Marc'Aurelio Ranzato

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RESEARCH INTERESTS

My primary research interests are in the area of machine learning and computer vision. Within these areas, my work focuses on learning and inference in hierarchical models, as well as on the design of unsupervised learning algorithms, primarily with applications to computer vision, but also to audio processing, robotics and natural language processing. I have developed expertise in a wide range of domains and I have been using a variety of tools including deep learning architectures, probabilistic graphical models, gradient-based learning methods, energy-based models, Markov Chain Monte Carlo methods, variational methods, kernel methods, and computational neural science models of vision. I have applied these models to a variety of applications in vision, such as generic object recognition, handwriting recognition, and image restoration. I have also worked on speech recognition and on natural language processing for retrieval and classification of text documents.

CURRENT APPOINTMENT

Facebook Inc., Menlo Park, CA - USA
Position: *Research Scientist*
Period: September 2013 to present

EDUCATION

New York University, The Courant Institute of Mathematical Sciences, New York, NY, U.S.A.
Ph.D. degree in Computer Science, May 2009
Advisor: Prof. Yann LeCun
Thesis: Unsupervised learning of feature hierarchies
Committee: Rob Fergus, Geoffrey Hinton, Yann LeCun, Sebastian Seung, Eero Simoncelli

University of Padova, Padova, Italy
Laurea in Electronics Engineering, April 2004 110/110 cum laude
Advisor: Prof. Pietro Perona and Prof. Ruggero Frezza
Thesis: Automatic recognition of biological particles in microscopic images

Conservatory "Frescobaldi", Ferrara, Italy
Diploma of music in violin, June 1999 9/10

ACADEMIC EXPERIENCE

University of Toronto, Department of Computer Science, Toronto, ON - CANADA
Position: *Post-Doctoral Fellow*
Supervisor: Prof. Geoffrey Hinton
Period: July 2009 to June 2011
Project: "Learning gated MRF's"
California Institute of Technology, Computer Vision Laboratory, Pasadena, CA, U.S.A.
Position: *Graduate Research Assistant*
Supervisor: Prof. Pietro Perona
Period: August 2003 - March 2004, July 2004 - August 2004
Project: "Automatic Visual Recognition of Biological Particles"

WORK EXPERIENCE

Google Inc., Mountain View, CA - USA
Position: *Research Scientist*
Period: October 2011 to September 2013

Yahoo! Research, Mission College, Santa Clara, CA, U.S.A.
Position: *Summer Intern*
Host: Kilian Weinberger, Malcolm Slaney, Olivier Chapelle, Kishore Papineni
Period: Summer 2008
Project: Learning sparse and locally shift-invariant feature hierarchies of images

Microsoft Research LTD., Cambridge, U.K.
Position: *Summer Intern*
Host: Martin Szummer
Period: Summer 2007
Project: Learning semantic representations of text documents from partially labeled collections

TEACHING EXPERIENCE

Teaching Assistant, New York University
Graduate Course on Machine Learning, Fall 2007. Instructor: Prof. LeCun
Tutorials and Guest Lectures
- CVPR 2014 Tutorial on Deep Learning
- CVPR 2013 Tutorial on Large Scale Visual Recognition
- ICML 2013 Tutorial on Deep Learning, jointly with Y. LeCun
- UCLA IPAM Summer School 2012 on Deep Learning
- CVPR 2012 Tutorial on Deep Learning
- Graduate Course on Computer Vision CS 231A, Winter 2014. Stanford University - Instructor: Prof. Savarese.
- Graduate Course on Advanced Machine Learning, Spring 2010. University of Toronto - Instructor: Prof. Zemel.
- CIFAR Summer School, 2010.

Students Advised
- Gregoire Mesnil (summer 2014 internship at Facebook)
- Babak Shakibi (winter 2014 internship at Facebook)
- David Eigen (summer 2013 internship at Google)
- Matthew D. Zeiler (summer 2012 internship at Google)

Students Co-Advised
- Sida Wang (University of Toronto)

PROFESSIONAL ACTIVITIES

Guest Editor for the International Journal of Computer Vision Special Issue on "Deep Learning", jointly with G.E. Hinton and Y. LeCun

Workshop Organizer

- Tutorial on Deep Learning for Computer Vision
  Conference: Computer Vision and Pattern Recognition (CVPR) 2014
- Representation Learning
  Conference: International Conference of Machine Learning (ICML) 2012
  Co-oranizers: Aaron Courville, Hugo Larochelle, Yoshua Bengio
- Challenges in Learning Hierarchical Models: Transfer Learning and Optimization
  Conference: Neural Information Processing Systems (NIPS) 2011
  Co-oranizers: Quoc V. Le, Ruslan Salakhutdinov, Andrew Ng, Josh Tenenbaum
- Deep Learning and Unsupervised Feature Learning
  Conference: Neural Information Processing Systems (NIPS) 2010
  Co-organizers: Honglak Lee, Yoshua Bengio, Geoffrey Hinton, Yann LeCun, Andrew Y. Ng

