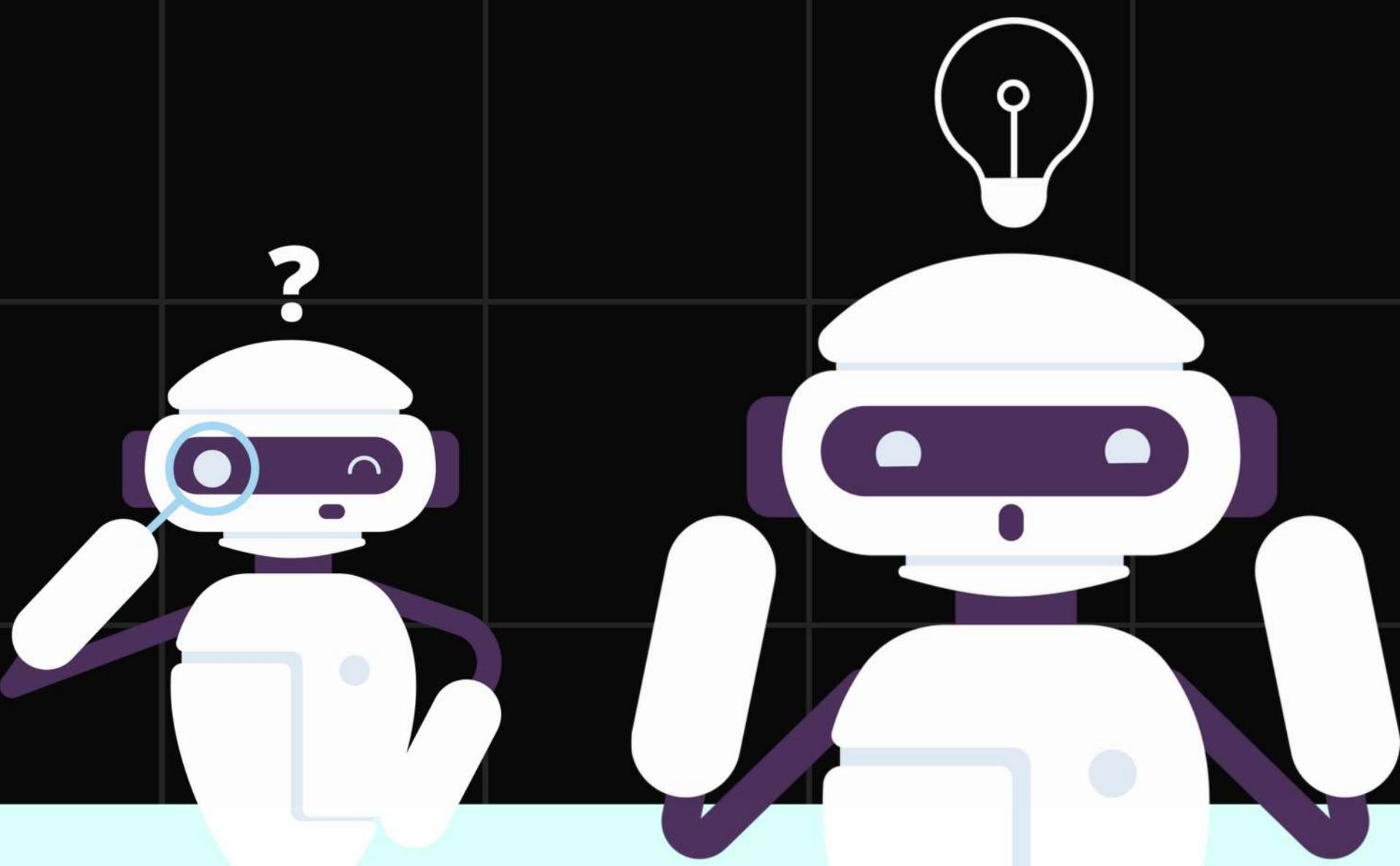




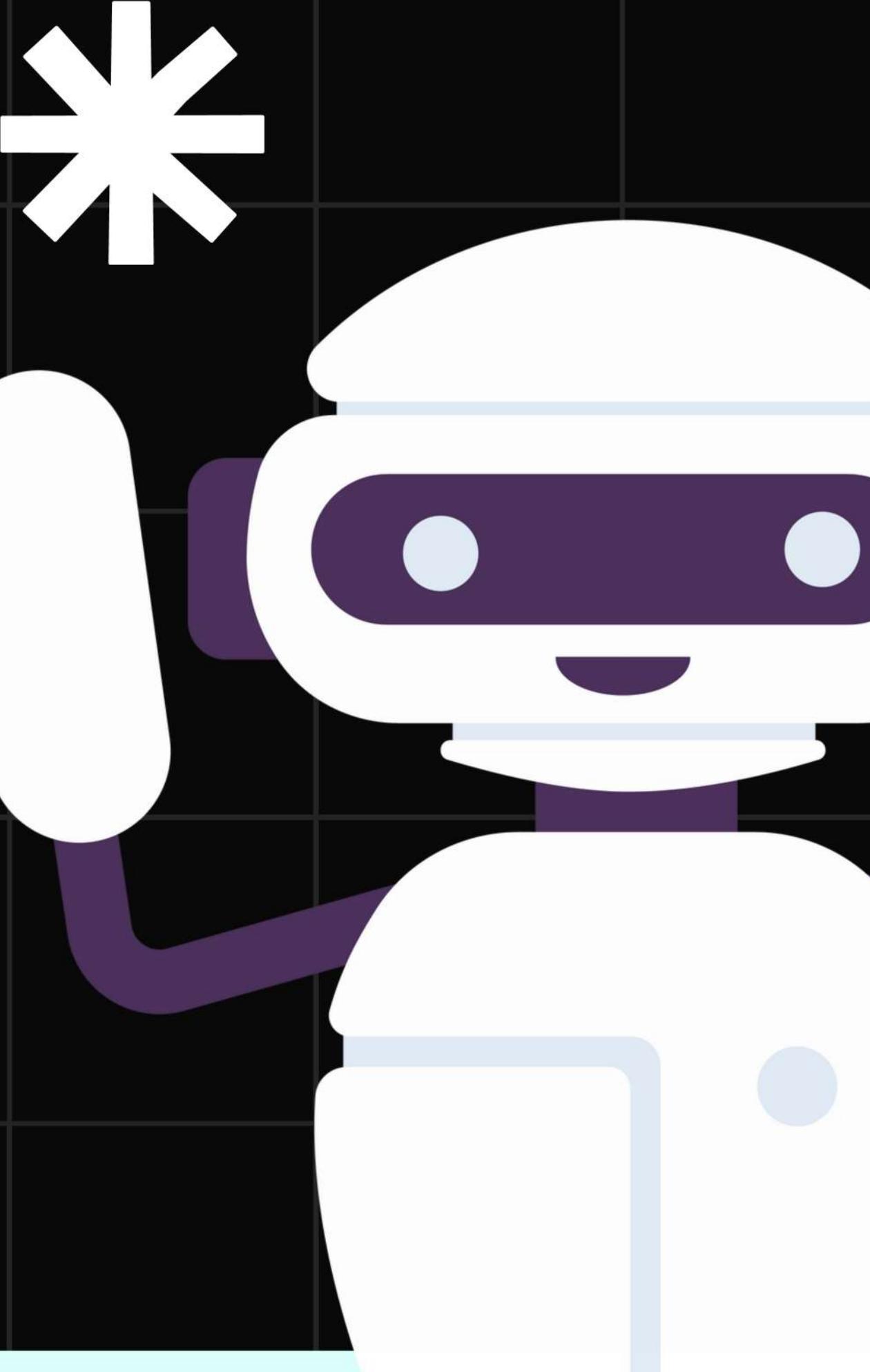
Quick Answers, Happy Customers: Revolutionizing United Airlines' Call Center

