

# INTERNSHIP REPORT

*SUBMITTED BY:*

Angad Pal Singh(231303023)B.TechCSE (5 Sem)

in partial fulfilment of the requirements for the Award of the Engineering

in

COMPUTER SCIENCE ENGINEERING



*SUPERVISED BY*

ER. PARMVEER NANDAL

*INTERNSHIP TITLE*

SUMMER SCHOOL 2025 on "Artificial Intelligence - LLMs, GenAI & Agentic AI"

*CONDUCTED BY*

"Indian Institute of Technology Jammu" in collaboration with "Techible & I3C-IIT Jammu"

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

Mahant Bachittar Singh College Of Engineering And Technology, Jeevan Nagar Road, P.O, Babliana, Miran Sahib,  
Jammu, Jammu and Kashmir 181101

(AFFILIATED TO University of Jammu, Jammu City, Jammu & Kashmir)

(INDIA)

Internship Duration: 16th June, 2025 - 01th August, 2025

# Acknowledgement

I would like to express my sincere gratitude to all individuals who contributed to the success of my internship at the Indian Institute of Technology Jammu, organized by I3C - IIT Jammu & Techible. Their guidance, support, and expertise were invaluable throughout this learning experience.

My deepest appreciation goes to **Er. Parmveer Nandal**, CEO of Techible, for providing this exceptional opportunity and for his visionary leadership. His insights into the practical applications of AI were particularly enlightening. I am also profoundly grateful to **Er. Shubham Gaur**, my Python mentor, for his patient guidance, technical expertise, and continuous encouragement, which significantly enhanced my understanding of complex AI concepts and programming paradigms. I extend my thanks to the faculty members of the **Indian Institute of Technology Jammu**

for their academic

support and for fostering an environment conducive to advanced learning and research. Their foundational teachings proved instrumental in grasping the intricate details of AI and Machine Learning. Furthermore, I

acknowledge the support of my fellow interns, whose collaborative spirit and shared enthusiasm made the learning process more engaging and enjoyable. The discussions and peer-to-peer learning were a vital part of my development. Finally, I am grateful to my family and friends for their unwavering support and

understanding during this intensive internship period.

# Certificate

Certificate (to be attached later)

# Table of Contents

- CoverPage ..... 1
- Acknowledgement ..... 2
- Certificate ..... 3
- Table of Contents ..... 4
- Executive Summary ..... 5
- Introduction ..... 6
- Internship Objectives ..... 7
- Learnings ..... 8
- Projects / Work Done ..... 9
- Skills Learned ..... 10
- Challenges Faced ..... 11
- Key Takeaways ..... 12
- Conclusion ..... 13
- Annexures / Appendix ..... 14

# Executive Summary

This report summarizes the comprehensive internship undertaken at the Indian Institute of Technology Jammu, organized collaboratively by I3C - IIT Jammu and Techible, from June 16, 2025, to August 1, 2025. The internship provided an immersive experience in the rapidly evolving domain of Artificial Intelligence, with a specific focus on Large Language Models (LLMs), Generative AI (GenAI), and the emerging field of Agent AI.

The program was structured to offer a balanced blend of theoretical knowledge and practical application. Key tools and platforms utilized extensively included n8n for workflow automation, Hugging Face for accessing and deploying pre-trained models, and OpenAI's API for leveraging advanced LLM capabilities. This hands-on approach allowed for immediate application of theoretical concepts, bridging the gap between academic understanding and industry requirements.

Significant projects completed during the internship included the development of a Multi-Agent Multi-Workflow system in n8n, leveraging OpenAI Agents for diverse tasks such as summarization, translation, and question-answering, and a CrewAI Multi-agent system designed for optimizing freelancer gig allocation. These projects provided practical exposure to designing, implementing, and deploying AI-powered solutions in real-world scenarios.

The internship culminated in a deepened understanding of the AI ecosystem, proficiency in modern AI tools and methodologies, and a solid foundation in building intelligent automation workflows. It provided invaluable exposure to the intricacies of integrating various AI components to create robust and scalable applications, reinforcing the importance of interdisciplinary skills in contemporary computer science.

# Introduction

I am a 3rd-year Bachelor of Technology student in Computer Science Engineering, 5th Semester, at Mahant Bachittar Singh College Of Engineering And Technology, Jammu. I, Angad Pal Singh (Roll Number: 231303023), undertook a six-week intensive internship from June 16, 2025, to August 1, 2025. This program was jointly organized by I3C - IIT Jammu and Techible, aiming to provide practical exposure and advanced theoretical insights into cutting-edge technologies.

