# Sagnik Dey

1st year Master's Student
Department of Computer Science
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## Academic Qualifications

| Year | Degree/Certificate | Institute | GPA |
|---|---|---|---|
| 2022-Present | M.S in Computer Science | Purdue University, West Lafayette | 4.0/4 |
| 2017-2021 | B.S in Mathematics | Indian Institute of Technology, Kanpur | 8.6/10 |

## Scholastic Achievements

- Graduated my bachelor's degree with **distinction** due to a high **GPA (8.6/10)**.
- Scored **332** in the **GRE** with a perfect score of **170** in quantitative reasoning.
- Among **15 students** selected out of 400+ for **Advanced Track Course** in ESC101 course for **C programming**.
- Secured **All India Rank 2549** in **JEE Advanced 2017** among the 1.7 Lakh shortlisted candidates.
- Secured **All India Rank 989** in **JEE Mains 2017** among the 12 Lakh candidates.

## Preprints

- **Predictive data race detection for GPUs** [arXiv] November'21

## Projects

- **Data Race Detection on GPUs** (*Dec'20 - Aug'22*)
  **Mentor: Swarnendu Biswas**, Department of Computer and Science and Engineering.
  - Explored whether existing predictive **race detection** techniques can be applied to the **GPU** context.
  - Implemented software only versions of existing hardware based race detectors for GPU such as **ScoRD** using **NVBit**.
  - Made improvements to existing race detectors such as Barracuda to address modern GPU architectures.
  - Explored efficient data race detection for **DPC++** programs using **USM** (Unified Shared Memory) running on Intel GPUs.
  - Using **Intel oneAPI** tools such as **gdb-oneapi** and **GTPin**. Several bugs have been found in these tools in the course of our work and some have been fixed by the Intel Team.
  - Implemented an in-GPU version of our algorithm.
- **Visualizing MPI performance on the fly** (*August'20 - May'22*)
  **Mentor: Preeti Malakar**, Department of Computer and Science and Engineering.
  - Extended the functionality of library **mpiP**, developed by **LLNL**, to generate reports intermittently, as controlled by a server.
  - Wrote a **python** script that converts the reports generated into usable csv format on the fly.
  - Built a **JavaScript** Library based on the **D3** library that presents the profiling data from the **CSV**s as useful **visualisations**.
  - Analysed runs of benchmarks and mini apps such as **LAMMPS** and **HPCG** with our tool.
  - Held a **Research Assistant** position at my institute for working on this project from June to August, 2021.
- **Low Rank Matrix Approximations and Algorithms** (*May'19 - June'19*)
  **Mentor: Sumit Ganguly**, Department of Computer and Science and Engineering.
  - Read up on and implemented **sampling algorithms** for **matrix approximations**.
  - Implemented **length squared sampling based** matrix multiplication.
  - Implemented **CUR method** for matrix sketching.
  - Implemented **low rank approximation** of matrix using sampling algorithms.
- **Personal Audio** (*Dec'18 - July'19*)
  **Mentor: Rajesh M. Hegde**, Department of Electrical Engineering
  - Aim: To implement adaptive equalization methods to create acoustic contrast controlled personal audio zones.
  - Implemented a generalized **Kalman Filter** for the estimation of channel response in dynamic scenarios.
  - Implemented **BACC** approach to estimate inverse filters for personalized audio zone creation.
- **Scrabble Game** (*Jan'18 - April'18*)
  Project under **Advanced Track** for **ESC101** course
  - Implemented GUI based scrabble game.
  - Algorithmic computer player of three difficulties with greedy selection of current best word.

## Work Experience

- **Advanced Application Engineering Analyst, Accenture Solutions Pvt. Ltd.** (*Mar'22 - May'22*)
  - Originally offered employment at **Accenture Japan Ltd.**
  - Started training virtually at the Mumbai office (MDC2B) of Accenture India due to pandemic related border closures.
  - Resigned to pursue higher studies before transferring to Accenture Japan Ltd. in May.
- **Software Engineer, Walmart Labs** (*Apr'20 - July'20*)
  **Mentor: Sathyanarayanan Jambunathan**, Senior Manager II, Software Engineering at Walmart Labs.
  - Made a **Java webapp** that fetches order details from an API according to given parameters and feeds the result into an **ElasticSearch**(ES) database linked to **Kibana** for generating useful visualizations.
  - Made a **python script** that crawls through log files based on a schedule to find and organise relevant data. This is again fed into an ES database through a Java webapp.
  - Both webapps were deployed on a virgin **VM** accessed via **SSH**, requiring setting up of various necessary software on the VM.
  - Added a module to perform **JDBC queries** on an Oracle database on an existing Walmart project. Was working on a streaming function to enable downloading fetched data as a CSV before the internship ended.
- **Google Summer of Code Participant** (*May'19 - August'19*)
  **Organization: Boost C++**
  - Worked on the library Boost.Real which is a C++17 library, attempting to get rid of untracked errors brought about due to truncation in floating point arithmetic by using range arithmetic.
  - Changed the number base used internally from decimal to INT_MAX for optimal space usage when storing numbers as vectors of digits. Redesigned all tests to better address the library functionality after internal representation changes.
  - Added **templating** to the entire library to enable custom variable type for internal real number representation.
  - Contributed towards several bug fixes in adding division operation to the library.
  - Added user defined literal functionality for declaring objects of type Boost.Real.
  - Final report on my github page.
- **Full Time Development Intern, IITK NYC Office** (*May'18 - July'18*)
  **Mentor: Prof. Manindra Agrawal**, Department of Computer and Science and Engineering.
  - Worked on the backend of a **scalable** web application using **Scala** language with **Akka http** library.
  - Led a team of 4 members during the course of the internship.

## Technical Skills

- **Programming Languages:** C, C++, Java, Python, MATLAB, CUDA
- **Other Skills:** git, LaTeX

## Extra - Curriculars

- **Secretary at Book Club, IIT Kanpur**

## Relevant Courses

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|---|---|
| **Undergraduate courses (IIT Kanpur)** | |
| Data Structures and Algorithms | Algorithms-II |
| Programming for Performance | Modern Cryptology |
| Analysis of Concurrent Programs | Parallel Computing |
| | |
| **Graduate Courses (Purdue University)** | |
| Advanced Computer Architecture | Interactive Computer Graphics |
| Algorithm Design, Analysis, And Implementation | |
| | |
| **Online Courses** | |
| Machine Learning ( Coursera Certificate) | I/O-efficient algorithms ( Coursera Certificate) |
| Deep Learning Specialization ( Coursera Certificate) | Parallel, Concurrent, and Distributed Programming in Java Specialization ( Coursera Certificate) |

**(*)**: ongoing