Chinmay Sonar
PhD Candidate
[Website] [Scholar] [LinkdIn] [GitHub]

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Education

- **University of California, Santa Barbara, USA** *Fall 2019 - Current*
  PhD candidate, Computer Science
  Research: Fairness considerations for the Committee Selection Problems in AI/ML
  GPA: 4/4
  Advisor: *Prof. Subhash Suri*
  (Expected graduation: March 2024)
- **Indian Institute of Technology Gandhinagar, India** *Fall 2014 - 2019*
  Master of Technology, Computer Science *(2017-2019)*
  Research: Algorithms for problems in Computational Social Choice [Thesis]
  GPA: 9.83/10
  Advisor: *Prof. Neeldhara Misra*
  Bachelor of Technology, Mechanical Engineering *(2014 - 2017)*

Research Interest

Keywords: Optimization, Economics-CS (EconCS), AI, Deep Learning
Description: I am a part of the algorithms and game theory lab at UCSB. I broadly work on the optimization problems arising from AI, ML, computational social choice, and geometry applications. In the major part of my PhD research so far, I explored the design of exact and approximation algorithms for fairness aspects in committee selection (facility location) scenarios. I have also worked economic efficiency of fairly dividing shared resources among stake-holding parties, and more generally, on the problems at the interface of economics and computer science. My current research focuses on using DL techniques for combinatorial optimization.

Research Experience

- **Graduate Researcher**, UCSB CS, CA, USA *(Oct 2019 - current)*
  - Design of exact and approximation algorithms with provable guarantees for problems motivated from fairness in AI (ComSOC)/ ML and computational geometry
  - Publications in several top AI and theory conferences
- **Undergraduate Research Intern**, Clemson, SC, USA *(Summer 2017)*
  - Developed a simulation software for resonance in hydrogel in C and `C++`
  - Created a user-friendly interface to study visualizations in Matlab and Mathematica
  - Simulation is used to study mechanical properties of gel by Kuksenok research group [poster]
- **Undergraduate Research Intern**, IIT Gandhinagar, India *(Summer 2016)*
  - Implemented popular multiwinner election rules in Python
  - Designed efficient algorithms for election winner determination resulting in publication at Algorithmic Decision Theory 2017 conference

Technical Skills

- **Programming and Scripting**. Python (Proficient), C++ (Good), Shell Scripts (Good), Ruby (Good)
- **Machine Learning**. PyTorch, Pandas, scikit learn
- **Libraries/ Tools**. MATLAB, git workflow, ggplot (R), LaTeX

Relevant Graduate Coursework

- Deep Learning on Graphs
- Graduate Machine Learning
- Probability, Linear Algebra
- Algorithmic Game Theory
- Randomized Algorithms
- Advanced Data Science
- Markov Chain Monte Carlo Algorithms
- Blockchain and Cryptocurrencies
- Industrial Engineering and Operational Research

Selected Projects

- **Learning Structured Sparse Recovery (DL)** *(Spring'21)*
  - Proposed, implemented Q-leaning agent to recover model for sparse compressive sensing
  - Agent trained for 15k iterations outperforms the individual baseline algorithms for several underlying graph based models
- **Electricity Generation Prediction Model (ML)** *(Spring'19)*
  - Built and compared multiple generation prediction models (time series analysis)
  - Yielded over 75% accuracy with 5 years of training data
- **Low Rank Matrix Approximation (Advanced Data Science)** *(Spring'17)*
  - Implemented alternating minimization based algorithm for *low rank factorization*
  - Algorithms give 25% speedup for the task of collaborative filtering on the Movielens 100k dataset
- **Blockchain Model (Distributed Systems)** *(Winter 2020)*
  - Developed and implemented a distributed consensus protocol for distributed ledger (Blockchain)
  - 1000+ lines of code in Python with socket programming and multiprocessing [code]
- **Python Garbage Collector Analysis (Runtime Systems)** *(Spring'20)*
  - Understood internal functionality and parameters for Python and PyPy GC
  - Created custom visualizer to examine performance effects with parameters
  - Compared performance with state-of-the-art GC algorithms [code]

Working Papers

- **Multiwinner Elections under Minimax CC-rule in Euclidean Space**
  with Subhash Suri and Jie Xue
  (In submission to **AAAI 2022**)
- **Robustness for Clustering in low-dimensional Euclidean Space**
  with Subhash Suri
  (Fault-tolerant clustering in low-dimensional Euclidean Space)

Publications

- **Anonymity-Preserving Space Partitions**
  with Úrsula Hébert-Johnson, Subhash Suri and Vaishali Surianarayanan
  In The 32nd International Symposium on Algorithms and Computation (ISAAC 2021) [pdf]

- **Equitable Division of a Path**
  with with Neeldhara Misra, P. R. Vaidyanathan and Rohit Vaish
  In The 8th International Workshop on Computational Social Choice (COMSOC 2021) [ArXiV]
- **Fair Covering of Points by Balls**
  with Daniel Lokshtanov, Subhash Suri and Jie Xue
  In Canadian Conference of Computational Geometry (CCCG 2020), Saskatoon, Canada [pdf]
- **On the Complexity of Winner Verification and Candidate Winner for Multiwinner Voting Rules**
  with Palash Dey and Neeldhara Misra
  In International Joint Conference on Artificial Intelligence (**IJCAI'20**), Yokohama, Japan [pdf]
- **Robustness Radius for Chamberlin-Courant on Restricted Domains**
  with Neeldhara Misra
  In International Conference on Current Trends in Theory and Practice of Informatics (SOFSEM'19), Nový Smokovec, Slovakia [pdf]
- **On the Complexity of Chamberlin-Courant On Almost Structured Profiles**
  with Neeldhara Misra and P. R. Vaidyanathan
  In International Conference on Algorithmic Decision Theory (ADT'17), Luxembourg [pdf]
- **Design and development of an efficient Onion harvester for Indian farms**
  with Amogh Parab, Prasannajeet Mane, Janga Sai Kiran, Panna Lal Saini, Vineet Vashista
  In Machines, Mechanisms and Robotics 2019, Mumbai, India [pdf]

Teaching Experience

- **UCSB CS | Teaching Assistant**: *(Oct 2019 - June 2021)*
  - CS 130A, CS 130B: Data Structures and Algorithms
  - CS 8: Introduction to Python Programming
- **IIT Gandhinagar CS | Teaching Assistant:** *(Aug 2018 - June 2019)*
  - CS 112 - Introduction to Python
  - ACM-W Summer School on **Algorithmic Game Theory** (Summer'19)

Scholarships and Awards

- Graduate Entrance Fellowship (UCSB), 2019
- Selected among top 25 students in India for a pre-conference school fellowship at CALDAM 2019.
- Awarded *Swabhanu challenge travel grant to present outstanding undergraduate research* (IIT Gandhinagar) work in international conference (ADT) at Luxembourg, 2017
- Dean's List Award for excellent academic performance, IIT Gandhinagar, 2016 & 2017

Service

- **Professional Service:** Reviewer for SODA (2020), MFCS (2019), AAMAS (2019) conferences
- **CS Graduate Representative:** Co-lead CS talks and events committee (UCSB, 2019-20)

Miscellaneous

- **Competitive Programming:** Qualified for the *ACM-ICPC* India regionals as the University topper (2017) [YouTube]
- **Languages:** English (fluent), Hindi (fluent), Marathi (native), Spanish (beginner)