INTERNSHIP REPORT – VISHESH CHAVDA

Internship Duration: 17 April 2025 – 17 June 2025

Organization: NullClass

Internship Domain: AI/ML Chatbot Development

Tasks Completed: 3 out of 5

# 1. Introduction

During my internship at NullClass, I worked on advanced chatbot development tasks leveraging Large Language Models (LLMs), real-world datasets, and multimodal AI integration. The internship provided deep exposure to natural language processing, model evaluation, and interface deployment using tools like Streamlit and open-source APIs.

# 2. Background

I was assigned 5 structured tasks to be completed over a 2-month period. Out of these, I successfully completed 3 major projects:  
- Article Generator Chatbot using Open Source LLMs  
- Medical Q&A Chatbot using the MedQuAD Dataset  
- Multi-modal Chatbot capable of text and image input/output  
  
These tasks involved end-to-end implementation — from dataset processing and model selection to evaluation and interactive user interface development.

# 3. Learning Objectives

- Compare and evaluate open-source LLMs for content generation  
- Build specialized QA systems using medical data  
- Integrate text and image capabilities using multimodal AI models  
- Deploy intelligent chatbot applications using Python and Streamlit  
- Improve research, problem-solving, and hands-on ML development skills

# 4. Activities and Tasks

## Task 1: Article Generator Chatbot

I compared three open-source LLMs — LLaMA-2, Falcon, and OpenChat — for article generation. I designed a chatbot where users can input a topic and receive an article response. The models were evaluated based on coherence, fluency, and relevance. Streamlit was used to build a dynamic UI for interaction.

## Task 2: Medical Q&A Chatbot

Using the MedQuAD dataset from the NIH, I developed a retrieval-based chatbot that answers medical queries. A TF-IDF-based search mechanism identified relevant QA pairs from the dataset. Basic medical entity recognition was added using spaCy. A Streamlit interface allowed users to type medical questions and get precise answers.

## Task 3: Multi-modal Chatbot

I created a chatbot capable of handling both text and image input/output by integrating Google’s Gemini API and PaLM API. This chatbot could:  
- Understand and respond to user text  
- Accept images as input (e.g., a prescription or diagram)  
- Generate relevant text or visual output  
I used Streamlit’s image input feature and modular backend to handle different modalities. This task showcased my ability to work with advanced, multimodal AI systems.

# 5. Skills and Competencies Gained

- Python, Streamlit, Transformers, NLTK, and spaCy  
- Prompt engineering and fine-tuning for LLMs  
- Vector similarity search using TF-IDF  
- Working with image+text multimodal APIs  
- Full-stack ML app development and deployment  
- Structured problem-solving and research methodology

# 6. Challenges and Solutions

- LLM inference time: Solved by using lighter model variants or APIs like HuggingFace hosted endpoints.  
- Medical terminology matching: Implemented a hybrid NER + fuzzy matching approach for better answer relevance.  
- Multimodal input handling: Carefully managed pre-processing steps for image analysis and output rendering using Streamlit widgets.

# 7. Outcomes and Impact

- Built and deployed 3 advanced AI chatbots  
- Strengthened understanding of LLM comparison, domain-specific retrieval, and image-text AI interaction  
- Boosted confidence in delivering full-stack ML solutions  
- Gained practical experience aligning ML with real-world use cases (healthcare, content creation, human-AI interaction)

# 8. Conclusion

This internship at NullClass was a valuable learning journey. Each task deepened my understanding of AI-driven chatbot systems. From generating articles with LLMs to building a medical QA engine and designing a multimodal chatbot, I developed both technical and research skills that will benefit me in future AI/ML roles.