Area Chair

- International Conference of Computer Vision 2015
- Computer Vision and Pattern Recognition 2015
- Neural Information Processing Systems 2014
- International Conference of Machine Learning 2014
- ACM Multimedia 2014
- Neural Information Processing Systems 2013
- International Conference of Machine Learning 2013
- Neural Information Processing Systems 2012
- International Conference of Machine Learning 2012
- Conference on Uncertainty in Artificial Intelligence 2012

Reviewer

- Neural Computation
- Journal of Machine Learning
- IEEE Transactions on Pattern Analysis and Machine Intelligence

- International Journal of Computer Vision
- International Journal of Machine Learning and Cybernetics
- Neural Information Processing Systems
- International Conference on Learning Representations
- International Conference of Machine Learning
- Artificial Intelligence and Statistics
- Computer Vision and Pattern Recognition
- Eurepean Conference of Computer Vision
- International Conference of Computer Vision
- Conference on Knowledge Discovery and Data Mining
- AAAI Conference on Artificial Intelligence
- Conference on Uncertainty in Artificial Intelligence

HONORS

– NYU Dean's dissertation fellowship, 2008-2009
– "Henry M. MacCracken" Award Scholarship, 2004-2008
– "Ing. Aldo Gini" Award for Italian researchers abroad, 2004

CONFERENCE PAPERS

- **M. Ranzato**, A. Szlam, J. Bruna, M. Mathieu, R. Collobert and S. Chopra, *Video (Language) Modeling: A Baseline for Generative Models of Natural Videos*, in International Conference on Learning Representations (ICLR), 2015

- T. Mikolov, A. Joulin, S. Chopra, M. Mathieu and **M. Ranzato**, *Learning Longer Memory in Recurrent Neural Networks*, in International Conference on Learning Representations (ICLR), 2015

- Y. Taigman, M. Yang, **M. Ranzato** and L. Wolf, *DeepFace: Closing the Gap to Human-Level Performance in Face Verification*, in IEEE Proc. of Computer Vision and Pattern Recognition Conference (CVPR), 2014

- N. Zhang, M. Paluri, **M. Ranzato**, T. Darrell and L. Bourdev, *PANDA: Pose Aligned Networks for Deep Attribute Modeling*, in IEEE Proc. of Computer Vision and Pattern Recognition Conference (CVPR), 2014

- **M. Ranzato**, J. Susskind, V. Mnih and G.E. Hinton, *On Deep Generative Models with Applications to Recognition*, in IEEE Proc. of Computer Vision and Pattern Recognition Conference (CVPR), 2011

- M. Denil, B. Shakibi, L. Dinh, **M. Ranzato**, N. de Freitas, *Predicting Parameters in Deep Learning*, Advances in Neural Information Processing Systems (NIPS), MIT Press, 2013

- A. Frome, G. Corrado, J. Shlens, S. Bengio, J. Dean, **M. Ranzato**, T. Mikolov, *DeViSE: A Deep Visual-Semantic Embedding Model*, Advances in Neural Information Processing Systems (NIPS), MIT Press, 2013

- M.D. Zeiler, **M. Ranzato**, R. Monga, M. Mao, K. Yang, Q.V. Le, P. Nguyen, A. Senior, V. Vanhoucke, J. Dean, G.E. Hinton, *On Rectified Linear Units for Speech Processing*, International Conference on Acoustic, Speech and Signal Processing (ICASSP), 2013

- A. Senior, G. Heigold, **M. Ranzato**, K. Yang, *An Empirical Study of Learning Rates in Deep Neural Networks for Speech Recognition*, International Conference on Acoustic, Speech and Signal Processing (ICASSP), 2013

- G. Heigold, V. Vanhoucke, A. Senior, P. Nguyen, **M. Ranzato**, M. Devin, J. Dean, *Multilingual Acoustic Models using Distributed Neep Neural Networks*, International Conference on Acoustic, Speech and Signal Processing (ICASSP), 2013

- J. Dean, G. Corrado, R. Monga, K. Chen, M. Devin, Q.V. Le, M. Mao,**M. Ranzato**, A. Senior, P. Tucker, K. Yang, A.Y. Ng, *Large Scale Distributed Deep Networks*, Advances in Neural Information Processing Systems (NIPS), MIT Press, 2012

- Q.V. Le, **M. Ranzato**, R. Monga, M. Devin, G. Corrado, K. Chen, J. Dean, A.Y. Ng, *Building High-Level Features Using Large Scale Unsupervised Learning*, International Conference of Machine Learning (ICML), 2012.

