

Gilvir Gill

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Github: gillgamesh

Education

Stony Brook University

Ph.D. Candidate in Computer Science

Advisors: Michael Bender, Joe Mitchell

Stony Brook, NY

Aug. 2022 - May 2027

Stony Brook University

B.S. in Computer Science & Mathematics; Minor in Political Science

Member of Computer Science Honors program.

GPA: 3.97/4.0

Stony Brook, NY

Aug. 2018 - May 2022

Peer-Reviewed Papers

- David Tench, Evan T. West, Kenny Zhang, Michael Bender, Daniel DeLayo, Martin Farach-Colton, **Gilvir Gill**, Tyler Seip, and Victor Zhang. *Exploring the Landscape of Distributed Graph Sketching*, ALENEX 2025
- Siddharth Mangalik, Johannes C. Eichstaedt, Salvatore Giorgi, Jihu Mun, Farhan Ahmed, **Gilvir Gill**, Adithya V. Ganesan, Shashanka Subrahmanya, Nikita Soni, Sean A. P. Clouston, and H. Andrew Schwartz. *Robust Language-based Mental Health Assessments in Time and Space Through Social Media*, npj Digital Medicine 2023

Algorithms/Theory Research

Stony Brook Algorithms Lab

P.h.D. Candidate (Advisors: Michael Bender, Joseph Mitchell)

Stony Brook, NY

Aug. 2022 - Present

- Working on sketching and external-memory data structures for graph streaming algorithms (space-efficient connectivity queries, minimum cuts, and cut/spectral sparsifiers).
- Led the theory paperwork on an improved ℓ_0 -sampler for accepted conference paper.
- Leading new research on support-sensitive ℓ_0 -samplers and graph sketching algorithms, and on external-memory algorithms for single-pass spectral sparsification of graph streams.
- Implementation work in C++ including lock-free parallel Euler tour trees, reimplementing sketching algorithms in Kokkos for GPU, and creation of new k -sparse recovery data structure.
- General research interests include scheduling, approximation algorithms for streaming (sketching, sampling, etc.), parallel algorithms, computational geometry, and hashing.

Sandia National Lab - Center for Computing Research

Graduate Research Intern

Albuquerque, NM

May 2023 - Nov. 2024

- Worked for the Discrete Math and Optimization team on a project related to reverse engineering process schedules. Developed graph neural network and self-attention network approaches and evaluated performance versus traditional integer programming approaches.
- Used p -Wasserstein metrics on probability distributions, and related statistical distance/ transportation theory concepts, to develop new temporally-sensitive evaluation criteria for process matching.
- Contributed to a distributed toolset for genetic algorithm and Markov chain convergence using Python and MPI, and made an internal crash course for using Tensorflow for deep learning.

Computational Social Science Research

BIAS-NRT Fellowship

Research Assistant/Fellow (Mentors: Susan Brennan, Reuben Kline)

Stony Brook, NY

Aug. 2023 - Present

- Member of NSF traineeship, funded for two of three years, that promotes convergent research projects (with a focus on bias in institutions and artificial intelligence) by bringing together social science and computational/data science researchers.
- Worked on software/data science tools for innocence organizations' intake procedures, and on geospatial and network analyses for trends related to wrongful convictions.
- Leading project on using sentence transformers and hundreds of millions of geotagged social media posts to understand evolving racial and political attitudes in the U.S., by county with weekly granularity. Important constituent pieces include extracting unsupervised topic labels at-scale with parametric UMAP alternatives and density-based clustering.

HLab (Human-Centered NLP Lab)

Research Assistant (Advisor: Andrew Schwartz)

Stony Brook, NY

Jan. 2021 - Aug. 2022

- Aided with a study of PTSD and related health indicators among World Trade Center first responders. Created a feature-selection pipeline that only keeps shared phrases with similar semantics between two domains in order to better generalize traditional interpretable language models (used in lab paper accepted to npj Digital Medicine).
- Investigated how user-factor adaptation can be used with contextual models (typically BERT-like) in lieu of unsupervised domain adaptation for applying social media models to clinical settings.
- Developed a covariance-normalizing embedding distance metric based on Mahalanobis distance to aid in feature-selection pipeline that has been used in other lab projects such as county-level mental health indicators.

