AI/ML Intern

A report on the summer research internship carried out by

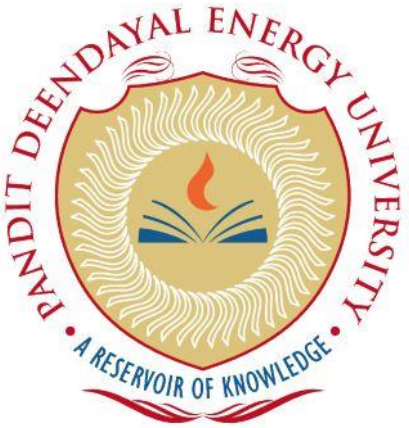
Patel VishwKumar HiteshBhai
21BIT231

At
Yama Technology Pvt. Ltd.

Under the guidance of
Mr. Sanket Joshi Sir

Submitted in Partial Fulfillment of the Requirements for the Degree of
Bachelor Of Technology

In
The Department of Information & Communication Technology,
SoT, PDEU, Gandhinagar



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Internship Completion Certificate

YAMA TECHNOLOGIES PVT LTD.

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02 July 2024

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Patel Vishw Hiteshkumar has completed his internship as an AI/ML Intern at our esteemed organization located in Ahmedabad from May 2024 to June 2024. (Six Weeks)

During his internship, he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations, and he could complete his assignments and projects on time.

We wish him all the best for his upcoming career.

Yours Sincerely,

For, **YAMA Technologies Pvt. Ltd.**

Authorized signatory,
HR & Admin department.

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Roll Number of the Student: 21BIT231

Signature of the Student:

Name of the Supervisor (PDEU): Dr. Ritesh Vyas
Designation of the Supervisor: Assistant Professor, PDEU
Signature of the Supervisor:

Place: 3, Times corporate park, Thaltej-Shilaj Road, Ahmedabad

Date: 5th August 2024

Acknowledgement

Accomplishing a task is never a single person's effort. Several prominent persons have helped in this present work. A journey becomes easy when you travel together. Interdependence is definitely much more valuable than independence. This thesis stands as an outcome of that work whereby I have been accompanied and supported by many people. I consider it a pleasant aspect that now I am having the opportunity to express my gratitude for all of them.

I would like to thank Yama Technology Pvt. Ltd. for providing me the opportunity to undergo training at their 3, Times corporate park, Thaltej-Shilaj Road, Ahmedabad.

With great pleasure, I wish to express a deep sense of gratitude to my training mentor Naimish Sir & extend my appreciation to Mr. Sanket Joshi Sir who guided & supported me throughout the training period.

I prolong my sincere gratitude to Dr. Dhaval Pujara (Director, School of Technology, PDEU) & Dr. Paawan Sharma (HoD, PDEU) for supporting & providing this platform.

I also thank all the teaching and non-teaching staff for their inspiration and support in overcoming challenges during the implementation.

Patel VishwKumar HiteshBhai

Abstract

AI and Machine Learning integrate thoroughly into today's world's everyday life, having revolutionized sectors of activity while bringing increased convenience and efficiency along the way. From tailored suggestions on streaming platforms, smart assistants that keep our calendars in order, through advanced algorithms in autonomous vehicle control systems to sophisticated medical diagnostics, AI/ML technologies rewrite how we interact with the world. They let enterprises understand terabytes of information, develop customer experience, and automate complex tasks to make daily activities smoother and more intelligent. While these technologies continue to evolve in the near future, their impact on daily life is sure to only get deeper, touching fields such as healthcare, finance, entertainment, and transport.

As an AI/ML Intern, I had an opportunity to work with a very dynamic team focused on the development of cutting-edge artificial intelligence and machine learning solutions. I worked independently on designing and implementing various algorithms and models going through tests. Tools applied include Python and scikit-learn. I supported data preprocessing and feature engineering tasks and collaborated on projects aimed at improving model accuracy and performance. I have gained very valuable experience in viewing the AI/ML lifecycle from conceptualization to deployment with real-world datasets and challenges. This internship has much enhanced my technical skills, broadened the view of industrial applications, and deepened my passion in pursuing AI technologies.

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LIST OF FIGURES

Abbreviations & Nomenclature

Subscripts

TECH	Technology
Pvt	Private
Ltd	Limited

Abbreviations

AI	Artificial Intelligence
ML	Machine Learning

About the Industry

1.1 Introduction

Yama Technology Pvt. Ltd. has always been at the forefront of delivering excellence in innovative and customized analytical and digital solutions. Driven by customer-centric services, we empower lives, improve productivity and create a transformational experience for the communities we serve. From milk collection in the villages and bulk centers to complex data control in the dairy plant, we ensure every aspect of the milk procurement process is streamlined and seamlessly efficient. We also place a huge emphasis on extensive research and tailored services that help simplify and ease the lives of our dairy farmers, processors and the F&B industry.