- K. Swersky, **M. Ranzato**, D. Buchman, B.M. Marlin, N. de Freitas, *On Autoencoders and Score Matching for Energy Based Models*, International Conference of Machine Learning (ICML), 2011.

- **M. Ranzato**, J. Susskind, V. Mnih and G.E. Hinton, *On Deep Generative Models with Applications to Recognition*, in IEEE Proc. of Computer Vision and Pattern Recognition Conference (CVPR), 2011

- **M. Ranzato**, V. Mnih and G.E. Hinton, *Generating More Realistic Images Using Gated MRF's*, Advances in Neural Information Processing Systems (NIPS), MIT Press, 2010

- G. Dahl, **M. Ranzato**, A. Mohamed and G.E. Hinton, *Phone Recognition with the Mean-Covariance Restricted Boltzmann Machine*, Advances in Neural Information Processing Systems (NIPS), MIT Press, 2010

- **M. Ranzato** and G.E. Hinton, *Modeling Pixel Means and Covariances Using Factorized Third-Order Boltzmann Machines*, in IEEE Proc. of Computer Vision and Pattern Recognition Conference (CVPR), 2010

- **M. Ranzato**, A. Krizhevsky and G.E. Hinton, *Factored 3-Way Restricted Boltzmann Machines for Modeling Natural Images*, in Proc. of the 13-th International Workshop on Artificial Intelligence and Statistics (AISTATS), 2010

- K. Jarrett, K. Kavukcuoglu, **M. Ranzato** and Y. LeCun, *What is the Best Multi-Stage Architecture for Object Recognition?*, in IEEE Proc. of International Conference on Computer Vision (ICCV), 2009

- K. Kavukcuoglu, **M. Ranzato**, R. Fergus, Y. LeCun, *Learning Invariant Features through Topographic Filter Maps*, in IEEE Proc. of Computer Vision and Pattern Recognition Conference (CVPR), 2009

- **M. Ranzato**, M. Szummer, *Semi-supervised Learning of Compact Document representations with Deep Networks*, International Conference of Machine Learning (ICML), 2008.

- **M. Ranzato**, Y. Boureau, Y. LeCun, *Sparse Feature Learning for Deep Belief Networks*, Advances in Neural Information Processing Systems (NIPS), MIT Press, 2007
- **M. Ranzato**, Y. LeCun, *A Sparse and Locally Shift Invariant Feature Extractor Applied to Document Images*, International Conference on Document Analysis and Recognition (ICDAR), 2007.
- Y. LeCun, S. Chopra, **M. Ranzato**, F.J. Huang, *Energy-Based Models in Document Recognition and Computer Vision*, International Conference on Document Analysis and Recognition (ICDAR), 2007.
- **M. Ranzato**, F.J. Huang, Y. Boureau, Y. LeCun, *Unsupervised Learning of Invariant Feature Hierarchies with Applications to Object Recognition*, in IEEE Proc. of Computer Vision and Pattern Recognition Conference (CVPR), 2007
- **M. Ranzato**, Y. Boureau, S. Chopra, Y. LeCun, *A Unified Energy-Based Framework for Unsupervised Learning*, In Proc. of the 11-th International Workshop on Artificial Intelligence and Statistics (AISTATS), 2007
- **M. Ranzato**, C.S. Poultney, S. Chopra, Y. LeCun, *Efficient Learning of Sparse Representations with an Energy-Based Model*, Advances in Neural Information Processing Systems (NIPS), MIT Press, 2006

JOURNAL PAPERS

- **M. Ranzato**, V. Mnih, J. Susskind, G.E. Hinton, *Modeling Natural Images Using Gated MRFs.* IEEE Trans. Pattern Analysis and Machine Intelligence, 2013.
- **M. Ranzato**, P.E. Taylor, J.M. House, R.C. Flagan, Y. LeCun, P. Perona, *Automatic recognition of biological particles in microscopic images.* Pattern Recognition Letters, Vol. 28, Issue 1, 1 Jan. 2007, pp. 31-39.

