DSE 6311 – Data Science Capstone

Team Gamma

**Team Lead:** Sabri, Abdelmalek

sabria@merrimack.edu

**Reporter:** Crozier, Amber

croziera@merrimack.edu

**Spokesperson:** Canfield, Ryan

canfieldr@merrimack.edu

EVALUATING AI’s ROLE IN CUSTOMER SATISFACTION AND RETENTION

Preliminary Project Proposal

Table of Contents

[Background & Question 2](#_gjdgxs)

[Question: 2](#_30j0zll)

[Addressed Need: 2](#_1fob9te)

[Rationale: 2](#_3znysh7)

[Originality: 2](#_tyjcwt)

[Hypothesis and Prediction 2](#_3dy6vkm)

[Hypothesis: 2](#_1t3h5sf)

[Prediction: 3](#_4d34og8)

[Data & Analysis 3](#_2s8eyo1)

[Outcome Variable: 3](#_26in1rg)

[Predictor Variables: 3](#_lnxbz9)

[Pitfalls and Challenges: 3](#_1ksv4uv)

[Assessing the Answer to the Research Question: 4](#_44sinio)

[Hypothesis Validation: 4](#_2jxsxqh)

[Technical Details 4](#_z337ya)

[Coding Language: Python 4](#_3j2qqm3)

[Other Resources: 4](#_1y810tw)

[GitHub Link: 4](#_4i7ojhp)

[References 5](#_2xcytpi)

# Background & Question

## Question:

How does the overuse of artificial intelligence in customer interactions affect customer satisfaction, error rates, and cost efficiency, and at what point does it lead to negative customer sentiment and a decrease in loyalty or sales?

## Addressed Need:

This question addresses the challenge of finding a good balance between efficiency and customer satisfaction in AI-driven customer service. AI use is continually increasing within the business model specifically in addressing customer interactions. As this increase occurs, it’s important to identify when AI is beneficial to customer relationships, and when it’s harmful. This insight can guide companies in using AI effectively without risking customer loyalty or driving up costs due to customer dissatisfaction without losing the beneficial aspects of AI.

## Rationale:

This question is worth exploring because AI can offer major savings and efficiencies but relying too heavily on it may make interactions feel impersonal or ineffective which could alienate customers. Businesses can refine their approach to keep customer satisfaction high and continue to reduce errors by studying where the tipping point is between automation and human interaction. Even small adjustments to the use of AI could lead to long-term loyalty and reduce customer turnover, which can support broader business goals.

## Originality:

Many studies have looked at AI’s role in customer service but fewer have focused on identifying the exact point at which AI’s benefits are not efficient in improving the customer experience. We can obtain better insight into how much AI is appropriate and beneficial to customer interactions by finding this threshold. This would help companies set practical guidelines for AI use that genuinely enhances customer relationships.

## Hypothesis and Prediction

### Hypothesis:

While the implementation of AI in retail settings improves cost efficiency and reduces errors, excessive reliance on AI in customer service without human interaction will lead to increased frustration. This will ultimately lower customer satisfaction and retention, with a noticeable drop in loyalty once a threshold of negative sentiment is reached.

### Prediction:

Sentiment analysis of customer reviews and feedback will show a correlation between the level of AI usage and negative sentiment. Initially, moderate AI usage may improve customer satisfaction by streamlining processes and reducing errors. However, as AI overuse increases, particularly in customer service and decision-making tasks that require empathy or human nuance, customers will express frustration. This sentiment will intensify when the perceived lack of human support coincides with issues such as service errors or theft, leading to reduced sales and loyalty for companies that overly depend on AI.

# Data & Analysis

Data Source and Relevance:

The “Customer Satisfaction Response to Artificial Intelligence Tools Usage During Online Shopping” dataset has much of the data that we will need to analyze customer satisfaction and use of AI.

<https://figshare.com/articles/dataset/Customer_Satisfaction_Response_to_Artificial_Intelligence_Tools_Usage_During_Online_Shopping/24633105?file=43284342>

Key Metrics:

### Outcome Variable:

Customer Satisfaction (AI\_Satisfaction)

### Predictor Variables:

1. Demographic: Country, Generation (Age), Gender, Education, and Living\_Region
2. AI tools used: Chatbots, Virtual Assistants, Voice & Photo Search
3. Customer trust in AI: AI\_Privacy\_No\_Trust, AI\_Endorsement
4. Customers think AI improved experience (AI\_Enhance\_Experience)

Tentative Analysis Plan:

Our plan is to start with data cleaning & preparation to remove incomplete or irrelevant entries as needed. Then we will summarize the data with descriptive statistics to see trends in AI usage, demographics, and customer satisfaction. We will also use sentiment analysis and/or correlation analysis depending on availability of open-ended data, if open-ended responses are available in other data we will use sentiment analysis. We will use threshold analysis to identify the point when AI usage begins to correlate with increased negative sentiment and/or reduced satisfaction. We will also build a model to predict the likelihood of negative customer sentiment/satisfaction based on AI usage and other predictor variables.

