



Dylan Festa

Postdoctoral Research Fellow in System and Computational Neuroscience

Current position

2016–present **Postdoctoral Research Fellow**, *Albert Einstein College of Medicine*, Bronx, New York.
Dept. of Systems & Computational Biology, Coen-Cagli Lab

Education

- 2012–2016 **Ph.D. in Computational Neuroscience**, *Computational and Biological Learning Lab (CBL)*, Cambridge, UK.
Thesis approved with minor revisions
- 2011–2012 **Research intern**, *MPI of Complex Dynamics and Self-Organization*, Göttingen, GER.
- 2008–2011 **Master degree in Physics**, *Università degli Studi di Pisa*, Pisa, Italy.
Final grade: 110/110 *cum laude*. Specialization: Physics of Condensed Matter
- 2005–2008 **Bachelor degree in Physics**, *Università degli Studi di Pisa*, Pisa, Italy.
Final grade: 110/110 *cum laude*.
- 2000–2005 **Diploma**, *Liceo Scientifico D. Alighieri*, Matera, Italy.
Final grade: 100/100

Research Experience

Postdoctoral researcher

Subject *Neural codes for natural images in the visual cortex*
Leading P.I. Ruben Coen-Cagli
Description I expanded and developed a probabilistic inference model tuned to natural image statistics, to make predictions on both mean response and trial-to-trial response variability of neurons in primary visual cortex (V1). Computationally, I reimplemented and extended the model of interest, finding new results that I used for both analytical studies and numerical simulations. In parallel to this, I worked in close collaboration with experimentalists in a primate lab (A. Kohn group), to test the theory using both existing data and new experiments. I contributed to both stimulus design and data analysis (including spike-sorting).

Ph.D. Studies

Subject *Embedding Analog Memories in a Balanced Rate-Based Network of E-I Neurons*
Contributors Máté Lengyel (mentor) & Guillaume Hennequin (collaborator)

Description Following an original idea by G. Hennequin, I built from scratch a novel optimisation procedure that operates on inhibition-stabilized recurrent neural networks (ISNNs), with a superlinear activation function. The optimized networks display several relevant biological features, and can robustly store memories in the form of fixed-point attractors. In my work, I modeled and tested these systems extensively, and compared them with other approaches used to construct attractor networks.

Research Intern

Subject *Chaos Characterization of Pulse-Coupled Neural Networks in Balanced State*
Supervisors Professor Fred Wolf (external supervisor) & Professor Leone Fronzoni
Description Recurrent neural networks (RNNs) can be in a chaotic dynamical regime. In this project, starting from a RNN of quadratic integrate and fire neurons, I implemented the computation of the so-called “Lyapunov vectors”, that measure not only the presence of chaos, but also the direction and dimensionality of the most dynamically stable or unstable dimensions. This allows for a more in-depth characterization of the ergodic properties of RNNs, in a line of work that was later taken over and extended by R. Engelken (arXiv:2006.02427).

Journal and Conference Papers

- 2020 **Neuronal variability reflects probabilistic inference tuned to natural image statistics**, Dylan Festa, Amir Aschner, Aida Davila, Adam Kohn, Ruben Coen-Cagli.
Submitted. Preprint: <https://doi.org/10.1101/2020.06.17.142182>
- 2014 **Analog Memories in a Balanced Rate-Based Network of E-I Neurons**, Dylan Festa, Guillaume Hennequin & Máté Lengyel.
Advances in Neural Information Processing Systems (NIPS) 2014

Conferences, Workshops and Schools attended

- 2020/03 **CoSyNe**, Denver, USA.
poster presentation: *Quantifying the role of divisive normalization in contextual modulation of neuronal variability*
- 2019/09 **Bernstein Conference**, Berlin, Germany.
poster presentation: *A Functional Model for Neuronal Response Variability in Primary Visual Cortex*
- 2019/09 **CCN**, Berlin, Germany.
poster presentation: *A Functional Model for Neuronal Response Variability in Primary Visual Cortex*
Conference proceedings: <https://doi.org/10.32470/CCN.2019.1307-0>
- 2018/03 **CoSyNe**, Denver, USA.
poster presentation: *Contextual Modulation of Response Variability in Primary Visual Cortex*
- 2017/10 **CCN**, New York, USA.
poster presentation: *A Flexible Model of Uncertainty in Natural Images and V1 Response Variability*
- 2017/09 **BMM Summer Course**, Woods Hole, USA.
developed a small project on site.
- 2017/03 **CoSyNe**, Salt Lake City, USA.
poster presentation: *Cherchez les auxiliaires: interneurons are key for high-capacity attractor networks*
- 2015/08 **NCCD**, Bilbao, Spain.
poster presentation: *Neural Computation, Coding and Dynamics*.
- 2014/12 **NIPS**, Montreal, Canada.
full oral presentation and poster presentation: *Analog Memories in a Balanced Rate-Based Network of E-I Neurons*
- 2013/08 **ACCN summer school**, Bedlewo, Poland.
(4 weeks) developed a small project on site.

- 2013/09 **CoSyNe**, Salt Lake City, USA.
poster presentation: *Graded Memories in Balanced Attractor Networks*.
- 2012/09 **CoSyNe**, Salt Lake City, USA.
- 2012/03 **FACETS-ITN worskop**, Leysin, Switzerland.
Workshop title: *Theoretical approaches to new computing concepts*.
- 2011/09 **9th fall course on Comp. Neuroscience**, Göttingen, Germany.

Teaching experience

- 2020/06 **NeuroMatch Academy**, virtual summer school.
Quality-assessment of the course material before the beginning of the course, and teaching assistant (TA) during the course, overseeing a small cohort of students in their daily activities and offering help full-time.
- 2013-2016 **Student Supervisions**, *University of Cambridge*.
During the whole extent of Ph.D. in Cambridge I tutored small groups of students in a module of the 3rd year course "Introduction to Neuroscience", held at the Engineering Dept.

Computer skills

- Operative sys. Linux (Ubuntu), Windows, Mac OSX
- Programming Julia, Python, Matlab, C++, ocaml; some experience using git and as Linux sys. admin ; LaTeX
- Software Plexton Offline Spike Sorter, Adobe Illustrator, Indesign, Microsoft Office

Languages

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|---------|------------------------|---|
| Italian | Fluent | <i>native proficiency</i> |
| English | Fluent | <i>professional working proficiency</i> |
| German | Basic knowledge | <i>elementary proficiency (A2)</i> |
| Latin | Basic knowledge | <i>elementary proficiency</i> |

Extras

- 2018-2020 **Co-chair of the Einstein Postdoctoral Association (EPA)**, *Einstein College, Bronx, NY*.
Leadership role in the local postdoctoral organization: I helped organizing and planning social events, and I sat in different committees and in the Senate of the college.
- 2018 **NET Impact NYC Service Corps**.
I volunteered as a pro-bono consultant for a few months, helping a Bronx association marketing a K12 school program. The program was centered on indoor school-farming, based on hydroponics.