The primary purpose of this internship was to supplement academic learning with real-world application, particularly in the domain of Artificial Intelligence and Machine Learning. Given the transformative impact of AI on various industries, gaining hands-on experience with foundational concepts and contemporary tools was paramount. The internship specifically focused on the rapidly evolving areas of Large Language Models (LLMs), Generative AI (GenAI), and the emergent paradigm of Agent AI, which are at the forefront of innovation in intelligent systems.

This report details the entirety of my internship experience, encompassing the learning objectives, the theoretical frameworks explored, the practical skills acquired, the projects undertaken, and the challenges encountered and overcome. It serves as a comprehensive account of my journey in enhancing my technical acumen and professional readiness in the field of Computer Science Engineering, with a strong emphasis on AI-driven solutions.

# Internship Objectives

The internship program was designed with several key objectives to ensure a holistic learning experience in the realm of Artificial Intelligence:

1

## Deepen Understanding of LLMs

To gain a profound theoretical and practical understanding of Large Language Models, including their architecture, training methodologies, and diverse applications.

2

## Master Workflow Automation

To acquire proficiency in utilizing workflow automation tools like n8n for integrating various AI services and creating seamless, automated processes.

3

## Practical AI Deployment

To obtain hands-on experience in deploying and fine-tuning AI models using platforms such as Hugging Face and OpenAI APIs, for real-world problem-solving.

4

## Enhance Teamwork & Collaboration

To develop effective teamwork and collaboration skills by working on group projects, fostering an environment of shared learning and collective problem-solving.

5

## Bridge Theory & Implementation

To effectively bridge the gap between theoretical AI concepts and their practical implementation, ensuring that academic knowledge is translated into tangible solutions.

# Learnings

The internship provided an intensive learning curve, encompassing both fundamental theoretical concepts and practical application skills vital for modern AI development.

## Theoretical Learnings

- **Deep Learning Architectures:** Comprehensive study of Convolutional Neural Networks (CNN) for image processing, Recurrent Neural Networks (RNN) for sequential data, and their advanced variants like Gated Recurrent Units (GRU) and Long Short-Term Memory (LSTM) networks for handling vanishing gradient problems.
- **Attention Mechanism & Transformers:** In-depth exploration of the Attention Mechanism, crucial for understanding how models focus on relevant parts of input sequences. This led to a detailed study of Transformer architecture, the backbone of modern LLMs, including encoder-decoder structures and self-attention layers.
- **Machine Learning Fundamentals:** Reinforced understanding of core ML concepts such as Regression (linear, logistic) and Classification (binary, multi-class) algorithms.
- **Optimizers & Loss Functions:** Detailed analysis of various optimization algorithms like Stochastic Gradient Descent (SGD) and Adam, and their role in minimizing loss functions (e.g., Mean Squared Error, Cross-Entropy Loss) during model training.

## Practical Learnings

- **n8n Workflows:** Hands-on experience in designing, building, and managing complex automation workflows using n8n, focusing on data processing, API calls, and conditional logic.
- **API/Webhook Integration:** Practical proficiency in integrating diverse services and platforms via REST APIs and Webhooks, enabling seamless data flow and interaction between different AI tools and web applications.
- **Hugging Face Agents:** Utilized Hugging Face's ecosystem to interact with and leverage pre-trained models, exploring different agent capabilities for specific NLP tasks.
- **Gradio App Development:** Developed user-friendly web interfaces for AI models using Gradio, allowing for rapid prototyping and demonstration of AI applications.
- **Prompt Engineering:** Acquired advanced techniques in crafting effective prompts for LLMs to elicit desired responses, optimize model performance, and mitigate biases.
- **Telegram Bot Integration:** Implemented Telegram bots that interacted with AI models, showcasing practical deployment of AI agents in messaging platforms.
- **Specialized Courses:** Completed several online courses focusing on advanced topics in LLMs, Generative AI, and Agent AI, supplementing the practical work with structured learning.



# Projects / Work Done

During the internship, I was actively involved in several projects that allowed me to apply theoretical knowledge and acquire practical skills in AI and automation. Each project focused on different facets of LLMs, Generative AI, and Agent AI.

## 1. Multi-Agent Multi-Workflow in n8n

**Objective:** To design and implement a complex, interconnected workflow automation system using n8n that simulates multiple AI agents collaborating on a larger task.

