

**Master Thesis Proposal**

**Customer support using Al technologies**

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**Abstract**

This project proposes the implementation of an AI-powered system to significantly enhance the customer support experience by improving response times and increasing customer satisfaction while reducing the manual handling of routine inquiries. The initiative will be executed in five strategic phases: **Requirement Gathering, Data Preparation and Model Development, System Integration, Deployment, and Evaluation**.

Key outcomes include a reduction in response times and the automation of routine inquiries, resulting in an increase in customer satisfaction scores. The AI system will automate responses, efficiently categorize support tickets and transforming customer support into a more streamlined and satisfying experience. This project aims to set a new standard in customer support efficiency and effectiveness by leveraging advanced AI technologies.

**Introduction**

Today's customer service landscape is rapidly evolving, with Artificial Intelligence (AI) at the heart of this transformation. As businesses expand, they often find themselves grappling with an increasing volume of customer inquiries. Traditional support systems like Customer Relationship Management (CRM) can falter under this pressure, leading to slower response times and a decline in the quality of service. Such shortcomings can significantly dampen customer satisfaction.

However, the integration of AI into the customer support systems is not merely a remedy for efficiency; it's a gateway to redefining customer interactions. By harnessing AI, organizations have the opportunity to not only streamline their processes but also to add a layer of personal touch to their communications, fundamentally enhancing the overall customer experience AI, particularly in the context of CRM, leverages machine learning (ML) and deep learning (DL) methods to extract insights from data, identify patterns, and make decisions with minimal human oversight (Kumar et al., 2020).

Also, the modern language generation model ChatGPT, created by Open Artificial Intelligence (AI), with the ability to “generate human-like text” (Aydın & Karaarslan, 2022) is recognized for its capacity to comprehend context and produce pertinent content. This model is built on the transformer architecture, which enables it to process massive volumes of data and produce text that is both cohesive and illuminating. Service is a crucial component everywhere as it provides the basis for establishing client rapport and offering aid and support.

Businesses may enhance customer experience by using ChatGPT's potential for assistance in any sector. The application of ChatGPT for customer support has been one of the most significant advances in recent years. This strategic adoption of AI technologies paves the way for more responsive, intuitive, and personalized service, transforming how businesses connect with their customers.

**Problem Definition**

One of the persistent challenges in Customer Relationship Management (CRM) is providing personalized, timely responses to customer inquiries. Traditionally, CRM systems have been effective in managing customer data but often fall short in delivering real-time, context-aware interactions. This can lead to customer dissatisfaction, as modern consumers expect quick and tailored services based on their previous interactions and preferences.

Many organizations struggle with integrating their CRM systems across various departments. This often results in data silos where valuable customer information is trapped in one part of the business and inaccessible to others, hindering effective communication and service delivery (Ngelyaratan & Soediantono, 2022).

Scalability Issues, as businesses grow, the volume of customer interactions increases exponentially. Traditional CRM systems may not scale efficiently, leading to slower system performances and increased waiting times for customers.

AI technologies, particularly those using machine learning algorithms, can analyze vast amounts of data from CRM systems to identify patterns and preferences of individual customers. ChatGPT can leverage this data to generate personalized responses automatically, ensuring that each customer feels understood and valued. This not only improves the customer experience but also enhances customer loyalty and retention (Libai et al., 2020)

Real-Time Response and Interaction, by Chat Generative Pre-Trained Transformer (ChatGPT) can process and respond to customer queries in real time, significantly reducing waiting times. With its advanced natural language processing capabilities, it can understand and engage in human-like conversations, providing immediate and relevant assistance to customers. This capability is crucial for maintaining high customer satisfaction levels in a fast-paced market environment (J. Paul, A. Ueno, C. Dennis, 2023)

ChatGPT can be integrated into existing CRM systems to bridge the gap between data silos within an organization. It can pull information from various sources to provide a comprehensive view of the customer, which is accessible to all relevant departments. This holistic approach ensures that all interactions with a customer are informed and consistent across all touchpoints (A.S. George, A.H. George, 2023).

AI-driven solutions like ChatGPT are highly scalable, capable of handling an increasing number of interactions without additional significant resources. This makes it an ideal solution for growing businesses that need to manage large volumes of customer interactions efficiently. Moreover, the automation of routine inquiries frees human agents to handle more complex issues, enhancing overall productivity and service quality. By addressing these core CRM issues effectively, AI and ChatGPT not only streamline customer relationship management processes but also transform them into more customer-centric systems that can adapt and evolve in response to changing customer needs (Abid Haleem, Mohd Javaid, Ravi Pratap Singh, 2024)

**Dataset**

This section describes a collection of public datasets in different literature and resources that are used in the field of Customer support. Some resources have also used data collected from CRMS of various sectors.

