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Professional Summary

A detail-oriented and innovative Artificial Intelligence Engineer with a strong foundation in Computer Science from Amrita Vishwa Vidyapeetham. Experienced in the end-to-end development of AI-powered applications, from backend architecture and microservices to multimodal chatbot systems and data-driven model validation. Proven ability to enhance system efficiency, optimize code quality, and deliver impactful solutions for enterprise-level clients. Seeking to leverage expertise in Python, machine learning frameworks, and LLM integration to solve complex challenges in a forward-thinking organization.

Education

- **Amrita Vishwa Vidyapeetham, Coimbatore (2020 - 2024)**
 - **B.Tech in Computer Science and Engineering (Artificial Intelligence)** | CGPA: 7.98/10
 - **Maharishi International Residential School (CBSE), Chennai (2018 - 2020)**
 - **All India Senior School Certificate Examination** | Percentage: 93.4%
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Technical Skills

- **Programming Languages:** Python, Java, MATLAB, SQL
 - **AI & Machine Learning:** TensorFlow, PyTorch, Scikit-learn, Pandas, LangChain, Hugging Face, OpenCV
 - **Web Development & Frameworks:** Django REST Framework, Flask, FastAPI, React.js, HTML, CSS, JavaScript, Streamlit
 - **Databases:** MySQL, MongoDB
 - **Developer Tools & Platforms:** Git, Vercel, Docker, Office 365
 - **Networking & IoT:** IRC Protocol
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Professional Experience

Python Developer (AI Code Quality and Optimization) | Turing

(Aug 2024 - Present)

- **LLM Code Validation & Analysis:** Conducted rigorous static and dynamic analysis of LLM-generated Python code within FastAPI, Flask, and Django environments. Systematically identified logical errors, security vulnerabilities, and deviations from best practices, ensuring the delivery of robust and reliable code for enterprise clients like Amazon, Apple, and ByteDance.
- **Performance Optimization:** Profiled data science workflows to pinpoint performance bottlenecks and suboptimal algorithmic patterns. Recommended and implemented optimizations in Pandas and PyTorch that led to significant improvements in runtime efficiency and model robustness.
- **Generative Model Refinement:** Collaborated closely with a team of AI researchers to curate and refine high-quality, domain-specific Python code datasets. This work was instrumental in the fine-tuning of next-generation generative models, improving their accuracy and contextual understanding for code generation tasks.

Software Engineer Intern | FocusR

(Feb 2024 - May 2024)

- **AI-Powered Recruitment Platform Development:** Architected and implemented the core backend services for an intelligent hiring platform using Django REST Framework. Designed a scalable microservices architecture to handle distinct functionalities like resume processing and candidate-job matching, ensuring high availability and maintainability.
- **Workflow Automation:** Engineered a sophisticated resume parsing microservice that automated the extraction of key candidate information (e.g., skills, experience, education). This initiative automated a critical part of the recruitment pipeline, reducing manual recruiter effort by over 60%.
- **Advanced Prompt Engineering:** Designed, tested, and fine-tuned complex prompts for the OpenAI GPT-3.5 API to enhance the accuracy of automated candidate ranking. This involved creating structured prompts that guided the model to perform nuanced evaluations, leading to more relevant and fair candidate suggestions.

Projects

EmoBot: Multimodal Emotion-Aware Chatbot

- **Objective:** To design and deploy a sophisticated conversational AI system capable of perceiving a user's emotions from real-time video and dynamically tailoring its responses for a more empathetic and context-aware interaction.
- **Implementation:**
 - Engineered a computer vision pipeline using OpenCV to capture video streams and perform real-time face detection with Haar Cascades.
 - Trained a custom ResNet Convolutional Neural Network (CNN) with TensorFlow on a labeled dataset of facial expressions to accurately classify emotions (e.g., happy, sad, neutral).

- Integrated the emotion detection module with a Cohere Large Language Model via LangChain, enabling the chatbot's conversational strategy to adapt based on the user's detected emotional state.
 - Deployed the entire application using Streamlit for a user-friendly and interactive interface.
- **Outcome:** Successfully created a fully functional multimodal chatbot that demonstrates a deeper level of human-computer interaction by responding not just to text, but also to non-verbal emotional cues.

Advanced Image Dehazing Pipeline

- **Objective:** To implement and evaluate a state-of-the-art image dehazing algorithm based on the academic paper "Efficient Image Dehazing with Boundary Constraint and Contextual Regularization" (Meng et al., ICCV 2013).
- **Implementation:**
 - Developed a multi-stage pipeline in Python, starting with **Airlight Estimation** using a minimum filtering approach to identify atmospheric light.
 - Engineered a **Transmission Map Estimation** module that utilized contextual regularization with Kirsch filters and iterative optimization to accurately model haze density.
 - Built a haze removal module to recover a clear, high-fidelity image by applying the dehazing formula with the estimated airlight and refined transmission map.
 - Created a novel **Synthetic Hazing** script to generate realistic hazy images for testing and developed an evaluation module to quantitatively assess performance using **PSNR** and **SSIM** metrics against ground-truth images.
- **Outcome:** Successfully replicated and validated a research-level computer vision pipeline, demonstrating a deep understanding of image processing, atmospheric scattering models, and quality evaluation metrics.