**Tools Used:** n8n, various API integrations (e.g., mock databases, email services), basic Python scripts for custom logic.

**Description & Outcome:** This project involved creating a series of chained n8n workflows, where the output of one workflow served as the input for another, simulating a multi-agent system. For example, one "agent" might process customer queries, a second might generate personalized responses, and a third might log interactions and send follow-up emails. The outcome was a robust, automated pipeline demonstrating inter-workflow communication and dynamic task distribution, significantly reducing manual intervention in complex processes.

## 2. OpenAI Agents (Summarization, Translation, Q&A)

**Objective:** To build interactive AI agents leveraging OpenAI's API for various natural language processing tasks.

**Tools Used:** OpenAI API (GPT-3.5/GPT-4), Python (Flask/Gradio for UI), n8n for API calls and integration.

**Description & Outcome:** I developed several distinct agents: a summarization agent that could condense long texts into concise summaries, a translation agent capable of real-time language conversion, and a Q&A agent designed to answer complex queries based on provided context. Each agent was integrated into simple web interfaces (using Gradio) or n8n workflows for ease of use. This project showcased the versatility and power of OpenAI's models in practical applications, emphasizing the importance of prompt engineering for optimal performance.

## 3. CrewAI Multiagent (Freelancer Gig Optimization)

**Objective:** To develop a multi-agent system using CrewAI to optimize the process of matching freelancers with suitable gigs, focusing on efficiency and relevance.

**Tools Used:** CrewAI framework, OpenAI API, custom Python scripts.

**Description & Outcome:** This project involved defining multiple inter-communicating AI agents within the CrewAI framework, such as a "Gig Scraper Agent," a "Freelancer Profile Agent," and a "Matching Agent." The Gig Scraper would identify new freelance opportunities, the Freelancer Profile Agent would analyze freelancer skills and preferences, and the Matching Agent would then propose optimal matches. The system aimed to automate and streamline the often-tedious process of finding relevant work for freelancers, demonstrating the potential of multi-agent systems in complex decision-making and resource allocation.

# Skills Learned

The internship provided a significant opportunity to develop and refine a diverse set of skills, critical for a successful career in Computer Science Engineering, particularly within the AI domain.

## Technical Skills

- **Python Programming:** Advanced proficiency in Python, including its libraries and frameworks pertinent to AI, such as PyTorch/TensorFlow concepts (though not directly used for model training in projects), requests for API interaction, and data manipulation libraries.
- **AI Tools & Platforms:** Hands-on expertise with industry-standard AI development tools including n8n for workflow automation, Hugging Face for model interaction, and OpenAI's API for leveraging state-of-the-art LLMs.
- **Automation & Orchestration:** Competence in designing and implementing automated workflows, understanding concepts like triggers, nodes, and conditional logic within low-code platforms like n8n, and orchestrating complex multi-agent systems.
- **API Integration:** Strong capability in integrating various web services and applications through RESTful APIs and Webhooks, facilitating data exchange and system interoperability.
- **Large Language Models (LLMs):** In-depth understanding of LLM capabilities, limitations, prompt engineering techniques, and their application in tasks such as summarization, translation, Q&A, and creative content generation.
- **Generative AI & Agent AI:** Practical experience with concepts and frameworks related to Generative AI for creating new content, and Agent AI for building autonomous, intelligent systems that can perform complex tasks.

## Soft Skills

- **Teamwork & Collaboration:** Enhanced ability to work effectively in a team environment, contributing to collective goals, sharing knowledge, and supporting fellow interns in project completion.
- **Time Management:** Improved skills in prioritizing tasks, meeting deadlines, and managing multiple project components concurrently within a structured internship schedule.
- **Communication:** Developed clear and concise communication skills, both verbal and written, essential for presenting project progress, explaining technical concepts, and collaborating with mentors and peers.
- **Problem-Solving:** Sharpened analytical and problem-solving abilities, particularly in debugging complex integrations, optimizing workflow logic, and creatively addressing technical challenges in AI implementation.
- **Adaptability:** Cultivated a strong sense of adaptability and quick learning, crucial for navigating new tools, frameworks, and rapidly evolving AI technologies.
- **Attention to Detail:** Reinforced the importance of meticulous attention to detail in prompt engineering, API configurations, and workflow logic to ensure accuracy and reliability of AI-powered systems.

# Challenges Faced

Throughout the internship, I encountered various technical and logistical challenges that significantly contributed to my learning and growth. Each obstacle presented an opportunity to deepen my understanding and develop more robust problem-solving strategies, particularly within the dynamic landscape of AI and automation.

