

Pedro Mediano

Curriculum Vitae

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This is a shortened version of my full CV. Please email me for the full version.

Education

- Oct 14 – present **PhD: Machine Learning and Neuroscience**, *Imperial College*, London, UK.
Pursuing PhD studies in the Computational Neurodynamics group under the supervision of Prof. Murray Shanahan.
- Sep 10 – Jun 14 **MSc in Physics**, *Universidad de Valencia*, Valencia, Spain, 9.5/10.
Senior (4th) year at *Imperial College*, London, UK.
Ranked top 1% of class.
- MEng thesis *Data-Efficient Reinforcement Learning for Autonomous Helicopters*, with Dr. Marc Deisenroth at Imperial College, London.
- BSc thesis *Complexity and Criticality in Spiking Neural Networks*, with Prof. Kim Christensen at Imperial College, London.
- Sep 08 – Jun 10 **Science and technology high school diploma**, *IES El Bohío*, Cartagena, Spain, 9.95/10.
Graduated with First Honours, Extraordinary Award (top 0.1%).

Research expertise

- Computational Neuroscience I am interested in how large populations of neurons are capable of displaying intelligent behaviour, i.e. performing sophisticated computations. I study how the dynamics of such populations affect and give rise to higher cognitive processes.
- Machine Learning I am fascinated by Bayesian statistics and how representations of uncertainty allow machines to show more intelligent behaviour. At the same time, I follow closely the latest developments in deep learning and neural networks.
- Complex systems I am interested in how large-scale complex phenomena emerge from simple local interactions between individuals (e.g. particles, organisms or cells).

Experience

- Nov 15 – Jul 17 **Lead machine learning scientist**, *Emotech Ltd.*, London, UK.
Member of the AI/ML team building the personal robot Olly. Raised angel and series A funding, hired a team of 30, filed two patents and won four CES Innovation Awards.
- Jun 13 – Nov 13 **Machine learning software developer**, *Wolfram Research, Inc.*, Oxford, UK.
Created first version of the Machine Learning library in Mathematica 10 (released 2014).

2011 – 2014 **Student intern**, *various institutions*.

Student intern at several universities, including Harvard, Carnegie Mellon, FermiLab, University of Sydney and University of Valencia.

Honours and Awards

Award **Four CES Innovation Awards.**

Awarded 4 CES Innovation Awards in the categories Drones and Unmanned Systems, Home Audio and Video, Home Appliances and Smart Home as part of the Olly team at Emotech. To date, highest number of CES awards given to a single start-up or product.

Award **Premio Extraordinario de Bachillerato.**

Prize awarded to 0.1% of Spanish high school students based on a single paper-based test.

Teaching and supervision

I have taught the following courses at Imperial College for four years:

- Computational Neurodynamics
- C and C++ Programming
- Probabilistic Inference
- Mathematical Methods

I have also supervised multiple MSc and UG projects in related neuroscience and machine learning topics.

Invited talks and seminars

I have been invited to give more than a dozen talks about neuroscience and machine learning in seminars, conferences and workshops in several countries, including in the Universities of Cambridge, Sussex, Bristol, Groningen, Sydney, Imperial College and Caltech.

Outreach

I firmly believe that outreach is a fundamental part of a scientist's job, and I have been occasionally invited to talk for non-technical audiences, radio interviews and high school students.

For a recent example see my May 2017 non-technical [talk](#) about Reinforcement Learning in the MeetAI event in London, UK.

Publications

Code and electronic versions of all articles are available upon request.

Scientific papers

- T. Tax*, **P. Mediano*** and M. Shanahan (2017). *The Partial Information Decomposition of Generative Neural Network Models*. *Entropy*, 19(9), 474.
- **P. Mediano** and M. Shanahan (2017). *Balanced Information Storage and Transfer in Modular Spiking Neural Networks*. arXiv: 1708.04392.

- S. McGregor and **P. Mediano** (2017). *Adaptation Is Not Improvement Over Time: Measuring Fitness Effects of Causal Interactions*. Submitted to Artificial Life.
- K. Nikiforou, **P. Mediano** and M. Shanahan (2017). *An Investigation of the Dynamical Transitions in Harmonically Driven Random Networks of Firing-Rate Neurons*. Cognitive Computation 3 (9).
- X. Arsiwalla, **P. Mediano** and P. Verschure (2017). *Spectral Modes of Network Dynamics Reveal Increased Informational Complexity Near Criticality*. Procedia Computer Science 108.
- **P. Mediano**, J.C. Farah and M. Shanahan (2016). *Integrated Information and Metastability in Systems of Coupled Oscillators*. arXiv: 1606.08313.
- N. Dilokthanakul, **P. Mediano**, M. Garnelo et al. (2016). *Deep Unsupervised Clustering with Gaussian Mixture Variational Autoencoders*. arXiv: 1611.02648.
- **P. Mediano** and M. Shanahan (2015). *An unexpected discrepancy in a well-known problem: Kraskov estimators applied to spiking neural networks*. Proceedings of the European Conference in Artificial Life (ECAL'15).
- **P. Mediano** and R. Schroeter (2014). *Hadron Production in $p+A$ Interactions in the NOvA Experiment*. Harvard University technical report.

Patents

My work at Emotech Ltd. has lead to two patents on applications of machine learning to personal assistant technology. These are currently under review by the UK Patent Office.

Theses

- **P. Mediano** (2014). *Data-Efficient Reinforcement Learning for Autonomous Helicopters*. MEng thesis, Imperial College London. Supervisor: Marc Deisenroth.
- **P. Mediano** (2014). *Complexity and Criticality in Spiking Neural Networks*. BSc thesis, Imperial College London. Supervisors: Kim Christensen and Nicholas Moloney.

Abstracts and posters

I have presented my work in talks, abstracts and posters in a number of conferences over the years, including Computational Neuroscience (CNS), Association for the Scientific Study of Consciousness (ASSC), Cognitive Computational Neuroscience (CCN), Conference on Complex Systems (CCS) and Artificial Life (ALife) among others.