CCTV Motion Detection with IRC Alerting System

- **Objective:** To build a real-time motion detection system using a webcam that automatically sends alerts to a remote IRC (Internet Relay Chat) channel hosted on a Raspberry Pi.
- **Implementation:**
 - Utilized OpenCV in Python to capture live video feed and implemented a frame-differencing algorithm to detect significant changes indicative of motion.
 - Developed a custom IRC client class to handle the connection, authentication, and messaging protocol for communicating with the Raspberry Pi-hosted IRC server.
 - Integrated the motion detection logic with the IRC client, triggering an automated "Motion_detected!" message to a specified channel upon detection.
- **Outcome:** Created a functional and efficient IoT-style security application, showcasing skills in real-time video processing, network programming, and cross-platform communication between a PC and a Raspberry Pi.

AI-Powered Satellite Image Analysis and Chatbot for Disaster Management

- **Objective:** To develop a full-stack, AI-driven web application to provide disaster response teams with rapid, actionable insights from satellite imagery through an intuitive chat interface.
- **Implementation:**
 - Architected a RESTful backend using Flask to manage image uploads and orchestrate AI model inferences.
 - Integrated state-of-the-art models from Hugging Face via LangChain for specialized tasks, including image captioning to generate descriptive summaries and Visual Question Answering (VQA) to answer specific user queries about the imagery.
 - Developed a dynamic and responsive frontend using React.js, allowing users to seamlessly upload images, interact with the chatbot, and visualize the AI-generated insights.
- **Outcome:** Delivered a powerful, browser-based decision-making tool that significantly accelerates the process of analyzing satellite data, enabling faster and more informed responses during critical disaster relief operations.

Covid-19 Forecasting using DMD and Comparative Analysis

- **Objective:** To forecast confirmed COVID-19 cases in U.S. states by implementing Dynamic Mode Decomposition (DMD) and rigorously comparing its performance against traditional time-series models like SARIMAX, ARIMA, and ARMA.
- **Implementation:**
 - Utilized MATLAB and Python (with Pandas and Statsmodels) to preprocess and analyze time-series data of COVID-19 cases.
 - Implemented the DMD algorithm to capture the underlying dynamics of the infection spread and project future trends.
 - Systematically benchmarked the DMD model's predictions against established statistical models to validate its effectiveness on epidemiological data.
- **Outcome:** The DMD-based forecasting model achieved a Root Mean Square Error (RMSE) of 969 cases, outperforming the next best traditional model by a significant margin of 30%, demonstrating the superiority of DMD for this specific forecasting task.

Portfolio Website with Integrated RAG Chatbot

- **Objective:** To build and deploy a fully responsive personal portfolio website to showcase technical projects, while also enhancing user engagement through an intelligent, custom-trained chatbot.
- **Implementation:**
 - Developed a modern frontend with React.js and a lightweight backend with Flask.
 - Integrated a Retrieval-Augmented Generation (RAG) pipeline using the Ollama and LangChain frameworks. The pipeline allows the chatbot to answer user queries in real-time by retrieving information directly from documents detailing my projects and experience.
 - Deployed the application on Vercel for scalable and reliable hosting.
- **Outcome:** Launched a professional portfolio that not only presents my work but also actively engages visitors, resulting in a measured 70% increase in user interaction time thanks to the real-time, context-aware chatbot.

JPEG-like Image Compression using Discrete Cosine Transform (DCT)

- **Objective:** To implement the core mechanics of the JPEG compression algorithm in MATLAB to demonstrate a fundamental understanding of lossy image compression techniques.
 - **Implementation:**
 - Processed the input image by converting it to the YCbCr color space and isolating the luminance (Y) channel.
 - Segmented the luminance channel into 8x8 pixel blocks and applied the **Discrete Cosine Transform (DCT)** to each block, converting spatial pixel data into frequency coefficients.
 - Performed **Quantization** on the DCT coefficients using a standard JPEG quantization matrix, which significantly reduces the data volume by diminishing high-frequency information imperceptible to the human eye.
 - Reconstructed the image by applying the inverse processes: **Dequantization** and the **Inverse DCT (IDCT)**.
 - **Outcome:** Successfully built a functional compression/decompression pipeline from scratch, providing deep insight into the mathematical principles that underpin modern image compression standards like JPEG.
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Certifications & Achievements

- **Qualified GATE (DA) 2024:** Achieved an All India Rank (AIR) of 5804 in the highly competitive Graduate Aptitude Test in Engineering for Data Science & AI.
- **Amazon Proof of Concept (PoC) Contributor:** Played a key role within a six-member team to successfully develop and deliver a Proof of Concept project for Amazon, demonstrating strong collaborative and technical skills in a corporate context.
- **AWS Cloud Essentials Badge:** Earned a badge recognizing foundational knowledge of the AWS Cloud, its services, and its core value proposition.