Submitted By : Team ChanduChampion

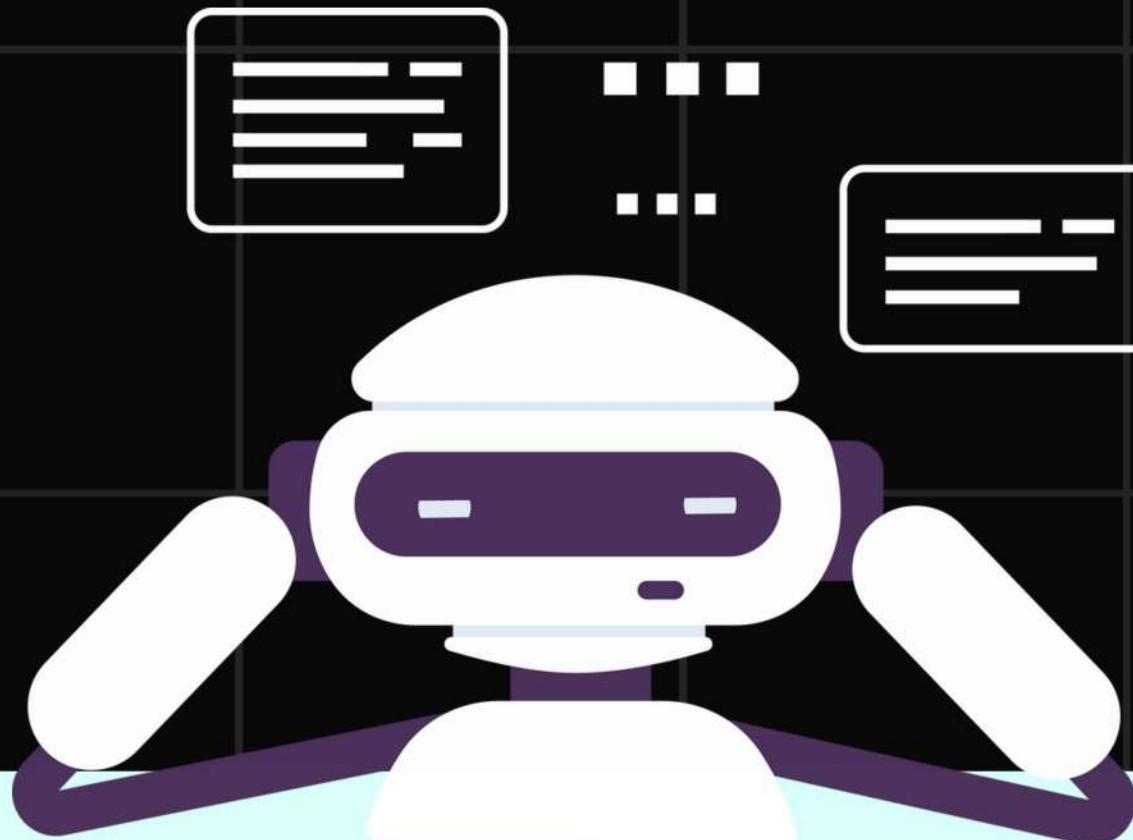


Problem Statement

United Airlines aims to optimize its call center operations by reducing Average Handle Time (AHT) and Average Speed to Answer (AST), improving customer service efficiency and satisfaction. Through data analysis, we will identify inefficiencies, key drivers of extended call durations, and areas where self-service options can reduce agent workload. The goal is to streamline call handling processes, enhance resource allocation, and elevate the overall customer experience while maintaining high service quality.



Data Description



Calls Data

Customers call transcript and duration with agents.

Customer Data

Customer insights

Call Reasons Data

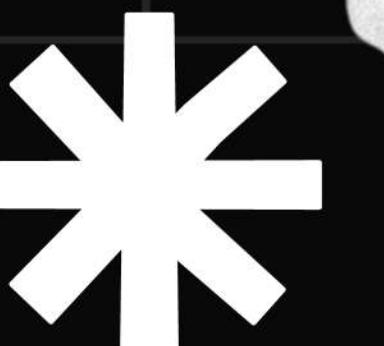
Call reasons of conversation

Sentiments Data

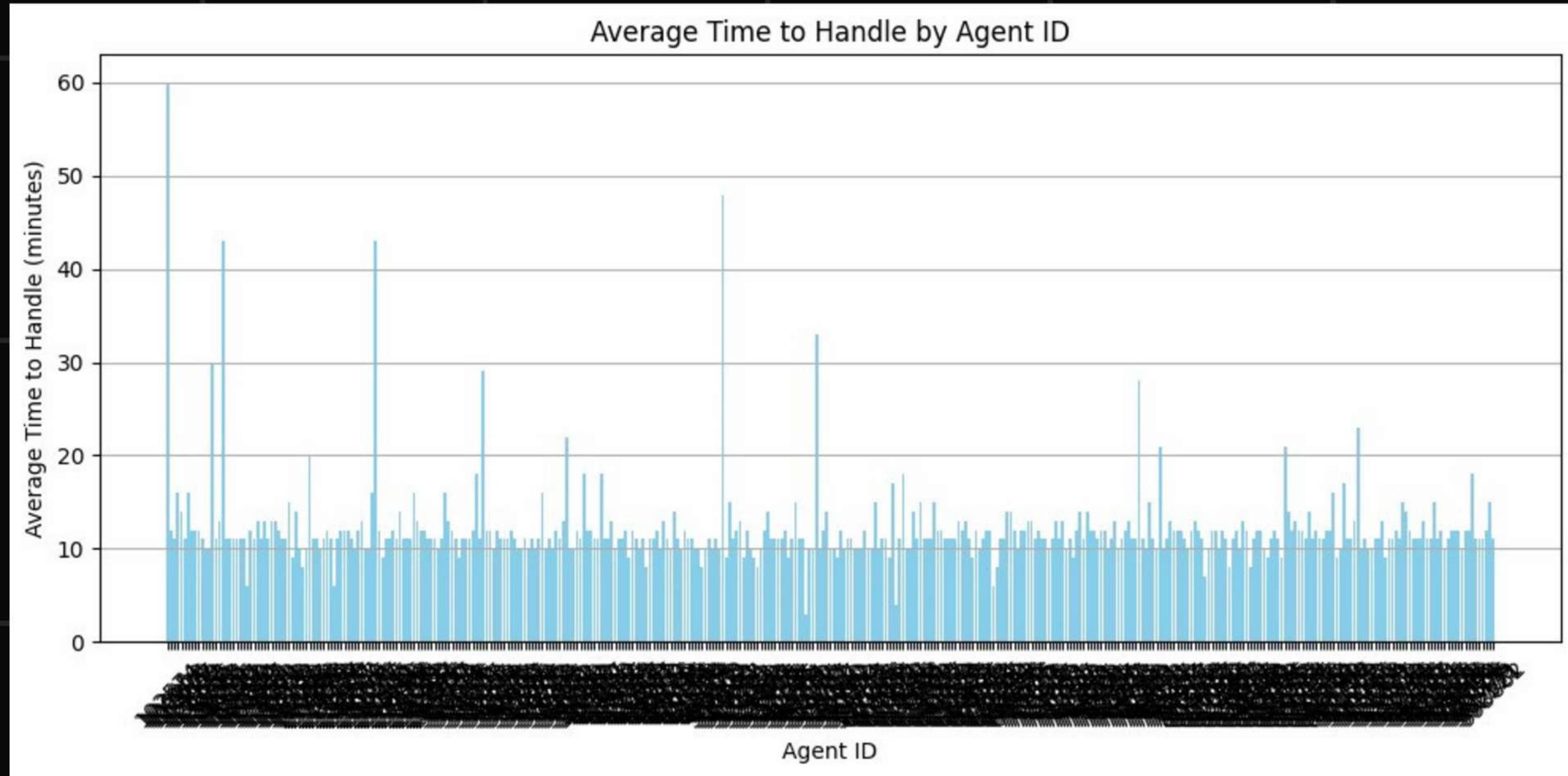
Customer conversations sentiments

Deliverables

- Analyze AHT and AST data to identify inefficiencies and key drivers of long call times.
- Quantify percentage difference between most frequent and least frequent call reasons' AHT.
- Identify self-solvable issues escalating to agents and recommend IVR improvements.
- Categorize primary call reasons to streamline processes and reduce manual efforts.
- Provide actionable recommendations to optimize call center performance.



