

# CLEMENT FARABET

PHD, DEEP LEARNING  
CO-FOUNDER & CTO, MADBITS  
TECH LEAD & ENG MANAGER, TWITTER

1355 Market Street, #900  
San Francisco, CA 94103  
www.clement.farabet.net

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## Education

2010 - 2013      **Université Paris Est**      *PhD in Computer Science*  
**ESIEE Paris, France**      *(Graduated in 2013)*

Advised by Profs Laurent Najman and Yann LeCun (NYU), my PhD thesis focuses on Real-Time Image Understanding, from an algorithmic and computational point of view. My thesis work was carried out at Pf Yann LeCun's lab at New York University.

2002 - 2008      **Institut National des Sciences Appliquées**      *M. Eng., Electrical Engineering*  
**INSA, Lyon, France**      *(With Honors)*

Final year's major in Image and Signal Processing. Relevant courses: Computer Science, Control Theory, Electronics, Telecommunication, Mathematics (probability theory, optimization) and Physics.

## Experience

2014 - today      **Twitter**      *Staff Software Engineer*  
*Founder & Tech Lead of Twitter Cortex*  
*Manager of Cortex Core ML Team*

My team and I joined Twitter via the MadBits acquisition. The team initially focused on image and video applications: spam clustering, pornography/NSFW content flagging, visual classification of image and video content, classification of live video content (see press links below).

My co-founder and I then proposed the creation of a team to tackle more general ML-related problems: we founded Twitter Cortex to centralize these efforts. I pitched the acquisition of a second ML startup, Whetlab, to help staff Cortex and expand our ML platform capabilities.

Cortex now focuses on a large array of modeling efforts around text (tweets), media, users, and already impacted core Twitter products, ranging from Ads to our various Content Recommendation systems (trends, home timeline, search, etc.). Today I lead & manage a subset of Cortex called Core, which focuses on building a high-leverage, modular ML platform to empower every product/ad team at Twitter with ML, with a strong focus on Deep Learning.

NSFW: <https://www.wired.com/2015/07/twitters-new-ai-recognizes-porn-dont/>  
Live Video: <https://www.technologyreview.com/s/601284/twitters-artificial-intelligence-knows-whats-happening-in-live-video-clips/>  
Whetlab: <https://techcrunch.com/2015/06/17/twitter-acquires-machine-learning-startup-whetlab/>

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## Experience

- 2013 - 2014*      **MadBits**      *Co-Founder and CTO*
- I co-founded and developed MadBits, a startup that focused on building new user experiences in the media space (photos and videos), by leveraging state-of-the-art Deep Learning-based computer vision techniques. We focused mostly on classifying user libraries and stock photographs, and produced search indexes over these photo/video collections (such features are now available in Google Photos and Apple Photos). Our core stack was built on technologies I developed during my PhD. MadBits was sold to Twitter, Inc. in July, 2014.
- Acquisition: <https://techcrunch.com/2014/07/29/twitter-acquires-image-search-startup-madbits/>
- 2011 - 2013*      **New York University (Courant Institute)**      *Research Scientist*
- After 3 years of research on high-performance hardware for computer vision, I developed an algorithmic framework to automatically parse and understand images and videos, based on Deep Learning. This is the core of my PhD thesis.
- 2009 - 2011*      **New York University (Courant Institute)**      *Research Scientist*  
**Yale University (E-Lab)**      *Visitor Scientist*
- I developed a fully custom dataflow processor—NeuFlow—for complex/generic vision tasks. This processor arch was patented, and it was implemented on FPGAs and an full ASIC. The processor was used as part of several autonomous robot navigation projects. This work was done both at Yale’s e-Lab (Prof. Eugenio Culurciello) and New York University (Prof. Yann LeCun).
- 2008 - 2009*      **New York University (Courant Institute)**      *Junior Research Scientist / Intern*
- I designed and implemented an FPGA-based vector processor for convolutional neural networks + a Lisp compiler to turn high-level descriptions of neural networks into compatible byte code for the processor.
- 2006 - 2007*      **University of New South Wales at ADEFA**      *Junior Research Scientist / Intern*
- I developed a miniaturized FPGA-based system to analyze video streams from a camera. This system was designed to be embedded in an unmanned helicopter (UAV) to provide the main computer with visual guidance.

