Anubhav Dhar

Fourth Year Undergraduate Student
Integrated B.Tech-M.Tech (Dual Degree) - Computer Science & Engineering
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Curriculum Vitae

Education

Degree	Institute	Score	Year
Integrated B.Tech-M.Tech (CSE) †	Indian Institute of Technology Kharagpur	9.91*/10	2025
Higher Secondary Education †	Hijli High School	98.0%	2020
Secondary Education †	Hijli High School	95.7%	2018

Cumulative GPA for the first seven semesters (as of **January 2024)* †*Language of Instruction:* ***English***

Publication

- **Anubhav Dhar, Soumita Hait and Sudeshna Kolay — "Efficient Algorithms for Euclidean Steiner Minimal Tree on Near-Convex Terminal Sets"— The 34th International Symposium on Algorithms and Computation (ISAAC 2023)**:
  Supervisor: Prof. Sudeshna Kolay `https://doi.org/10.4230/LIPIcs.ISAAC.2023.25`
  - The **Euclidean Steiner Tree** Problem is an NP-Hard Problem in Computational Geometry where the input is a set of points on the Euclidean Plane and the objective is to find the tree of minimum total length interconnecting the input points. Our results include the following:
    - Closed form solutions for pair of concentric, parallel, regular n-gons (for large n and distant polygons)
    - FPTAS for particular configuration of input point set
    - Proof that no FPTAS exists for a particular configuration of input point set

Internship

- **Investigating OpenFPGA**: - **Summer@EPFL** internship, LAP-EPFL, Lausanne, Switzerland *May 2023 - July 2023*
  Supervisor: Prof. Paolo Ienne Mentor: Louis Coulon
  - The objective was investigation of the opensource software **OpenFPGA** (used for designing, implementing and analysing customizable **FPGA** architecture) and extending it to **Coarse Grained Reconfigurable Architecture**
  - Implemented support for customizable **Physical Blocks** having arbitrary functionalities and hardware implementation
  - Investigated and proposed ways of modifying the **routing architecture** to have buses wider than 1 bit

Other Projects

- **RISC Processor Design and Implementation on FPGA**: *October 2022 - November 2022*
  - **Computer Organisation Lab Project** to design a suitable **single-cycle instruction architecture** for a RISC instruction set consisting of 23 instructions (including arithmetic & bitwise operations, branches and memory load-store)
  - Implemented **Von Neumann Architecture** with **Xilinx ISE 14.7** on the **Spartan 3 FPGA board**
  - Suitable **mnemonics chosen** for opcode and implemented **Assembler** with elementary error detection using flex

- **'tinyC' Compiler Design and Implementation**: *August 2022 - November 2022*
  - **Compilers Lab Project** to build a compiler for a subset of the **C-syntax** capable of handling functions (with recursion), pointers, loops, conditionals, arithmetic operators, etc.
  - Used **Flex** for **Lexical Analysis**, **Bison** for **Syntax Analysis** & **Translation** to intermediate representation, and **C++** for translation to **x86_64 assembly**. Included basic optimizations in translation
  - Included features indicating location and cause of **Syntax Error**, option to produce **Verbose Output**

- **Codeforces Round #819 (Div-1 + Div-2) Co-Author and Co-Editorialist**: *June 2022 - September 2022*
  Coordinator: Artyom Titov Co-Author: Mainak Roy
  - **Author** (of problems **A**, **B**, **H**) and **editorialist** (of problems **A**, **B**, **C**, **E**, **G**, **H**) Competitive Programming Contest on ***codeforces.com*** (with **22026** global participants) on algorithmic coding problems related to **Greedy Paradigm**, **Computational Geometry**, Optimization using **Data Structures**, **Combinatorics**, **Dynamic Programming** and **Polynomial Multiplication** using **FFT** in **Finite Fields**

- **Clap Triggered Robotic Model**: *December 2020 - March 2021*
  - **DIY Lab Project** of designing a **Robotic Model** of a dog capable of performing different mechanical movements based on the **number of consecutive claps** using a **microphone amplifier circuit** on **Arduino UNO**

- **PID Controlled Ball Balancing Table**: *May 2017 - June 2017*
  - Created a **PID controlled** ball balancing table, as a part of **MIT-IIT Robotics Program** 2017, for school students, using Resistive Touch Screen, Servo Motors and **Arduino Nano** board

Skills and Expertise

- **Programming Languages**: C, C++, bash, flex, bison, gawk, Python, Java, HTML, Javascript, SQL
- **Assembly Languages**: MIPS, x86_64
- **Hardware Description Language**: Verilog, BLIF
- **Platforms**: Linux, Windows, Xilinx ISE 14.7, Arduino, Freecad