AHT and AST Analysis

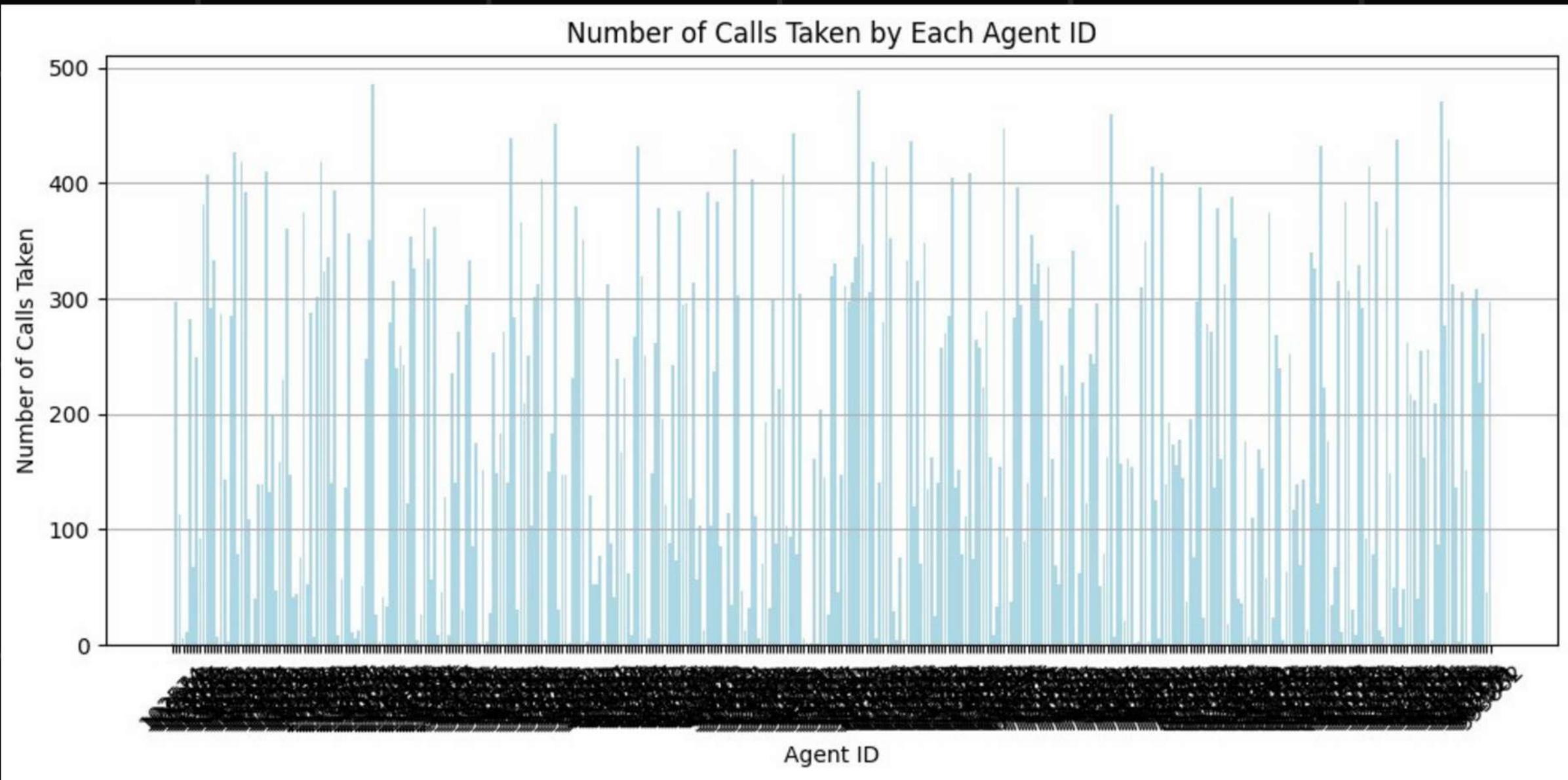


Metric	Value
Count	383
Mean	0 days 00:12:06.579634464
Std Dev	0 days 00:04:46.525582134
Min	0 days 00:03:00
25th Percentile	0 days 00:11:00
Median (50th Percentile)	0 days 00:11:00
75th Percentile	0 days 00:12:00
Max	0 days 01:00:00

The graph illustrates each agent's Average Handle Time (AHT). To enhance customer experience, AHT should ideally remain low, but certain agents exhibit significantly higher times. These outliers need to be reviewed, and appropriate steps should be taken to understand and address the reasons behind their longer call durations.

Agents with higher AHT should be monitored and coached to optimize their performance and improve overall efficiency.

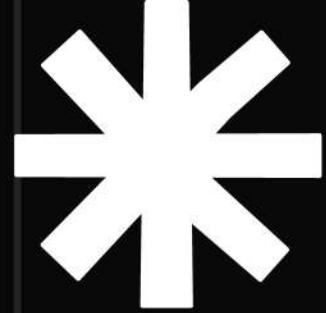
AHT and AST Analysis



Metric	Value
Count	383
Mean	187.493
Std Dev	137.938
Min	1
25th Percentile	54.5
Median (50th Percentile)	161
75th Percentile	302.5
Max	486

The graph displays the number of calls handled by each agent. Agents handling fewer calls should be assessed to understand why they are less occupied. If an agent has more available time, they should be handling more calls to reduce customer queueing time and improve the Average Speed to Answer (AST). This can help optimize resource allocation and enhance overall call center efficiency.

