


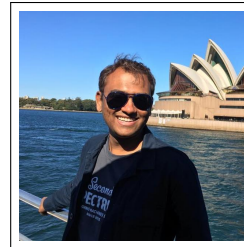
Pratik Chaudhari

Curriculum Vitæ

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Research Interests

- Machine Learning** deep learning, non-convex optimization, statistical physics of learning, learning theory, stochastic processes, partial differential equations
- Robotics** motion planning, state-estimation and control under uncertainty, urban autonomous navigation, formal verification methods

Current Position

2014 – 2018 **PhD candidate, Computer Science, University of California, Los Angeles.**

Advisor: Stefano Soatto

Thesis: A picture of the energy landscape of deep neural networks

GPA: 3.85/4

Balu and Mohini Balakrishnan fellowship (2014)

Academic Background

2010 – 2014 **Engineer's and Master's, Aeronautics & Astronautics, Massachusetts Institute of Technology.**

Advisor: Emilio Frazzoli, Laboratory of Information and Decision Systems (LIDS)

Theses: Sampling-based algorithms for state estimation (2012)

Algorithms for autonomous urban navigation with formal specifications (2014)

GPA: 4.9/5

Patricia and David Vous Foundation fellowship (2010)

2006 – 2010 **BTech, Aerospace Engineering, Indian Institute of Technology Bombay.**

Thesis: Design and stabilization of a one legged hopping robot (2010)

GPA: 9.2/10, **Department rank:** 1 / 21

Institute Silver medal for academic performance (2010)

Aeronautical Society of India award (2010)

Work Experience

Sum. '14-15-16 **Principal autonomous vehicle engineer, nuTonomy Inc..**

Sum. '11-12-13 **Visiting researcher, Singapore-MIT Alliance for Research and Technology, Singapore.**

Sum. '09 **Research engineer, Honeywell Technology Solutions, Bangalore (India).**

Sum. '08 **IIT Bombay student satellite project, Indian Space Research Organization.**

Publications [\[Google Scholar\]](#)

- 2017 **Stochastic gradient descent performs variational inference, converges to limit cycles for deep networks**
P. Chaudhari, S. Soatto
Short version submitted to International Conference on Learning and Representations (ICLR)
Short version presented at the Workshop on Advances in Approximate Bayesian Inference, NIPS, Dec 4-9
In preparation, Journal of Machine Learning Research (JMLR)
- 2017 **Parle: distributed training of deep neural networks**
P. Chaudhari, C. Baldassi, R. Zecchina, S. Soatto, A. Talwalkar, A. Oberman
preprint arXiv:1707.00424
- 2017 **Deep Relaxations: partial differential equations for optimizing deep neural networks**
P. Chaudhari, A. Oberman, S. Osher, S. Soatto, G. Carlier
Under review, Communications of Pure and Applied Mathematics (CPAM)
Short version in Proc. of the Workshop on Principled Approaches to Deep Learning, ICML, Aug 6-11, 2017.
Presented at SIAM Conference on Analysis of Partial Differential Equations, Dec 9-12.
Presented at Asilomar Conference on Signals, Systems and Computers, Oct 29-Nov 1.
- 2016 **Entropy-SGD: biasing gradient descent into wide valleys**
P. Chaudhari, A. Choromanska, S. Soatto, Y. LeCun, C. Baldassi, C. Borgs, J. Chayes, L. Sagun, R. Zecchina
Proc. of the International Conference on Learning and Representations (ICLR), April 24-26.
- 2015 **On the energy landscape of deep neural networks**
P. Chaudhari, S. Soatto
Presented at the Workshop on Advances in Non-convex Optimization, ICML, Jun 19-24.
- 2014 **Incremental minimum-violation control synthesis for robots interacting with external agents**
P. Chaudhari, T. Wongpiromsarn and E. Frazzoli
Proc. of the American Control Conference (ACC), Jun 4-6
- 2014 **Sampling-based algorithms for motion planning using process algebra specifications**
V. Varricchio, P. Chaudhari and E. Frazzoli
Proc. of the International Conference on Robotics and Automation (ICRA), Jun 1-4
- 2014 **Game theoretic controller synthesis for multi-robot motion planning**
Part I : Trajectory based algorithms
M. Zhu, M. Otte, P. Chaudhari, E. Frazzoli
Proc. of the International Conference on Robotics and Automation (ICRA), Jun 1-4
- 2013 **Incremental sampling-based algorithm for minimum-violation motion planning**
L. Reyes Castro, P. Chaudhari, J. Tumova, S. Karaman, E. Frazzoli, D. Rus
Proc. of the Conference on Decision and Control (CDC), Dec 10-13
- 2013 **Sampling-based algorithms for continuous-time POMDPs**
P. Chaudhari, S. Karaman, D. Hsu, E. Frazzoli
Proc. of the American Control Conference (ACC), Jun 17-19
- 2012 **Sampling-based algorithm for filtering using Markov chain approximations**
P. Chaudhari, S. Karaman and E. Frazzoli
Proc. of the Conference on Decision and Control (CDC), Dec 10-13

