Arpon Kapuria

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Summary

I'm a Computer Science graduate, deeply passionate about problem-solving and building AI systems that improve our day-to-day life. Alongside my technical pursuits, I enjoy teaching as a way to give back and simplifying complex ideas for others. Outside work, I love to travel, write and explore new places.

Research Interests

Deep Learning, Representation Learning, Large Language Models

Education

National Institute of Technology Tiruchirappalli — Tiruchirappalli, India
B.Tech in Computer Science & Engineering — **December 2020 – June 2024**

Courseworks: Data Structures and Algorithms · Operating Systems · Database Management Systems · Computer Networks · Machine Learning · Artificial Intelligence · NLP · Image Processing · Augmented and Virtual Reality · Technical Writing

Research Experience

Advanced Machine Intelligence Research Lab — Dhaka, Bangladesh
Research Intern | *Advisor: Prof. M. Firoz Mridha* — **February 2025 – Present**

- Investigate LLM reasoning capabilities to improve performance on complex tasks, with a focus on reducing hallucinations and applications of Retrieval Augmented Generation.

Indian Institute of Technology Bombay — Mumbai, India
Research Intern | MeDAL Lab | *Advisor: Prof. Amit Sethi* — **May 2023 – July 2023**

Project 1: Enhancing Self Supervised Learning framework - BYOL

- Conducted an in-depth survey on self-supervised learning, focusing on contrastive learning frameworks and their core principles.
- Reproduced BYOL and simCLR in PyTorch to establish a baseline for improvements.
- Introduced changes to BYOL by incorporating a novel loss function, algorithmic modifications and architectural adjustments to improve representation learning.

Project 2: Radiology DICOM Image Anonymization

- Created a user-friendly Flask-based system for DICOM image processing and anonymization using Pydicom, ensuring HIPAA-compliant privacy across **5,000+ medical scans**.
- Evaluated the CRAFT model for text detection in X-ray images and extracting clinically relevant annotations.

National Institute of Technology Tiruchirappalli — Tiruchirappalli, India
UG Research Assistant | Industrial Automation Lab — **October 2022 – February 2023**

Project: Assam Smart Home Automation — *Advisors: Prof. M. Brindha, Prof. G. S. Ilango*

- Developed a Flutter app to automate energy operations and digital billing for a solar-powered microgrid in Assam, India, serving **200+ households**.
- Integrated Flutter frontend with Django-based REST API and deployed an MQTT broker enabling real-time data exchange with **50+ IoT sensors** for energy consumption and control.
- Project supported by the Ministry of Science & Technology, Government of India, under the initiative **SUSTENANCE** to achieve Novel Carbon Neutral Energy Communities.

Skills

- **Programming Languages:** C, C++, Python, Dart, JavaScript, SQL, Bash
- **Frameworks & Libraries:** PyTorch, Hugging Face, LangChain, FastAPI, Flutter, Unity
- **Databases/Vector Stores:** PostgreSQL, MongoDB, ChromaDB, FAISS
- **Tools & Platforms:** Linux, Docker, Git, Postman, Android Studio, LaTeX
- **Languages:** Bengali (Native), English (IELTS 7.5), Hindi (Verbal), German (A1.1)

Selected Projects

Cold Email Generator
Python, LangChain, FAISS, RAGAS, Llama-4 **April 2025**

- Automated and end-to-end multimodal RAG system to streamline graduate application outreach by aligning applicant profiles with professor research via web scraping, text parsing, and CV image analysis, achieving a **92.6% relevance score** (RAGAS).
- Designed a LangChain-based pipeline leveraging LLaMA-4 Maverick, Jina Embeddings v3, and FAISS, leveraging both textual and visual embeddings to generate contextually personalized cold emails.
- Incorporated Cohere Reranker v3.5, achieving a **Precision@K of 87.3%**, with robustness validated across diverse input formats (PDFs, HTML, images).

NoSmokeZone: AI for Smoker Detection in Public Spaces
Python, TensorFlow, Keras, OpenCV **December 2023 – January 2024**

- Engineered a real-time smoker detection system with minimal human intervention leveraging CNN models (EfficientNetV2, VGG16, ResNet-50) and Vision Transformer, achieving **93% accuracy**.
- Fine-tuned models and applied data augmentation techniques, reducing false positives/negatives by **around 7%** compared to baseline models, significantly minimizing misclassifications.

Malicious Website Detection Using Machine Learning
Python, Flask, HTML/CSS, JavaScript **October 2022 – November 2022**

- Implemented and deployed a machine-learning model achieving **94% accuracy** for real-time malicious website detection.
- Trained and benchmarked **4 models** — KNN, SVM, LR & MLP — and optimized hyperparameters, resulting **14% enhancement** in model performance .
- Built a Chrome extension using JavaScript to extract **27 real-time features** (e.g., URL length, domain authority) from webpages and integrated user feedback collection, used by **100+ test users**.
- Applied a continual learning pipeline that retrains the model every **24 hours** on the feedback data, reducing false positives by **almost 6%** and increasing detection robustness.

Open Source Contributions

- `Huggingface/transformers`

Achievements

2020 **ICCR Scholarship** – Ministry of External Affairs, Government of India; awarded for academic excellence and promoting cultural exchange.
2017 **Academic Excellence Award** – Chamber of Commerce, Kushtia; SSC Board (10th) Results.
2015 **General Grade Scholarship** – Government of Bangladesh; JSC Board (8th) Results.
2012 **1st Place** – Zilla Shilpakala Academy, Kushtia; Art Competition (Independence Day).
2011 **2nd Place** – Bangladesh Udichi Shilpigoshthi, Kushtia; Art Competition (Bengali New Year 1418).

References

Dr. M. Brindha, Associate Professor
Department of Computer Science & Engineering, NIT Trichy, India | brindham@nitt.edu

Amit Sethi, Professor
Department of Electrical Engineering, IIT Bombay, India | asethi@iitb.ac.in

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