



ITESM Campus Monterrey

# **Proof of Concept: Enhancing Customer Service with Natural Language Processing (NLP)**

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# Introduction

In today's fast-paced digital environment, large enterprises face significant challenges in providing efficient and accurate customer service. Automated systems often struggle with ambiguous language in customer queries, and although many systems currently integrate predetermined button answers, these rarely satisfy the needs of users, leading to incorrect responses, no possibility of resolving their doubts, and decreased customer satisfaction.

This Proof of Concept (PoC) aims to demonstrate how advanced Natural Language Processing (NLP) techniques—specifically word sense disambiguation and text summarization—can be integrated into customer service systems to enhance their performance and accuracy.

The proposed solution involves implementing a word sense disambiguation (WSD) module to accurately interpret the meaning of ambiguous terms in customer queries. Additionally, a text summarization feature will be integrated to condense lengthy customer communications into concise summaries, enabling quicker and more effective responses. These enhancements will be integrated into the existing customer service platform.

By adopting these NLP techniques, the enterprise can expect a significant improvement in response accuracy, leading to a reduction in the number of incorrect responses. This will not only enhance customer satisfaction but also reduce the workload on human agents, thereby improving overall operational efficiency.

This PoC makes a strong case for the integration of advanced NLP techniques in customer service, offering a pathway for enterprises to improve customer interactions and maintain a competitive edge in the market. The successful implementation of this concept could pave the way for further innovations in automated customer service solutions.

## **Business Problem**

Since the 2020 pandemic, as more services have shifted online, customer service has increasingly relied on digital solutions. From forums to quick-answer links, companies now offer a variety of ways to resolve customer issues online. The most innovative of these solutions, driven by advances in AI, are virtual assistants that ‘chat’ with users in real-time, attempting to simulate human conversation to clear up doubts.

However, the main issue with these virtual assistants is their general ineffectiveness. Users often find themselves more frustrated after interacting with a chatbot, ultimately preferring to speak with a human representative. “Research has shown that despite the benefits of convenience and 24/7 availability, consumers remain skeptical about engaging with chatbots, often perceiving them as less effective compared to human agents (Xu et al., 2022).” This raises critical concerns: while a virtual assistant may be less costly than hiring more human agents, the process from setup to implementation is not simple or inexpensive. Moreover, ongoing operational costs, potential security concerns, and the risk of delivering a poor customer experience make it difficult to justify the investment. If users end up frustrated and seeking human assistance, then the chatbot fails to benefit either the customer or the company, leading to the question: what’s the point?

# Proposed Solution

To address the challenges associated with virtual assistants in customer service, this PoC proposes the implementation of advanced NLP techniques to enhance the effectiveness and user satisfaction of these systems. The primary focus is on integrating WSD and text summarization features into the existing chatbot framework.

## 1. Word Sense Disambiguation (WSD):

The first step in improving chatbot interactions is the implementation of a WSD module. This module aims to accurately interpret the meaning of ambiguous terms in customer queries, which is a common source of frustration for users. By applying WSD, the chatbot will be able to distinguish between different meanings of the same word based on the context, ensuring that the responses it generates are relevant and accurate. This technique is particularly valuable in handling queries that involve homonyms or context-dependent terminology, which are frequent in customer service scenarios.

## 2. Text Summarization:

In addition to improving the accuracy of responses, this PoC suggests the integration of a text summarization feature. This component will condense lengthy customer communications into concise summaries that can be quickly processed by the system or human agents. Text summarization will streamline the handling of complex queries and ensure that essential information is retained, improving response times and reducing the cognitive load on both the system and the user.

## 3. Integration with Existing Systems:

Both WSD and text summarization will be integrated into the company's existing chatbot platform. The integration process will involve:

- **Data Collection and Preprocessing:** Gathering relevant customer interaction data and preparing it for analysis.
- **Implementation of WSD and Summarization Modules:** Developing and deploying these modules within the current chatbot architecture.
- **Testing and Optimization:** Conducting thorough testing to ensure that the enhancements perform as expected and optimizing the system based on feedback and performance metrics.

## **Expected Outcomes**

There are several expected outcomes of implementing this solution:

- Overall improvement in customer satisfaction
- Increased accuracy in customer responses
- Reduced need for human intervention

There are also several performance metrics to be used to measure the performance and success of the proposed solution:

- Amount of time spent by user with chatbot
- Number of times a user ultimately ends up with a human representative
- Customer satisfaction scores (through surveys)

## Conclusion

This PoC outlines a strategic approach to overcoming the limitations of current virtual assistants in customer service. By incorporating advanced NLP techniques, the proposed solution aims to significantly enhance the accuracy and relevance of chatbot responses. These enhancements will not only reduce user frustration but also improve customer satisfaction and operational efficiency.

Implementing WSD will enable chatbots to better understand the context of ambiguous terms, ensuring more accurate responses. Meanwhile, text summarization will streamline the handling of complex queries, allowing both the system and human agents to focus on essential information. These innovations address critical issues that have historically hindered the effectiveness of virtual assistants.

As companies continue to navigate the demands of an increasingly digital customer base, this PoC presents a viable pathway to elevating customer service interactions. The successful deployment of these techniques could set a new industry standard, providing a solid return on investment and positioning enterprises for future innovations in AI-driven customer service solutions.

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