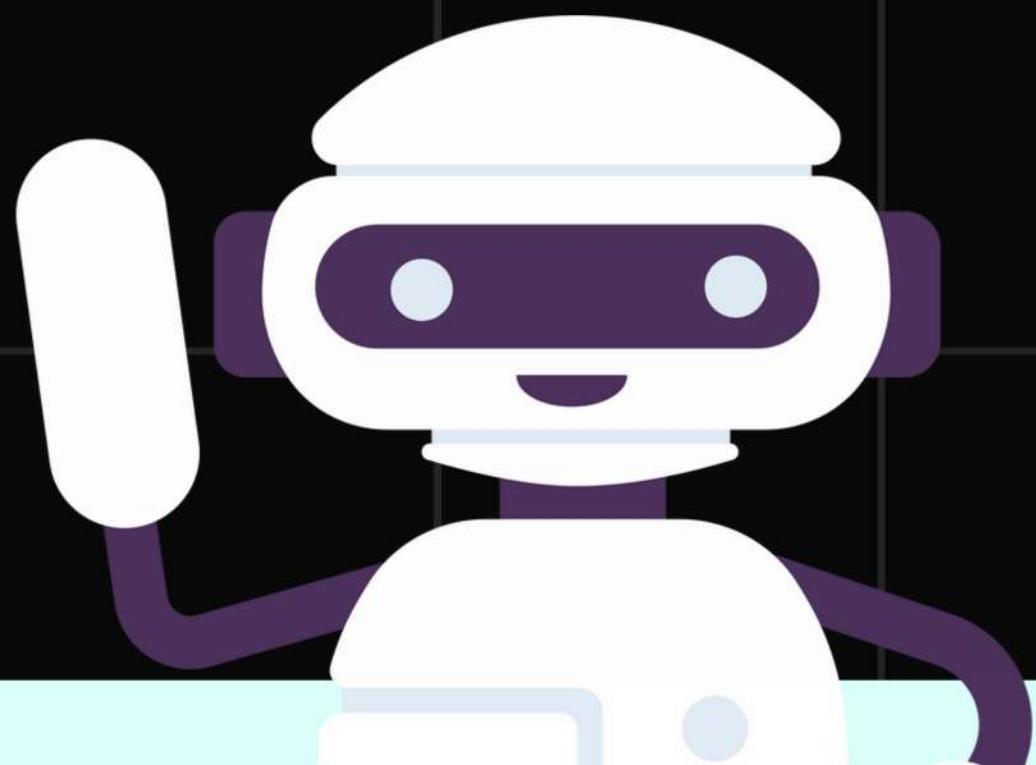
AHT and AST Analysis



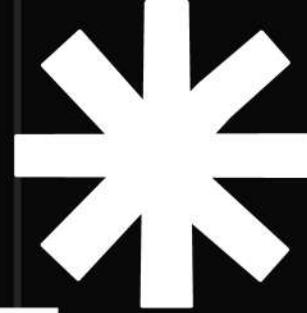
Agents that must be reviewed:

Number of agents that need to be revised (High AHT > 12.00 minutes and Low Calls < 54.50): 48

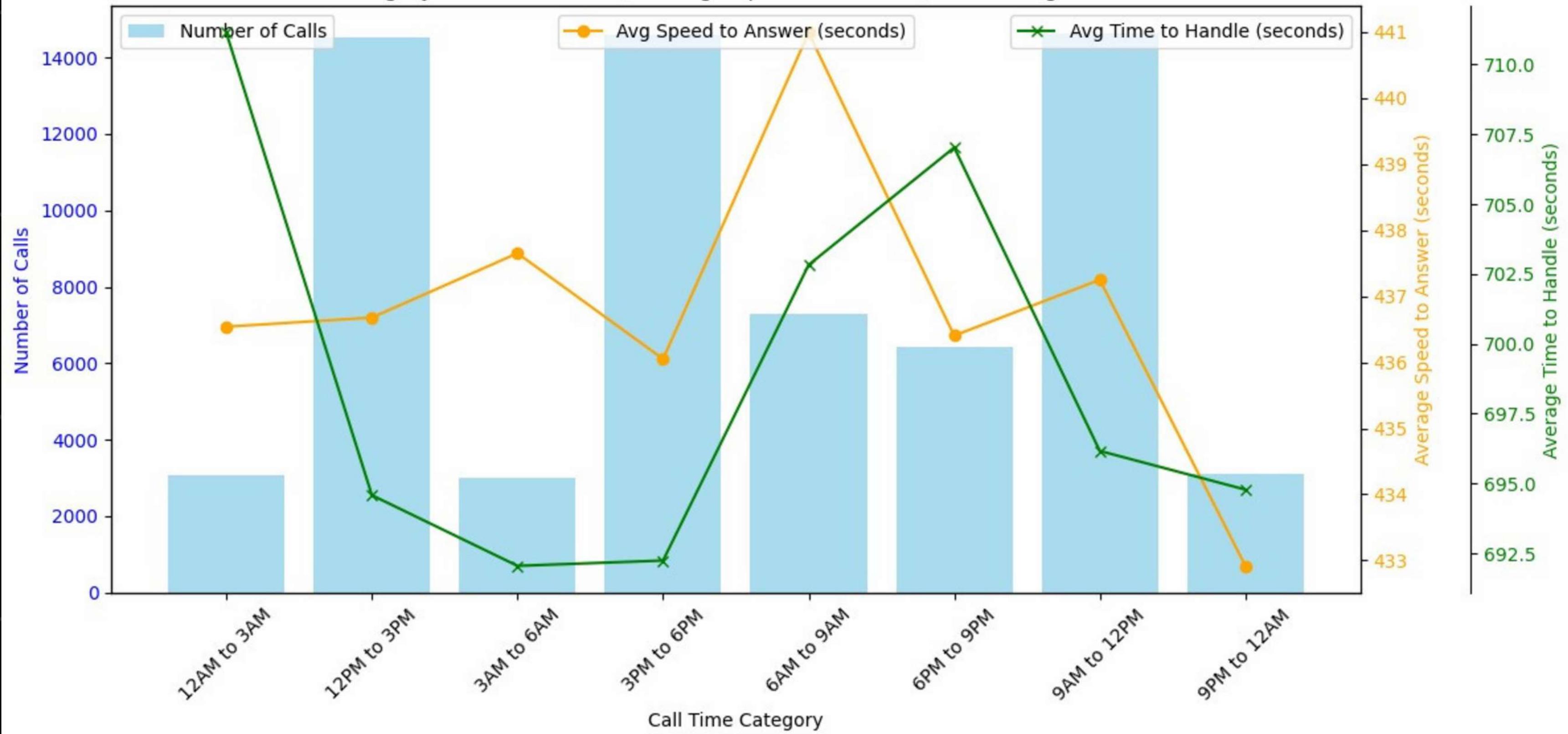
The thresholds of 12.00 minutes for high average handle time (AHT) and 54.50 for low call volume are derived from statistical analysis using percentiles. The 12.00 minutes represents the 75th percentile of AHT, indicating that agents exceeding this time are performing slower than 75% of their peers. The 54.50 reflects the 25th percentile of total calls taken, meaning that agents handling fewer than this number may be underperforming in engagement. Together, these metrics highlight agents needing revision for potential performance improvements.

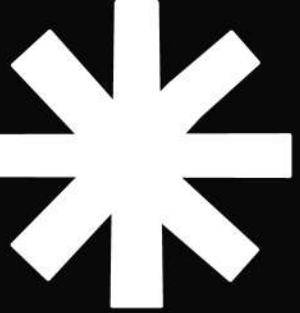


AHT and AST Analysis



Call Time Category: Number of Calls, Average Speed to Answer, and Average Time to Handle

