



MSA Project Week Executive Summary

Seaworld Sucks

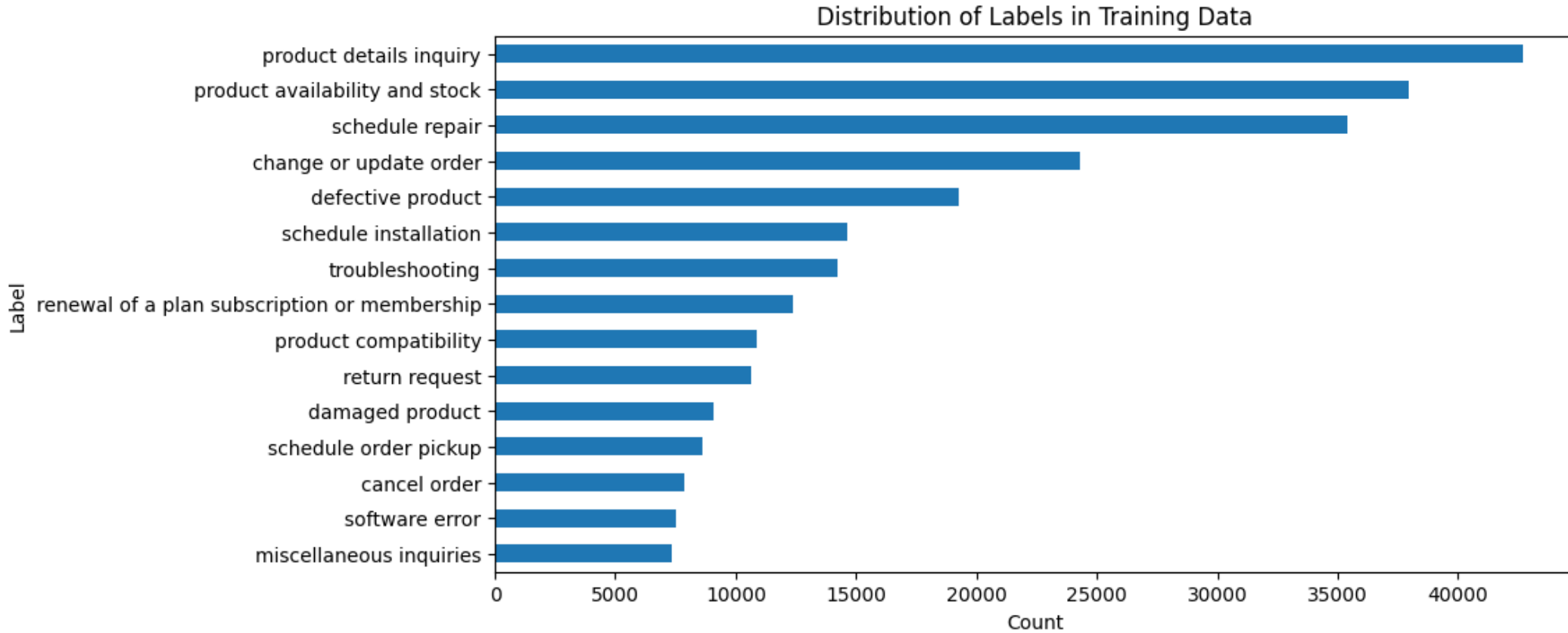
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Problem Statement

- **Data source:** Best Buy call center interactions
- **Goal:** Classify the intent of call transcripts into one of 57 categories
- **Purpose:** Enable improved customer service interactions