1.2 Background

Everest's tech savvy IT professionals were keen on achieving greater heights beyond dairy industry and they were involved in conceiving, developing and commissioning of software solutions to big industries across India. Their dedication and commitment were commendable and their excellence further expanded in the fields of Hardware Automation and range of Tech Interfaces. Extending their reach into different tech solutions brought success to not just Everest but to the huge network of clients in Dairy Industry. These remarkable achievements gave food for thought, for the tech team and there emerged an idea of expanding the outreach and serving the open market with their excellent services and innovative solutions with a new entity. Thus, in December 2017, Yama Tech was born.

1.3 Insights

With over two decades of presence in precision analytical dairy instrument manufacturing industry, Everest's Instruments Pvt. Ltd. had a phenomenal growth and had crossed turn over of 100 crores in last 3 consecutive financial years. This has been possible because of the expertise of their IT team who has the experience and knowledge of latest technologies, to be integrated to their instruments for value addition. This team now under the under the aegis of Yama Tech is ready to get diversified to foray into new products development in IT with its own ERP Solution along with HRMS, Sales & Distribution solution, etc. beyond dairy sector.

Motivation & Objective

With so much smart technology in this modern world, it has plenty of applications and related software used by tones of data; hence, the integration has to be errorless and effortless across all of the systems and applications. That's what motivates me to help businesses with such transformation and easy migration of their human-driven process onto online digital platforms equipped with IT devices. It ensures the provision of such platforms and complete services to companies of multiple sizes to achieve smooth transition, curbing challenges and enhancing their growth.

Skillful team and Teamwork lead to deliver any customized needs of the customer within a desired time window, which turns into more beneficial outcome and organization growth. It relies on excellent quality products that would impress the users and gets into the market faster than its competition. Following the latest trends; I'm responsible for providing software development solutions to our overseas partners and co-invent new verticals of today's fast-growing business domains.

The primary objective of this internship was to develop a comprehensive understanding of AI/ML fundamentals, work with basic libraries, and gain practical experience through hands-on projects. Key goals included mastering the application of supervised and unsupervised models and creating a functional chatbot to demonstrate the ability to implement learned concepts.

Only by owning dedicated team one could provide end to end services, to observe the application performance and provide the necessary support to keep your business up and running 24 x 7.

- To learn and adapt the new/upcoming technologies to enhance my knowledge.
- To be a value creator for all our stakeholders by providing analytical solutions and make their life easy inscribing services.
- Strive to create advanced technological applications to stay ahead of the competitions.

Work progress & Timeline

Internship Duration: May 20, 2024 - July 1, 2024

Department: Artificial Intelligence and Machine Learning

Summarizes the work progress and timeline of my internship at Yama Technologies in the Artificial Intelligence (AI) and Machine Learning (ML) department. The internship provided me with hands-on experience in AI/ML fundamentals, Genetic Algorithm using Rosen brocks function, supervised and unsupervised learning models, chatbot development and Python libraries essential for building AI solutions.

Week 1 (May 20 - May 26): Onboarding and Orientation

May 20 - May 22:

- Introduction to the AI/ML department and team members.
- Overview of the internship objectives and expected outcomes.

May 23 - May 26:

- Completed initial training on company systems, tools, and resources.
- Began studying AI/ML fundamentals, including key concepts and terminology.
- Attended orientation sessions on Yama Tech's AI/ML projects and methodologies.

Week 2 (May 27 - June 2): Developing a GENETIC Algorithm using Rosen Brocks Function.

May 27 - May 29:

- Engaged in learning modules covering basic Genetic Algorithm.

May 30 - June 2:

- Implementation of Genetic algorithms using Rosen Brocks function in Python.
- Hands-on experience with VS code Notebooks for code experimentation and documentation.

Week 3 (June 3 - June 9): Learning Models

June 3 - June 5:

- Engaged in learning modules covering supervised and unsupervised learning models.
- Covered basic algorithms such as linear regression, logistic regression, k-means clustering, and decision trees.

- Practical exercises with algorithms like k-means clustering.

June 6 - June 9:

- Applied supervised learning techniques to real-world datasets.
- Analysed results and refined models based on performance evaluations.
- Applied unsupervised learning techniques to explore and visualize data patterns.
- Generated insights and reports based on unsupervised learning outcomes.

Week 4 (June 10 - June 16): Libraries for Chatbot AI

June 10 - June 12:

- Began learning chatbot development frameworks and libraries.

June 13 - June 16:

- Hands on to AWS services for implementing Chatbot.
- Designed a flow to process and respond to user inputs/prompts.

Week 5 (June 17 - June 23): Chatbot Implementation.

June 17 - June 19:

- Chatbot development frameworks and Integration of code in python.

