

# CURRICULUM VITÆ

Pratik Chaudhari

August 2018

## PERSONAL AND CONTACT INFORMATION

Born	September 3, 1988, Indian citizen
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## RESEARCH AND TEACHING INTERESTS

Machine Learning and Computer Vision	deep learning, non-convex optimization, distributed algorithms, statistical physics, learning theory, stochastic processes, partial differential equations, Markov chain Monte Carlo, structure from motion, visual inertial sensor fusion
Robotics and Control	urban autonomous navigation, motion planning, filtering and stochastic control, planning under uncertainty, formal verification methods

## PROFESSIONAL EXPERIENCE

### **University of Pennsylvania**, Philadelphia, PA

Assistant Professor of Electrical and Systems Engineering (starting July 2019)  
Member of the General Robotics, Automation, Sensing and Perception (GRASP) Laboratory

### **nuTonomy Inc.**, Cambridge, MA

Principal Autonomous Vehicle Engineer (2014-2016)

### **Singapore-MIT Alliance for Research and Technology**, Singapore

Visiting Researcher (Summers 2011, 2012 and 2013)

### **Honeywell Technology Solutions Research Laboratories**, Bangalore, India

Research Engineer (Summer 2009)

### **Indian Space Research Organization and IIT Bombay**

IIT Bombay student satellite project (Summer 2008)

## EDUCATION

### **University of California**, Los Angeles, CA

PhD in Computer Science (2018)  
Advisor: Stefano Soatto  
Thesis: A picture of the energy landscape of deep neural networks (defended on June 28, 2018)  
Committee: Arash Amini (UCLA), Stanley Osher (UCLA), Fei Sha (USC), Ameet Talwalkar (CMU)  
GPA: 3.85/4.0

**Massachusetts Institute of Technology**, Cambridge, MA

Engineer (2014) and Master's (2012) degrees in Aeronautics and Astronautics  
Advisor: Emilio Frazzoli, Laboratory of Information and Decision Systems (LIDS)  
Theses:

Algorithms for autonomous urban navigation with formal specifications (2014)  
Sampling-based algorithms for state estimation (2012)

GPA: 4.9/5.0

**Indian Institute of Technology Bombay**, India

B. Tech in Aerospace Engineering (2006-2010)  
Advisors: Hemendra Arya, Bhartendu Seth  
Thesis: Design and stabilization of a one legged hopping robot (2010)  
GPA: 9.2/10, Department rank 1/21

PUBLICATIONS

Google Scholar profile [here](#).

