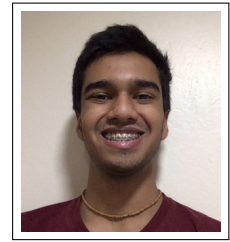


Balaram D. Behera

Curriculum Vitae

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DOB: July 2, 2004



Education

- 2019 – 2021 **University of California, Santa Cruz**, *Bachelors in Science, Computer Science & Bachelors in Arts, Mathematics.*
Final GPA (as of Dec. 2020) is at 4.00.
- 2016 – 2019 **Foothill College**, *Transferred, Computer Science & Mathematics.*
Final GPA (as of Aug. 2019) is at 3.88.

Research Experience

- Jun. 2020 – Present **Clique Counting Under c -closed Graph Model**, *University of California, Santa Cruz*, Research under Prof. C. Seshadhri (UCSC CSE).
Worked on advancing fairly new research on a new distribution-free model for real-world graphs (such as social networks) which is adapted from the property of high triadic closure in such graphs. Primarily researched on finding fixed-parameter tractable bounds (with parameter c with c -closed graphs) for an established clique counting algorithm PIVOTER in the applied world. Also researched into other applications of this pivoting technique for other dense subgraph counting problems, also under the same c -closed graph model. This research was in collaboration with Dr. Shweta Jain and Prof. C. Seshadhri with 3 upcoming publications, and additionally geared toward a Senior Thesis under Prof. C. Seshadhri.
- Aug. 2020 – Present **Environmental Impact of Road Infrastructure in California with Machine Learning**, *University of California, Santa Cruz*, Research under Prof. Narges Norouzi (UCSC CSE).
Analyzed public temporal datasets on California road infrastructure in relation to data regarding biodiversity and wildfire containment. Employing machine learning with key features such as road density, type, and shape to first determine relevant correlations. Aiming to provide further insight into impact of roads especially in wildfire containment, and thus conclude important strategies for future infrastructure development projects. This research is geared toward a Senior Thesis under Narges Norouzi.
- Sep. 2020 – Present **Presence and Power of c -closed Graphs in SAT Solving**, *University of California, Santa Cruz*, Research under Prof. C. Seshadhri (UCSC CSE), Prof. Daniel J. Fremont (UCSC CSE).
Initially ran experiments on the variable incidence graphs (VIGs) of industrial SAT instances up to graph sizes of 800,000 computing c -closure and weak c -closure values. These experiments did indicate the high prevalence of low (weak) c -closure which sparked research in building a random c -closed graph generator. Currently simulating these generated SAT instances on CDCL aiming to establish this c -closed model for efficient industrial conflict-driven SAT solving.

- Sep. 2020 – **ACM Data Analysis Team Lead**, *ACM University of California, Santa Cruz Chapter*.
Present Individually lead undergraduate research team of a dozen students involving machine learning mentorship and political polarization research. Building weekly action steps and research plans for team members and actively advancing machine learning analysis of apparent misconceived political divides present in America.
- Jan. 2020 – **Software Engineering & Mathematical Analysis Research**, *YektaSonics Inc.*, Research under Navid Guogol, Prof. Stephen Petersen (UCSC ECE), Prof. Ali Niknejad (UCB EECS).
Sep. 2020 Developed the C++ codebase for HIFU (High Intensity Focused Ultrasound) device of YektaSonics Inc. in tandem with the PicoScope and Keysight devices. Developed robust algorithms for reading peak-to-peak and phase reading for the software involving the PicoScope device, requiring extensive research into the mathematics of expected correctness and errors of the algorithms, confirmed with physical testing. This research was under the supervision of Navid Guogol, CEO of YektaSonics Inc., and advisors Prof. Stephen Petersen and Prof. Ali Niknejad.
- Dec. 2019 – **Graph-based Sorting**, *University of California, Santa Cruz*, Independent Research.
Jun. 2020 Designed a new creative graph-based sorting algorithm running in optimal time, and beating MERGESORT in both time and space. The development was centered on the effective use of the topological sort of a generated corresponding graph to the given array. The research followed into empirical results on performance and practical viability. This research was conducted completely independently, with mentorship from Prof. C. Seshadhri and Prof. Patrick Tantalo, and published in Elsevier's Theoretical Computer Science.