June 20 - June 23:

- Designed and built a basic chatbot using Python, AWS Lex service and AWS Lambda Function.
- Meeting Scheduling Bot & Hotel Room Booking Bot

Week 6 (June 24 - July 1): Final Review and Wrap-Up

- Prepared and delivered a final presentation on my work and accomplishments during the internship.
- Submitted a comprehensive report summarizing my learning experiences and project outcomes.
- Received feedback and participated in a wrap-up meeting with my supervisor and team.

Problem statement & Introduction

4.1 Understanding AI/ML Fundamentals:

Build up a clear understanding of the basics of Artificial Intelligence and Machine Learning. Learn the basic tenets, terminologies, and methodologies that set a base underpinning for these technologies.

4.2 Implementing and Exploring Learning Models:

Practice supervised learning models on labeled datasets using algorithms such as linear regression, decision trees, support vector machines, and neural networks, and evaluate their performance.
Design and implement unsupervised learning models whose desire is to take an analysis on a dataset without labels. Techniques in this category include clustering and association rules all of these allow hidden patterns or structures to emerge from data.

4.3 Building a Chatbot AI:

Developed a functional chatbot as a project and applied the learned AI/ML concepts. This involves designing the chatbot’s architecture, implementing AWS Machine Learning services, and integrating it with a user interface.

Develop a Hotel Booking chat bot. It should allow users to search for hotels, book rooms, and modify reservation. The goal is to streamline hotel booking management, enhancing efficiency and user satisfaction by offering a unified and intuitive solution.

Develop a chatbot for scheduling meetings that integrates with users' calendars. The goal is to simplify meeting management, reduce scheduling conflicts, and enhance productivity by providing an intuitive, automated solution for users to coordinate meetings effortlessly.

Introduction

AI/ML are those transformative technologies that would find applications across diversified fields. This internship provides hands-on experience and exposes the practical aspects associated with working on AI/ML systems. Students, internees, or interns are usually exposed to concepts, tools, and techniques relevant for the development and deployment of machine learning models.

The primary objective of this internship was to develop a comprehensive understanding of AI/ML fundamentals, work with basic libraries, and gain practical experience through hands-on projects. Key goals included mastering the application of supervised and unsupervised models and creating a functional chatbot to demonstrate the ability to implement learned concepts.

The tasks during the internship included getting familiar with AI/ML basics, different libraries, and their application of different models to problems in the real world. This would involve theoretical understanding regarding learning and practical implementation, which is convergent into a project from which the skills learned could result in a functional AI application.

This internship laid the foundation in AI/ML Fundamentals, provided practical skills, and prepared advanced work in the sphere. Industry practices and tools, application of theoretical knowledge to solving real problems—this experience gave me everything.

Methodology & Internship Activities

5.1 Learning and Understanding Fundamentals

- **Reading and Study materials:** Engage with given materials and online resources.
- **Lectures:** Participated in interactive lectures on AI/ML fundamentals.
- **Hands-On Exercises:** Work on exercises and small projects to apply theoretical concepts.

5.2 Supervised Learning

- **Model Training:** Apply algorithms such as linear regression, decision trees, and support vector machines on labelled datasets.
- **Evaluation Metrics:** Learn to evaluate model performance using metrics like accuracy.
- **Hyperparameter Tuning:** Experiment with different hyperparameters to optimize model performance.

5.3 Unsupervised Learning

- **Clustering Techniques:** Apply clustering algorithms like K-means and hierarchical clustering to group unlabelled data.
- **Pattern Discovery:** Implement association rule learning to identify relationships and patterns in data.

5.4 Building a Chatbot

- **Natural Language Processing (NLP):** Apply NLP techniques for text processing, entity recognition, and sentiment analysis.
- **Dialogue Management:** Design the flow of conversation, including intents, responses, defining slots, slot types, confirmation, fulfilment, closing response.
- **Aws Lex:** Automate informational responses. Designed conversational solutions that provide responses to frequently asked questions.

  When building a chatbot, the first step is to set up sample utterances. These are the phrases users might say to trigger the chatbot's intents, so they help ensure the chatbot understands user requests correctly.

Next, you need to define slots and slot types. Think of slots as the pieces of information the chatbot needs to complete a request, and slot types as the categories or types of these pieces of information. For example, if your chatbot is booking a restaurant reservation, it might need slots for the date, time, and number of people.

There are three key phases to manage when handling user intents:

- **Confirmation:** This phase is all about making sure the chatbot has understood the user's request correctly. It asks the user to confirm their intent or cancel it if necessary. For example, the chatbot might say, "Just to confirm, you'd like to book a table for two at 7 PM, right?"
- **Fulfilment:** This is where the actual work happens. The chatbot runs a backend process, often using a Lambda function, to carry out the request. After the task is complete, the chatbot lets the user know what's been done, such as, "Your reservation is confirmed for 7 PM."
- **Closing Response:** This is the final touch where the chatbot wraps up the interaction. It thanks the user and provides a closing remark, like, "Thank you for your reservation! Have a great day!"

➢ **Integration and Testing:** Develop a functional chatbot and test its performance in real-world scenarios to ensure robustness and usability.