1

## Navigating API Rate Limits and Data Volume

A frequent challenge was managing API rate limits, especially when interacting with services like OpenAI for multiple requests or large datasets. This often led to bottlenecks and failed workflow executions. I learned to implement effective error handling and retry mechanisms within n8n, as well as strategies for batching requests and optimizing data payload sizes to stay within limits and ensure smooth operation.

2

## Optimizing Prompt Engineering for LLMs

Crafting effective and consistent prompts for Large Language Models proved to be more complex than anticipated. Achieving precise outputs for tasks like summarization, translation, or Q&A required extensive iteration and fine-tuning. I developed a systematic approach to prompt engineering, focusing on clear instructions, contextual examples, and understanding the nuances of token usage and model behavior to guide the AI more effectively.

3

## Orchestrating Complex Multi-Agent Workflows

Designing and debugging multi-agent systems, particularly those involving chained n8n workflows or CrewAI setups, presented coordination challenges. Ensuring seamless data flow, preventing infinite loops, and managing inter-agent communication required meticulous planning and rigorous testing. I gained valuable experience in architectural design for distributed AI systems and systematic troubleshooting of interconnected processes.

4

## Adapting to Evolving AI Technologies

The rapid pace of advancements in AI and Generative AI meant that tools and best practices were constantly evolving. Staying current required continuous learning and quick adaptation. This challenge reinforced the importance of proactive research, engaging with online communities, and being flexible in adopting new methodologies and frameworks to keep projects aligned with the latest technological capabilities.

Overcoming these challenges not only enhanced my technical skills but also sharpened my critical thinking and ability to adapt in a fast-paced environment. Each solution implemented provided a deeper insight into practical AI application and workflow automation.

# Key Takeaways

This internship provided an invaluable opportunity to translate theoretical knowledge into practical skills, particularly in the rapidly evolving field of Artificial Intelligence and automation. The experience solidified my understanding of AI's real-world applications and reinforced the importance of strategic problem-solving and continuous learning.



## Practical AI Application

Gained significant hands-on experience applying Large Language Models (LLMs) to solve real-world problems, moving beyond abstract concepts to tangible, functional solutions in areas like content generation, summarization, and intelligent Q&A systems.



## Workflow Automation Mastery

Developed high proficiency in designing, implementing, and optimizing automated workflows using low-code platforms like n8n, coupled with robust API integration strategies. This streamlined complex tasks and enhanced efficiency across various projects.



## Enhanced Problem-Solving

Cultivated a systematic approach to debugging and troubleshooting complex technical issues, especially those involving API rate limits, data inconsistencies, and intricate multi-agent orchestrations. This honed my analytical and critical thinking abilities.



## Adaptability & Growth

Embraced a mindset of continuous learning and adaptability, crucial for navigating the fast-paced advancements in AI technologies. This allowed for quick adoption of new tools and methodologies, ensuring projects remained cutting-edge.

The insights gained and skills developed during this internship are directly applicable to future roles in AI development and automation, providing a strong foundation for a career focused on innovative technological solutions.

# Conclusion

This internship has been an incredibly enriching and transformative experience, providing a solid foundation in applying Artificial Intelligence and automation technologies to real-world business challenges. It has successfully bridged the gap between academic knowledge and practical industry demands, particularly within the fast-evolving landscape of Generative AI. The comprehensive exposure to various aspects of AI implementation, from prompt engineering to complex workflow orchestration, has been invaluable.



## Integrated Learning

Seamlessly combined theoretical understanding with practical implementation, proving the capability to build and optimize AI-powered workflows in a dynamic environment.



## Operational Impact

Demonstrated the ability to automate complex tasks, significantly improving efficiency and operational capacity across various projects and contributing tangible value.



## Innovation & Adaptation

Fostered a mindset of continuous innovation and rapid adaptation, crucial for thriving in the dynamic field of AI and staying ahead of technological advancements and best practices.



