Avni Mittal

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EDUCATION

Indian Institute of Technology Mandi

Bachelor of Technology in Computer Science and Engineering

• CGPA: 8.93/10

Nov. 2020 - May 2024 Himachal Pradesh, India

Technische Universität Darmstadt

5th Semester, Semester Exchange, B.Tech CSE

∘ CGPA: 9.33/10

Oct. 2022 - March 2023 Darmstadt, Germany

PATENTS AND PUBLICATIONS

C=CONFERENCE, J=JOURNAL, P=PATENT, S=IN SUBMISSION, T=THESIS

- [C.1] "PROTECT: Policy-Related Organizational Value Taxonomy for Ethical Compliance and Trust". In SICon 2025 (ACL Workshop).
- [C.2] "MedSegDiffNCA: Diffusion Models With Neural Cellular Automata for Skin Lesion Segmentation". In IEEE *International Symposium on Computer-Based Medical Systems (CBMS)*, 2025.
- "Unveiling Learner Dynamics: The ECLIPSE Dataset and NeuralGaze Framework for Prolonged Engagement [C.3] Assessment in Online Learning". In European Conference on Artificial Intelligence (ECAI), 2024.
- [C.4] "Exceda: Unlocking Attention Paradigms in Extended Duration E-Classrooms with Attention Mechanism". In IEEE International Conference on Multimedia Information Processing and Retrieval (MIPR), 2024.
- [P.1] (Under review) "Figure Editor Agent for Visual Guide Generation". Patent pending.
- [P.2] (Under review) "Multi-Agent Prompt Optimization for Task-Specific LLM Coordination". Patent pending.

EXPERIENCE

 Microsoft 2024

Data Scientist Hyderabad, India

- Designed and implemented the complete agent logic and pipeline for Security Analysis Agent, including context engineering, iterative code execution, and long-horizon task planning.
- Built a scalable multi-scenario, multi-prompt autotuning framework from scratch, reducing manual developer effort by over 50x.
- o Developed the "Swarm Pinboard," an intelligent multi-agent orchestration board capable of autonomous agent spawning and lifecycle management for security tasks.
- Optimized vector database retrieval for DSPM agents, improving accuracy from 60% to 91%.
- Published research on aligning AI agents with enterprise security policies; accepted at ACL 2025 Workshop (SICon).

MIDAS Lab, IIIT Delhi

Sept. 2023 - Present Research Intern Remote

- Designed a neural cellular automata-based model with local-global attention for engagement prediction on classroom videos (DAiSSE dataset), surpassing existing benchmarks.
- o Integrated facial behavioral features using OpenFace; benchmarked performance of ViT, Residual Attention, and Global-Local Attention networks.
- Research work with Dr. Rajiv Ratn Shah accepted at ECAI 2024 and IEEE MIPR 2024.

 Intuit India May 2023 - Jul. 2023

Software Engineer Intern

Data Science Fellow

Bangalore, India

- Migrated TestEasy (internal tool) from monolith to microservices by implementing advanced cloning features across document, consent, and identity data pipelines.
- Ensured robustness through unit testing and Karate test automation; deployed services to production systems.

 TU Darmstadt Dec. 2022 - Mar. 2023

Student Research Intern

Darmstadt, Germany

Remote

- Evaluated and compared explainable AI methods under adversarial attacks (DeepFool, Carlini-Wagner L2), focusing on robustness and interpretability.
- Conducted empirical analysis to measure sensitivity of XAI visualizations under perturbations.

· Fellowship.AI Oct. 2022 - Dec. 2022

 Reproduced and extended the Total-Relighting pipeline for real-time object insertion and relighting in images, including harmonization and matting and build an end-to-end interactive demo for real-time testing and validation.