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## Articles

- Journal Papers*
- C. Farabet, C. Couprie, L. Najman and Y. LeCun**, “Learning Hierarchical Features for Scene Labeling”, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, in press, 2013.
- C. Farabet, R. Paz, J. Perez-Carrasco, C. Zamarreno, A. Linares-Barranco, Y. LeCun, E. Culurciello, T. Serrano-Gotarredona and B. Linares-Barranco**, “Comparison Between Frame-Constrained Fix-Pixel-Value and Frame-Free Spiking-Dynamic-Pixel ConvNets for Visual Processing”, in *Frontiers in Neuroscience*, 2012.
- M. Garratt, H. Pota, A. Lambert, S. E.-Maslin and C. Farabet**, “Visual Tracking and LIDAR Relative Positioning for Automated Launch and Recovery of an Unmanned Rotorcraft from Ships at Sea”, in *Naval Engineers Journal*, vol 121, no. 2, pp. 99-110, June 2009.
- Book Chapters*
- C. Farabet, Y. LeCun, K. Kavukcuoglu, B. Martini, P. Akselrod, S. Talay, and E. Culurciello**, “Large-Scale FPGA-Based Convolutional Networks”, in R. Bekkerman, M. Bilenko, and J. Langford (Ed.), *Scaling Up Machine Learning*, Cambridge University Press, 2011.
- Conference Proceedings*
- C. Couprie, C. Farabet, L. Najman, Y. LeCun**, “Indoor Semantic Segmentation using depth information”, ArXiv preprint, January 2013, in *Review for the Proceedings of the International Conference on Learning Representations*.
- C. Culurciello, J. Bates, A. Dundar, J. Carrasco, C. Farabet**, “Clustering Learning for Robotic Vision”, ArXiv preprint, January 2013, in *Review for the Proceedings of the International Conference on Learning Representations*.
- C. Farabet, C. Couprie, L. Najman, Y. LeCun**, “Scene Parsing with Multi-scale Feature Learning, Purity Trees, and Optimal Covers”, in *Proc. of the International Conference on Machine Learning (ICML'12)*, Edinburgh, Scotland, 2012. Video: <http://techtalks.tv/talks/57300/>
- P.H. Pham, D. Jelaca, C. Farabet, B. Martini, Y. LeCun and E. Culurciello**, “NeuFlow: Dataflow Vision Processing System-on-a-Chip”, in *IEEE International Midwest Symposium on Circuits and systems, IEEE MWSCAS*, 2012, Boise, Idaho, USA.
- C. Farabet, B. Martini, B. Corda, P. Akselrod, E. Culurciello and Y. LeCun**, “NeuFlow: A Runtime Reconfigurable Dataflow Processor for Vision”, in *Proc. of the Fifth IEEE Workshop on Embedded Computer Vision (ECV'11 @ CVPR'11)*, IEEE, Colorado Springs, 2011. Invited Paper.
- C. Farabet, B. Martini, P. Akselrod, S. Talay, Y. LeCun and E. Culurciello**, “Hardware Accelerated Convolutional Neural Networks for Synthetic Vision Systems”, in *International Symposium on Circuits and Systems (ISCAS'10)*, IEEE, Paris, 2010.

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## Articles

**Y. LeCun, K. Kavukcuoglu and C. Farabet**, “Convolutional Networks and Applications in Vision”, in *International Symposium on Circuits and Systems (ISCAS’10)*, IEEE, Paris, 2010.

**C. Farabet, C. Poulet and Y. LeCun**, “An FPGA-Based Stream Processor for Embedded Real-Time Vision with Convolutional Networks”, in *Proc. of the Fifth IEEE Workshop on Embedded Computer Vision (ECV’09 @ ICCV’09)*, IEEE, Kyoto, 2009.