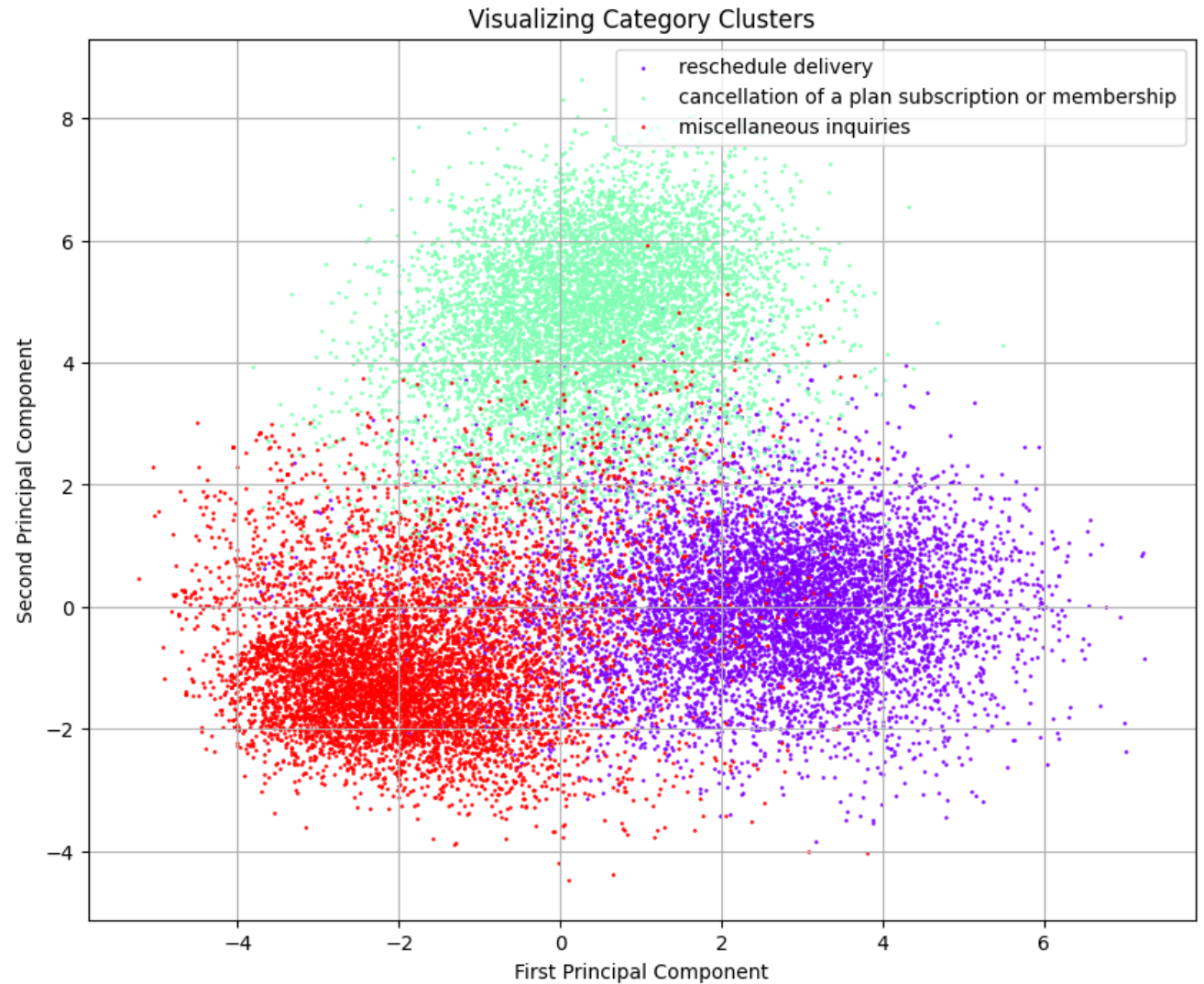
Digging into the data



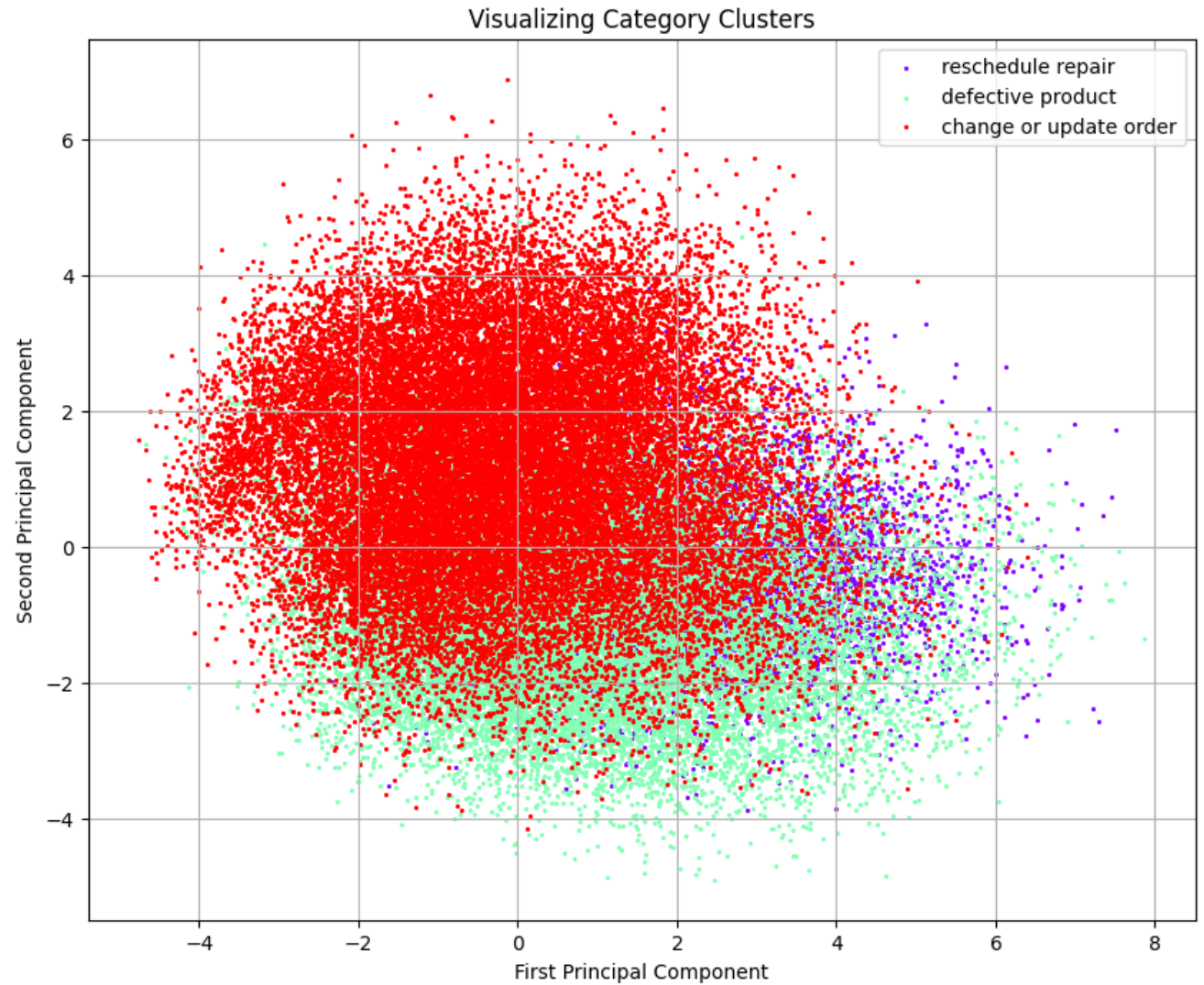
Digging into the data



**Some
categories
were very
discernible...**



**... others
weren't.**



Tested (but unused) Methods

- **spaCy NLP library**
 - Parallel on 16-Core CPU
- **Transformer Tokenization**
- **Stemming**
- **Pretrained HuggingFace Models (T5, BERT, GPT)**
 - Run and Trained on NVIDIA GPU w/ ~1400 CUDA cores



