Siddharth Chandak | CV

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Graduate Student at Stanford University

Education

- **Stanford University** — **Stanford, CA, USA**
  PhD, Electrical Engineering — *2021–present*
- **Stanford University** — **Stanford, CA, USA**
  MS, Electrical Engineering, GPA: 4.13/4 — *2021–present*
- **Indian Institute of Technology Bombay** — **Mumbai, India**
  Bachelor of Technology in Electrical Engineering, CPI 9.89/10 — *2017–2021*
  - President of India Gold Medal
  - Honors in Electrical Engineering & Minor in Computer Science

Academic Achievements

- Recipient of the **3Com Corporation Stanford Graduate Fellowship**
- **President of India Gold Medal** at IIT Bombay for best academic standing in B.Tech. in 2021
- **Prof. K. C. Mukherjee Award** at IIT Bombay for best B.Tech. Project among Electrical Engineering students in 2021
- Among the **top 50** candidates in the **Indian National Olympiads in Chemistry and Physics** and chosen to attend respective **Selection Camps** for **International Olympiads** in 2017
- **All India Rank 346** in JEE Advanced 2017 among 220,000 students
- **All India Rank 73** in JEE Main 2017 among 1.18 million students
- Recipient of **KVPY Fellowship** with an **All India Rank 86** in 2016 (KVPY is a Fellowship in Basic Sciences, initiated by the Department of Science and Techology, Govt. of India)
- **NTSE** Scholar (National Talent Search Exam conducted by NCERT, Govt. of India) since 2015

Publications

Journal

- S. Chandak, V. S. Borkar and P. Dodhia, "Concentration of Contractive Stochastic Approximation and Reinforcement Learning", in *Stochastic Systems*, doi:10.1287/stsy.2022.0097
- S. U. Haque, S. Chandak, F. Chiariotti, D. Gunduz and P. Popovski, "Learning to Speak on Behalf of a Group: Medium Access Control for Sending a Shared Message", in *IEEE Communications Letters*, doi:10.1109/LCOMM.2022.3181733
- V. S. Borkar, S. Chandak, "Prospect-theoretic Q-learning", in *Systems and Control Letters*, doi: 10.1016/j.sysconle.2021.105009
- S. Chandak, F. Chiariotti and P. Popovski, "Hidden Markov Model-Based Encoding for Time-Correlated IoT Sources", in *IEEE Communications Letters*, vol. 25, no. 5, pp. 1463-1467, May 2021

Preprints

- V. S. Borkar, S. Chandak and H. Dolhare, "A Concentration Bound for LSPE(λ)", *arXiv (2021)*, 2111.02644. *Submitted to Systems and Control Letters.*

Teaching Experience

Served as undergraduate teaching assistant for a batch of 50 freshmen, conducting weekly tutorial sessions, special doubt sessions, and grading answer sheets for the following courses:

- MA106: Linear Algebra — Spring 2019-20
- MA105: Calculus — Autumn 2019-20
- PH108: Basics of Electricity and Magnetism — Spring 2018-19
- PH107: Quantum Physics and Applications — Autumn 2018-19

Selected Courses

- **Advanced Courses:** Information Theory and Statistics, Statistical Signal Processing, Convex Optimization, Queuing Systems, Error Correcting Codes, Stochastic Optimization, Advanced Probability and Random Processes, Information Theory and Coding, Number Theory and Cryptography, Applied Linear Algebra
- **Core EE Courses:** Digital Communication, Data Analysis and Interpretation, Control Systems, Digital Systems, Microprocessors, Digital Signal Processing
- **Computer Science:** Deep Learning for Computer Vision, Reinforcement Learning, Advanced Machine Learning, Theoretical Machine Learning, Data Structures and Algorithms, Logic for CS, Computer Networks, Digital Image Processing, Operating Systems
- **Miscellaneous:** Biology, Chemistry, Economics, Sociology, Environmental Studies, Complex Analysis, Differential Equations

Older Research Projects

- **Prospect-Theoretic Q-Learning** — August 2020 - January 2021
  Guide - Prof. Vivek Borkar, EE, IIT Bombay
  Studying classical Q-learning from a prospect theoretic viewpoint, i.e., when the valuation of future returns is distorted by a subjective map that accentuates perceived higher returns and diminishes perceived losses
  - Analyzing asymptotic behaviour of the resulting Q-learning scheme using monotone dynamical systems, in particular, determining number and locations of equilibrium points under different conditions
  - Simulated Q-learning scheme and the equivalent differential equation to verify theoretical results
- **Hidden Markov Model-Based Encoding for Time-Correlated IoT Sources** — April - July 2020
  Guide - Prof. Petar Popovski, Department of Electronic Systems, Aalborg University, Denmark
  Proposed encoding and decoding scheme for transmitting short IoT packets with time correlation across a noisy channel by modeling source dynamics using Hidden Markov Models
  - Proposed selective puncturing of Markov state bits and higher error protection for random bits in a packet, instead of source compression used in traditional approaches
  - Used forward-backward decoding to exploit Markov source dynamics and achieve low decoding latency
  - Tested approach for Binary Symmetric Channel using BCH and Convolutional codes
  - Proposed scheme achieves significantly lower packet error rate than traditional compression-based encoding schemes in simulations
- **Social Network Inference from Survey Data** — May - July 2019
  Guide - Prof. Nick Jones, Mathematics, Imperial College London, UK

Investigated the difference between social networks in UK, ICL and "Hackspace" - a smaller technical community at ICL, by analyzing survey data on friendships within and across communities

- Modeled the social network using a stochastic block model and inferred the model parameters and error bounds using Bootstrapping and Bayesian Inference
- Analyzed "Hackspace" survey to examine if innovative spaces promote friendships between communities (defined with respect to gender, age, education, etc.)
- Used notions of distance between probability distributions to define a statistic for "Homophily", the tendency to socialize within one's own community
- Related Homophily to people's subjective health for different regions of the UK

- **A Survey in Pedagogy** December 2018 - December 2019
  Guide - Prof. D. Manjunath, EE, IIT Bombay
  Conducted a department-wide survey to improve curriculum design and pedagogy process
  - Designed a questionnaire about course related issues such as factors affecting grades, evaluation structure and course feedback
  - Conducted the survey for 40 students and 20 professors chosen randomly from the EE department
  - Performed statistical analysis of survey data to investigate how students from different grade ranges approach academics
  - Suggested methods to improve course experience for students and professors on the basis of survey data

Technical Skills

- **Programming Languages:** C++, Python, MATLAB, LaTeX, C#, SQL
- **Hardware and Software Skills:** VHDL, Assembly, Embedded C, Unity, Arduino IDE, SolidWorks, AutoCAD, Ngspice