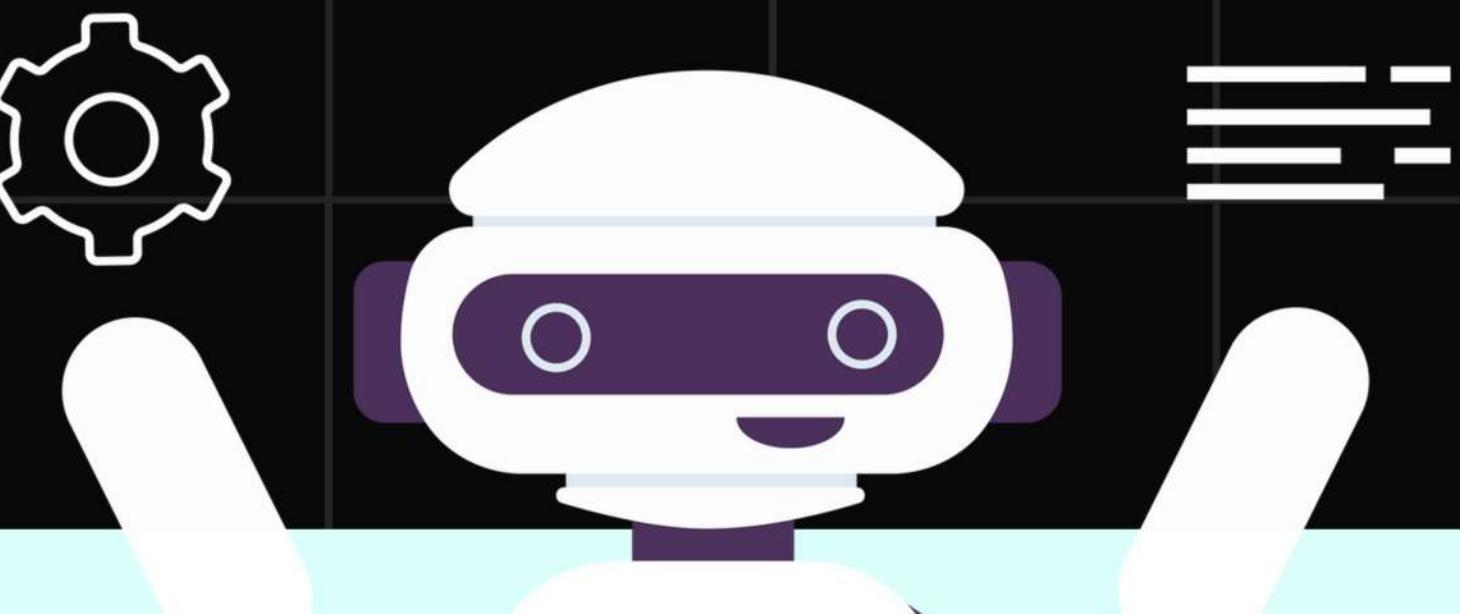




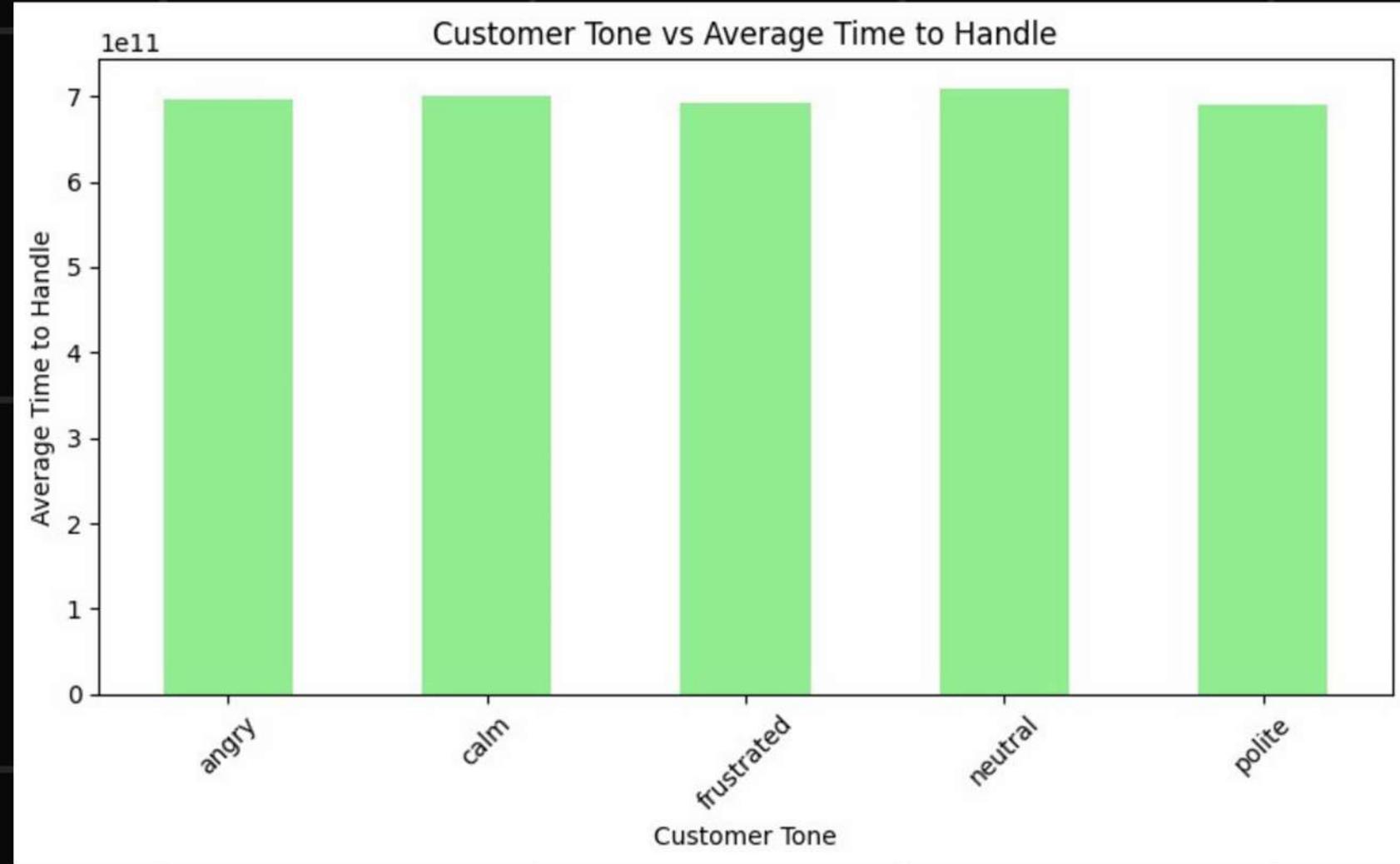
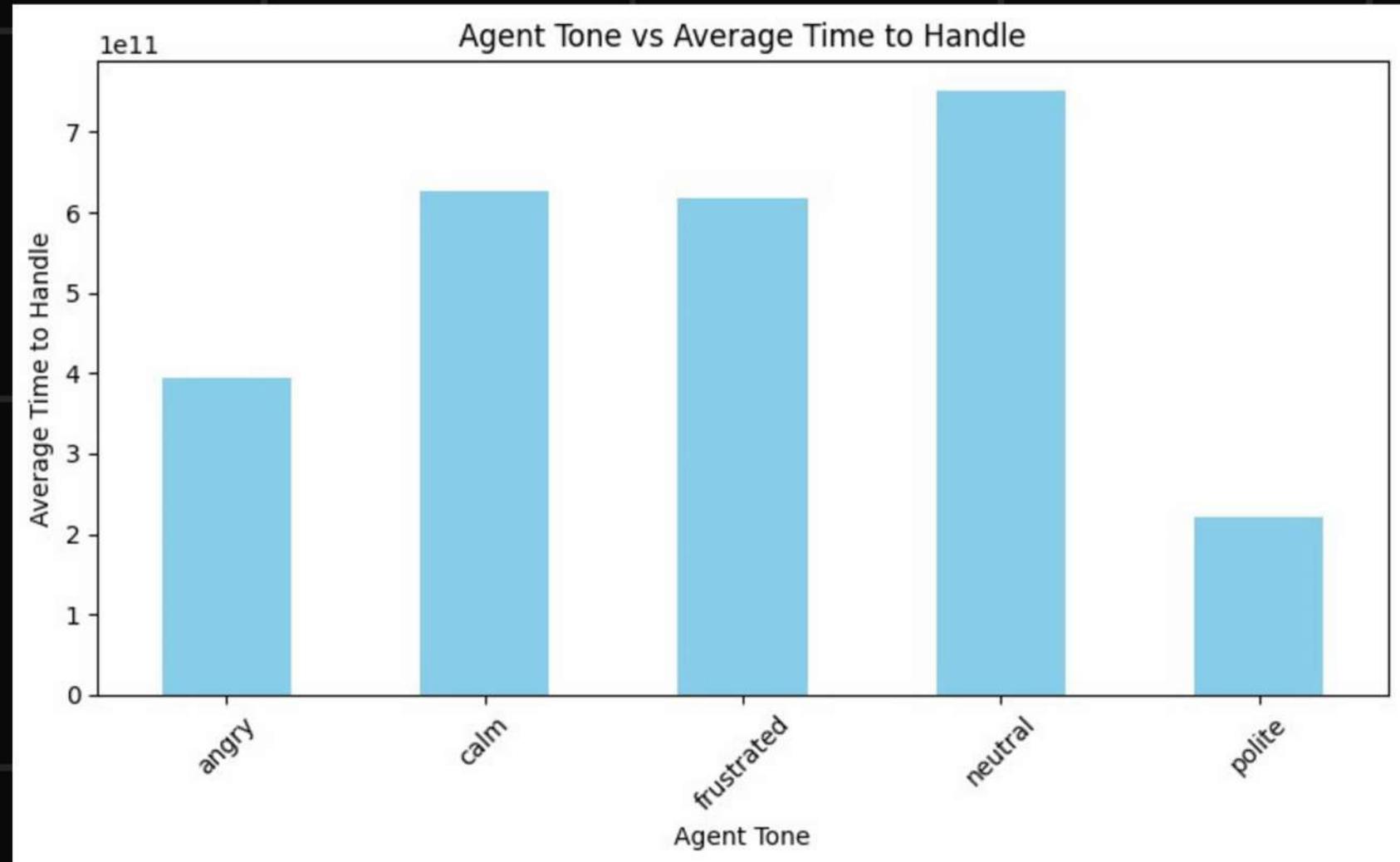
AHT and AST Analysis