Remove Most Common Words

Remove Repeating Digits,
Punctuation and One-Letter Words

Lemmatize Entire Dataset

TFIDF High-Dimensional Text
Vectorization

PCA Dimensionality Reduction

Standard Scaling

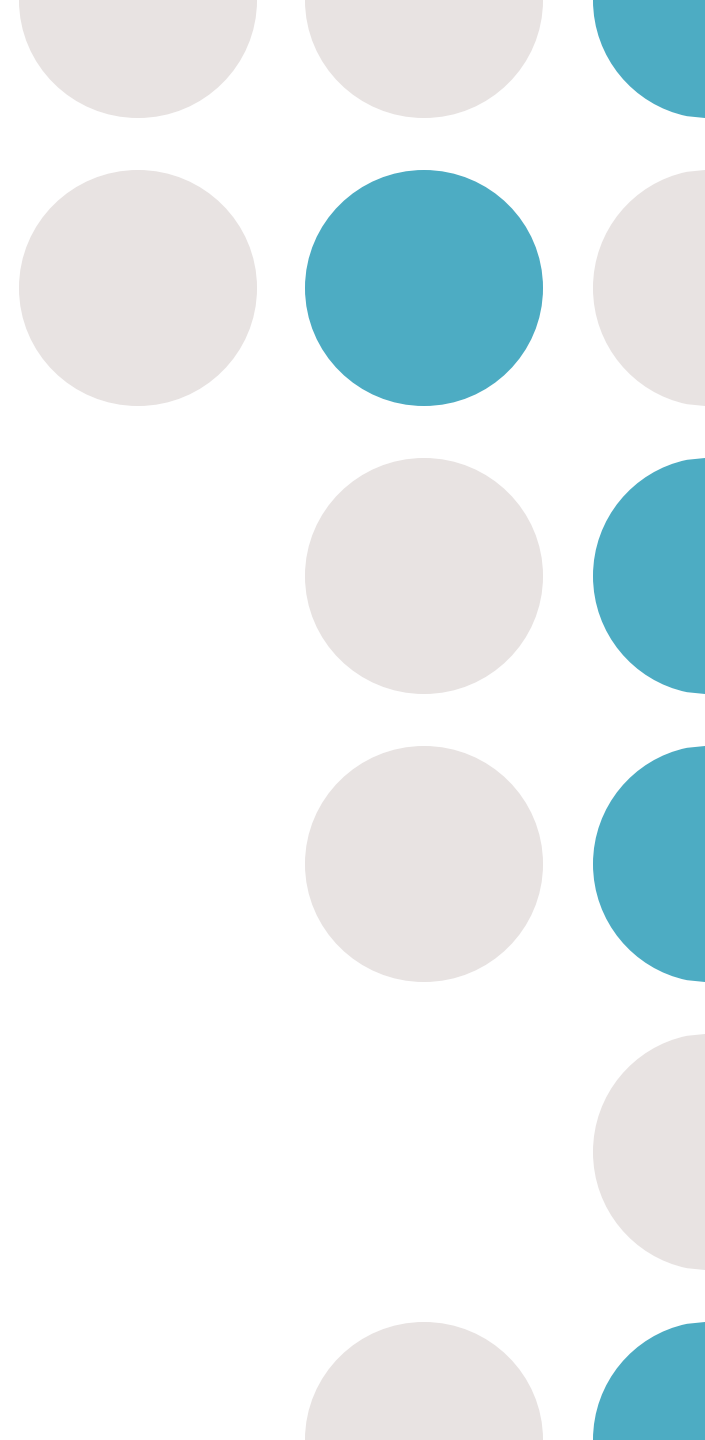
Text Processing

Entire Processing Runtime: 28min 31secs



Model Selection

- Generalization Risk (Assessed with cross-validation accuracy)
 - Computational Cost of Training and Prediction
 - Models with an ability to output probabilities and binary classifications
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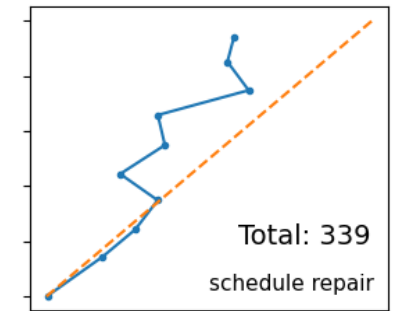