OTHER PUBLICATIONS AND TECHNICAL REPORTS

- **M. Ranzato** *On Learning Where To Look*, ArXiv:1405.5488 2014
- K. Kavukcuoglu, **M. Ranzato**, Y. LeCun, *Fast Inference in Sparse Coding Algorithms with Applications to Object Recognition*, CBLL Technical Report December 2008, arXiv 1010.3467
- Y. LeCun, S. Chopra, R. Hadsell, **M. Ranzato**, F.J. Huang, *A Tutorial on Energy-Based Learning*, in Bakir et al. (eds) "Predicting Structured Outputs", MIT Press 2006

WORKSHOP AND DEMONSTRATION PAPERS

- G. Mesnil, T. Mikolov, **M. Ranzato**, Y. Bengio, *Ensemble of Generative and Discriminative Techniques for Sentiment Analysis of Movie Reviews*, workshop at the International Conference on Representation Learning (ICLR), 2015
- D. Eigen, I. Sutskever, **M. Ranzato**, *Learning Factored Representations in a Deep Mixture of Experts*, workshop at the International Conference on Representation Learning (ICLR), 2014

- O. Yadan, K. Adams, Y. Taigman, **M. Ranzato** *Multi-GPU Training of ConvNets*, workshop at the International Conference on Representation Learning (ICLR), 2014
- E. Horster, M. Slaney, **M. Ranzato**, K. Weinberger, *Unsupervised Image Ranking*, Proc. of the first ACM workshop on Large-scale multimedia retriaval and mining, Beijing, China, 2009
- K. Kavukcuoglu, **M. Ranzato**, Y. LeCun, *Fast Inference in Sparse Coding Algorithms with Applications to Object Recognition*, "Optimization for Machine Learning" workshop at Advances in Neural Information Processing Systems (NIPS), 2008
- D.R. Edgington, I. Kerkez, D.E. Cline, **M. Ranzato**, P. Perona, *Detecting, Tracking and Classifying Animals in Underwater Video*, IEEE International Conference on Computer Vision and Pattern Recognition (CVPR), demonstration, New York, New York, 2006
- D.R. Edgington, I. Kerkez, D.E. Cline, D. Oliver, **M. Ranzato**, P. Perona, *Detecting, Tracking and Classifying Animals in Underwater Video*, IEEE International Conference on Computer Vision and Pattern Recognition (CVPR), demonstration, San Diego, California, 2005

INVITED PRESENTATIONS

- *Deep Learning for Vision*
  - workshop on Web-Scale Vision and Social Media at CVPR 2014
  - Workshop on Scene Understanding at CVPR 2014
  - Large Scale Visual Recognition tutorial at CVPR 2014
  - Large Scale Visual Recognition tutorial at CVPR 2013
  - Bay Area Vision Meeting 2013
- *On The Quest For Good Generative Models of Natural Images*
  - CIFAR NCAP Workshop, Vancouver, Canada, December 2010
  - CBLL seminar, New York University, New York, November 2010
- *Modeling Natural Images with Higher-Order Boltzmann Machines*
  - CIFAR Summer School, Toronto, Canada, August 2010
  - Redwood Center for Theoretical Neuroscience, June 2010
  - Computer Science Department, Stanford, June 2010
  - Google Research, Mountain View, June 2010
  - Department of Computer Science, University of California, San Diego, June 2010
  - Department of Computer Science, University of California, Irvine, June 2010
  - CIFAR NCAP Workshop, Vancouver, Canada, December 2009
- *High-Accuracy Object Recognition with a New Convolutional Net Architecture and Learning Algorithm*, Learning Workshop, Snowbird - Clearwater, April 2009
- *Unsupervised Learning of Sparse and Invariant Features Hierarchies*, Learning Workshop, Snowbird - Puerto Rico, March 2007

- *Efficient Learning of Sparse Representations with an Energy-Based Model*
  - Computational Vision Laboratory, California Institute of Technology, December 2006
  - Laboratory for Computational Vision, Center for Neuroscence - NYU, October 2006
- *Energy-Based Model for Unsupervised Learning of Sparse Overcomplete Representations*
  - Learning Workshop, Snowbird Utah, April 2006
  - CIAR NCAP Workshop, Vancouver Canada, December 2005

OTHER MEETINGS

- Workshop: *Mathematics of Knowledge and Search Engines - Workshops II: Numerical Tools and Fast Algorithms for Massive Data Mining, Search Engines and Applications*, IPAM UCLA, October 2007.
- Graduate Summer School: *Neural Computation and Adaptive Perception*, CIAR University of Toronto, August 2006.
- NESCAI - Cornell University, Ithaca, April 2006.
- Graduate Summer School: *Intelligent Extraction of Information from Graphs and High Dimensional Data*, IPAM UCLA, July 2005.