



Suman Kumar Raj

Ocean Engineering and Naval Architecture
Indian Institute Of Technology, Kharagpur

+91-9798196180

sumanraj4176@gmail.com

LinkedIn | GitHub | Portfolio

EDUCATION

Degree/Certificate	Institute	CGPA/Percentage	Year
B.TECH + M.TECH	Indian Institute of Technology, Kharagpur	8.12	2020–2025
Class XII (CBSE)	S K P Vidya Vihar Mandroza Bhagalpur, Bihar	92%	2020
Class X (CBSE)	D P S Sabour Bhagalpur, Bihar	10	2018

PROJECTS

- **Multi-Agent Research Assistant** [↗](#)
Python, LangGraph, LangChain, OpenAI, Tavily, Wikipedia, LangSmith
 - o Built a multi-agent research system using **LangGraph** to decompose complex topics into specialized analyst perspectives with human-in-the-loop refinement.
 - o Implemented parallel information retrieval using **Tavily** and **Wikipedia**, enabling agents to gather and synthesize context from multiple sources.
 - o Implemented a map-reduce pipeline to parallelize analyst interviews and synthesize a comprehensive final report.
- **MyTaskManager** [↗](#)
Python, LangGraph, LangChain, OpenAI, Pydantic, Trustcall
 - o Built a stateful AI task-management agent using LangGraph that maintains short-term conversational state and structured long-term memory across interactions.
 - o Designed separate **Profile**, **To-Do**, and **Instruction** memory with Pydantic schemas, enabling structured memory extraction, updates, and personalized task management.
 - o Implemented conditional agent routing and cyclic workflows to determine when memory updates are required, route operations to the appropriate memory node, and return control to the main agent.
- **Fingerprint Liveness Detection (Presentation Attack Detection)** [↗](#)
Python, TensorFlow, Keras, MobileNetV3-Small, OpenCV
 - o Built a **Presentation Attack Detection (PAD)** system using **MobileNetV3-Small** transfer learning to classify fingerprint images as **LIVE** or **SPOOF** for biometric authentication.
 - o Developed an end-to-end pipeline covering 70/15/15 dataset splitting, image augmentation, ImageNet normalization, model training, threshold calibration, and single-image inference.
 - o Calibrated the threshold against a target **BPCER** of **3%** and evaluated held-out test performance using **APCER**, **BPCER**, **ACER**, **EER**, **ROC-AUC**, **F1-score**, and **APCER–BPCER** trade-off analysis.
- **LendingClub Risk Prediction** [↗](#)
Python, Pandas, NumPy, Scikit-learn, TensorFlow/Keras
 - o Built an end-to-end credit risk prediction pipeline using TensorFlow/Keras on **396K+** LendingClub loan records, covering missing-value handling, categorical encoding, feature engineering, and MinMax scaling.
 - o Trained a deep neural network with ReLU activations, dropout, & sigmoid output to classify loans as fully paid or defaulted.
 - o Achieved a **0.93 F1-score** on the test set, effectively handling significant class imbalance in loan default prediction.

SKILLS SUMMARY

- **Generative AI:** LangChain, LangGraph, Agentic AI, Memory Systems, Multi-Agent Systems, LLM Orchestration, RAG, VectorDB, GraphDB, Prompt Engineering, Tool & Function Calling, Structured Outputs, LLM Evaluation.
- **Machine Learning:** Classification, Regression, EDA, NLP, Neural Networks.
- **Programming Languages:** Python, SQL
- **Frameworks and Libraries:** TensorFlow, Keras, PyTorch, Scikit-learn, **NumPy**, **Pandas**, **Matplotlib**, **Seaborn**.
- **Platforms & Tools:** Docker, Git, GitHub, LangSmith, VS Code, Jupyter Notebook, Google Colab, Kaggle.
- **Data Structures and Algorithms, DBMS, Object-Oriented Programming, MLOps, Probability and Statistics**

EXPERIENCE

- **AI/ML Engineer Intern | MakeMyBrain** [May'24 – Jul'24]
 - o Built an end-to-end **mood-based music recommendation RAG system**, processing structured metadata, acoustic features, and textual profiles across audio catalogs.
 - o Engineered a **hybrid search pipeline** combining **BM25 keyword matching** and **dense vector embeddings** ($\alpha = 0.4$), boosting retrieval **Recall@10** from **0.61** to **0.79** compared to lexical search alone.
 - o Implemented a **cross-encoder re-ranking** stage to filter **top 100** retrieved candidates down to **top 10–20 tracks** before **LLM generation**, ensuring personalized and context-aware recommendations.
- **Mentor | AlgoZenith** [Oct'22 – May'24]
 - o Mentored **500+** students in DSA, guiding them through complex coding challenges and technical problem-solving.
- **Teaching Assistant | Indian Institute of Technology, Kharagpur** [Aug'23 - May'25]
 - o Conducted tutorials, evaluated assignments, and led doubt-clearing sessions for undergraduate courses at IIT Kharagpur.

AWARDS AND ACHIEVEMENTS

- Qualified **GATE 2024** with All India Rank (AIR) **64**.
- Received the prestigious **Prof. J.P. Ghose Memorial Award (2022–23)** for exceptional academic performance.
- **Gold Medal** recipient and distinguished participant in the Gymkhana Championship Choreography (2021–2022).

OPEN SOURCE

- **CodeBeat — Open-Source Python Package | PyPI** | [↗](#)
 - o Created a Python profiling package for function tracing and execution-time analysis to identify performance bottlenecks.