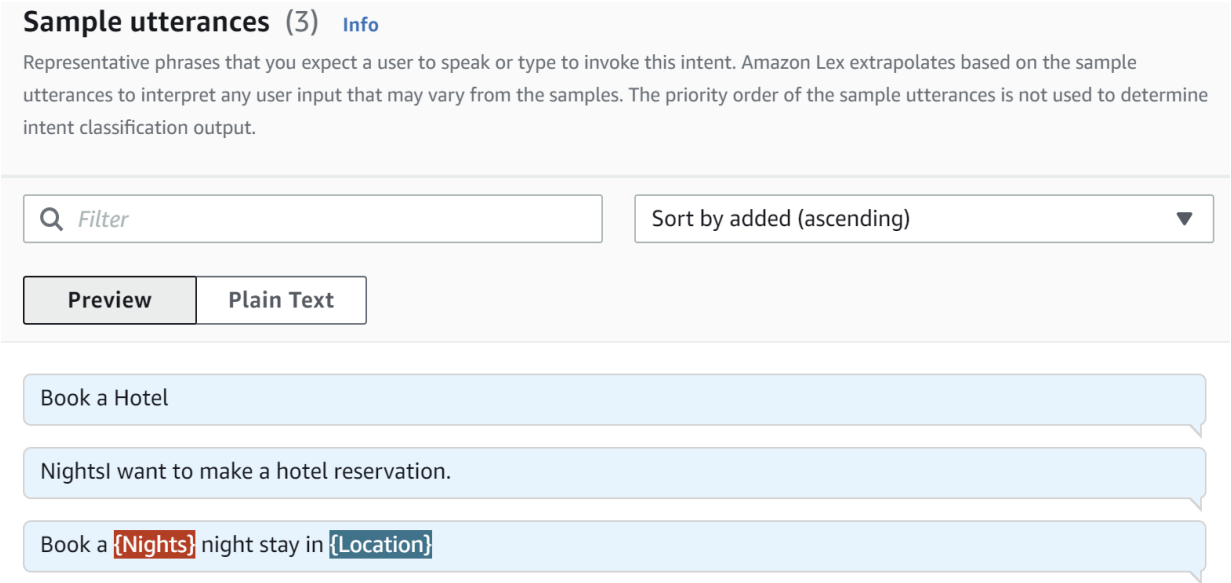

Figure-5.1 Representative Phrases

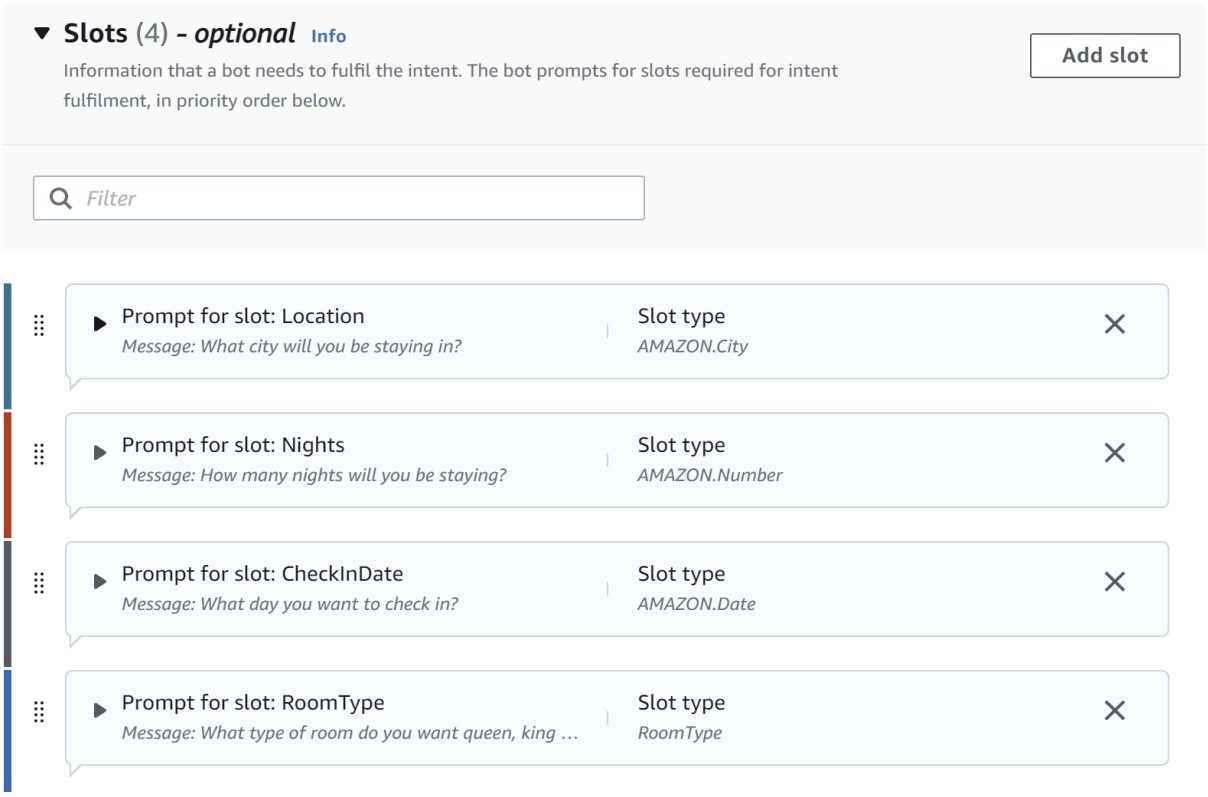

Figure-5.2 Slots (Information that a bot needs to fulfill the intents)

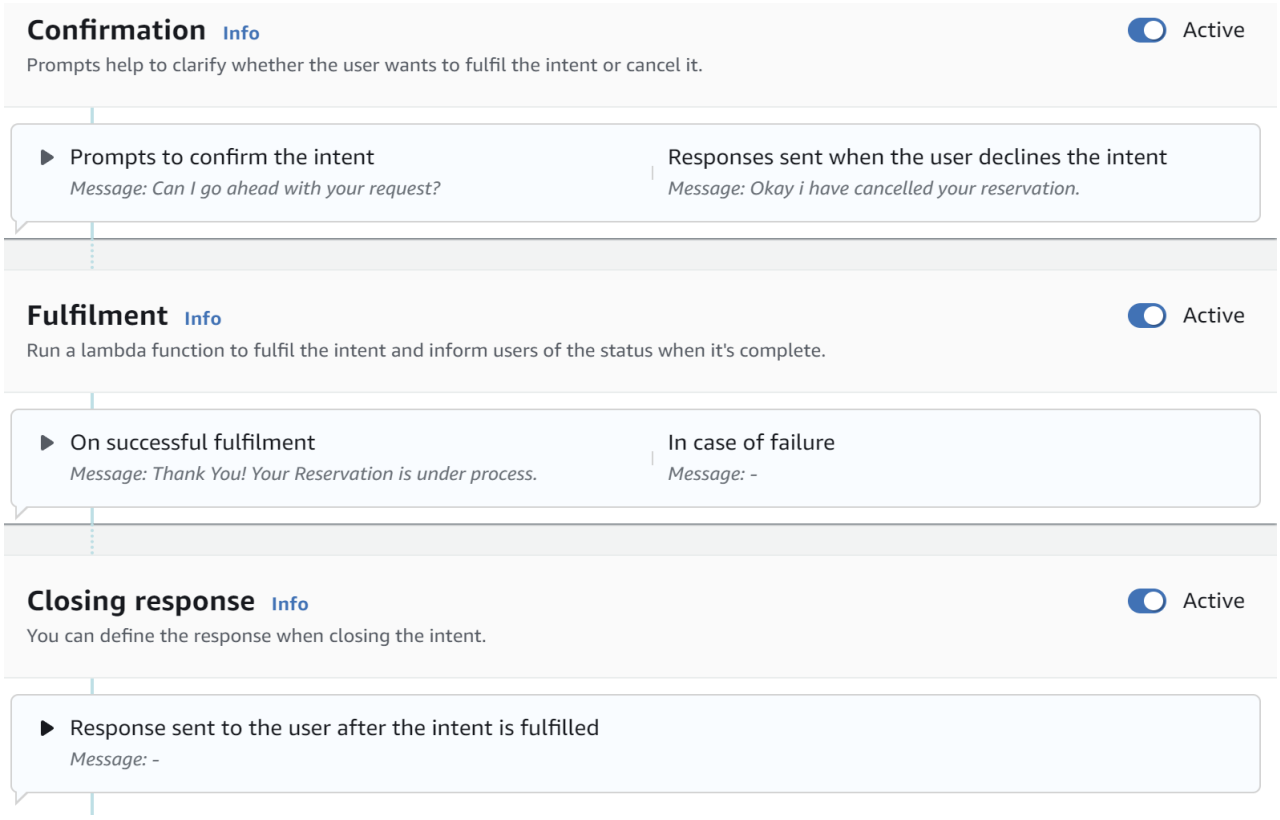

Figure-5.3 Confirmation, Fulfilment and Closing Response

Internship Activities

5.5 Onboarding and Orientation

- **Introduction to the Team:** Meet with mentors, team members, and other interns to understand the project's scope and team dynamics.
- **Company Tools and Processes:** Get familiar with the tools, platforms, and workflows used within the company.

5.6 Training and Workshops

- **Technical Training:** Attend workshops and training sessions on specific AI/ML topics, tools, and methodologies.
- **Soft Skills Workshops:** Participate in sessions focusing on communication, project management, and teamwork.

