

# Archit Patil

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## RESEARCH EXPERIENCE

### MONCRIEF COMPUTATIONAL GENOMICS | ENGINEERING INTERN

May 2026 -- Present | Oden Institute, UT Austin

- Constructed privacy-preserving genomic sequence models for splice-site, promoter, and open-chromatin-region prediction tasks.
- Designed a spacer-independent inverted-repeat search algorithm, reducing dependence on spacer length from  $O(s)$  to  $O(1)$  for targeted search ranges and producing over  $50\times$  faster processing.
- Developed and benchmarked chromosome-scale genomic pipelines using parallel high-performance computing workflows.

### SOLOVEICHIK RESEARCH GROUP | UNDERGRADUATE RESEARCHER

May 2025 -- Present | University of Texas at Austin

- First-authored an accepted DNA32 conference publication developing scalable Hilbert-basis algorithms for equilibrium analysis in DNA molecular computation.
- Generalized prior equilibrium-analysis methods to unsaturated molecular systems, extending the framework beyond the strongly binding regime.
- Reduced exhaustive polymer enumeration to covering-design subproblems, achieving over  $1,000\times$  speedup on large systems.

### PEJAVER LAB | UNDERGRADUATE RESEARCHER

May 2025 -- Aug 2025 | Icahn School of Medicine at Mount Sinai

- Processed over one million clinical notes to construct a structured dataset connecting patient records with rare-disease concepts.
- Developed a BERT-based clinical NLP pipeline achieving 85% AUC when identifying patients with rare diseases from the MIMIC database.

## PUBLICATIONS

- Archit Patil**, Minki Hhan and David Soloveichik. "Scalable Enumeration of Pareto-optimal Polymers for Computing Equilibrium Concentrations." *32nd International Conference on DNA Computing and Molecular Programming*, accepted, 2026.
- Kimonas Provatas, Guliang Wang, Nikol Chantzi, **Archit Patil**, Imee M. A. Del Mundo, Candace S. Y. Chan, Ilias Georgakopoulos-Soares, and Karen M. Vasquez. "HSeeker: an Algorithm for Systematic H-DNA Sequence Identification." *bioRxiv*, preprint, 2026. doi:10.64898/2026.07.10.737678.

## TEACHING EXPERIENCE

### CS 311H: DISCRETE MATHEMATICS | UNDERGRADUATE COURSE ASSISTANT

Aug 2025 -- Dec 2025 | University of Texas at Austin

- Planned and graded assignments and led more than 10 office hours for 50 honors students in combinatorics, graph theory, sets, logic, and proof techniques.

## EDUCATION

### UNIVERSITY OF TEXAS AT AUSTIN B.S.

COMPUTER SCIENCE

Turing Scholars Honors Program

MATHEMATICS

COMPUTATIONAL BIOLOGY

Aug 2024 -- May 2028

Austin, TX

College of Natural Sciences

GPA: 3.75 / 4.00

## RESEARCH INTERESTS

Algorithms and complexity

Systems

Privacy-preserving computation

Unconventional computing

Computational genomics

Bioinformatics

DNA molecular computation

## TECHNICAL SKILLS

**LANGUAGES** Python • C++ • C • Java • JavaScript • SQL • Verilog

**FRAMEWORKS** PyTorch • TensorFlow • React • Node.js • SDL2 • ROS

**TOOLS** Linux • Git • SLURM • TACC  
ARM Assembly • x86 Assembly  
Normaliz • COFFEE •  $\text{\LaTeX}$

## COURSEWORK

**COMPUTER SCIENCE** Algorithms and Complexity: Honors  
Principles of Computer Systems: Honors  
Data Structures: Honors  
Discrete Mathematics: Honors  
Computer Architecture: Honors  
Introductory Game Theory

**MATHEMATICS AND DATA** Scientific Computation  
Numerical Methods  
Real Analysis  
Probability  
Statistics  
Linear Algebra  
Differential Equations  
Number Theory

## SELECTED PROJECTS

### EAR-EEG PAIN MONITORING WITH FOUNDATION MODELS

| PYTHON, PYTORCH

Jan 2026 -- May 2026

- Evaluated three EEG foundation models for pain detection using full-scalp EEG and wearable ear-EEG channel configurations.
- Developed channel-perturbed Tent-LCC test-time adaptation, improving cross-subject pain-classification accuracy by 20.6%.

### OPERATING SYSTEMS IMPLEMENTATION | C++, ASSEMBLY

Aug 2025 -- Dec 2025

- Built a multicore preemptive kernel supporting over 1,000 concurrent threads while eliminating race conditions and memory leaks.
- Implemented virtual memory, process isolation, file systems, user programs, and more than 25 system calls.
- Led a four-person project implementing a graphics subsystem capable of running multiplayer DOOM.

### AUTOMATING PCR WITH THE UFACTORY XARM 6 LITE |

PYTHON, ROS, ARDUINO

2025 | ECLAIR Robotics, UT Austin

- Developed a robotic PCR-preparation workflow integrating computer vision, ROS-based robot control, and Arduino-controlled pipette actuation.
- Designed and tested a custom pipette gripper for precise and repeatable laboratory liquid handling.
- Presented the project at UT Austin Research Week and archived the poster through Texas ScholarWorks.

### GAME BOY EMULATOR | C++, SDL2

Apr 2025

- Built a Game Boy emulator implementing the SM83 CPU instruction set, memory-mapped I/O, interrupts, timers, input handling, and graphics rendering.
- Optimized the event loop and Picture Processing Unit to achieve 60 FPS and compatibility across multiple ROMs.

### PIPELINED RISC PROCESSOR | VERILOG

Mar 2025

- Designed a five-stage pipelined 16-bit RISC processor with instruction forwarding and data- and control-hazard resolution.

## PRESENTATIONS

- **Scalable Enumeration of Pareto-optimal Polymers for Computing Equilibrium Concentrations.** Oral presentation, DNA32, 2026.
- **DW-IRF: Scalable Detection of Long-Spacer Imperfect Inverted Repeats** Poster presentation, UT Austin DW-IRF: Scalable Detection of Long-Spacer Imperfect Inverted Repeats, 2026.
- **Automating PCR with the UFACTORY xArm 6 Lite.** Poster presentation, UT Austin Research Week, 2025.

**BIOLOGY** Genetics

Laboratory Experiments in Biology

**GRADUATE** Unconventional

Computation

## PATENT

**POSTPARTUM HEMORRHAGE CUP** Nov 2021 -- Mar 2024

Indian patent granted

- Engineered a patented device for measuring maternal blood loss in real time.
- Reduced blood-loss estimation error from approximately 100% to less than 5%.
- Expanded deployment from an initial prototype to 39 hospitals across India.
- Enabled earlier clinical intervention, contributing to over 100 maternal lives saved and a reported 50% reduction in maternal mortality in critical-care settings.

## HONORS

**JEE MAIN** 2024

All India Rank 53 among approximately 1.2 million candidates.

**JEE ADVANCED** 2024

All India Rank 160 in the Indian Institute of Technology entrance examination.

**NATIONAL OLYMPIADS** 2023 -- 2024

Ranked within the top 1% nationally in India in Physics, Astronomy, and Chemistry Olympiads.

## LINKS

GitHub:// [ArchitRahul](#)

LinkedIn:// [Architrpatil](#)

[Personal Website](#)