Aritra Ambudh Dutta

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Academic Qualifications

Year	Degree/Certificate	Institute	Performance
2023 - Present	B.Tech	Indian Institute of Technology Kanpur	**9.4**/10
2023	CBSE (XII)	Narayana School Kalyani Expressway, Sodepur	97%
2021	WBBSE (X)	Ramakrishna Mission Boys' Home Rahara, Kolkata	97%

Scholastic Achievements

- Recipient of **Director's Scholarship** and **Batch of 1965 Scholarship** for academic excellence during the first two years at IITK *2025*
- Recipient of **Academic Excellence Award** consecutively in 2 academic years for outstanding academic performance at IITK *2025*
- Received the **outstanding grade A*** in **five courses** depicting excellent academic performance across two years at IIT Kanpur *2025*
- Recipient of **Reliance Foundation Undergraduate Scholarship**, awarded to meritorious first year students across India *2024*
- **Aditya Birla Scholar - Batch of 2023**, **one of 16** selected candidates, chosen nationwide for the prestigious scholarship *2023*
- Secured **AIR 162** in **JEE Advanced 2023** and **AIR 201** in **JEE Mains 2023** among **11.62 lakhs+** candidates all over I0ndia *2023*
- Secured **All India Rank 382** in **KVPY-SA** conducted by **IISc Bangalore**, among **50 thousand+** candidates across India *2023*
- Secured **State Rank 6** in **WBJEE 2023** in Engineering Stream among **1.24 lakhs+** appearing candidates across West Bengal *2023*
- Qualified for **INPhO**, **INChO** and **INAO** 2023, ranking in the **National Top 1%** and **State Top 1%** among 40,000 candidates *2023*
- Selected as **JBNSTS Junior Scholar**, issued by **Jagadis Bose National Science Talent Search (JBNSTS)**,West Bengal *2021*
- Secured **State Rank 3** in the **National Talent Search Examination (NTSE) Stage 1**, West Bengal among 50,000 candidates *2021*

Research Experience

Sign Language Translation for ISL | SURGE | Prof. Ashutosh Modi, CSE, IIT Kanpur (*May '25–Present*)

Objective	• To develop a **multimodal model** for interpreting and generating **Indian Sign Language (ISL)** using text, vision and audio modalities, to learn compositional representations for accurate, context-aware translation and generation, enhacing accessibility
Approach	• Conducted extensive **literature review** on *multimodal learning*, *optimal transport* and *sign language translation models* • Collected the **largest-known** Indian Sign Language **dataset** from YouTube using a custom web-scraping and labelling pipeline • Employed **YOLOv11** for efficient video preprocessing to accurately detect and consistently track the person frame-by-frame
Results	• Implemented **OPEL** (**Optimal Transport Guided Procedure Learning**) for sign language modeling for the **first time**, enabling flexible alignment of gesture sequences and text, improving generalisation and interpretability in multimodal learning • Released the **most diverse** ISL dataset to date, empowering multimodal encoders for sign tasks and expanding research scope

Key Projects

Brain-Spy | *Brain and Cognitive Science Club (BCS), IIT Kanpur* (*May '25 - Jul '25*)
- Developed a **ADNI MRI-based 3D CNN screener** to detect early **Alzheimer's** by identifying subtle *hippocampal* and *cortical atrophy*
- Engineered **MRI data pipeline** with *N4 bias correction*, *MNI152 alignment*, *skull stripping* and *BIDS conversion* for standardized analysis
- Implemented and trained a **PyTorch**-based 3D-CNN for **multi-class Alzheimer's stage classification**, leveraging *5-fold cross-validation*

Roomble | *Course Project* | *Prof. Indranil Saha, CSE, IIT Kanpur* (*Jan '25 - Apr '25*)
- Built a **MERN Stack Web Application** to streamline property discovery and simplify roommate matching for landlords and tenants
- Implemented **secure user authentication**, profile management, and a compatibility-based matching algorithm based on user preferences
- Leveraged **Node.js** and **Express.js** to build a secure backend, with **MongoDB** for structured storage of user, property and chat data
- Built a responsive **React.js** frontend with property filters, reviews and real-time messaging using **Socket.io** for seamless user interaction

IITK-Mini-MIPS | *Course Project* | *Prof. Debapriya Basu Roy, CSE, IIT Kanpur* (*Jan '25 - Apr '25*)
- Designed a **32-bit Single-Cycle MIPS Processor** in **Verilog HDL**, supporting over 30 instructions across **R-**, **I-** and **J-type** formats
- Engineered modular components for a non-pipelined architecture, including **ALU**, **Control Unit**, **Decoder**, **Register File** and **Memory**
- Simulated the processor using **Xilinx Vivado** and deployed it on a **PYNQ-Z2 FPGA** board,validating instruction execution on hardware
- Verified functionality by executing **Bubble Sort**, **Multiplication**, and **Floating Point Addition**, covering *fetch-decode-execute* stages

Lluminating Languages: An NLP-based Chatbot | *Brain and Cognitive Society (BCS), IIT Kanpur* (*May '24 - Jul '24*)
- Built a **RAG**-based chatbot using **vector embeddings** and **FAISS**-based *semantic search* to fetch relevant IITK-specific content
- Scraped IITK content using **Selenium**, applied **NLTK-based analytics** and **chunking** to build a structured **context retrieval pipeline**
- Integrated **LLaMA** via *llama.cpp*, merging cleaned queries with retrieved context to generate accurate & contextual responses for freshmen
- Employed **prompt engineering** and **dynamic query preprocessing** to construct context-rich prompts for coherent LLM responses

Library Management System | *Mentor: Prof. Indranil Saha, CSE, IIT Kanpur* (*Feb '25 - Mar'25*)
- Developed a **C++ Console Application** to manage library operations, including book reservations and fine tracking of overdue books
- Modeled user roles using an abstract `User` base class with polymorphic overrides in `Student`, `Faculty`, and `Librarian` for role-specific logic
- Leveraged **encapsulation** and *virtual functions* to implement **runtime polymorphism**, enforcing role-specific limits and access controls

Technical Skills

- **Programming Languages:** C, C++, Python, Javascript
- **Competitive Programming:** Maximum rating **1561** on Codeforces
- **Software/Libraries:** Numpy, Pandas, Matplotlib, Scikit-Learn, PyTorch, NLTK
- **Tools/Utilities:** Git/GitHub, LaTeX, Verilog HDL

Relevant Coursework

A: Outstanding Performance*

Data Structures and Algorithms	Introduction to Computer Organisation	Software Development & Operations
Data Science and Machine Intelligence (A*)	Fundamentals of Programming - I & II	Introduction to Electronics
Discrete Mathematics & Probability	Real Analysis (A*) & Multivariate Calculus	Linear Algebra

Positions of Responsibility

Coordinator, Association for Computing Activities (ACA), IITK (*Feb '25 – Present*)
- Managed a team of **90+** student mentors to conduct **22** specialized **Computer Science Projects**, engaging over **700+** freshers
- Conducted various events like **Career Guidance Sessions**, **Happy Hours** and **Talks** by *Alumni*, *Professors* throughout the tenure