5.7 Project Work

- **Research and Design:** Conduct research to understand project requirements and design the approach for implementing AI/ML solutions.
- **Implementation:** Write code, develop models, and integrate them into the project. For a chatbot, this might include NLP model training, dialogue flow design, and system integration.
- **Testing and Evaluation:** Working of chatbot, analyse results, and iterate based on feedback and performance metrics.

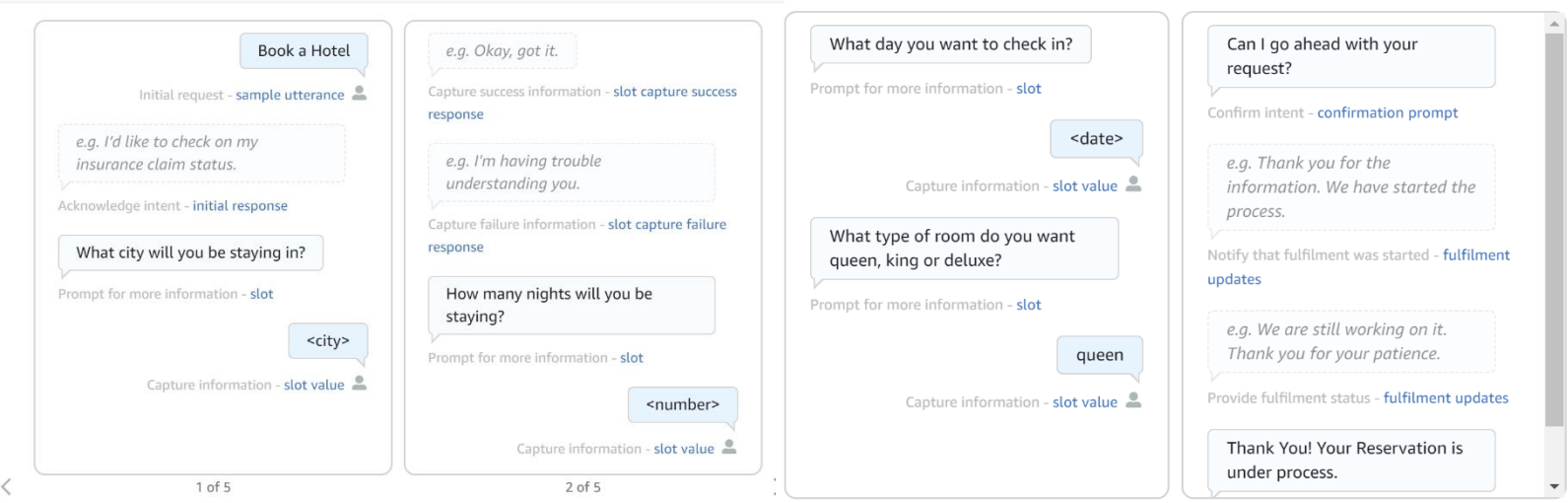

Figure-5.4 Chat Bot Conversation Flow

5.8 Code Reviews and Feedback

- **Peer Reviews:** Engage in code reviews with peers and mentors to improve code quality and learn best practices.
- **Mentor Feedback:** Receive regular feedback from mentors on project progress, challenges, and areas for improvement.

5.9 Documentation and Reporting

- **Technical Documentation:** Prepare documentation for code, models, and algorithms, including explanations of methodologies and results.
- **Final Report/Presentation:** Create a final report or presentation summarizing your internship experience, project outcomes, and key learnings.

Results & Discussion

Results:

6.1 Understanding of AI/ML Fundamentals:

- **Knowledge Acquisition:** Developed a strong foundational understanding of AI/ML principles. This included core concepts such as supervised and unsupervised learning, key algorithms, and their applications. The learning process involved theoretical study complemented by practical exercises.
- **Skill Proficiency:** Gained proficiency in implementing fundamental algorithms such as linear regression, logistic regression, k-means clustering, and decision trees. Successfully applied these models to real datasets to evaluate their performance.

6.2 Chatbot Development:

- **Functionality:** Built and deployed a functional chatbot capable of understanding and responding to user inputs.
- **Performance:** The chatbot demonstrated effective communication abilities, providing relevant responses.

6.3 Project Implementation and Results:

- **Model Training and Evaluation:** Successfully trained and evaluated multiple AI/ML models, achieving results that met or exceeded project objectives. Performance metrics such as accuracy, were used to gauge model effectiveness.
- **Insights and Optimization:** Identified key insights from data analysis and model evaluation, leading to iterative improvements and optimization of models. Achieved enhanced performance and robustness in the deployed solutions.

