

AKHIL RATHNAKAR KULAL

M.Tech, Artificial Intelligence & Data Science — VJTI, Mumbai (2026)

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SUMMARY

M.Tech candidate in AI & Data Science (CGPA 8.55) with hands-on experience across the full ML lifecycle — from multimodal model design and large-scale GPU training to RAG pipelines and full-stack deployment. Comfortable moving between systems-level programming (OS internals, networking) and applied deep learning research. Seeking roles in AI/ML Engineering, Software Engineering, or Computer Engineering.

TECHNICAL SKILLS

- **Languages:** Python, C, JavaScript
- **AI / ML / DL:** PyTorch, Transformers, PEFT/QLoRA, Multimodal Fusion, CNNs, NLP (Bio_ClinicalBERT), RAG pipelines, scikit-learn
- **Systems & Infra:** Linux, Docker, DGX A100 cluster training, Git, REST APIs, FastAPI
- **Web / Full-Stack:** React.js, React Native, Node.js
- **Core CS:** Data Structures & Algorithms, Operating Systems, Computer Networks, Statistics & Probability

FLAGSHIP PROJECT — M.TECH THESIS

NutriDermAI: Multimodal Image-Text Fusion for ABCDE-Aware Skin Lesion Analysis | VJTI, Mumbai — Advisor: Prof. Manasi Kulkarni
May 2025 – Present

- Investigated the problem of combining heterogeneous visual and clinical-textual signals for dermatological diagnosis, motivated by the observation that single-modality classifiers underperform on ambiguous or low-contrast lesions where clinical context disambiguates diagnosis.
- Proposed a 9-stage architecture integrating lesion segmentation (ARCUNet), hierarchical visual classification (EfficientFormerV2-S2), clinical text encoding (Bio_ClinicalBERT), and a novel MARIA-based cross-modal fusion mechanism with learned gate weighting between modalities.
- Curated and unified a multimodal corpus of 415,508 samples across three heterogeneous public datasets (Derm1M, PAD-UFES-20, MM-SkinQA), addressing dataset-specific label taxonomy mismatches and class imbalance across 51 diagnostic categories.
- Evaluated fusion effectiveness against unimodal baselines, demonstrating that joint image-text representations meaningfully improve classification robustness (**66.3% accuracy, 0.675 weighted F1**) over vision-only approaches, with the learned gate consistently favoring near-balanced modality contribution (0.511 image / 0.489 text) — suggesting genuine complementary signal rather than modality dominance.
- Extended the architecture to a generative setting via parameter-efficient fine-tuning (QLoRA) of a vision-language model for open-ended dermatological VQA, and further to a retrieval-augmented question-answering system, examining how retrieval grounding affects factual consistency in generated clinical responses.
- Conducted an 80+ reference literature survey situating this work against existing multimodal medical imaging approaches, with results and methodology documented in a 100+ page thesis and companion conference submission.

ACADEMIC PROJECTS

Multimodal Medical Image Analysis System for Skin Disease | Independent / Coursework
May 2024 – Nov 2024

- Built an early deep-learning pipeline (CNN, PyTorch) for skin disease classification from medical images and clinical metadata, later evolved into the NutriDermAI thesis project above.
- Designed the model architecture and implemented preprocessing, training, and evaluation stages.

Stock Market Prediction using News Sentiment Analysis | Coursework — ML & Data Analytics
Jun 2024 – Nov 2024

- Built a pipeline predicting stock market trends from financial news sentiment, covering text preprocessing, sentiment classification, and trend prediction on historical price data.
- Implemented data preprocessing, sentiment analysis, and model evaluation in Python.

Kernel Threads in XV6 | Coursework — Operating Systems
Jun 2022 – Nov 2022

- Extended the XV6 teaching OS to support kernel-level threads, implementing thread creation, scheduling, and synchronization primitives in C.

HTTP Protocol over TCP | Coursework — Computer Networks
Jul 2020 – Nov 2020

- Implemented HTTP request/response handling over raw TCP sockets in C to model reliable client-server communication.

BC Command Implementation | Coursework — Data Structures & Algorithms Sep 2019 – Oct 2019

- Implemented a stack-based arithmetic expression parser and evaluator in C, replicating core BC command functionality.

EDUCATION

Degree	Institute	University/Board	Score	Year
M.Tech, AI & Data Science	VJTI, Mumbai	University of Mumbai	8.55 CGPA	2026
B.Tech/B.E, Computer Engineering	College of Engineering, Pune	Savitribai Phule Pune University	6.86 CGPA	2024
Class XII	Sardar Patel College of Arts & Science	MSBSHSE	91.61%	2018
Class X	St. Aloysius English High School	MSBSHSE	93.6%	2016

CERTIFICATIONS

- **Data Visualization with Python** — IBM, via Coursera (Nov 2024)

LANGUAGES KNOWN

English, Hindi, Marathi, Kannada, Tulu