This graph in the previous slide shows call volume across 3-hour slots, along with Average Speed to Answer (AST) and Average Handle Time (AHT).

- **High AST During Low Traffic (9 PM - 12 AM):** Despite fewer calls, AST remains high, indicating inefficiency during low traffic hours.
- **Consistent AST Despite High Traffic (6 AM - 9 AM):** Even with higher call volumes, AST is not reduced, suggesting inefficiency during peak hours.
- **Actionable Insight:** AST should be reduced to decrease waiting time, particularly during low-traffic periods. AHT improvements can enhance call handling and overall efficiency.

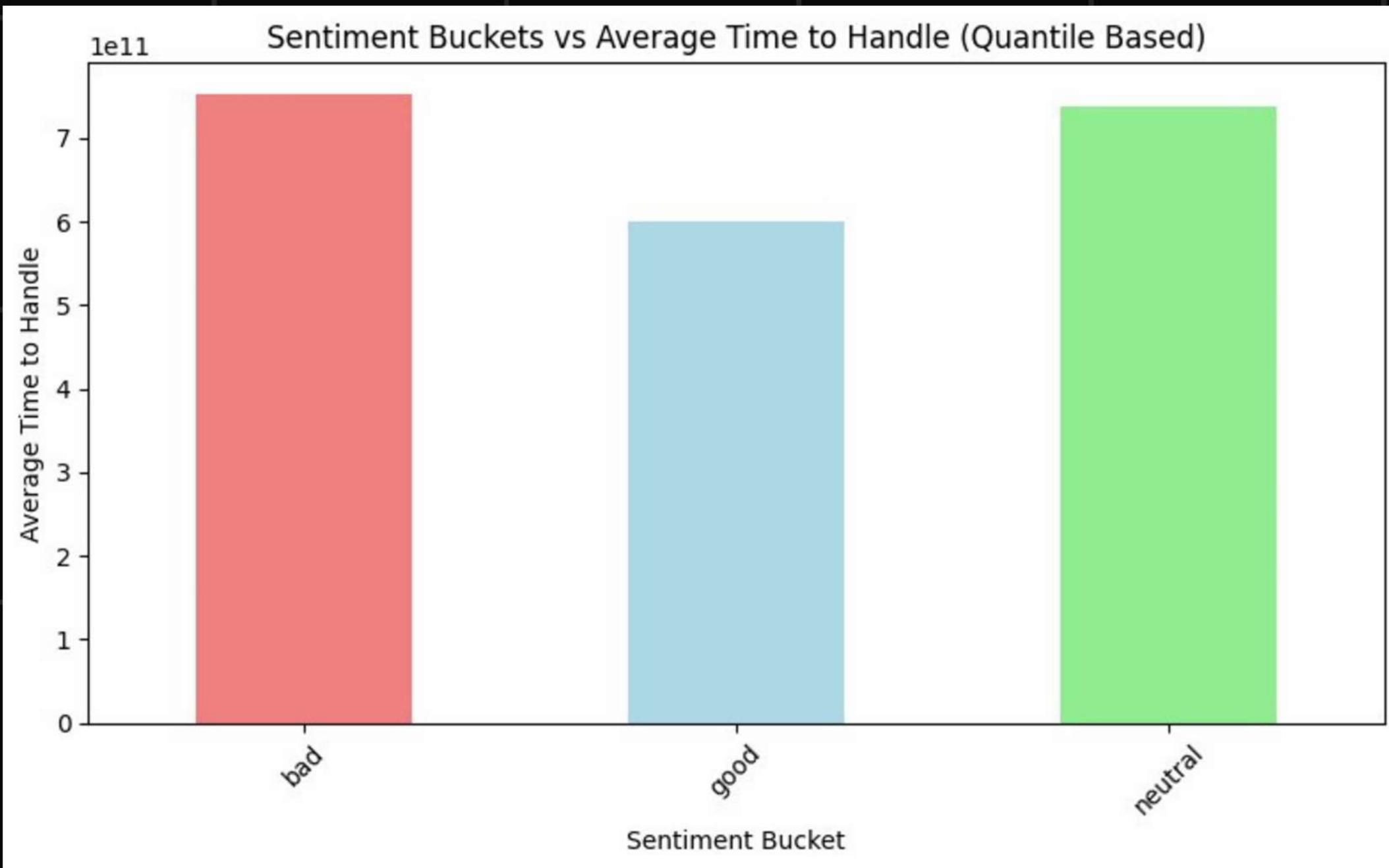


Sentiment Analysis



Observation: The graph doesn't reveal clear patterns or behaviors that directly explain the impact on call durations. Therefore, we can't precisely predict how different factors are affecting call times from this data alone.

