Anirban Chetia

Website: https://anirban166.github.io

Education

Northern Arizona University — Flagstaff, Arizona, USA
Master's degree in Computer Science, cumulative grade point average: 4.0/4.0 — *Aug 2021 – Present*

Work Experience

Jet Propulsion Laboratory, NASA — July 2022 – Present
Visiting Student Researcher & EO Intern, Laboratory for Reliable Software — *Pasadena, California*

- Applying the DeepState framework to test F′ (NASA's open-source flight software), with emphasis on autocoders (and possibly other F Prime modules) to ensure that the generated commands (sent from ground to spaceflight systems) are functioning as per intention, using symbolic execution and various fuzzing engines on the backend.

Northern Arizona University — Aug 2021 – May 2022
Graduate Teaching Assistant — *NAU Eng. & SICCS, Flagstaff*

- For Spring '22, I served as the mentor for the CS Capstone course, being responsible for shepherding teams of senior undergraduates with their final projects, including an RTX gamification system, a GUI for the NPOI astronomical observatory, an android application for speech-directed (Alexa) meal preparation, a C & I tracking tool for doctoral degrees, and an automated UAV system for LiDAR-based drones to navigate rainforest understories.
- For Fall '21, I was the lab instructor for multiple core CS courses, being responsible for teaching C and Python programming to undergraduates, assigning and helping them (by debugging their code and suggesting optimized approaches, in addition to teaching them concepts such as pointer arithmetic, file I/O, stack-heap collisions, bit fields, linked data structures, etc.) with laboratory exercises, plus for evaluating/grading them based on their takes.

Google Summer of Code — May 2021 – Aug 2021
Student Developer, The R Project for Statistical Computing — *Remote*

- Incorporated several improvements to the directlabels R package, which include creation (GitHub Actions based workflows with multiple composite use cases) and configuration of software for automatic generation of a new documentation website (hosted on GitHub pages, instead of the former r-forge domain), addition of directlabels to the ggplot2 extensions gallery, refactoring the codebase to make low-level graphical object modification and testing a reality, and lastly, setting up of automated code coverage and testing (CI/CD). Link under Google: GSoC'21

Google Summer of Code — May 2020 – Aug 2020
Student Developer, The R Project for Statistical Computing — *Remote*

- Developed testComplexity, an R package that provides a suite of functions to systematically compute the asymptotic computational complexity (inclusive of time and space) of R algorithms passed as an expression, thereby replacing the use of subsequent traditional ad-hoc tests and visual diagnostic plots. Link under Google: GSoC'20

IIT Guwahati — June 2019 – Aug 2019
Summer Intern, Department of Mathematics & Computer Science — *Guwahati, Assam*

- Pursued mathematics based on number theory and elliptic curves in order to analyze modern-day cryptosystems, plus started solving Project Euler problems. Implemented the RSA cryptosystem in the programming languages I was aware of and open-sourced some of my work in order to enact as easy reference to the subject for others.

Skill Set

General: DSA, Debugging, Unit Testing, Workflow Automation (CI/CD), Technical Documentation, Mathematics, Cryptography, Statistics, Data Analysis and Visualization, Performance Benchmarking, Unix, Icon and Web Design
Developer Tools: Git, GitHub Actions, Unity, VS Code, RStudio, Homebrew, Docker, Azure, (C)Make, Gradle etc.
Programming: Cpp, C, Shell, R, Golang, C#, Python, Java, CUDA C/Cpp, SQL, JavaScript, Julia, Kotlin, ASM etc.
Frontend and Markup: CSS, Bootstrap, React, Swing, Compose, (HT, Math, YA, X)ML, (R)Markdown, and LaTeX.
Debugging/Testing/Fuzzing/Coverage: Valgrind, GDB, testthat, JUnit, CITRUS, Google Test, DeepState, covr etc.
Other Libraries: STL, POSIX, Boost, Thrust, OpenMP, MPI, NumPy, Matplotlib, ggplot2, Apache PDFBox/POI etc.

