



Guramrit Singh
Computer Science & Engineering
Indian Institute of Technology Bombay

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B.Tech.
Gender: Male
DOB: 04/03/2003

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2025	
Intermediate	CBSE	Bhavan's Vidyalaya, Chandigarh	2021	99.20%
Matriculation	ICSE	St.Xavier's Sr. Sec. School, Chandigarh	2019	97.00%

Pursuing Minor in Artificial Intelligence and Data Science

SCHOLASTIC ACHIEVEMENTS

- Secured **Department Rank 1** in a batch of 194 students in Computer Science and Engineering, IIT Bombay (2023)
- Received **Quadeye Scholarship** after 3-stage process consisting of CP & Aptitude test and an interview round (2023)
- Awarded **Institute Academic Prize** for securing **Institute Rank 1** among batch of **1400+** students (2022)
- Received **9 AP (Advanced Performer)** grades, given to **top 1%** students in courses including Software Systems Lab, Optimization, Decision Analysis and Game Theory, Linear Algebra, and Mathematical Structures for Control (2023)
- Bagged **All India Rank 26** in **Joint Entrance Examination Advanced** among 1,40,000+ candidates (2021)
- Secured **AIR 1** with perfect **300/300** score and **100** percentile in **JEE-Main** among 10,00,000+ candidates (2021)
- Honored with the prestigious **KVPY** fellowship by IISc Bangalore for achieving an **All India Rank of 22** (2021)
- Recipient of **National Talent Search Examination (NTSE)** Scholarship by NCERT, Govt. of India (2019)

OLYMPIADS

- Bagged **Silver** at the **Southeast Asian Mathematical Olympiad (SEAMO)** in Intermediate Category (2018)
- Qualified for the **Indian National Mathematics Olympiad (INMO)** conducted by HBCSE, India (2021)
- Selected to attend the Orientation-Cum-Selection Camp for **International Chemistry Olympiad (IChO)** (2021) by making it to the **top 64** students to clear **INChO**, Indian National Chemistry Olympiad
- Among the **top 102** students to clear **INAO**, Indian National Astronomy Olympiad and selected for the (2021) Orientation-Cum-Selection Camp for **International Olympiad on Astronomy and Astrophysics (IOAA)**
- Qualified for the **Indian National Junior Science Olympiad (INJSO)** conducted by HBCSE, India (2018)

RESEARCH EXPERIENCE

Recursive Solutions to First-Order Model Counting

(May 2023 - July 2023)

Guide: Prof. Kuldeep S. Meel | Summer Internship

National University of Singapore

- Contributed to a codebase focused on efficiently finding the **model count** of a given **first-order CNF formula**
- Devised and implemented an algorithm to find a set of sufficient **base cases** for a given list of **recursive functions**
- Developed code in **Scala** to generate **C++** code for evaluating recursive functions, considering provided base cases
- Utilized the **GMP** library for **infinite precision** model count computation with optimized memory **caching**

KEY PROJECTS

Railway Planner

(August 2022 - November 2022)

Guide: Prof. Supratik Chakraborty | Course Project, Data Structures and Algorithms Lab

IIT Bombay

- Developed efficient algorithms for a rail planner model, optimizing with data structures and successfully created a database-query system for time-tables and user reviews utilising **hash maps** with appropriate **collision resolution**
- Implemented auto completion feature using **tries** and analyzed user reviews with **Knuth-Morris-Pratt algorithm**
- Utilised **breadth-first search** to find journeys with **optimal cost** and **minimal layover** time at intermediate stations

FastChat

(October 2022 - November 2022)

Guide: Prof. Kavi J. Arya | Course Project, Software Systems Lab

IIT Bombay

- Developed a robust **client-server** network in Python, supporting secure text, image and file transfer interactions with **E2E encryption** and effectively utilized **PostgreSQL** databases for storage of credentials and unread messages
- Implemented **group** creation, enabling clients to create admin-enabled groups and broadcast messages to all members
- Conducted analysis of various **server load balancing** strategies including random, round-robin and least-connection

Enhancing Data Prefetching

(March 2023 - April 2023)

Guide: Prof. Biswabandan Panda | Course Project, Digital Logic Design and Computer Architecture

IIT Bombay

- Proposed a **heuristic-based prefetching** mechanism to bring data and instructions into **L1 caches** whenever the prefetch address asked for crossed a **page boundary**, and successfully integrated it with the existing codebase
- Evaluated existing **IPCP** (Instruction Pointer Classifier Based Prefetcher) on a number of **graph** and **SAT traces**
- Achieved a notable **enhancement** of **2.64%** in **IPC** values over a collection of **20 traces** of different classes

File Transfer: Socket Programming

(March 2023)

Guide: Prof. Bhaskaran Raman | Course Project, Computer Networks Lab

IIT Bombay

- Implemented a **client-server** network utilizing **TCP connections** to enable efficient two-way file exchange
- Used the **select system calls** for parallel transfer of files to achieve maximum throughput without buffer overflow
- Conducted comprehensive experiments with numerous clients, recording and analyzing network traffic using **Wireshark**