Stony Brook PoliTech / Center for Political Informatics

Research Assistant (Advisor: Robert Kelly)

Stony Brook, NY

Aug. 2019 - Aug. 2022

- Primary contributor to Automated Redistricting System (ARS) demo system for automated redistricting approaches.
- Led team research into merge-split graph partitioning, measuring statistical differences in redistricting plan distributions, and examining outcomes for theoretical MMP super-district system.
- Explored using geometric similarity measures and optimal transport distances to study clustering and seed independence in recombination ensemble.
- Performed analysis of Supreme Court districts in Louisiana on the behalf of the NAACP Legal Defense Fund to study whether a proposal to change the number of seats would meaningfully dilute Black representation in the courts.

Teaching Experience

CSE 385: Honors Analysis of Algorithms

Lead Teaching Assistant - Michael Bender

Stony Brook University

Spring 2023

- Instructor for 30% of lectures. Received one of two departmental nominations for the President's Award for Excellence in Teaching by a Graduate Student in 2024.

CSE 350: Honors Theory of Computation

Teaching Assistant / Recitation Instructor - Omkant Pandey

Stony Brook University

Fall 2022

- Led all recitation sections and 3 weeks of main lecture section, on top of typical exam/homework writing and grading responsibilities.

CSE 385: Honors Analysis of Algorithms

Lead Teaching Assistant - Michael Bender

Stony Brook University

Spring 2022

POL 369: Introduction to Political Informatics

Teaching Assistant - Robert Kelly / Samuel Jens

Stony Brook University

Spring 2022

CSE 548: Graduate Analysis of Algorithms
Lead Teaching Assistant - Michael Bender

Stony Brook University
Fall 2021

CSE 350: Honors Theory of Computation
Teaching Assistant - Michael Bender

Stony Brook University
Fall 2020

Awards/Honors/Service

- **Stony Brook Center for Inclusive Computing Fellow** *Fall 2023-Spring 2025*
 - Helped new C.S. department TAs become more aware of inclusivity and pedagogy challenges by leading department-mandated training sessions.
- **Stony Brook C.S. Undergraduate Curriculum Committee** *Fall 2023-Spring 2024*
 - Sole non-faculty member on committee that oversaw a revamp of C.S. major's theory and systems requirements.
- **Bias-NRT Fellow** (interdisciplinary NSF Research Fellowship) *Fall 2024 - Present*
- **Bias-NRT Trainee** *Fall 2023 - Summer 2024*
- **NSF GAANN Fellow** *Fall 2023 - Spring 2024*
- **Outstanding Undergraduate Teaching Assistant Award** *Summer 2021*
- **Goldwater Scholarship Nominee** *Spring 2021*
- **Stony Brook Undergraduate Researcher of the Month** *February 2021*

Industry Experience

Amazon.com

New York, NY

Software Development Engineer Intern

Jun. 2021 - Aug. 2021

- Created a disaster recovery/backfill tool for a tier 1 service that provides (terabytes of) real-time advertiser intent data to the rest of Amazon. Wrote several lambdas for enabling and performing backfill, and an ECS/Redis based-service for enforcing eventual consistency on out-of-order versions of items in the service following backfill events.
- Used several techniques from systems/theory (bloom filters, batching and write-optimization) to guarantee that the version-order enforcer could scale to the terabytes of data streaming through.

Interests & Skills

- **Relevant Math & C.S. Coursework:** Partial Differential Equations, Complex Analysis, Abstract Algebra, Differential Geometry, Computational Geometry, Distributed Systems, Quantum Computing, Natural Language Processing, Machine Learning
- **Primary Interests:** Randomized algorithms and data structures, distributed computing, sketching algorithms, graph theory (spectral and cut sparsifiers).
- **Secondary Interests:** Computational geometry, Markov-chain Monte Carlo algorithms, natural language processing and time-series machine learning, online problems and scheduling problems, computer architecture (and related theory), network science, social-science applications for operations research/optimization.
- **Languages:** Python, C++, C, Java, Go, JavaScript/TypeScript, Julia
- **Software/Frameworks/Tools:** PyTorch, HuggingFace, Scikit-learn, Numba, PostGIS, GeoPandas, React, AWS CloudFormation & CDK, MPI, Kokkos (and basic understanding of GPU architectures), Slurm
- **Soft Skills:** Math communication, public speaking, technical writing and communication, critical thinking, attention to detail, active listening, empathy, leadership.