**C. Farabet, C. Poulet, J. Y. Han and Y. LeCun**, “CNP: An FPGA-based Processor for Convolutional Networks”, in *International Conference on Field Programmable Logic and Applications (FPL’09)*, IEEE, Prague, 2009.

**M. Garratt, H. Pota, A. Lambert, S. E.-Maslin and C. Farabet**, “Visual Tracking and LIDAR Relative Positioning for Automated Launch and Recovery of an Unmanned Rotorcraft from Ships at Sea”, in *ASNE Conference on Launch and Recovery of Manned and Unmanned Vehicles From Surface Platforms*, American Society of Engineers, Annapolis, 2008.

## Academic talks & workshops

**C. Farabet**, Invited talk at the Rowland Institute at Harvard (David Cox’s lab), August 2012.

**C. Farabet, J. Bergstra**, Gave a series of lectures (tutorials) on deep-learning and feature learning, at the IPAM Graduate Summer School, July 2012.

**C. Farabet**, Invited talk at Gatsby, London, May 2012.

**C. Farabet, Y. LeCun**, Talk at the Big Learning Workshop, NIPS, 2011. Video: <http://www.youtube.com/watch?v=KaJtT1K3GtI>

**C. Farabet, P. Akselrod, B. Martini, K. Kavukcuoglu, B. Corda, S. Talay, E. Culurciello and Y. LeCun**, “A Dataflow Processor for General Purpose Vision”, presented at *Neural Information Processing Systems (NIPS10)*, Vancouver, 2010.

**B. Corda, C. Farabet, M. Scoffier and Y. LeCun**, “Building Heterogeneous Platforms for End-to-end Online Learning Based on Dataflow Computing Design”, in *Workshop on Learning on Cores, Clusters and Clouds (LCCC @ NIPS10)*, Whistler CA, 2010.

**B. Corda, C. Farabet and Y. LeCun**, “A Study of Parallel Computing for Machine Learning: Which Platform for Which Application”, presented at *the 4th Annual Machine Learning Symposium at the New York Academy of Sciences*, New York, 2010.

**C. Farabet**, “NeuFlow: a Vision Processor for Real-Time Object Categorization in Megapixel Videos”, presented at *AIPR Workshop*, Washington DC, 2010.

**C. Farabet**, “NeuFlow: a Dataflow Computer for General Purpose Vision”, presented at *e-labs Seminar Series*, Yale University, 2010.

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## Articles

**C. Farabet, B. Martini, P. Akselrod, S. Talay, Y. LeCun and E. Culurciello**, “Bio-Inspired Processing for Ultra-Fast Object Categorization”, in *High Performance Embedded Computing (HPEC10)*, MIT Lincoln Laboratory, Lexington, 2010.

**C. Farabet, C. Poulet, J. Y. Han, and Y. LeCun**, “An FPGA-based Processor for Convolutional Networks”, in *Snowbird Learning Workshop*, Clearwater FL, 2009.

**C. Farabet**, “Hardware Implementation of a Convolutional Neural Network – Design of a Neural Processor”, Masters thesis, *INSA Lyon – New York University*, 2008.

**C. Farabet**, “Implementation of a Tracking System within a FPGA”, *University of New South Wales at ADFA*, 2007.

## Misc

### Patents

US patent number 13/479,742 filed May 24, 2012, entitled “Runtime Re- configurable Dataflow Processor”. <https://www.google.com/patents/US20120303932>

### Reviewed for:

NIPS – Neural Information Processing Systems – <http://www.nips.cc>

ICML – International Conference on Machine Learning – <http://www.icml.cc>

ISCAS – International Symposium on Circuits and Systems – <http://iscas2010.org>

### Software

Was one of the main contributors of Torch7 (<http://torch.ch/>), which was adopted by multiple key AI players in the industry (Facebook’s FAIR, DeepMind and Twitter Cortex). Torch7 also inspired several new frameworks such as TensorFlow, Keras.

Fluent in pretty much any computer-related language, from HDLs (Verilog/VHDL) to Python, with Assembly, C, C++, Lua, Lisp in between.