Invited Talks

Universities

2017	Unraveling the mysteries of stochastic gradient descent	IPAM
	A picture of the energy landscape of deep neural networks	Stanford MIT Schloss Dagstuhl, Germany
	Entropy-SGD: biasing gradient descent into wide valleys	IPAM Statistics, UCLA ENS Paris and INRIA ENS Cachan Politecnico di Torino
2016	Spin glasses: on the energy landscape of deep networks	NYU
2014	Sampling-based algorithms: stochastic systems and formal specifications	KTH
	Approximate POMDP homomorphisms	MIT

Industry

2017	A picture of the energy landscape of deep neural networks	Amazon AWS OpenAI
2014	Sampling-based planning under uncertainty	Qualcomm Research
2013	Motion planning using formal specifications	Nissan

Conferences

2017	Unraveling the mysteries of stochastic gradient descent	NIPS
	Tutorial: Mathematics of deep learning, with Rene Vidal and Raja Giryes	CDC
	Entropy-SGD: biasing gradient descent into wide valleys	ICLR ITA
	Deep Relaxations: partial differential equations for optimizing deep networks	SIAM PDEs ICML Asilomar
	Parle: parallelizing stochastic gradient descent	SoCal ML
2016	Visual Representations: Defining properties and deep approximations	ICLR
	On the energy landscape of deep neural networks	ICML SoCal ML
2014	Sampling-based planning under uncertainty	RSS
	Motion planning using formal specifications	RSS
	Minimum-violation control for interaction with external agents	ACC
2013	Consistent approximations of continuous-time POMDPs	ACC
2012	Sampling-based algorithms for filtering	CDC

Teaching Experience

2012 **Feedback Control Systems, MIT**, *Instructor: Emilio Frazzoli.*

Helped develop course materials, hardware-based lab sessions, a "continued-evaluation" system using pre-lecture quizzes and conducted recitation sessions on material complementing the classwork.

Invited lectures

2016 **An introduction to deep learning**, *Machine Vision, Instructor: Stefano Soatto.*

2016 **Energy landscapes of deep networks**, *Advanced machine learning topics, Instructor: Fei Sha.*

2007 – 2010 **Technical Mentor**, *IIT Bombay.*

Organized competitions on robotics, electronics and programming with the help of on-campus technical clubs. Mentored undergraduate and graduate students for technical projects.

Professional Activities

Reviewer for

ML and Vision 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**)

Robotics and Control 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

Awards

2013 **Most societally beneficial video at IJCAI**, *Autonomous Cars to Reduce Congestion*

2009 **Individual Achievement Award**, for exceptional work at Honeywell Technology Solutions

2004 – 2010 **National Talent Search Scholarship**, Government of India

2008 **Institute Technical Color**, for leadership and fostering technical activities at IIT Bombay

2006 Ranked **1417/320,000** in the IIT Joint Entrance Examination and **318/523,000** in the All India Engineering Entrance Examination

2005 – 2006 Selected for the **Indian National Physics and Maths Olympiads**

Courses

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), advanced algorithms (D. Karger)

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), robust control (A. Megretski), geometric control (R. Banavar)