Capstone Project Summary

Enhancing Customer Support through Sentiment Analysis

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Overview

This capstone project aimed to automate the sentiment analysis of customer support tickets to improve efficiency and consistency in ticket prioritization. By utilizing AWS Comprehend, a powerful natural language processing (NLP) service, the project developed a system to accurately analyze the sentiment of customer support tickets. This automation allows for more effective prioritization of urgent matters while reducing bias in manual assessments.

Work Done

The project involved several key steps:

- Data Generation and Preparation: Various tools and models, including Groq, Mostly AI, Tonic AI, Mockaroo, OpenAI, and Hugging Face, were used to generate and prepare a robust dataset. The GPT-40 model ultimately provided the most suitable data. The dataset was cleaned and adjusted to ensure quality and relevance, including generating unique customer names, adjusting issue descriptions, and modifying date and phone number fields. Specific challenges included dealing with inconsistent data generation from Groq (LLaMA3 70B and Mixtral-8x7B) and OpenAI (GPT-3.5 Turbo), and ensuring unique and realistic data with Mostly AI and Mockaroo.
- 2. Sentiment Analysis Implementation: Using AWS Comprehend, sentiment analysis was conducted on the dataset. An AWS account and S3 bucket were set up to store and manage the data. The cleaned dataset was uploaded to the S3 bucket, and AWS Comprehend was used to analyze the sentiment of each customer support ticket. The results were then stored back in the S3 bucket. This step included setting up the AWS environment, configuring access permissions, and using Boto3 for seamless integration.
- 3. Integration with Jira: A Jira instance was created, and custom fields were set up to match the data requirements. The dataset was uploaded to Jira using API requests, ensuring all fields were correctly mapped and populated. The data was retrieved from Jira to verify

successful upload and accessibility for further analysis. This involved creating API tokens, setting up custom fields, and using Postman for API testing.

4. **Visualization and Analysis**: Interactive plots were created using Plotly to visualize the sentiment analysis results. Key findings included the distribution of sentiment, sentiment by priority, product, and status. An interactive dashboard was created within Jira using add-ons, allowing for dynamic analysis of the data. These visualizations provided insights into how different products and priorities correlated with sentiment scores.

Benefits to the Client

The client received an automated pipeline for sentiment analysis, integrated with Jira for better prioritization of support tickets. This automation allows for more effective handling of urgent issues, improving overall customer support services. Additionally, the created dashboard within Jira provides an accessible way to analyze sentiment data, helping the client identify trends and areas for improvement.

Key Outcomes

- 1. **Automated Sentiment Analysis**: The system accurately and consistently analyzes the sentiment of customer support tickets.
- 2. **Improved Prioritization**: Automated sentiment scores help prioritize urgent issues more effectively. Another approach would be prioritizing tickets using Priority alongside Sentiment and Sentiment Score fields.
- 3. **Improved Data Analysis**: The interactive dashboard within Jira provides valuable insights into sentiment trends and ticket status.
- 4. **Robust Data Generation**: The project explored various tools for data generation, ultimately selecting GPT-4o for its quality and consistency, ensuring a realistic dataset for analysis.
- 5. **Successful Integration with Jira**: The integration process ensured seamless data flow between the sentiment analysis system and Jira, facilitating real-time updates and accessibility.

Learning Experience

Throughout this project, several valuable lessons were learned:

1. **Expanding AI Skills**: More AI aspects were added to the project than initially planned. Working with large language models (LLMs) both locally and on the cloud, as well as using various APIs, significantly expanded my AI skills.

- 2. **Jira Integration**: The project involved extensive work with Jira, including creating custom fields, uploading data via API, and developing dashboards using add-ons. This improved my understanding of Jira's capabilities and integration techniques.
- 3. **AWS Skills**: Setting up and using AWS services for sentiment analysis and data storage sharpened my AWS skills, particularly in using IAM, S3 and Comprehend.
- 4. **Adversarial Training**: The knowledge about adversarial attacks and defense mechanisms is theoretical and was not implemented in our case due to being outside the project's scope. However, it was a valuable learning experience.
- 5. **Tool Limitations and Adaptations**: Understanding the limitations of various data generation tools and adapting the approach accordingly was essential. This included dealing with issues in data generation from tools like Groq, OpenAI, and Mostly AI.

Recommendations

By following these recommendations, the company can continue to utilize data-driven insights to improve customer service, augment issue resolution times, and ultimately increase customer satisfaction.

- 1. **Continual Data Monitoring and Analysis**: To maintain the effectiveness of the sentiment analysis and issue prioritization, it is essential to continuously monitor and analyze new data. Regular updates to the sentiment analysis model with fresh data will ensure its accuracy and relevance over time.
- 2. Advanced Visualization Tools: While the add-ons significantly improved Jira's visualization capabilities, exploring other advanced visualization tools or integrating Jira with business intelligence platforms like Tableau or Power BI could provide even deeper insights and more customization options.
- 3. **Customer Feedback Loop**: Implement a feedback loop where customers can rate the resolution of their issues. This additional feedback can help further refine the sentiment analysis model and improve customer satisfaction by addressing any unresolved concerns.
- 4. Adversarial Attack Mitigation: To protect the sentiment analysis model from adversarial attacks, consider implementing robust pre-processing steps and continuous monitoring for unusual patterns in the data. Training the model with adversarial examples can also help in making it more resilient to manipulation.