

Pratik Chaudhari

Interests: deep learning, statistical learning theory, perception and control of cyber-physical systems

RESEARCH EXPERIENCE

Research Assistant

Oct 2014 - Present

Advisor: Stefano Soatto, Vision Laboratory, UCLA

- **Spin Glasses**

Gradient noise can be used to control the complexity of deep networks — modifying them from exponentially many local minima to polynomially many local minima — resulting in regularization schemes for dramatically accelerated training and improved generalization error.

- **Adaptive Jump SGD**

Statistical physics based, non-local training algorithms for deep networks that evaluate multiple local minima.

Research Assistant

Sept 2010 - May 2014

Advisor: Emilio Frazzoli, Information and Decision Systems, MIT

- **Formal Verification Methods**

Algorithms for model checking linear temporal logic (LTL) and process algebras to model behavior of autonomous agents fulfilling conflicting task specifications, as also their interaction with external agents in the environment.

- **Stochastic Control & Estimation**

Efficient point-based solvers for control (MDPs, POMDPs) and filtering (HMMs) of continuous-time stochastic processes using techniques from random geometric graphs.

WORK EXPERIENCE

Autonomous Vehicle Engineer

June- Sept 2014, July - Sept 2015

nuTonomy LLC., Cambridge

- **Algorithms for Urban Planning**

Implemented sampling-based temporal logic motion planning and low-level control algorithms that provably conform to driving manuals on a full-size autonomous car.

- **Large-scale Simulation Environment**

Implemented high-performance simulators for sensors like Velodyne, LIDARs, cameras etc. Built a traffic simulation platform for continuous testing of the interaction of multiple copies of the code against each other.

Visiting Researcher

July 2011, Aug 2012, Feb - May 2013

Singapore-MIT Alliance for Research and Technology, NUS

- **Minimum-violation Planning Algorithms**

Built a drive-by-wire golf-cart and implemented motion planning and localization algorithms. Demonstrated a passenger pickup & delivery system in the NUS campus.

COURSE PROJECTS

- Phase transitions in random k -SAT
- Twitter based real-time geographic mood estimation
- Non-parametric belief propagation for motion estimation
- Aggressive maneuvers for quadrotors using differential flatness
- Discrete variational integrators for optimal control

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EDUCATION

2014 – PRESENT

Doctor of Philosophy
COMPUTER SCIENCE

GPA: 3.8/4 *University of California, Los Angeles*

2010 – 2014

Engineer and Master of Science
AERONAUTICS & ASTRONAUTICS

GPA: 4.9/5 *Massachusetts Institute of Technology*

2006 – 2010

Bachelor of Technology
AEROSPACE ENGINEERING

GPA: 9.2/10 *Indian Institute of Technology Bombay*

COURSEWORK

Learning *machine learning, computer vision, graphical models, statistical data processing, information theory*
Probability *measure theory, theoretical statistics, advanced stochastic processes, percolation theory*
CS Theory *theory of computation, communication complexity*
Robotics *principles of autonomy, stochastic estimation & control*

PUBLICATIONS

1. The effect of gradient noise on the energy landscape of deep networks, (*submitted*).
2. Incremental minimum-violation control synthesis for robots interacting with external agents, *ACC 2014*.
3. Sampling-based algorithms for optimal motion planning using process-algebra specifications, *ICRA 2014*.
4. Game theoretic controller synthesis for multi-robot motion planning, *ICRA 2014*.
5. Incremental algorithms for minimum-violation motion planning, *CDC 2013*.
6. Sampling-based algorithms for continuous-time POMDPs, *ACC 2013*.
7. Sampling-based algorithms for filtering using Markov chain approximations, *CDC 2012*.

AWARDS

- 2014-2015 **Fellowship**, Computer Science, UCLA
2010-2011 **Fellowship**, Aero-Astro, MIT
2010 **Aeronautical Society of India Award**
2010 **Institute Silver Medal**, Aerospace, IIT Bombay
2009 **Individual Achievement Award**, Honeywell Research
2004-2010 **National Talent Search Scholarship**, Govt. of India

SKILLS

Programming C++, Python, Lua, OpenGL, CUDA
Robotics ROS, LCM