• Multi Agent System for Predictive analysis of Low Resource language performance

July 2025 - Present

Tools: Multi agent system, Low resource language, multilingual

- Developed a graph based multi agent system for performing predictive analysis of low resource languages on combination of tasks and language models
- Working under Dr. Sandipan Dandapat and Dr. Monojit Choudhury

• Medical Image Segmentation using Neural Cellular Automata and Diffusion

Aug. 2023 - Present

Tools: Diffusion Models, Neural Cellular Automata, Python, M3D-NCA, Web Deployment

- Worked under Dr. Arnav Bhavsar and Dr. Anirban Mukhopadhyay to develop a denoising diffusion probabilistic model using neural cellular automata in place of UNet for medical image generation and segmentation tasks. Work accepted at IEEE CBMS 2025. Extending work by including graph-based embeddings to learn global image information in an efficient manner
- Accelerated M3D-NCA model inference by 40% by integrating a novel region-of-interest (ROI) detection pipeline, reducing overall compute overhead.
- Built a browser-accessible interface for seamless deployment and real-time inference.

• ToolBot: Tool Learning for Large Language Models

Oct. 2023 - Dec. 2023

Tools: LLMs, Finetuning, Chainlit, CoT, DFSDT, OpenAI API

- Designed a conversational agent to answer developer queries using enterprise tool-specific knowledge grounded in LLM reasoning with three novel methods based on ToolLLM and Gorilla using DFSDT and Chain-of-Thought strategies.
- Generated synthetic dataset using Self-Instruct pipeline; fine-tuned on Llama, Zephyr, and MPT models.
- Achieved 5th position in DevRev's challenge at Inter-IIT Tech Meet 12.0.

• C-Arm Orientation Tracking for Surgical Workflow Optimization

Dec. 2022 - Mar. 2023

Tools: Computer Vision, Regression, Geometry, Python

- Developed two real-time methods for tracking 3D C-arm orientation from 2D images for intraoperative imaging.
- · Built complete pipeline including data collection, segmentation, object detection, and regression modeling.
- Proposed both ML and analytical geometry-based methods; preliminary work submitted to MICCAI 2023.

• BOSCH's Gender and Age Detection System

Feb. 2022 - Apr. 2022

Tools: ESRGAN, ResNet, Python

- Developed a robust algorithm for age and gender detection in surveillance video using ESRGAN and deep CNNs.
- Secured Top 10 position in the Inter-IIT Tech Meet 10.0 challenge by BOSCH.

SKILLS

- Programming Languages: Python, C++, Java, JavaScript, Shell Scripting, HTML, CSS, PHP, LaTeX
- Machine Learning & Deep Learning: PyTorch, TensorFlow, Keras, scikit-learn, OpenCV, HuggingFace, Diffusion Models, Prompt Engineering, Large Language Models (LLMs), Autonomous Agents
- Frameworks & Tools: LangChain, Langraph, AutoGen, Streamlit, FastAPI, Flask, Docker, Git, Azure, React, Node.js, Django, Spring Boot, REST APIs, MySQL, MongoDB
- Relevant Courses: Advanced Deep Learning, Computer Vision, Learning Robots, Probabilistic Graphical Models, Text Analytics, Information and Database systems, Computer Organization, Data Structures and Algorithms

HONORS AND AWARDS

- Academic Excellence Award (CSE), IIT Mandi: Highest SGPA in 5th and 6th semesters (2023, 2024)
- Top 10 Finalist, ACM-W India Hackathons: National selections (2021, 2022)
- Inter-IIT Tech Meet: 5th rank (2023), Top 10 (2022), representing IIT Mandi
- Hackathon Wins: LLM Hack, Atlas Astrathon, Vision Arcadia, Build-a-Bot, Hack36; Finalist, Google Girl Hackathon

LEADERSHIP EXPERIENCE

- Academic Mentor & Research Group Lead, IIT Mandi (2024–25) TA for "Data Science III" and "Paradigms of Programming"; mentored students in ML and model evaluation; led two 6-member research groups on GNNs and Neural Cellular Automata.
- Organizer, Technical Fests & Hackathons, IIT Mandi (2021–22) Headed sponsorship for AstraX'22, increasing industry support by 40%; coordinated Enigma hackathons including logistics, problem design, and judge onboarding.
- Technical & Cultural Club Roles, IIT Mandi (2021–23) Core team member of ACM-W, KamandPrompt, Robotronics (organized coding and robotics events); Co-Coordinator of Photography Moviemaking Club, managing event coverage and creative media projects.