

# Thomas Mesnard

Graduate Student in Applied Mathematics and  
Machine Learning from *École Normale Supérieure*

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## Education

- 2015 – 2016 **École Normale Supérieure**, Paris, France.  
MSc in Applied Mathematics, Machine Learning, Computer Vision (a.k.a Master MVA).  
Supervisor: Francis Bach. Completed with honors.
- 2013 – 2016 **École Normale Supérieure**, Paris, France.  
MSc in Computer Science, Neuroscience and Chemistry.
- 2011 – 2013 **Lycée René Cassin**, "Classes préparatoires PC\*", Bayonne, France.  
Two-year program in Mathematics and Physics for competitive entrance to top French engineering schools. Completed summa cum laude.

## Work Experience

- 2017-2018 **Montreal Institute of Learning Algorithms**, *Research Intern*, Montreal, Canada.  
1 year Supervisors: **Yoshua Bengio**, **Blake Richards**.
  - Exploring new methods for credit assignment in deep neural structures
  - Investigating predictive coding and learning in binarized neural networks
- 2016 **EPFL**, *Research Intern*, Switzerland. Supervisors: **Wulfram Gerstner**, **Johanni Brea**.  
4 months
  - Exploring deep learning techniques with spiking neurons in energy based models
  - Investigating backpropagation with random feedback weights in deep neural networks
- 2015 **Montreal Institute of Learning Algorithms**, *Research Intern*, Montreal, Canada.  
5 months Supervisor: **Yoshua Bengio**.
  - Focusing on new biologically plausible deep learning algorithms
  - Exploring new versions of RNNs/Clockwork RNNs using LSTM and GRU
- 2014 **Institut Curie**, *Research Intern*, Paris, France. Supervisor: **Filippo Del Bene**.  
2 months
  - ZebraFish visual system mapping using data-analysis and machine learning

## Publications

- [1] **Thomas Mesnard** and Blake Richards. "Activation alignment: exploring the use of approximate activity gradients in multilayer networks". In: *CCN* (2018).
- [2] **Thomas Mesnard**, Gaëtan Vignoud, Jonathan Binas, and Yoshua Bengio. "Fully discretized training of neural networks through direct feedback". In: *Under Review* (2018).
- [3] **Thomas Mesnard**, Gaëtan Vignoud, Walter Senn, and Yoshua Bengio. "Ghost Units Yield Biologically Plausible Backprop in Deep Neural Networks". In: *CCN* (2018).
- [4] Benjamin Scellier, Anirudh Goyal, Jonathan Binas, **Thomas Mesnard**, and Yoshua Bengio. "[Extending the Framework of Equilibrium Propagation to General Dynamics](#)". In: *International Conference on Learning Representations* (2018). Workshop.
- [5] Yoshua Bengio, **Thomas Mesnard**, Asja Fischer, Saizheng Zhang, and Yuhuai Wu. "[STDP-Compatible Approximation of Backpropagation in an Energy-Based Model](#)". In: *Neural computation* 29 (2017), pp. 555–577.
- [6] **Thomas Mesnard**, Wulfram Gerstner, and Johanni Brea. "[Towards deep learning with spiking neurons in energy based models with contrastive Hebbian plasticity](#)". In: *Proceedings of the 29th Neural Information Processing Systems*. Computing with Spikes Workshop. With Oral Presentation and [Poster](#). 2016.

- [7] Yoshua Bengio, Asja Fischer, **Thomas Mesnard**, Saizheng Zhang, and Yuhuai Wu. “[From STDP towards Biologically Plausible Deep Learning](#)”. In: *Proceedings of the 32th international conference on Machine learning*. Deep Learning Workshop. 2015.
- [8] Yoshua Bengio, Dong-Hyun Lee, Jorg Bornschein, **Thomas Mesnard**, and Zhouhan Lin. “[Towards biologically plausible deep learning](#)”. In: *arXiv preprint:1502.04156v3* (2015).

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## Computer Skills and Languages

- IT Skills**
- General: Python, Julia, Matlab, Octave, Git, Unix, L<sup>A</sup>T<sub>E</sub>X
  - Deep Learning: Tensorflow, PyTorch, Theano
  - Machine Learning: Numpy, Scikit-learn
- Languages**
- French Native
  - English Fluent
  - Spanish Intermediate

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## Implementations

**Teaching Machines to Read and Comprehend**, by Karl Moritz Hermann and al. from Google DeepMind. [Code](#). [Report](#).  
With Alex Auvolat and Étienne Simon

**CTC: Labelling Unsegmented Sequence Data with RNN**, by Alex Graves and al. from Google DeepMind. [Code](#). [Report](#). [Poster](#).  
With Alex Auvolat

**Predictive models for transaction volumes in financial markets**, in response to a competition proposed by Capital Fund Management. [Code](#). [Report](#).

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## Teaching and Academic Awards

- 2018 **Student at the Cargese Summer School**, Cargese, France.  
[Statistical Physics and Machine Learning Back Together](#)
- 2018 **Student at the Beg Rohu Summer School**, Quiberon, France.  
[Deep Learning and Statistical Physics](#)
- 2015 **École Normale Supérieure**, Paris, France.  
Talk about Deep Learning
- 2014 **Louis Le Grand and Stanislas High Schools**, Paris, France.  
Delivered lectures during the National Olympiad
- 2014 **Saint Louis High School**, Paris, France.  
Examiner in "Classes Préparatoires" for nationwide competitive entrance to top French engineering schools
- 2013 – 2014 **École Normale Supérieure**, Paris, France.  
Delivered lectures during the International Olympiad
- 2012 Selected for the French final of the International Olympiad, 3<sup>rd</sup> out of 310
- 2011 Selected for the final of the National Olympiad, 21<sup>st</sup> out of 2,000

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## Interests and Activities

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| <p><b>Music</b> ○ Cello, 12 years</p> <p><b>Arts</b> ○ Performed concerts alone or in an orchestra<br/>○ Photography, 8 years</p> <p><b>Travel</b> ○ Many road trips around Asia, America, Africa, Europe</p> | <p><b>Sports</b> ○ Athletics<br/>○ Surf<br/>○ Trekking</p> |
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