United Airlines

Customer Calls prediction

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NSUT

United Airlines Call Center Optimization

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- **Objective**: Improve Average Handle Time (AHT) and Average Speed to Answer (AST)
- **Focus**: Enhance customer satisfaction and operational efficiency

Problem Statement

Key Metrics

- **Average Handle Time (AHT)**: Time from when the agent picks up the call to when they hang up
  - Formula: $\text{AHT} = \frac{\text{Total Handle Time}}{\text{Total Number of Calls}}$
- **Average Speed to Answer (AST)**: Time spent by the customer in queue till the agent answers the call
  - Formula: $\text{AST} = \frac{\text{Total Waiting Time}}{\text{Total Number of Calls}}$

Data Overview

Datasets Used

- **calls.csv**: Call details
- **customers.csv**: Customer information
- **reason.csv**: Call reasons
- **sentiment_statistics.csv**: Sentiment analysis
- **test.csv**: Test data for predictions

Data Analysis

Initial Data Exploration

- Loaded datasets using Pandas
- Displayed basic information about each dataset

```
Calls Dataset:
Data columns (total 7 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   call_id                  71810 non-null  int64
 1   customer_id              71810 non-null  int64
 2   agent_id                 71810 non-null  int64
 3   call_start_datetime      71810 non-null  object
 4   agent_assigned_datetime  71810 non-null  object
 5   call_end_datetime        71810 non-null  object
 6   call_transcript          71810 non-null  object
dtypes: int64(3), object(4)

Customers Dataset:
RangeIndex: 71810 entries, 0 to 71809
Data columns (total 3 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   customer_id     71810 non-null  int64
 1   customer_name   71810 non-null  object
```

Factors Contributing to Long AHT

Analysis of Call Durations

- The **Average Handle Time (AHT)** for a call is ≈ 697.05 seconds.
- The **Average Speed to Answer (AST)** for a call is ≈ 437.07 seconds .

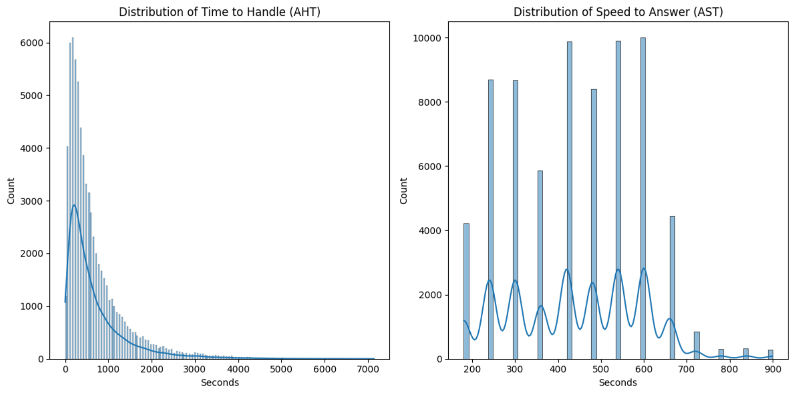
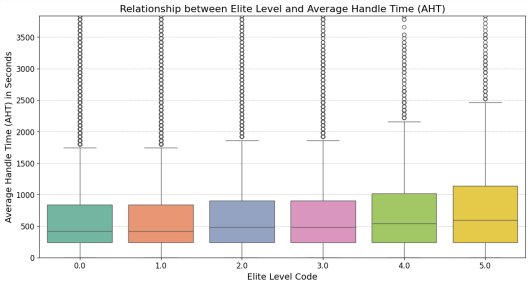


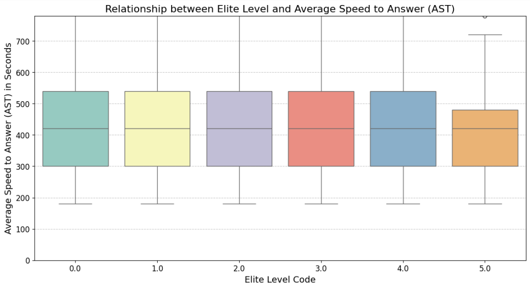
Figure 1: AHT Analysis

Analysis of Elite level of customers

Analysis of Elite level of customers

- Had discrete values (NaN were filled with zeroes) `[0, 1, 2, 3, 4, 5]`
- Note the outliers





