# fabio **anselmi**

Postdoctoral Fellow · Machine learning and computational neuroscience

*IIT, Italian Institute of Technology | Genova, Italy*

*MIT, The Center for Brains, Minds and Machines | Cambridge, MA*

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## summary


• Research scientist with 10 years of research, engineering and project management experience. • Ph.D. in Physics. • Multidisciplinary approach (from theoretical machine learning to computational neuroscience) to the computational challenge of building an artificial general intelligence.


## skills

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| **Research areas** | Machine learning, Deep learning, Computational neuroscience |
| **Languages** | Python (experienced), Matlab (experienced), Wolfram Mathematica (familiar) |
| **Algorithms** | Machine learning, Signal processing, Optimization |
| **Research tools** | Mathematical modeling (harmonic analysis, wavelet theory, group theory), Scientific programming, Optimization |
| **Writing** | Scientific publications, Research grant proposals, Project report deliverables |
| **Verbal** | Lectures, Technical talks, Communicating to non-technical audiences, Science outreach |
| **Management** | Mentoring, Workshops and course organization |
| **Service** | Peer reviewer for journal and conferences |
| **Spoken Languages** | Italian (native), English (fluent), Spanish (basic) |

## experience

### Postdoctoral fellow in machine learning and computational neuroscience

*Genova and Cambridge*

IIT and MIT, Main collaborators: Prof. T. Poggio and Prof. L. Rosasco — *2011–*

- Investigator in the "Theoretical frameworks for intelligence" CBMM research thrust. CBMM is a multi-institutional (MIT, Harvard University) NSF Science and Technology Center for the interdisciplinary study of intelligence (computer science, cognitive science, neuroscience). Collaborating with experts in the theory and algorithms for learning data representation together with cognitive scientists and neuroscientists.
- Projects: * Sample efficient deep networks: learning representations adapted to symmetries in the data through new regularization schemes * Biologically inspired hierarchical learning for invariant data representation * Grid cells computational models.
- Mentoring graduate and undergrad students.
- Organizational: e.g. co-organized "Brains, Minds and Machines workshop", MIT (100+ people), Sestri Levante, 2016.

## education

### Postdoc in Biophysics

*Milano, Italy*

Humanitas clinical institute — *2008–10*

- Developed and optimized new protocols for immunological-signaling experiments and data analysis.
- *Research areas*: Biology and biophysics of the immunological system.

### Postdoc in Biophysics

*Padova, Italy*

Venetian Institute of Molecular Medicine — *2005–08*

- Highlighted a new biological pathway for calcium signalling in the inner ear.
- *Research areas*: Biology and biophysics of hearing.

### Ph.D. in Quantum Information and Computation

*Hatfield, United Kingdom*

Hertfordshire University (UK) | School of Physics, Astronomy and Mathematics — *2001–04*

- *Ph.D. thesis*: Detecting, measuring and copying entangled states.
- *Research areas*: Quantum computing.

**Graduated in Physics** *Padova, Italy*

University of Padova *1996–2000*

- *Research areas*: Theoretical Physics thesis: Magnetic charge and monopoles in generic dimension.

## sample publications

• **F. Anselmi***, G. Evangelopoulos*, L. Rosasco, and T. Poggio, *Symmetry regularization*, *Center for Brains, Minds and Machines (CBMM) Memo No. 63*, `http://hdl.handle.net/1721.1/109391`, 2018, *Submitted to Pattern recognition*

• J.Z. Leibo, Q. Liao, W. Freiwald , **F. Anselmi**, T. Poggio. *View-tolerant face recognition implies mirror-symmetric neural tuning to head orientation*. Current Biology, Volume 27, Issue 1, 62-67, 9, 2017.

• **F. Anselmi**, L. Rosasco, T. Poggio. *On Invariance and Selectivity in Representation Learning*. Information and Inference, Volume 5, Issue 2, 134-158, 2016.

• **F. Anselmi**, J.Z. Leibo, L. Rosasco, J. Mutch, A. Tacchetti, T. Poggio. *Unsupervised Learning of Invariant Representations*. Theoretical Computer Science, 663, 112-121, 2016.

• **F. Anselmi**, S. Ortolano, A. Seydel, N. Kessaris, W. Richardson, H. Monyer, F. Mammano. *Dual role for inner ear connexins: adenosine 5'-triphosphate release and intercellular transfer of $Ca^{2+}$ mobilizing second messengers*. Proc. Natl. Acad. Sci U S A. 105(48):18770-5, 2008.

• **F. Anselmi**, A. Chefles, M.B. Plenio. *Local copying of orthogonal entangled quantum states*. New. J. Phys., Vol. 6, 164, 2004.

## Books

• T. Poggio, **F. Anselmi**. *Visual cortex and deep learning*. MIT Press, 2016.

## Popular press

• "How the brain recognize faces". Larry Hardesty, MIT News, 2016 (reported also by other various media)

• "Machines that learn like people". Larry Hardesty, MIT News, 2015 (reported also by PHYS.ORG).

## Recent invited talks

• May 2018, Invited talk at satellite workshop on "Neuromathematics of Vision" Conference on Imaging Science (Siam), Bologna.

• February 2018, invited talk at "Data science workshop" at International School for Advanced Studies, Trieste, Italy.

• November 2017, invited talk at "Cortical Inspired Non-holonomic Control for Imaging" workshop at Institute Henry Poincaire, Paris, France.

• November 2017, "Face recognition in macaque visual cortex and invariant and selective face representations", invited talk at Graphics and Vision Research Group, University of Basel, Switzerland.

• September 2017 "Invariant and selective representations and Deep convolutional networks" invited talk at "Systematic approaches to deep learning methods for audio", Schrodinger Institute, Vienna, Austria.