Teaching Experience

- Sep. 2020 – **Tutor for Algorithms and Data Structures**, *CSE 101 at University of California, Santa Cruz*.
Present Tutoring algorithmic fundamentals of the primary data structures such as linked lists, heaps, trees, graphs, and hashmaps; includes engaging in discussion sections and hosting personal office hours to assist students.
- Sep. 2020 **Tutor for Baskin Engineering Excellence Scholar Program**, *University of California, Santa Cruz*.
Tutored math fundamentals, focusing on precalculus and calculus topics, to incoming freshman students; included engaging in multiple problem-solving sessions with the students.
- Jul. 2020 **Reader for Applied Machine Learning**, *CSE 144 at the University of California, Santa Cruz*.
Constructed question banks for the course including over 250 quiz questions for the current and future offerings of the course. The topics were a fundamental overview of Machine Learning with an applied mindset.

Honors & Awards

- Jun. 2020 **Dean's Award for Undergraduate Research**, *University of California, Santa Cruz*.
Ranked in top ten engineering undergraduate research projects.
- Sep. 2019 – **Dean's Honor List**, *University of California, Santa Cruz*.
Present
- Jun. 2019 **Graduated With High Honors**, *Foothill College*.

Scholarships

- 2019 – 2021 **UC Regent's Scholarship**, *Regents of the University of California*.
Received \$10,000 in tuition aid in recognition of academic excellence over two years at the University of California, Santa Cruz.

Projects

- Aug. 2020 – Present **Pronouncability Tester**, *Machine Learning Algorithm to Evaluate a Word's Pronouncability*.
Developing a machine learning algorithm, employing vanilla neural networks and auto-encoders and consulting speech inflections data for words given by pronunciation audio, lists common spoken words, and comprehensive dictionaries, to predict the pronouncability of a given word. This project can be further used in evaluating written speeches and their ease of speaking, or even in choosing a valid acronym; or in fact, estimating how many possible pronounceable acronyms even exist.
- Dec. 2019 – Jun. 2020 **GraphSort**, *Implementation of Theoretical Algorithm Presented in "Sorting an Array Using the Topological Sort of a Corresponding Comparison Graph"*.
Implemented the graph-based sorting algorithm derived in a previous research project. The algorithm was coded in C for optimal computational power, and with custom graph data structures, the algorithm was efficiently applied as to produce results comparable to MergeSort in both space and running time.
- Apr. 2020 – Jul. 2020 **Stock Market App**, *Machine Learning and Natural Language Processing for Predicting Stock Prices*.
Collaborating with other members from the UCSC ACM Club, we brought together an application that predicted stock prices (only for Apple, Facebook, and Google currently) employing trends from before which required regression learning. Further, utilizing natural language processing of media relating to the stock of discussion which are believed to indicate and/or influence stock trends, the prediction algorithm was improved.
- Nov. 2019 – Mar. 2020 **Solving Games With Graphs**, *Applying Graph Coloring and Graph Lattice Techniques*.
Firstly, designed and implemented a basic Sudoku solver employing the graph coloring technique, that was modified in order to tackle more difficult Sudoku problems where the process can be intermittently non-deterministic (which occurs when provided with insufficient filled grid cells). Moreover, designed algorithms for solving the Rubik's cube and other similar "phase-movement games" applying graph lattice techniques. Involved considerable research and problem-solving in order to determine efficient graph algorithm procedures to solve the games under the lattice model.
- Jun 2018 – Aug. 2019 **Studu**, *Learning Application for Students and Teachers*.
Designed a web-application with a Node.js backend and JavaScript front-end from scratch geared toward serving as a platform for teachers and students to engage in the sharing of relevant resources and enhancing crucial study skills for student success. The principles of this project have been further brought forward by Henry Fan's The Learning Code, in which I have served as well.