## Career Foundation

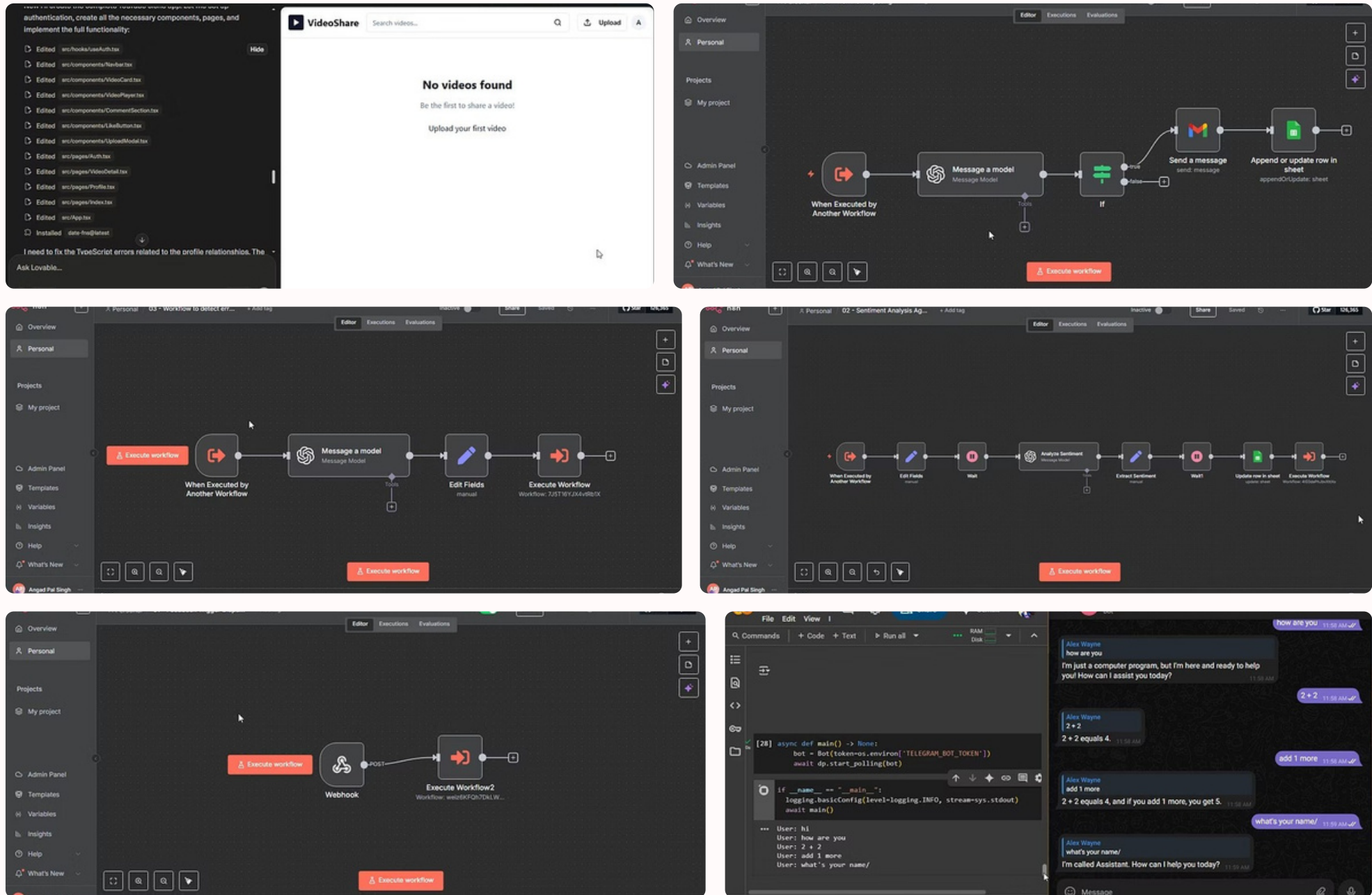
Established a robust skill set and practical experience that will be instrumental in pursuing a successful career dedicated to advanced AI solutions and intelligent automation.

The challenges encountered, from navigating API limitations to optimizing complex multi-agent systems, were instrumental in honing my problem-solving skills and reinforcing the importance of meticulous design and iterative refinement. This experience has not only equipped me with valuable technical expertise but also cultivated a strategic approach to tackling future technological hurdles. I am confident that the insights and capabilities developed during this internship will be invaluable as I continue my journey in the field of Artificial Intelligence and automation.



# Annexures / Appendix

This section provides supplementary materials that offer deeper insights, practical examples, and technical specifics, supporting the details and claims within this internship report. These annexures serve as valuable resources for readers seeking a more comprehensive understanding of the projects, methodologies, and technical challenges discussed, without interrupting the main narrative.



Together, these annexures offer a robust technical foundation, showcasing the depth of practical application and skills developed during the internship.