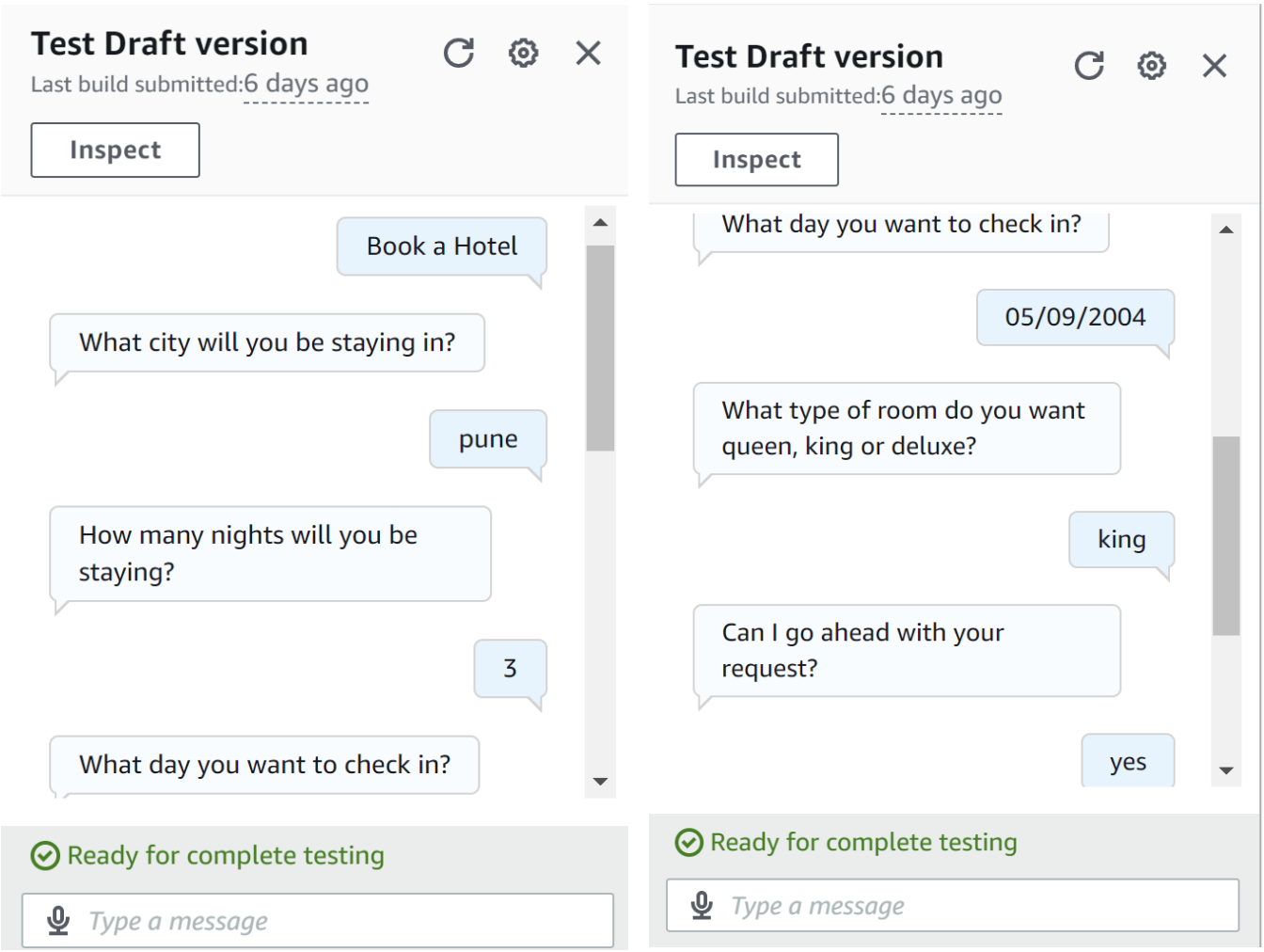

Figure-6.1 Hotel Booking Chat Bot

Discussion

6.4 Integration of Theory and Practice:

- This really availed the opportunity for the integration of theory with practice. This transition from classroom learning to real-world application showed practically that, without practical experience, theoretical knowledge alone would not have an adequate understanding and solution for complex problems arising in AI/ML.
- One of the challenges was striking a balance between theoretical knowledge and practical implementation. Of course, model optimization and integration of multiple technologies have been areas where this challenge was highly prevalent. These were attended to through iterative testing, feedback, and use of problem-solving skills in refining models and solutions.

6.5 Effectiveness of Chatbot Development:

- It made use of AWS Lex Services in developing a chatbot that provided efficient and engaging user interactions. While the chatbot did try very hard, a lot still can be improved with respect to contextual understanding and multilingual support.

6.6 Impact on Career Development:

- This internship experience has been associated with significant skill development, technical and soft. Enhanced expertise in AI/ML techniques, coding, and project management will be extremely instrumental in further career prospects and professional growth.
- It exposed me to live projects and got me a feel of the working of an accomplished team that helped me understand better the exact practices and expectations of the industry. This experience has made me have a clearer vision of the career goals and areas for further development.