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| --- | --- | --- | --- | --- |
| **Dataset Name** | **Link** | **Domain** | **Size & Samples** | **Description** |
| Telecom Agent Customer Interaction Text | [**https://shorturl.at/pfmcy**](https://shorturl.at/pfmcy) | Public domain - Telecom | 10.25 kB | This dataset includes customer interactions with support representatives, covering various issues. |
| Customer Support Ticket Dataset | [**https://shorturl.at/fIwfp**](https://shorturl.at/fIwfp) | Public domain - Tech products | 3.95 MB | Tickets for various tech products. It consists of customer inquiries related to hardware issues, software bugs, network problems, account access, data loss |
| Bank and Credit Card Complaints | [**https://shorturl.at/LjXBZ**](https://shorturl.at/LjXBZ) | Public domain - finance, banking | 65.47 MB | This dataset includes customer complaints in the banking sector, covering issues such as account management, transactions, and bank services. |
| Ecommerce Customer Data | [**https://shorturl.at/T4lUR**](https://shorturl.at/T4lUR) | Public domain - Ecommerce platform | 53.38 kB | This dataset contains customer reviews and ratings for various products and services in the e-commerce industry. |

**Related Work**

The application of AI in customer support has seen significant advancements in recent years, with numerous studies highlighting its impact on efficiency and user satisfaction.

AI in Customer Support Systems and AI-Driven Chatbots: Recent advancements in AI-driven chatbots have greatly enhanced their capabilities in customer support. (Luo et al., 2021) discuss how modern chatbots leverage deep learning and reinforcement learning to provide more accurate and context-aware responses, significantly improving customer interactions.

Machine Learning for Ticket Classification: The use of machine learning for automatic ticket classification has become more sophisticated, improving the efficiency of customer support systems. (Ghosh et al., 2020) presents a methodology using Bidirectional Encoder Representations from Transformers (BERT) for classifying customer support tickets, resulting in higher accuracy and faster processing times.

Sentiment Analysis for Customer Feedback: Sentiment analysis has seen enhanced accuracy with the application of deep learning techniques. (Zhang et al., 2021) demonstrate how BERT-based models can provide more nuanced insights into customer sentiment, aiding in better understanding and addressing customer concerns.

AI for Predictive Customer Support: Predictive analytics in customer support has benefited from AI advancements, enabling proactive issue resolution. (Huang et al., 2020) explore how AI models can predict customer issues before they arise, allowing support teams to take preemptive actions.

Voice Assistants in Customer Support: The integration of AI-powered voice assistants into customer support has seen significant growth. (Kumar et al., 2020) investigates the use of AI voice assistants in customer interactions, highlighting their potential to improve accessibility and user satisfaction.

AI for Customer Service Personalization: Personalizing customer service interactions is another area where AI has made significant strides. (Rzepka and Berger, 2021) discuss how AI can analyze customer data to tailor responses and recommendations, enhancing the customer experience through personalized support.

AI for Multilingual Support: Providing multilingual support is crucial for global businesses. (Costa-Jussa et al., 2020) highlight the advancements in AI translation models that allow customer support systems to interact with customers in their native languages, reducing the language barrier and improving customer satisfaction.

AI for Anomaly Detection in Customer Support: Detecting anomalies in customer support interactions can help preemptively identify and resolve issues. (Chen et al., 2020) discuss the use of AI for anomaly detection, which can highlight unusual patterns in customer behavior or support interactions, allowing for timely interventions.

The integration of AI into customer support systems has been extensively studied, with numerous applications demonstrating significant improvements and by building on these advancements, the proposed AI-powered system aims to further enhance customer support experiences by reducing response times, automating routine inquiries, and delivering personalized interactions.

**Related Work Summary**

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| **References** | **Focus Area** | **Datatype** | **Training Model** | **Accuracy** | **Dataset** | **Key Contributions** |
| (Luo et al., 2021) | AI-Driven Chatbots | Text | Deep Learning, Reinforcement Learning | Not specified | Proprietary dataset | Discusses the use of deep learning and reinforcement learning to provide context-aware responses, enhancing customer interactions. |
| (Ghosh et al., 2020) | Ticket Classification | Text | BERT | 92% | Proprietary dataset | Presents a methodology using BERT for classifying customer support tickets, resulting in higher accuracy and faster processing times. |
| (Zhang et al., 2021) | Sentiment Analysis | Text | BERT | 91% | Customer feedback dataset | Demonstrates how BERT-based models provide nuanced insights into customer sentiment, aiding in better understanding and addressing customer concerns. |
| (Huang et al., 2020) | Predictive Customer Support | Mixed (text, logs) | Various AI models | Not specified | Proprietary dataset | Explores how AI models can predict customer issues before they arise, enabling proactive issue resolution by support teams. |
| (Kumar et al., 2020) | Voice Assistants | Audio | AI voice models | Not specified | Proprietary dataset | Investigates the use of AI-powered voice assistants in customer interactions, highlighting their potential to improve accessibility and user satisfaction. |
| (Rzepka and Berger, 2021) | Customer Service Personalization | Text, user data | Various AI models | Not specified | Proprietary dataset | Discusses how AI can analyze customer data to tailor responses and recommendations, enhancing the customer experience through personalized support. |
| (Costa-Jussa et al., 2020) | Multilingual Support | Text | AI translation models | 95% | Proprietary dataset | Highlights advancements in AI translation models that enable customer support systems to interact with customers in their native languages. |
| (Chen et al., 2020) | Anomaly Detection | Mixed (text, logs) | Anomaly detection algorithms | 93% | Proprietary dataset | Discusses the use of AI for anomaly detection, which can identify unusual patterns in customer behavior or support interactions, allowing timely interventions. |

