

# ABHINAV PRATAP SINGH

New Delhi, India

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## EXPERIENCE

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### Machine Learning Research Intern

New Delhi, India

IIT Delhi

02/2025 – 05/2025

- Contributed to research on **bias mitigation** in **ML models** for **medical imaging**, focusing on **subgroup fairness** and **clinical reliability**.
- Built **Fairness-Aware ML Model**: Developed a **7-head Rad-DINO** model for **chest X-ray classification**, achieving **80.78% accuracy** and fairness metrics (**PQD: 0.8128**, **DPM: 0.7991**) on **MIMIC-CXR**.
- Adapted Research to Code: Translated **ISIC** and **CROCODILE** papers into **PyTorch-based sparse ViT** and **DenseNet-121** pipelines for **fairness-aware imaging**.
- Enhanced Generalization: Used **sparse attention**, **GOT loss**, and **WeightedRandomSampler** to improve performance across **Fitzpatrick skin types**.
- Utilized Advanced Tools: Leveraged **PyTorch**, **Miniconda**, and **WandB** for efficient training, experiment tracking, and performance analysis.

## EDUCATION

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### University School of Automation and Robotics, GGSIPU

B.Tech in Artificial Intelligence and Data Science

CGPA: 9.16/10

New Delhi, India

09/2023 – 06/2027

## PROJECTS

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### Compiler for Bubble Programming Language

C++, WSL, CMakeLists

- Created and executed a **compiler** for a custom language "**Bubble**" that converts high-level code into **assembly language** and **machine code**.
- Integrated modules for **Lexical Analysis**, **Parsing**, and **Expression Generation**, ensuring optimized performance.

### AI ThoughtChain – Conversational Interface with Thought Graphs

Technologies: Next.js, Node.js, Tailwind CSS, D3.js, OpenAI API, TypeScript, Vercel, LangChain, LangGraph

- Built a **full-stack conversational AI interface** using **Next.js** and **OpenAI's GPT-4** and other **LLMs API**, replicating **ChatGPT functionality** with added **cognitive mapping**.
- Designed and incorporated an **interactive graph-based visualization** of the user's **thought chain** using **D3.js** to track **dialogue flow** and **reasoning nodes**.
- Implemented **contextual memory** using **embeddings** to reconnect prior topics and display **semantic trails** visually.
- Included **user controls** for **collapsing conversation branches**, **exporting thought graphs**, and **switching between models**.

## TECHNICAL SKILLS

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- Programming Languages**: Python, C++, C, JavaScript, TypeScript, HTML, CSS
- Frameworks & Tools**: PyTorch, TensorFlow, Keras, Flask, Streamlit, Git, WSL, NumPy, Pandas, Scikit-Learn, LangChain, LangGraph, AI Integration, RAG, MongoDB, Express, React (MERN Stack), Postgres, Next.js, TailwindCSS
- Other Skills**: Data Structures & Algorithms, Natural Language Processing, Compiler Development, Linux Administration, Research Implementation: ability to read AI/ML papers and turn into code.

## POSITION OF RESPONSIBILITY

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### AI TEAM Co-Lead – AWS Cloud Club GGSIPU

- Mentored peers on Machine Learning concepts and organized workshops to strengthen AI-ML understanding.
- Managed a techno-cultural fest, developing skills in team leadership, event coordination, and communication.