**Sequence learning, prediction, and generation in networks of spiking neurons** Annual Computational Neuroscience meeting (CNS)	*Online*
2021	**Sequence learning, prediction, and generation in networks of spiking neurons** Annual Neuro-Inspired Computational Elements (NICE)	*Online*
2019	**Constraints on sequence processing speed in biological neuronal networks** Bernstein conference	*Berlin, Germany*
2019	**Constraints on sequence processing speed in biological neuronal networks** International Conference on Neuromorphic Systems (ICONS)	*Knoxville, United States*
2019	**Constraints on sequence processing speed in biological neuronal networks** INM-ICS retreat	*Jülich, Germany*

Teaching Experience

Tutor: Introduction to Computational Neuroscience *Aachen*

RWTH, Aachen *01/2018–05/2022*

- Neuron models
- Probabilistic description of neuronal signals

Tutor: Theoretical Neuroscience: Correlation structure of neuronal networks *Aachen*

RWTH, Aachen *01/2018–05/2022*

- Measures of pairwise correlation
- Correlations in linear systems
- Decorrelation of neural-network activity by inhibitory feedback

Student Supervision

Jette Oberländer (Bachelor thesis) *Jülich, Germany*

Juelich Research center *11/2021–09/2022*

- Thesis: Learning and Replaying SpatiotemporalSequences: A Replication Study

Hubertus Borsch (Master thesis) *Jülich, Germany*

Juelich Research center *04/2021–04/2022*

- Thesis: Learning spatiotemporal sequences with spiking neural networks

Voluntary Engagement

Doctoral representative *Jülich, Germany*

Jülich Research center *01/2020–12/2020*

- Worked on improving the working conditions of doctoral researchers
- General committee work and representative tasks

Helmholtz Junior representative *Jülich, Germany*

Jülich Research center *01/2020–12/2020*

- Enhance networking and share best practices
- Helped organize a mental health awareness month

Content Curation *Jülich, Germany*

Jülich Research center *01/2021—*

- Managing IT infrastructure
- Support in implementing reproducible research