6.7 Reflections and Lessons Learned:

- This has created an impression on me that iterative improvement and learning is important. Continual readjustment of the approaches in the light of feedback and results will be the key to optimum outcome attainment in AI/ML projects.
- Communication and teaming are critical elements of project delivery. There was a better understanding from the team members and other stakeholders that was gathered, and it made for a more unified and efficient working platform.

Skill Development

7.1 Technical Skills

- AI/ML Fundamentals:

  Gained a comprehensive grasp of core AI/ML principles, including supervised and unsupervised learning. Acquired knowledge of various algorithms such as linear regression, logistic regression, decision trees, k-means clustering, etc.

- Python Libraries:

  Improved proficiency with libraries such as NumPy and pandas for data manipulation.

  Gained experience with Scikit-learn for building and evaluating models.

- Supervised and Unsupervised Learning:

  Developed skills in training classification and regression models. Learned to evaluate model performance.

  Mastered techniques for clustering. Improved ability to analyse and interpret data patterns through unsupervised learning models.

- Chatbot Development:

  Gained practical experience with chatbot frameworks using AWS Services and Python code.

7.2 Practical Skills

- Project Implementation:

  Developed skills in implementing AI/ML models from conception through deployment.

  Enhanced coding skills through practical exercises and real-world projects.

- Tool Proficiency:

  Gained experience using VS Code Notebook in inscribing AWS CLI.

7.3 Analytical Skills

- Problem Solving:

  Applied algorithms to solve specific problems and improve model performance.

- Evaluation Techniques:

  Developed skills in evaluating and refining models based on performance metrics and results.

7.4 Soft Skills

- Presentation Skills: Improved ability to present technical work clearly and effectively.
- Feedback: Learned to incorporate feedback constructively to improve project outcomes.
- Teamwork: Gained experience working in a team environment, contributing to group discussions and supporting team goals.
- Task Prioritization: Developed skills in managing multiple tasks and meeting deadlines efficiently.
- Project Planning: Improved ability to plan and execute projects within the given timeframe.

7.5 Continuous Learning

- Up-to-Date Knowledge: Stayed informed about the latest trends and advancements in AI/ML.
- Future Learning Paths: Identified areas for further learning and specialization based on internship experiences.

Future work & Conclusion

8.1 Advanced AI/ML Techniques:

- **Deep Learning:** Explore advanced deep learning models such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to tackle more complex problems and improve performance in areas such as image and speech recognition.
- **Reinforcement Learning:** Investigate reinforcement learning algorithms to develop systems that can learn optimal actions through trial and error, applicable to areas like robotics and game AI.

8.2 Model Optimization and Scalability

- **Hyperparameter Tuning:** Experiment with hyperparameter optimization techniques to enhance model performance and accuracy.
- **Scalability:** Work on optimizing models and systems to handle larger datasets and more extensive user interactions efficiently.

8.3 Real-World Applications:

- **Industry Projects:** Apply the knowledge gained from the internship to real-world industry projects, possibly focusing on areas such as healthcare, finance, or e-commerce.
- **Cross-Disciplinary Integration:** Explore opportunities to integrate AI/ML with other fields such as IoT, cybersecurity, or biotechnology for innovative solutions.

Conclusion:

The internship at Yama Technologies Pvt. Ltd. provided a transformative experience, bridging the gap between theoretical knowledge and practical application in the field of AI/ML. Over the course of the internship, I developed a robust understanding of fundamental concepts, hands-on skills in model building, and proficiency with essential tools and libraries.

Mastered AI/ML core concepts related to supervised and unsupervised learning models, with hands-on experience in developing and deploying a functional chatbot and high-level Python coding using key libraries. Built models, applied key techniques, and managed real-world projects to strengthen technical and analytic competencies. Enhanced communication, teaming, and time management skills to contribute to the development of well-rounded professionals.

This internship has brought me enormous career clarity regarding the choice of areas of interest within AI/ML and spotting areas where further development of skills and knowledge is required. Practical experience gained has boosted my confidence and armed me with the wherewithal to take on complex problems and pursue advanced studies or career avenues in AI/ML.

I am very grateful to have had the opportunity to work with such a talented team and be exposed to quite cutting-edge technologies. The experience has been very rich, with many insights into the practical application of AI/ML and how collaborative tech projects are. In particular, I would like to acknowledge the great guidance and support my supervisor and colleagues gave me, thus helping me to grow and learn a lot.

Looking ahead, I get pretty excited to build off that base from this internship. I am committed to pursuing advanced techniques, exploring new applications, and seeking to develop myself professionally in some meaningful contribution in the field of AI/ML and leverage learned skills and knowledge in pushing innovation to solve real-world problems.

References

https://developers.google.com/machine-learning/resources/ml-ai-basics

https://learn.microsoft.com/en-us/training/modules/fundamentals-machine-learning/

https://aws.amazon.com/training/learn-about/machine-learning/

https://www.geeksforgeeks.org/machine-learning/

https://docs.aws.amazon.com/lex/

https://docs.aws.amazon.com/lambda/