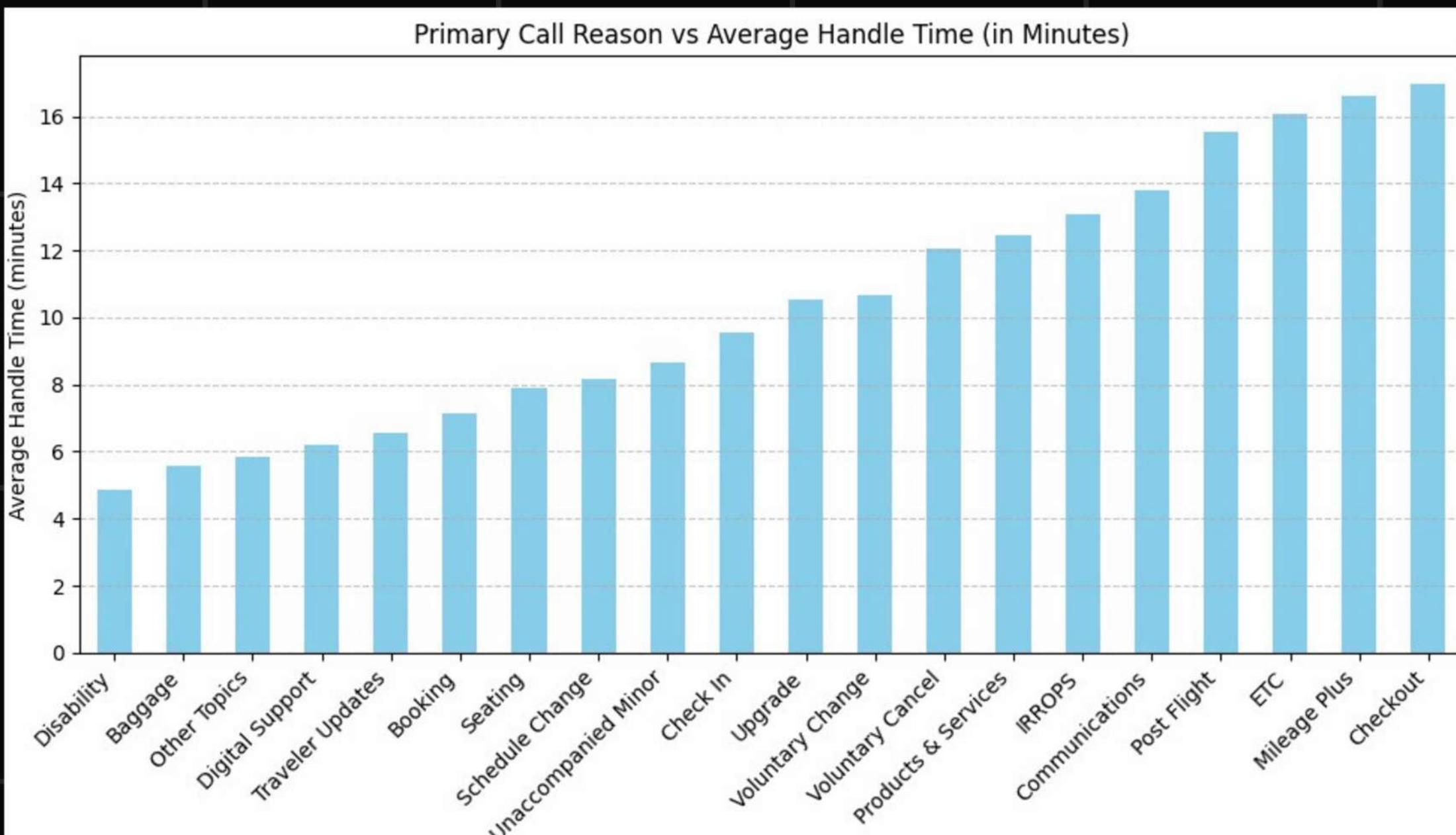
Sentiment Analysis



The graph divides sentiment into three buckets (bad, neutral, good) based on quantiles. The "bad" sentiment bucket shows a higher Average Handling Time (AHT), indicating that negative sentiment correlates with longer handling times. To improve efficiency, we should aim to maintain more positive sentiment during calls, which can help reduce AHT.

Difference in AHT b/w most frequent and least frequent call reasons

Your paragraph text



- Most Frequent Reason: IRROPS
- Least Frequent Reason: Unaccompanied Minor
- Average Handle Time (AHT):
 - IRROPS: 00:13:05
 - Unaccompanied Minor: 00:08:39
- Percentage Difference in AHT: 51.21%

Self-solvable Issues Analysis

IRROPS	13311
Voluntary Change	10848
Seating	6365
Mileage Plus	5851
Post Flight	4330
Communications	3840
Products & Services	3332
Baggage	2832
Upgrade	2738
Booking	2637
Check In	1904
Checkout	1888
Voluntary Cancel	1607
Digital Support	1225
ETC	952
Traveler Updates	937
Other Topics	818
Schedule Change	731
Disability	403
Unaccompanied Minor	104
Name: primary_call_reason, dtype: int64	

Key Insights:

- **Self-Solvable Reasons (49% of total calls):**
 - Voluntary Cancel, Booking, Seating, Mileage Plus, Checkout, Voluntary Change, Check In, Schedule Change, Digital Support, Traveler Updates
- **Agent-Required Reasons (28% of total calls):**
 - IRROPS, Upgrade, Baggage, Disability, Unaccompanied Minor
- **Mixed/Complex Reasons (23% of total calls):**
 - Other Topics, Communications, ETC

Recommendation:

Automate common tasks to reduce agent interactions by up to 49%, improving efficiency and customer satisfaction.

Designing the Model

Data Preprocessing

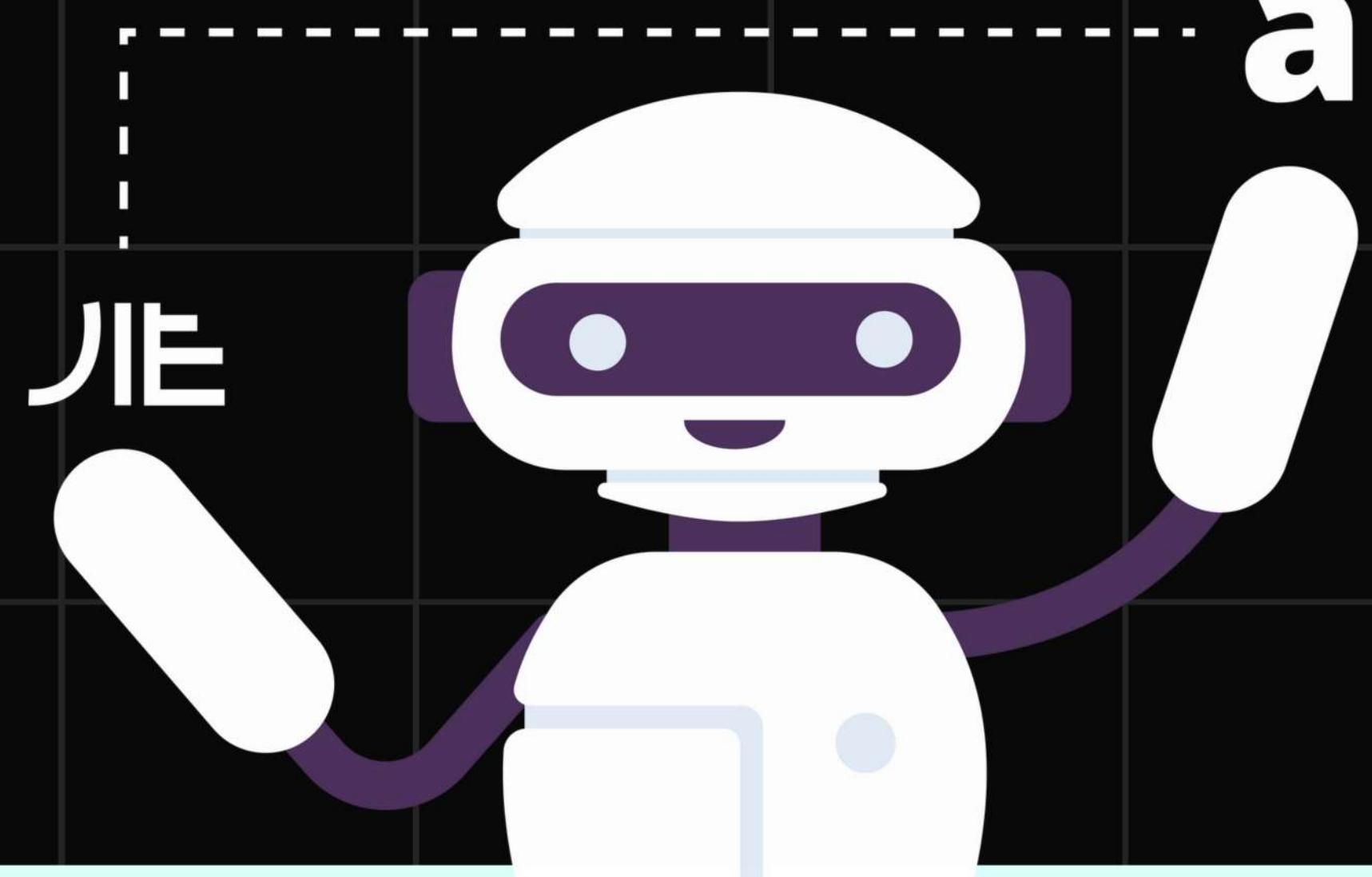
- Tokenize Call Transcripts
- Generate Embeddings
 - Using Normal Tokenizer
 - Using Universal Sentence Encoder