- **Silence Percentage**: Average silence in calls is $\approx 0.29\%$

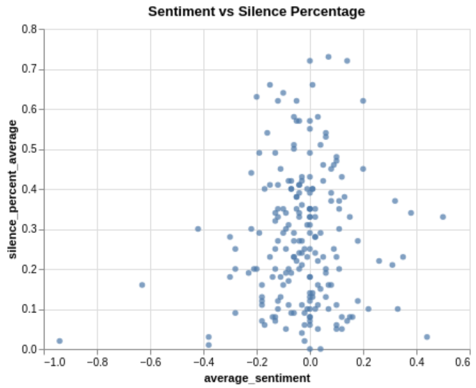
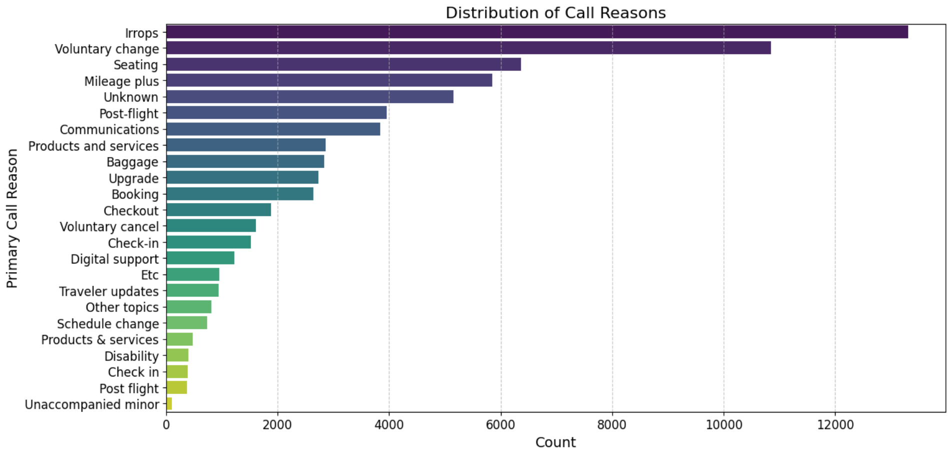


Figure 2: Silence Analysis

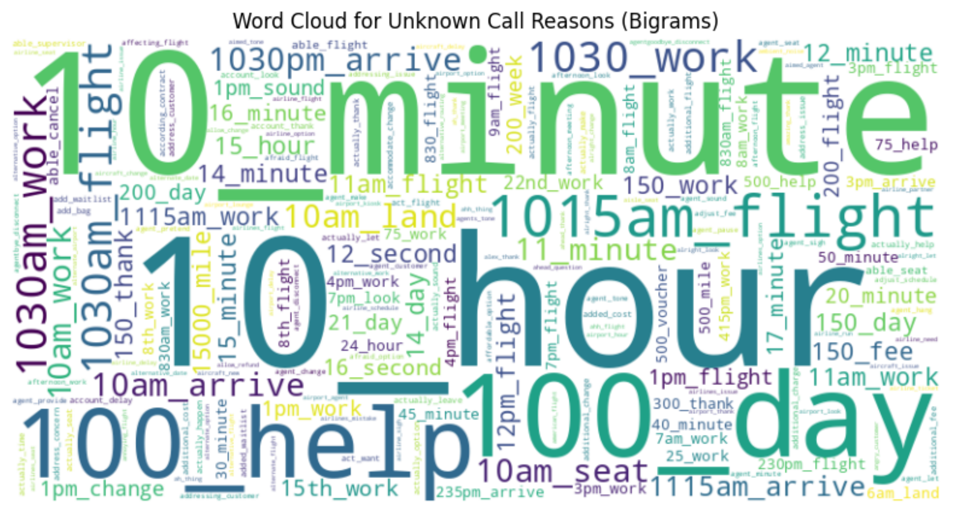
Categorizing Call Reasons

- Analyzed dataset to uncover patterns in call reasons
- Cleaned and normalized data for feature identification to categorize call reasons



Bigram Wordcloud

- Extracted and created a bigram wordcloud



Topic Modeling

- Used Latent Dirichlet Allocation (LDA) to identify topics in call transcripts

```
Topic 0:
looks like today customer youre welcome agent youre help today agent problem customer hi agent okay let pull im calling
Topic 1:
looks like understand frustration agent understand customer ugh earlier flight let know let check customer hi today customer
↪  agent youre
Topic 2:
agent youre youre welcome looks like agent problem let look san francisco customer hi today customer im calling let pull
Topic 3:
looks like understand frustration agent youre today customer im sorry travel voucher customer yeah help today let know
↪  customer service
Topic 4:
change fee looks like agent youre youre welcome really appreciate let look let know rest day agent understand customer hi
```

Reason Investigation

- Utilized Gemini-1.5-pro-preview to infer an actionable summary of call reasons for *each* category

```
**Irrops Call Driver Analysis:** ...

Customers frequently contact support due to disruptions (Irrops) stemming from:

- **Flight Schedule Changes:**
- **Baggage Issues:**
- **Compensation and Refunds:** ...

**Recommended Actions:**

- **Proactive Communication:** Implement automated notifications for flight
  changes and delays with clear rebooking options.
- **Streamlined Rebooking:** Develop a user-friendly online rebooking system
  with flexible search options for alternative flights and seat selection. ...

...
```

Model Predictions

Predicting Primary Call Reasons

- Used Meta Llama-3.2-1B-Instruct model to predict primary call reasons
- Utilized a prompt-based approach for inference with refined conversation context for better predictions
- 5157 predictions with $\sim$.45s latency

Recommendations

Actionable Insights

- **Reduce AHT**: Streamline processes and improve agent training
- **Enhance IVR System**: Implement self-service options for recurring issues
- **Categorize Call Reasons**: Improve call routing and reduce manual tagging through automation using SOTA ML models.

Further Investigation

- Explore additional data sources
- Conduct deeper sentiment analysis
- Implement finetuned models for better predictions

Q&A

Questions?

- Thank you for your attention!
- Feel free to ask any questions.