### Pitfalls and Challenges:

One challenge is being able to interpret sentiment accurately and finding an open source dataset which has narrative data where we can analyze sentiment. Another limitation might be operationalizing the definition of “overuse” of AI to be accurate against other industry benchmarks.

## Assessing the Answer to the Research Question:

The question will be answered if we are able to see a clear relationship between AI usage levels and customer satisfaction and identifying the point where satisfaction decreases as AI usage increases.

## Hypothesis Validation:

The hypothesis will be supported if we identify that moderate AI usage positively impacts customer satisfaction and high usage correlates with negative sentiment. If there is no significant relationship between AI usage levels and satisfaction, the hypothesis can be rejected.

# Technical Details

## Coding Language: Python

## Other Resources:

If we continue with our plan to implement sentiment analysis, we will need to identify a source of open-ended narrative data about AI interactions.

## GitHub Link:

link

# References

Arora, S. (2024, August 29). *Sentiment analysis using Python*. Analytics Vidhya. https://www.analyticsvidhya.com/blog/2022/07/sentiment-analysis-using-python/

Kannan, Rathimala; Ramakrishnan, Kannan; Ersoy, Ayse Begum; Contu, Davide (2023). Customer Satisfaction Response to Artificial Intelligence Tools Usage During Online Shopping. figshare. Dataset. <https://doi.org/10.6084/m9.figshare.24633105.v1>

**Peer Review:**

1. ***Dataset(s) Chosen*–Do you agree the datasets chosen are appropriate to the question? If so, why? If not, what kind of data would you suggest they look for instead? (2+ sentences feedback)**

I believe the dataset may be useful to the question being posed but, as stated in your report, you are looking for other datasets that are more open-ended about AI. I hope you are able to find datasets that help you answer that question. Maybe looking into research papers to find data sources could be useful though, of course, not all provide open-source datasets.

1. ***Analysis Plan*– Are the analyses selected appropriate to answer their question? If so, why? If not, what other types of analyses should they be looking at instead? (4+ sentences feedback)**

I am not very familiar with sentiment analysis but it would be interesting to know which specific algorithms you would plan to use. It would also be useful to know how you plan to quantify how much AI is being used so that you can correlate it to the sentiment of the customers. Do you have plans for using the outcome and predictor variables on the dataset you currently have? It would be helpful to know how those will be used and how they will relate to the sentiment analysis you plan to do.

1. ***Novelty of Question –*Do you think the question is novel? If so, why? If not, why not and is there a different angle or approach they could take to make it more original? (2+ sentences feedback)**

The question appears to be novel from the explanation you gave and sounds interesting in my opinion. I have seen studies and articles on how AI has increased employee workload or questioning if businesses are using too much AI but I haven’t specifically seen the question asked here. I hope you find a dataset that helps you answer this question.

1. ***Concerns you have* *–* Please address any concerns you might have from their proposal: (4+ sentences feedback)**
   1. **What concerns or pitfalls do you foresee?**

The biggest concern which you have already stated yourself is finding a dataset that can answer this question. I certainly understand the difficulty in finding open-source datasets with clear explanations in where the data was derived from.

* 1. **Is the project too ambitious? Not ambitious enough?**

The project seems quite ambitious due to the difficulty with finding a suitable dataset. Though if a dataset is found, I think the project sounds interesting and suited to the project for the course.

* 1. **Do you foresee any problems in their hypotheses or predictions? Any underlying biases?**

I only foresee two potential problems with the hypotheses or predictions. These are the dataset and quantifying how much AI is being used to compare to the sentiment of customers.

* 1. **Do the authors make any critical assumptions, either about the data or their models, that they need to address?**

Aside from everything previously stated, I do not believe there are any critical assumptions.

1. ***Anything else you think will be helpful. (1+ sentences feedback)***

I think your question is very interesting and appears novel. I understand the difficulty with finding suitable open-sourced datasets and hope you can find one to suit your needs.