**Research Objective**

The objective of this research is to develop and evaluate an advanced AI-powered customer support system that leverages state-of-the-art machine learning techniques to enhance user satisfaction and operational efficiency. Specifically, the research can contribute to one or more of the following objectives:

**Reduce Response Times:**

Implement AI-driven chatbots using deep learning and reinforcement learning to provide prompt and context-aware responses to customer inquiries.

**Automate Routine Inquiries:**

Utilize machine learning models such as BERT for the automatic classification and resolution of common customer support tickets, thereby minimizing the need for human intervention.

**Improve Sentiment Analysis:**

Apply advanced sentiment analysis models to extract nuanced insights from customer feedback, helping support teams better understand and address customer concerns.

**Enable Predictive Support:**

Integrate predictive analytics to anticipate and resolve potential customer issues before they escalate, allowing for proactive customer support.

**Enhance Multilingual Support:**

Incorporate AI translation models to facilitate seamless customer interactions in multiple languages, thereby improving the accessibility and inclusivity of the support system.

**Integrate Voice Assistants:**

Explore the use of AI-powered voice assistants to handle customer support interactions, making the support system more accessible and user-friendly.

**Detect Anomalies in Customer Behavior:**

Implement anomaly detection algorithms to identify unusual patterns in customer behavior or support interactions, enabling timely interventions and issue resolution.

By achieving these objectives, the proposed AI-powered customer support system aims to significantly improve the overall customer support experience, ensuring quicker, more accurate, and personalized responses to customer inquiries.

**Research Plan**

**Phase 1: Literature Review and Requirements Analysis**

**Literature Review:**

Conduct a comprehensive review of existing literature on AI applications in customer support, focusing on key areas such as chatbots, ticket classification, sentiment analysis, predictive support, personalization, multilingual support, voice assistants, and anomaly detection.

**Requirements Analysis:**

Gather and analyze requirements from our stakeholder, including customer support teams and end-users, to identify critical features and performance metrics for the AI-powered system.

**Phase 2: Data Collection and Preprocessing**

**Data Collection:**

Collect a diverse dataset comprising customer support interactions, including text-based tickets, chat logs and customer feedback from various sources.

**Data Preprocessing:**

Clean and preprocess the collected data to ensure quality and consistency. This may include text normalization and anonymization to protect user privacy.

**Phase 3: Model Development**

**Chatbot Development:**

Develop AI-driven chatbots using deep learning and reinforcement learning techniques to handle customer inquiries. Train the chatbots on the preprocessed dataset to provide accurate and context-aware responses.

**Ticket Classification:**

Implement BERT-based models for automatic ticket classification. Fine-tune the models on the collected ticket dataset to achieve high accuracy and efficiency.

**Predictive Analytics:**

Create predictive models to foresee potential customer issues. Utilize historical support data to train the models and validate their predictive capabilities.

**Multilingual Support:**

Integrate AI translation models to facilitate multilingual customer interactions. Train the models on a multilingual dataset to ensure accurate and fluent translations.

**Anomaly Detection:**

Implement anomaly detection algorithms to identify unusual patterns in customer behavior or support interactions. Train and validate the models on a mixed dataset of text, logs, and other relevant data.

**Phase 4: System Integration and Testing**

**System Integration:**

Integrate the developed models and algorithms into a cohesive AI-powered customer support system. Ensure seamless interaction between various components.

**Testing and Validation:**

Conduct rigorous testing of the integrated system. Evaluate performance metrics such as response time, accuracy, user satisfaction, and system reliability. Perform user acceptance testing (UAT) with real-world scenarios.

**Phase 5: Deployment and Evaluation**

**Deployment:**

Deploy the AI-powered customer support system in a live environment. Monitor the system's performance and address any initial issues that arise.

**Evaluation:**

Continuously evaluate the system's performance against established metrics. Gather feedback from users and stakeholders to identify areas for improvement.

**Phase 6: Documentation and Reporting**

**Documentation:**

Document the entire research process, including methodologies, model architectures, data preprocessing steps, and integration details. Ensure comprehensive documentation for future reference and replication.

**Reporting:**

Prepare detailed reports and presentations on the research findings, system performance, and user feedback. Share the results with the stakeholder and the broader research community.

By following this research plan, the project aims to develop a sophisticated AI-powered customer support system that significantly enhances user satisfaction and operational efficiency.

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