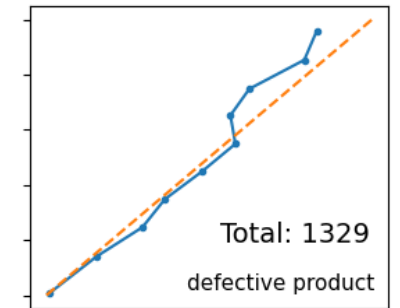
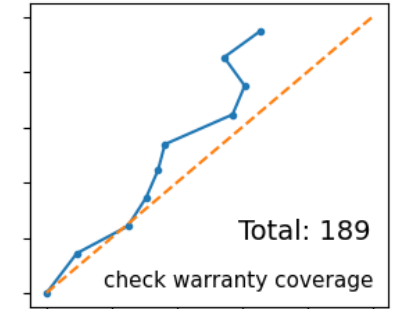
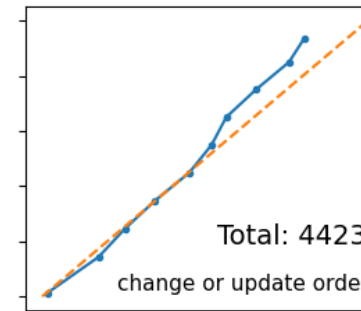
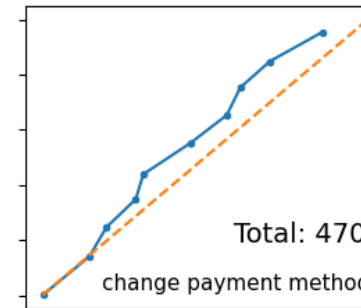
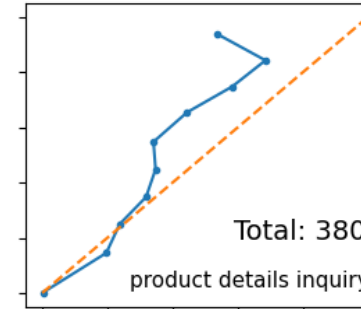
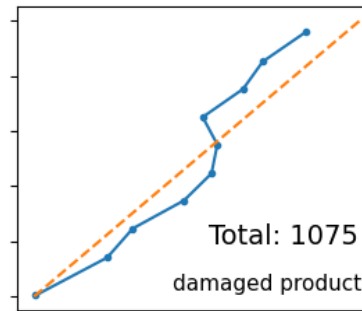
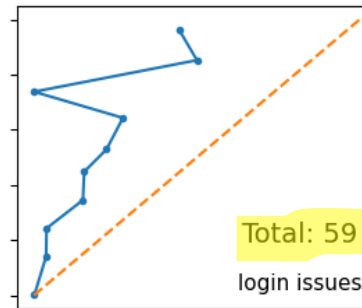
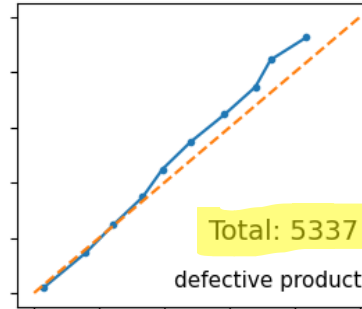
Model Evaluation

- **Final Model:** Multilayer Perceptron

- Micro-Average F1 Score: .5848
- Hidden layer of 150 Neurons
- *Training Runtime: 5m 30s*
- *Evaluation Runtime: <5s*

- **Other Models:**

- Random Forest: .355
- K-Nearest Neighbors: .184
- DistilBERT Pretrained Model: 0.214

