Younes Bouhadjar

Ph.D. candidate

Jülich, Germany

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Education

Ph.D. candidate — *Jülich, Germany*

Jülich Research Center — *Since 10/2018—*

- Thesis: Sequence learning, prediction, and generation in networks of spiking neurons
- Supervisors: Dr. Tom Tetzlaff & Dr. Dirk J. Wouters
- Topics: neural plasticity, probabilistic computing, neuromorphic engineering

M.S. 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.S. in Physics and Electronics — *Grenoble, France*

PHELMA INP Grenoble — *09/2013–09/2018*

- 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 **Bouhadjar, Y.**, Wouters, D. J., Diesmann, M., and Tetzlaff, T. (2022). Sequence learning, prediction, and replay in networks of spiking neurons. In press at PloS computational biology.

Preprints

2022 Oberländer, J, **Bouhadjar, Y**, and Morrison, A. (2022). Learning and Replaying Spatiotemporal Sequences: A Replication Study. Under review at Frontiers in Integrative Neuroscience.

2022 **Bouhadjar, Y.**, Wouters, D. J., Diesmann, M., and Tetzlaff, T. (2022). Coherent noise enables probabilistic sequence replay in spiking neuronal networks. arXiv preprint 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 preprint arXiv:1809.11087. (* shared first author)

Proceedings

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** — *Heidelberg, Germany*
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** — *Groningen, Netherlands*
Materials, devices and systems for neuromorphic computing (MatNeC), **best poster prize**

2021 **Sequence learning, prediction, and generation in networks of spiking neurons** — *Virtual*
Annual Computational Neuroscience meeting (CNS)

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

2019 **Constraints on sequence processing speed in biological neuronal networks** — *Berlin, Germany*
Bernstein conference

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

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—*

- 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