Image Processing and Data Analysis

(September 2022)

Guide: Prof. Suyash P. Awate | Course Project, Data Analysis and Interpretation

IIT Bombay

- Designed a **compression model** on the **MNIST dataset** of handwritten digits to compress them to an 84-dimensional subspace and achieved **82%** classification accuracy on a dataset of **10,000** images using a **distance-to-mean** approach
- Implemented the **PCA** algorithm for hyperplane fitting and **reconstructed image** from low dimensional latent space

OTHER PROJECTS

Sliding Puzzle SAT Solver

(January 2023 - February 2023)

Guide: Prof. Ashutosh K. Gupta | Course Project, Logic for Computer Science

IIT Bombay

- Modeled the Sliding Puzzle game as a SAT problem by encoding each state and move rules in **first order logic**
- Effectively utilized Python's **Z3py solver** to get a satisfying assignment within a given maximum number of moves

Optimization Algorithms

(January 2023 - April 2023)

Guide: Prof. Mani Bhushan | Course Project, Optimization

IIT Bombay

- Implemented a bunch of optimization algorithms in MATLAB including Quasi-Newton, **FR-CG**, Powell Dogleg, **Active set method** for QP, **Simplex method** of Linear Programming and a special class of **geometric program**
- Did a **literature survey** through websites of Cornell University, Stanford University and University of Pittsburgh

Fair-Cake Cutting Problem

(March 2023 - April 2023)

Guide: Prof. Urban Larsson | Course Project, Decision Analysis and Game Theory

IIT Bombay

- Investigated the fair division algorithm among n players as an extension of the '**I cut, you choose**' algorithm
- Developed a Python code implementation enabling the **simulation** of proportional and **envy-free** division

Snake Game

(October 2022)

Self Project

IIT Bombay

- Implemented the classic Nokia snake game, harnessing the power of the **Pygame** module for the vibrant game interface
- Used Pygame's **Audio Mixer** to incorporate an assortment of background music, enriching the user's gaming experience

Personalized Web Profile

(August 2022)

Guide: Prof. Kavi J. Arya | Course Project, Software Systems Lab

IIT Bombay

- Designed a fully functional website using HTML, CSS, JavaScript and **hosted** it on the **CSE Server of IITB**
- Utilized **Bootstrap** to make **website dynamic** so that it renders properly on both mobile and desktop screens

Random Walker

(August 2022)

Guide: Prof. Suyash P. Awate | Course Project, Data Analysis and Interpretation

IIT Bombay

- Simulated random walkers in MATLAB and obtained the **Gaussian distribution** plot of their final locations
- Verified the **law of large numbers** by analysing difference between true and empirically computed mean and variance

TECHNICAL SKILLS

Programming

Proficient in: C++, Python | Familiar with: Java, Scala, Bash, Awk, Sed, Prolog

Development

HTML, CSS, Bootstrap, JavaScript, PostgreSQL, Doxygen, Sphinx

Softwares and Packages

MATLAB, GitHub, L^AT_EX, Docker, NumPy, Matplotlib, Pandas

POSITIONS OF RESPONSIBILITY

Teaching Assistant | Dept. of Mathematics | IIT Bombay

(March 2023 - April 2023)

- Served as a Teaching Assistant for **Linear Algebra (MA106)** course offered in the Academic year of 2022-23
- Mentored nearly **40** first year **students** by conducting **weekly sessions** on theory discussion and problem solving

KEY COURSES UNDERTAKEN

Computer Science

Data Structures and Algorithms[†], Design and Analysis of Algorithms, Discrete Structures, Data Analysis and Interpretation, Software Systems Lab, Computer Networks[†], Digital Logic Design and Computer Architecture[†], *Operating Systems[†], Logic for Computer Science, *Automata Theory, *AI and ML[†], Abstractions and Paradigms in Programming[†], Computer Programming and Utilization

Mathematics

Calculus, Linear Algebra, Differential Equations, Mathematical Structures for Control, Optimization, Decision Analysis and Game Theory

[†]Course has corresponding lab

^{*}to be completed by November 2023

EXTRACURRICULAR ACHIEVEMENTS

- Solved **250+** problems in last year hosted on algorithmic programming sites like **Codechef** and **Codeforces** (2023)
- Completed a year long **National Sports Organisation (NSO)** programme in **cricket** at IIT Bombay (2022)
- Awarded **runner-up** in Senior category of **cricket tournament** among ICSE Schools in Chandigarh (2018)
- Bagged title of **Student of the Year** for Academic Year 2018-19 by St.Xavier's Sr. Sec. School, Chandigarh (2019)
- Secured **first** place in Brain Buster category of **Science Symposium** among ICSE Schools in Chandigarh (2018)