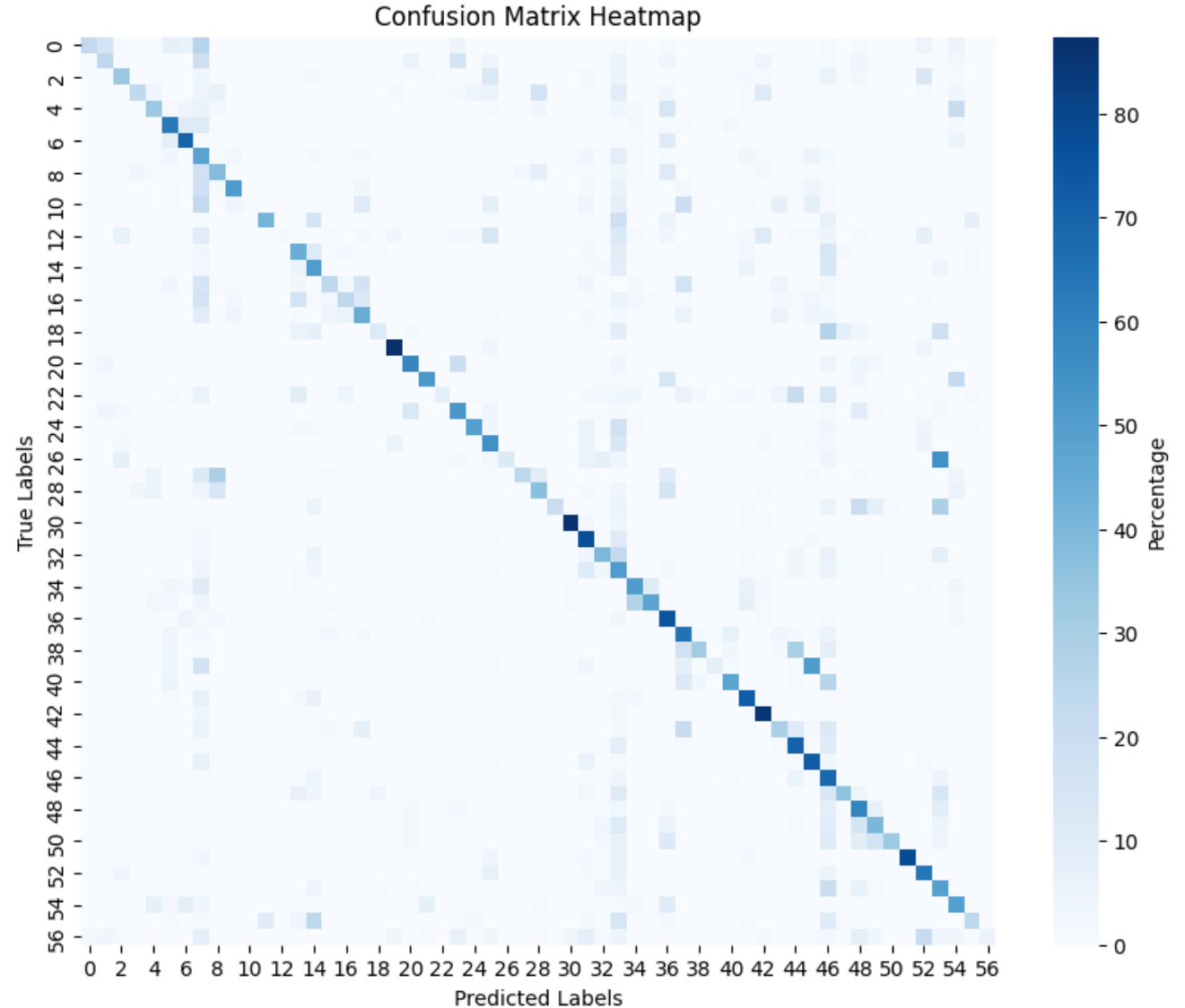


Commonly Confused Labels

- "troubleshooting" & "network or connectivity issues"
- "reschedule order pickup" & "schedule order pickup"
- "change payment method" & "payment failed"

General labels often misclassified:

- "Change or update order" (7)
- "Product details inquiry" (33)