Blogging

- May. 2020 – Present **Balaram Behera | Blog Posts in Theoretical Computer Science**, *Personal Blog*, at <https://balaramdb.com>.
The following are articles on my blog; all content is in the field (or neighboring fields of) Theoretical Computer Science in the form of full-fledged articles and teaching of material, personal literature surveys, or presentations of my projects.
- Sep. 2020 **Key Probabilistic Concentration Bounds**.
Discussed the key concentration bounds such as the Markov inequality, Chebyshev bound, the Chernoff tail bounds, and the Hoeffding bound that are geared toward probabilistic algorithm analysis.
- Aug. 2020 **Randomized QuickSort**.
Discussion of the algorithm from a basic theoretical standpoint, along with preliminary insight into the worst-case and expected run-time analysis.
- Jul. 2020 **Measure Theoretic Probability Theory**.
Discussed the fundamentals of measure theory (including σ -algebras, measurable sets, measures, etc.), and then included overview of the Lebesgue measure and its supplementary convergence theorems. Concluded with an introduction to probability theory in terms of probability measures and measure spaces.
- Jun. 2020 **Graph Theory Fundamentals**.
Discussed the all-important fundamental definitions and theorems of graph theory, including peeks into the broader range of advanced graph theory concepts.
- Jun. 2020 **Introduction to Graph Theory**.
Discussed the relevance of studying graph theory and the appearance of graphs in many practical applications.
- Jun. 2020 **Reservoir Sampling: Uniform Sampling of Streaming Data**.
Introduced the famous reservoir sampling procedure, discussing the surprising analysis in-depth and its intuition; included empirical confirmations of its success as well.
- Jun. 2020 **Introduction to Probability Distributions**.
Discussed an overview of the primary probability distributions: the uniform, normal, Bernoulli, geometric, and Poisson distributions.
- May. 2020 **GraphSort Paper**.
Presented the conclusions of my independent graph-based sorting research.

Service

- Jun. 2020 – Present **The Learning Code**, *Foothill College & San Jose State University*.
Collaborated with the co-founder of this initiative, Henry Fan (who works closely with Prof. Anderson of Foothill College and mentors in SJSU), in the making of content to assist students aiming to conquer college with study skills, organization, and smart learning habits. Planning to begin a blog series on my personal journey for the benefit of participants of The Learning Code program.
- Jun. 2020 – Present **ACM UCSC Chapter Secretary**, *University of California, Santa Cruz*.
As part of the UCSC ACM Club Board, I organized weekly meetings throughout the year to inspire and assist students in their journey through UCSC, focusing on the Computer Science aspects. We particularly held job-search workshops, research seminars, networking sessions, and panel discussions. Further, the club organizes the famous annual hackathon event HackACM for all undergraduate students which experiences turnouts over a hundred.

Jun. 2017 – **Youth Jam.**

Present Leading an initiative to attract youth into yoga, mantra meditation, and music guided by my well-experienced mentor who leads a similar initiative for adults. This leadership was in collaboration with two of my peers, and in fact a whole team, which exposed me to many leadership opportunities and moments with this initiative.

Jul. 2018 – **Computer Science Club Officer, Foothill College.**

Jun. 2019 Served as the officer for Foothill College's Computer Science Club where duties included the organization of workshops and hackathons.

Skills

Programming Java (5 years), C++ (2 years), Python (3 years), C (1 year), strong in Python notebooks for empirical testing, strong in Java/C++/C for practical implementations of theoretic algorithms.

Mathematics Well-founded knowledge of and experience with graph theory, ease in writing rigorous theoretical proofs with strong sense of logic, broad exposure to undergraduate Mathematics.

Coursework

- Java, Assembly, Python
- Algorithm Design & Analysis
- Graph Theory
- Computational Models
- Machine Learning
- Probability Theory
- Ordinary Differential Equations
- Computer Systems
- Complexity Theory
- Data Structures
- Discrete Mathematics
- Number Theory
- Advanced Linear Algebra
- Randomized Algorithms
- Real Analysis
- Computer Architecture
- Formal Methods
- Artificial Intelligence

Publications

Dec. 2020 B.D. Behera, "Sorting an Array Using the Topological Sort of a Corresponding Comparison Graph," *Theoretical Computer Science*, vol. 845, pp. 76-97, doi: 10.1016/j.tcs.2020.09.004, 2020.

Aug. 2020 B.D. Behera, "Sorting an Array Using the Topological Sort of a Corresponding Comparison Graph," *arXiv preprint arXiv:2009.00098 [cs.DS]*, 2020.