DSE 6311 – Data Science Capstone

Team Gamma

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EVALUATING AI’s ROLE IN CUSTOMER SATISFACTION AND RETENTION

Preliminary Project Proposal

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# 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:**

The dataset seems very fit and relevant to the purpose of this research topic. It seems like it has the right features which are relevant to the question and it is an ideal size which can be used efficiently for the project.

The analysis plan makes sense and it seems like you know where this is going. However, since the main purpose of the data science projects is to predict, what machine learning techniques will you be using to make predictions? Will it be a regression problem or a classification problem? The threshold analysis can be helpful to maybe predict at what point a customer will be dissatisfied with the AI experience.

I think the question for this project is novel. I have not read or heard of a project that researches customer satisfaction based on AI experience. However, you mentioned that this has been researched before but the novelty in it is that they have not looked at what point the satisfaction starts to become negative. I think that you could use this and predict at what point someone may be dissatisfied by AI.

My concern is about how the open-ended analysis will be incorporated into the dataset and project and if it will add or change anything about the analysis. However, I would be interested to see how that would play out and if it will change the course of the outcome. I think the project is just the right amount of ambitious and I think that this is a very hot topic in today’s world where many institutions are carrying out these types of research questions about the negative effects of AI development. So far I do not see any major problems in the hypothesis and predictions. They both seem to make sense and I am sure the data will prove their hypothesis to be correct as most people in today’s world aren’t too fond of AI playing a huge role in customer service experiences. The only bias is the knowledge that as AI grows, it poses a threat to people’s jobs and this notion can be an underlying reason for people’s dissatisfaction with AI. The authors make assumptions that AI can lead to decreases error rates but I think that sometimes the machines don’t work as well as humans do and can often make errors if they crash or glitch. Sometimes humans pay more attention to detail and cannot be replaced by AI in certain career roles. One of these roles can be customer service representatives.

In regard to interpreting sentiment, there are sentiment dictionaries in python which read in the text and apply a sentiment to it. There are different dictionaries that give different outputs but the most common ones give a ‘positive’, ‘negative’, or ‘neutral’ sentiment. This is a very fast and efficient tool if you end up dealing with text sentiment analysis. It is only one line of code.