1. Pratik Chaudhari and Stefano Soatto. Stochastic gradient descent performs variational inference, converges to limit cycles for deep networks. *Proc. of International Conference of Learning and Representations (ICLR)*, Apr 30-May 3, 2018, 2018. [[arXiv:1710.11029](#)]; Workshop on Advances in Approximate Bayesian Inference, NIPS, Dec 4-9; Information Theory and Applications Workshop (ITA), Feb 11-16, 2018. In preparation, *Journal of Machine Learning Research (JMLR)*;
2. Pratik Chaudhari, Carlo Baldassi, Riccardo Zecchina, Stefano Soatto, Ameet Talwalkar, and Adam Oberman. Parle: parallelizing stochastic gradient descent. 2017. [[arXiv:1707.00424](#)]; Systems and Machine Learning Conference, Feb 15-16, 2018
3. Pratik Chaudhari, Adam Oberman, Stanley Osher, Stefano Soatto, and Guillaume Carlier. Deep Relaxation: partial differential equations for optimizing deep neural networks. *Journal of Research in the Mathematical Sciences (RMS)*, 2017. [[arXiv:1704.04932](#)]; Short version in Proc. of the Workshop on Principled Approaches to Deep Learning, ICML, Aug 6-11, 2017; SIAM Conference on Analysis of Partial Differential Equations, Dec 9-12, 2017; Asilomar Conference on Signals, Systems and Computers, Oct 29-Nov 1, 2017; SIAM Conference of Imaging Sciences, Bologna, June 5-8, 2018
4. Pratik Chaudhari, Anna Choromanska, Stefano Soatto, Yann LeCun, Carlo Baldassi, Christian Borgs, Jennifer Chayes, Levent Sagun, and Riccardo Zecchina. Entropy-SGD: Biasing gradient descent into wide valleys. *Proc. of International Conference of Learning and Representations (ICLR)*, 2017. [[arXiv:1611.01838](#)]; Information Theory and Applications Workshop (ITA), Feb 12-17, 2017
5. Pratik Chaudhari and Stefano Soatto. On the energy landscape of deep networks. *Workshop on Advances in non-convex analysis and optimization, International Conference on Machine Learning (ICML) June 19-24, 2016*, 2015. [[arXiv:1511.06485](#)]
6. Minghui Zhu, Michael Otte, Pratik Chaudhari, and Emilio Frazzoli. Game theoretic controller synthesis for multi-robot motion planning Part I: Trajectory based algorithms. In *Proc. of International Conference on Robotics and Automation (ICRA) June 1-4, 2014*, 2014. [[arXiv:1402.2708](#)]
7. Pratik Chaudhari, Tichakorn Wongpiromsarn, and Emilio Frazzoli. Incremental minimum-violation control synthesis for robots interacting with external agents. In *Proc. of American Control Conference (ACC) Jun 4-6 2014*, 2014. [[pdf](#)]
8. Valerio Varricchio, Pratik Chaudhari, and Emilio Frazzoli. Sampling-based algorithms for optimal motion planning using process algebra specifications. In *Proc. of International Conference on Robotics and Automation (ICRA) Jun 1-4, 2014*, 2014. [[pdf](#)]
9. Luis I. Reyes Castro, Pratik Chaudhari, Jana Tumova, Sertac Karaman, Emilio Frazzoli, and Daniela Rus. Incremental sampling-based algorithm for minimum-violation motion planning. In *Proc. of Conference on Decision and Control (CDC) Dec 10-13, 2012*, 2013. [[arXiv:1305.1102](#)]
10. Pratik Chaudhari, Sertac Karaman, David Hsu, and Emilio Frazzoli. Sampling-based algorithms for continuous-time POMDPs. In *Proc. of American Control Conference (ACC) Jun 17-19, 2013*, 2013. [[pdf](#)]
11. Pratik Chaudhari, Sertac Karaman, and Emilio Frazzoli. Sampling-based algorithm for filtering using Markov chain approximations. In *Proc. of Conference on Decision and Control (CDC) Dec 10-13, 2012*, 2012. [[pdf](#)]

## INVITED TALKS AND SEMINARS

### 2018

Theory of Deep Learning Workshop & Geometry in Machine Learning Workshop, ICML (July); SIAM Imaging Sciences Bologna (June); Aptiv/Delphi Advanced Research Division (May); JHU Electrical and Computer Engineering (Apr); Annual Cognitive Science Symposium, UCLA (Apr); Microsoft Research New England (Apr); Mechanical Engineering MIT (Apr); Electrical and Systems Engineering & Computer Science and Information Systems, University of Pennsylvania (Mar); Bio-Medical Engineering, JHU (Mar); Inverse problems in machine learning, Caltech (Feb); New Deep Learning Techniques, Institute of Pure and Applied Mathematics IPAM (Feb); Electrical Engineering Department (UCLA); Aerospace Engineering, Georgia Institute of Technology (Feb); Electrical and Computer Engineering, UCLA (Feb); Computer Science, USC (Feb); Graduation Day Talk at Information Theory and Applications (Feb); University of Cambridge (Jan);