Languages

I'm well-versed in **English**, which includes fluent conveyance of my thoughts and straightforward communication aspects while using the language. Apart from my vernaculars, I learnt **French** (post on conjugation) and a bit of **Japanese**.

Positions of Responsibility

GitHub Oct 2021 – Present

Campus Expert *Reference: Juan Pablo Flores*

- As the GCE for NAU, I conduct information sessions on topics related to the Git version control software and the GitHub platform (for instance, basic to intermediate git commands and use of the RSA algorithm for SSH and Commit Signing within GitHub respectively) for a community comprised of undergraduate and graduate students.
- Stills from some of my presentations/talks, along with a list of topics: Gallery

Microsoft Sep 2019 – Sep 2021

Student Ambassador

- Conducted workshops based on technologies such as Git, GitHub, and Azure, thereby achieving the Beta position. Effectively led a technical community on campus and micromanaged local events via Microsoft Teams.

useR! 2021 Jul 2021 – Jul 2021

Conference Moderator

- Helped attendees to navigate through the Lounge (conference lobby), switch between sessions and engage in useR specific activities on two separate days (Schedule), apart from enforcing proper conduct as a Marmot all the while.

Unity Technologies Mar 2019 – Jun 2021

Student Ambassador

- Hosted and attended webinars on topics such as mesh rendering, level design, Cinemachine and the C# scriptable render pipeline. Developed a third-person view runner game and designed levels for one in the adventure genre.

Kharagpur Open Source Society Dec 2020 – Jan 2021, Dec 2019 – Jan 2020

Winter of Code Mentor ('20, '19)

- Taught Git & concepts of Golang (such as go-routines & channels) to interested students and undertook open-source contributions to my personal project 'World Lines', a divergence calculator written in Go & based on Steins;Gate.
- Introduced a few students to version control systems and the world of open-source, taught them C# for scripting Unity games (with emphasis towards handling game objects) and covered concepts such as Events and Raycasts.

GeeksforGeeks Jul 2019 – Aug 2019

Technical Scripter

- Scripted multiple programs on various domains such as object-oriented programming, database management, computational mathematics (numerical method implementations) and web development over an array of articles.

</> Open Source Projects

Helios

- A high-performance distance matrix computation tool written in C that utilizes both shared-memory (OpenMP threads) and distributed memory (MPI processes across CPU cores) parallelism, in addition to tiling (2D tile-based accesses instead of the regular row-wise ingress) for better cache utilization and spatial locality. Upon tests on the Million Song dataset with a distance matrix of size 10^{10} (floating-point data computed across 90 dimensions), Helios achieved more than hundred times the performance of the sequential brute force version with a tiled computation (tile size of 500) handled by 64 processes each tied to a separate CPU core (from an AMD Rome processor), with multiple threads per core. (enabling the funneled threads of a rank to re-use portions of the dataset from cache).

testComplexity

- An R package that quantifies the runtimes for an algorithm, classifies its corresponding time complexity trend, tests for an expected time complexity class, and plots the benchmarked data to help visually conceive the results. Additionally, other features such as quantifying memory allocations, subsequently predicting the space complexity class and classifying complexity for user-defined output parameters (apart from time/memory cases) have been implemented. For a complete introduction to the features and functionality of the package, please check the General Vignette.

directlabels *Reference: Toby Dylan Hocking*

- An R package for adding direct labels to plots. Modern plotting packages like lattice and ggplot2 show automatic legends based on the variable specified for colour, but these can be often confusing in many cases (if there are too many colours, overlapping issues, etc.). To help with this, directlabels literally provides direct variable-based labelling on intuitively placed positions which are a useful, clear and more attractive alternative to those confusing legends observed in many common plots.

World Lines

- A mini-project that attempts to replicate the concept of world lines (introduced in Steins;Gate, a time travel fiction) via goroutines. Currently, it computes the divergence for lines lying within Alpha & Beta attractor fields.