Modeling

- Pass Embeddings to Models
 - ANN (Artificial Neural Network)
 - ANN with LSTM (Long Short-Term Memory)

Training

- Train Models on Dataset
- Predict Call Reasons



Proposed Architecture

Layer (type)	Output Shape	Param #
lstm_6 (LSTM)	(None, 1, 256)	787,456
dropout_16 (Dropout)	(None, 1, 256)	0
lstm_7 (LSTM)	(None, 128)	197,120
dropout_17 (Dropout)	(None, 128)	0
dense_55 (Dense)	(None, 256)	33,024
dense_56 (Dense)	(None, 128)	32,896
dense_57 (Dense)	(None, 20)	2,580

Total params: 1,053,076 (4.02 MB)

Trainable params: 1,053,076 (4.02 MB)

Non-trainable params: 0 (0.00 B)

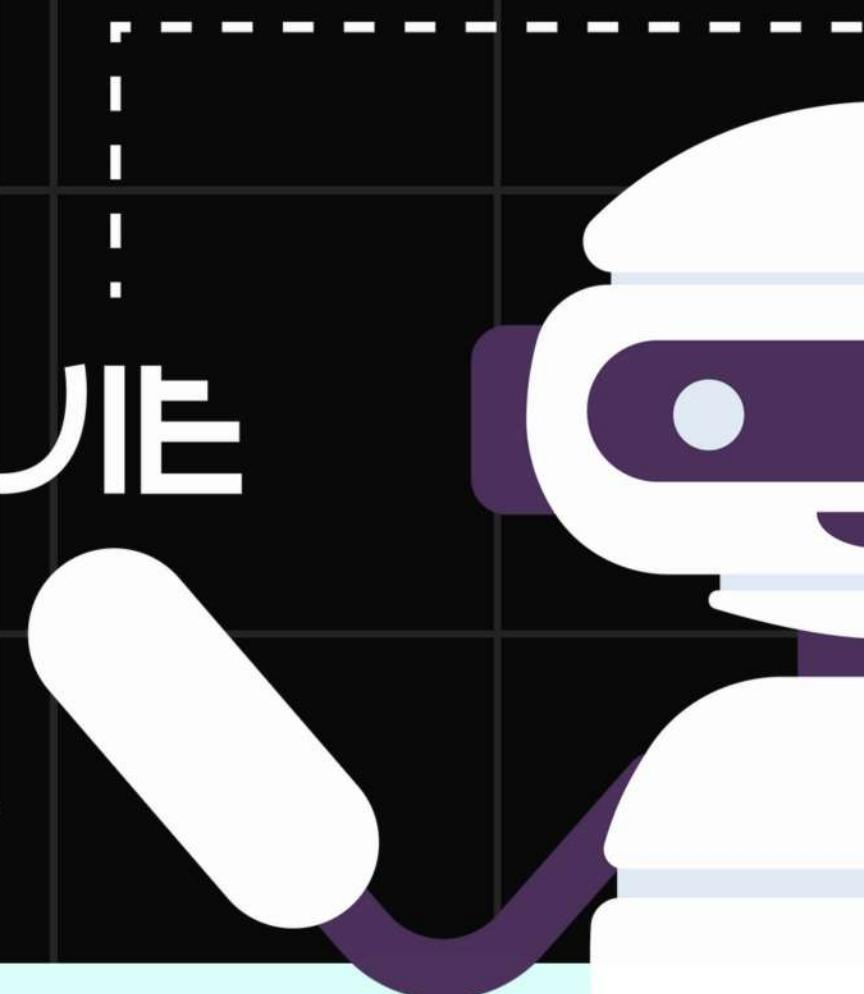
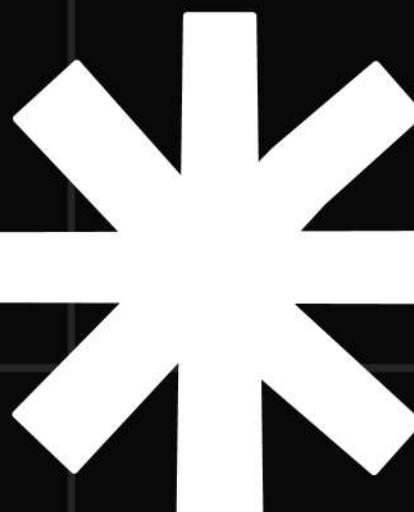
This architecture consists of:

- LSTM Layers: Two LSTMs with 256 and 128 units, learning sequential patterns.
- Dropout Layers: Added after each LSTM to prevent overfitting.
- Dense Layers: Three fully connected layers (256, 128, and 20 units) for classification.
- Total Parameters: 1,053,076 (all trainable).

Designing Model 2

The model predicts customer call reasons by analyzing historical call center data, focusing on interactions, sentiment, and call timing.

- Data Preprocessing: Merged datasets based on `call_id` and `customer_id`, dropping irrelevant columns like `customer_name` and `call_transcript`.
- Feature Engineering: Processed timestamps for call duration insights and normalized textual data (e.g., `primary_call_reason`).
- Embeddings: Used text embeddings for features like `primary_call_reason`, `agent_tone`, and `customer_tone` to convert them into numerical data.
- Model: Applied classification algorithms (e.g., XGBoost) using features like sentiment, tone, call timings, and agent/customer interactions to predict call reasons effectively.





Recommendations

- **Optimize Agent Performance:** Identify and monitor agents with high AHT and low call volume for improvement through targeted coaching and training programs.
- **Enhance Resource Allocation:** Reallocate staff during off-peak hours to reduce AST (Average Speed to Answer) and improve efficiency during low call traffic. Similarly, increase staffing flexibility during peak hours to better manage high traffic volumes.
- **Automate Self-Solvable Issues:** Enhance self-service capabilities for common issues like booking, seating, and cancellations by improving IVR systems and online tools. This will reduce agent workloads and speed up customer resolutions.
- **Utilize Sentiment Analysis:** Implement real-time sentiment tracking tools for agents, enabling them to adjust their tone and communication style to maintain a positive atmosphere during calls. This can reduce AHT and improve customer satisfaction.



Some Suggestions

- **Personalized Agent Training:** Offer ongoing, personalized training to agents based on their specific performance metrics (e.g., higher AHT), focusing on call-handling efficiency and customer interaction skills.
- **Optimize Call Distribution:** During peak hours, optimize call distribution through automatic systems to ensure that agents handle calls more evenly and no single agent is overloaded.
- **Enhance IVR and Digital Support:** Continuously improve IVR flow and digital self-service tools based on the most frequent customer queries. Implement features that help customers resolve their issues faster without needing to speak to an agent.
- **Incentivize Positive Customer Interaction:** Create incentives for agents to maintain positive customer interactions, as positive sentiment correlates with lower AHT. Introduce soft skills workshops to help agents handle frustrated customers more effectively.

**

Thankyou