### 2017

Tutorial on Deep Learning, Control and Decision Systems (Dec); Level set seminar, Institute of Pure and Applied Mathematics, IPAM (Nov); Asilomar Conference on Signals and Systems (Oct); Deep learning for computer vision, Schloss Dagstuhl Workshop (Sep); Ecole Normale Supérieure, Cachan (May); French Institute for Research in Computer Science and Automation INRIA (May); Human Genetics Foundation, Politecnico di Torino (May); Electrical Engineering and Computer Science, MIT (Mar); Information Theory and Applications (Feb); Computer Science, Stanford University (Feb); Amazon Web Services (Feb); OpenAI (Feb); Level set seminar, Institute of Pure and Applied Mathematics, UCLA (Feb); Department of Statistics, UCLA (Jan);

### - 2016

Computer Science, New York University (Dec 2016); Machine Vision, UCLA (Nov 2016); Advanced machine learning topics, UCLA (Feb 2016); Automatic Control Laboratory, Royal Institute of Technology KTH (Apr 2014);

## TEACHING

2016 An introduction to deep learning, guest lecture in a course on Machine Vision (UCLA)  
2016 Energy landscapes of deep networks, guest lecture in a course on Advanced Machine Learning Topics (UCLA)  
2012 Teaching Assistant for 16.31 Feedback Control Systems (MIT)  
2007 - 2010 Technical Mentor, IIT Bombay

## AWARDS

2014 Balu and Mohini Balakrishnan fellowship  
2013 Most societally beneficial video at International Joint Conference of Artificial Intelligence (IJCAI)  
2010 Patricia and David Voss Foundation fellowship  
2010 Institute Silver medal for academic performance  
2010 Aeronautical Society of India award  
2009 Individual Achievement Award, Honeywell Technology Solutions Research Laboratories  
2008 Institute Technical Color for leadership and fostering robotics activities at IIT Bombay  
2004 - 2010 National Talent Search Scholarship, Government of India

## PROFESSIONAL SERVICES

Machine Learning, Computer Vision and Optimization Reviewer for Conference on Learning Theory (COLT), International Conference on Artificial Intelligence and Statistics (AISTATS), International Conference on Machine Learning (ICML), International Conference on Computer Vision (ICCV), Transactions of Pattern Analysis and Machine Intelligence (PAMI), Neural Information and Processing Systems (NIPS), Journal of Selected Topics in Signal Processing (J-STSP), Applied and Computational Harmonic Analysis (ACHA)  
Robotics and Control Reviewer for International Conference of Robotics and Automation (ICRA), International Conference of Intelligent Robots and Systems (IROS), Robotics and Automation Letters (RA-L), International Conference on Cyber-Physical Systems (ICCPS), Conference on Decision and Control (CDC), International Federation of Automatic Control (IFAC), Transactions on Aerospace and Electronic Systems (TAES)  
2016-2017 Graduate Admissions Committee, Computer Science, UCLA

## COURSEWORK

CS and EE	Machine Learning (T. Jaakkola), Probabilistic Graphical Models, (T. Jaakkola), Computer Vision (S. Soatto), Information Theory (S. Diggavi), Theory of Computation (M. Sipser), Communication Complexity (A. Sherstov)
Probability	Fundamentals of Probability (J. Tsitsiklis), Measure Theory (M. Bonk), Advanced Stochastic Processes (D. Shah), Statistical Data Processing (D. Shah), Theoretical Statistics (A. Amini), Percolation Theory (E. Procaccia, M. Biskup)
Robotics and Control	Principles of Autonomy (E. Frazzoli), Feedback Control (E. Frazzoli, J. How), Stochastic Estimation (J. How), Optimal Control (S. Hall), Nonlinear Control (JJ Slotine), Geometric Control (R. Banavar)
Projects	Distributed Training of Deep Networks, Deep Recurrent Generative Models for Natural Images, Phase Transitions in Random $k$ -SAT, Column Generation Techniques for Linear Programs, Motion Estimation in Videos using Graphical Models, Aggressive Maneuvers for Quadrotors using Differential Flatness, Discrete Variational Integrators for Optimal Control, SAT-based Constraint Satisfiability

## REFERENCES

Available upon request.