Resume Ranker
- A multiplatform application that filters resumes (.pdf/.doc files) in a user-specified directory and scans them for desired keywords, enlisting the ones found along with the total strength of each resume (based on the existence of the specified keywords) to help rank them. Initially coded in Java with a Swing interface, but recently, I refactored it and ported the entire logic to Kotlin, using a fitting design pattern and developing a reactive UI using Compose.

Zephyr
- A batch scheduler written in Cpp that simulates various pragmatic scheduling algorithms (including priority-based schemes such as SJF and FCFS, in addition to backfilling strategies such as EASY and CBF) for compute clusters (supercomputer workloads included), keeping track of job schedules and compute-node usage (memory and cores).

Boids Simulation
- Golang program that creates a simulation of the flocking behaviour in birds (represented by a goroutine each).

Visual Sort
- React-based app. which visually delineates the process of array sorting in terms of block swaps & colour switches.

Knights Unification Module
- A comprehensive module which, along with several new-found factions, incorporates my 'Knights' race into the default cluster and coherently reconstitutes the baseline Dawn of War faction hierarchy. Includes new structures, units, maps and win conditions. Development has been temporarily stalled since Dec '17, but prior to my arrival at this break point, I put in a substantial amount of work which is publicly portrayed: Gallery

Knights Module
- A module for the RTS game Dawn of War Soulstorm that adds a faction named 'Knights' with new structures & units encapsulated within a compressed package. I made it within Corsix Studio, during my leisure time as a kid.

</> Open Source Coursework

Big Data (Genomics) *Reference: Viacheslav Fofanov*
- My ventures into big data with Cpp, Slurm and a compute cluster for analysis, organization and querying of large genomic datasets (readsets in FASTA format and genomes such as Anthrax and SARS-CoV-2, each containing millions of sequence fragments) via use of various data structures (chained hash tables, prefix and suffix trees etc.).

High Performance Computing *Reference: Mike Gowanlock*
- Distributed memory parallel programs written in C with MPI and executed on NAU's compute cluster facility (Monsoon). Includes my ventures into challenging and interesting problems such as random communication with broadcasted payloads to pre-determine receiver ranks and performing a distribution sort (with versions based on uniformly and exponentially generated data, in addition to a histogram-based work distribution among processes).

Parallel Programming
- Parallel programs that I wrote in C and CUDA using OpenMP, POSIX threads and GPUs from a compute cluster, while aiming to solve specific problems (such as optimizing the count of euclidean distances within a threshold or search radius from a point) or tackle scenarios given by a problem statement (for instance, a bakery simulation).

Blogwork

Software Dev.: Workflow Automation with GitHub Actions, Software Development in R, Basic Git Concepts
Cpp: A bit of unsigned C++ knowledge, Skewness and Kurtosis, Perceptron Training, Middle-bit Toggling
R: Hypothesis Testing, GSoC'20 conclusive post (testComplexity), Benchmarking in R, R package creation
Parallel Computing: An Optimization Problem, GPGPU Computing, Automatic Parallelization of Loops
Miscellaneous: Switching to OS X, Cybersecurity Tips, Monte Carlo Estimation of Pi, Parsers & Tables

Awards & Rankings

- Received the 'International Excellence Award' from Northern Arizona University (NAU), apart from other forms of funding. Financial assistance was the main reason among my rationale to opt for NAU instead of UIUC (view offer).
- Among the top 1% of problem solvers (out of 1,50,000+) in HackerRank's Project Euler+ contest.
- Among the top 10% of 'c++' tagged question answerers on Stack Overflow, since late '20 till I left recently ('22).
- Ranked third out of 4,500+ in GeeksforGeeks Data Structures and Algorithms SPW Contest.
- Ranked third in Pocket Build's machine building contest wherein I built a modern aircraft carrier with a smart docking port using C# (view work), thereby attaining the 'Expert' builder role in the official discord channel.