Limitations of Data and Model

Granularity of categories

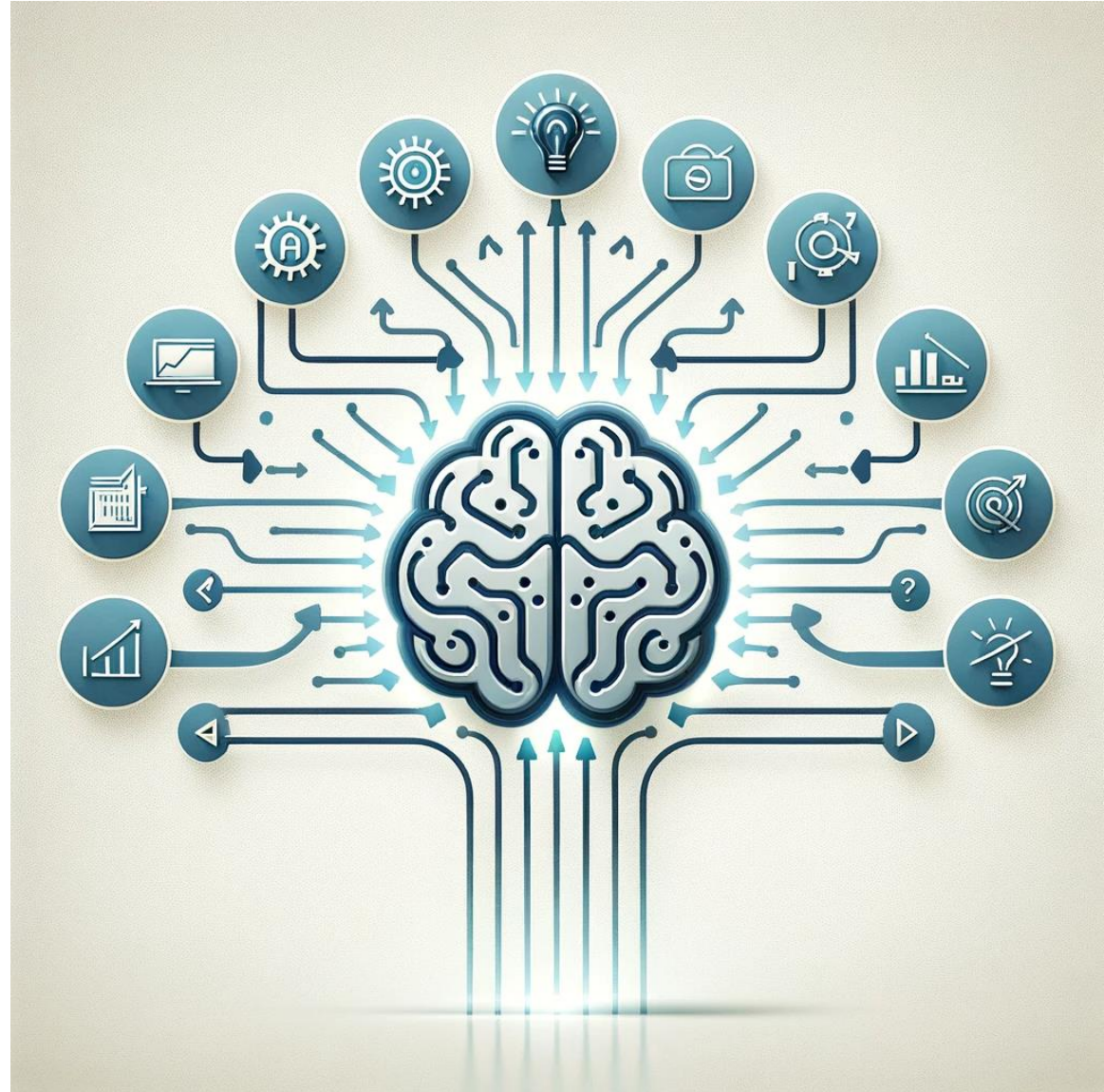
Misclassification of training data

Quality of transcript

"...####. and its still active..agent says thats what im seeing..agent says and and im looking to the purchase of of that you made. and that is showing that its there..agent says and.agent says xxxxxx i can what it can be what can be done right now. it can be canceled. but the system is not trying to give me back any refund what i want to do i will still escalate it and you will receive a answer in about voice.creditcard.digitstranscribed says#### days let me do that for you so they can investigate that alright.agent says lets me set this up..customer says well i dont. i dont. i dont know. i guess im im with you right now. where.customer says after xxxxx since i just i just bought something..customer..."

Business Applications of an NLP Model

- Task automation
 - Efficient Resource Allocation
 - Real-Time Triage
 - Quality Assurance
 - Track trends over time
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Questions