Coursework Information

- **Computer Science**: Programming and Data Structures*, Algorithms-I*, Discrete Structures, Formal Language and Automata Theory, Switching Circuits and Logic Design*, Algorithms-II, Randomized Algorithm Design, Software Engineering*, Systems Programming Laboratory, Compilers*, Computer Organisation and Architecture*, Computer Networks*, Operating Systems*, Machine Learning, Advanced Machine Learning, Cryptography & Network Security, Parallel Algorithms, Statistical Learning Theory, Artificial Intelligence, High Performance Computer Architecture†, Computational Geometry†, Approximation & Online Algorithms†, Selected Topics in Algorithms†, Foundations of Cryptography†
- **Mathematics**: Advanced Calculus, Linear Algebra, Probability and Statistics, Operations Research
- **Other Courses**: Basic Electronics*, Signals and Systems, Physics of Waves*, Chemistry*, Basic Engineering Mechanics, Science of Living Systems, Electrical Technology, Engineering Laboratory, Cell and Molecular Biology, Economics, Engineering Drawing*, Environmental Science, English for Communication*, DIY Laboratory

* *marked courses include laboratory component as well* † *marked courses are ongoing courses of Spring 2024*

Awards and Achievements

- Holding current **Department Rank 1** (among 71 students) enrolled in the same course of current university
- Secured **All India Rank** of **489** in **JEE Advanced, 2020** among 1.5 lakh shortlisted candidates
- Secured **All India Rank** of **126** in **KVPY SA, 2018** after qualifying aptitude test and interview round among 1 lakh candidates
- Secured **All India Rank** of **381** in **KVPY SX, 2019** after qualifying aptitude test and interview round among more than 1.5 lakh candidates
- Secured **12th rank** in **West Bengal Joint Entrance Examination 2020** among 1.2 lakh candidates
- Secured **2nd Position** in **ICPC for Schools 2019, Amritapuri Regionals**
- Secured **12th Position** in **ICPC 2023-24, Online Preliminary Round, India**
- Selected for Round 3 in **Google Code Jam 2021** among 37398 participants securing a **Global Rank of 418** with a **Country Rank of 5** in Round 2
- Selected for Round 3 in **Google Code Jam 2022** among 32702 participants securing a **Global Rank of 658** with a **Country Rank of 7** in Round 2
- Selected for Round 2 in **Facebook Hackercup 2021** and **2022** securing a **Global Rank** of **395** in 2021 (among 34584 participants, leading to advancement in Round 3) and **749** in 2022 (among 27604 participants)
- **Regionalist** in ICPC 2020 (held in 2021) securing ranks of **35** in **Amritapuri Regionals** and **80** in **Gwalior Regionals**
- Best Global Ranks in **Google Kick Start** include **178** (2022 Round C, among 12425 participants), **109** (2021 Round A, among 19841 participants) and **325** (2020 Round D, among 11704 participants)
- Qualified **Indian National Olympiad in Informatics** and selected in **International Olympiad in Informatics Training Camp** of India, in **2019** and in **2020**
- Qualified **Regional Mathematics Olympiad** after qualifying Pre-Regional Mathematics Olympiad in **2018** and **2019**
- **Indian National Mathematics Olympiad Merit Awardee** of the year **2019**
- Qualified **National Standard Examination in Chemistry, 2020**
- Qualified **National Standard Examination in Astronomy** in the years **2019** and **2020**
- **Senior Scholar** at **Jagadish Bose National Science Talent Search** after qualifying three levels in JBNSTS exam, 2020
- Felicitated by the **Government of West Bengal** for securing **rank 10** (among 7.6 lakh students) in the **Higher Secondary Examination**
- **'Master'** at **Codeforces** with a rating of **2189** (global rank 1518 among 133,934) and **'6-star coder'** in **Codechef** with a rating of **2351** (global rank 223 among 239,962)

Positions of Responsibility

- **Tech. Lead** of **Codeclub**, the Departmental Society of Computer Science & Engg. IIT Kharagpur
- **Governor** of **Grimoire of Code**, the Official Competitive Programming Society of IIT Kharagpur
- **Secretary, Maths Olympiad** of Lal Bahadur Shastri Hall of Residence IIT Kharagpur, for 2021-22
- **Associate Member** of **Chess Club** IIT Kharagpur

Extra Curricular Activities

- **Volunteer at National Service Scheme(NSS), IIT Kharagpur (Dec 2020 - March 2020 & Jan 2022 - Apr 2022)**: Performed various online and offline activities for the welfare of people in the villages near Kharagpur including cleanliness drives and raise awareness about various government schemes, planned and created a model demonstrating rain water harvesting that can be implemented in school campus and houses for the purpose of conserving water in drought-prone areas, worked on location at waste management plant on segregation of plastic from biodegradable waste.
- **Chess**: Active chess player on chess.com (bullet rating: 1822) and lichess.org (bullet rating: 2022). Part of the Tactics Team, editor for the coverage on 2021 World Chess Championship Match, by Chess Club IIT Kharagpur.
- **Keen Problem Setter**: Problem Setter on platforms of Codeforces, Codechef and Hackerrank.
- **Indian Classical Music(Vocal)**: 17 years of training; last 14 years under the guidance of Vidushi Sangeeta Bandhyopadhyay. Part of *National Cultural Appreciation* of IIT Kharagpur (March 2021 - Dec 2021).