SENTIMENT ANALYSIS TO INDICATE CUSTOMER SATISFACTION

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INTRODUCTION

- Consulting experience with Accenture
- Senior Manger in Core Finance Transformation
- Business Transformation
- Complex systems implementation
- Masters' student in Data Analytics at Western Governors University

CONTEXT

Internet invented in 1983

Myspace launched in 2003

Currently over 116 unique social media platforms

How do we keep a pulse on what our customers are saying about us?

Customer Satisfaction Score

PROBLEM STATEMENT & HYPOTHESIS

Problem statement: Can a neural network model be constructed on the dataset to accurately predict customer reviews as positive or negative, allowing these predictions to be used to calculate a customer satisfaction score?

Null hypothesis: a neural network *cannot* be constructed to accurately predict customer reviews as positive or negative sentiment

Alternative hypothesis: a neural network *can* be constructed to accurately predict customer reviews as positive or negative sentiment with an accuracy greater than 80%

DATA ANALYSIS PROCESS

Exploratory Data Analysis completed leveraging bar charts, frequency counts, and examining the data's nuances

Data was cleaned: removed punctuation, set all to lowercase, removed stop words, unique strings (xbf, xef, xfd) removed, reviews tokenized, reviews padded

Four models evaluated

Accuracy and loss metrics used to determine which model to use (Model 3)

Social Media reviews imported, cleaned, and model 3 used to predict sentiment

Customer Satisfaction Score calculated across all reviews

EXAMPLE OF CLEANED REVIEW

Column	Value
Review	Why does it look like someone spit on my food? I had a normal transaction, everyone was chill and polite, but now i dont want to eat this. Im trying not to think about what this milky white/clear substance is all over my food, i d*** sure am not coming back.
Review_lowercase	why does it look like someone spit on my food? i had a normal transaction, everyone was chill and polite, but now i dont want to eat this. im trying not to think about what this milky white/clear substance is all over my food, i d*** sure am not coming back.
Review_no_punct	why does it look like someone spit on my food i had a normal transaction everyone was chill and polite but now i dont want to eat this im trying not to think about what this milky white clear substance is all over my food i d sure am not coming back
Review_no_stopwords	look someone spit food normal transaction everyone chill polite now dont want eat im trying think milky white clear substance food d sure coming back
Review_no_xbf_xef	look someone spit food normal transaction everyone chill polite now dont want eat im trying think milky white clear substance food d sure coming back
Review_tokenized	[326, 294, 2196, 7, 595, 3021, 354, 2369, 505, 210, 337, 159, 104, 661, 444, 289, 3602, 938, 1219, 4782, 7, 572, 258, 345, 74]
Review_padded_max	[326, 294, 2196, 7, 595, 3021, 354, 2369, 505, 210, 337, 159, 104, 661, 444, 289, 3602, 938, 1219, 4782, 7, 572, 258, 345, 74, 0]
Review_padded_median	[4782, 7, 572, 258, 345, 74]

OUTLINE OF FINDINGS

Mode 3 the most accurate at 87%

```
In [454]: print(df_model_metrics)
  model_name       model_description  test_loss  test_accuracy epoch_stopped_at
0    model_1     2 layers max length   0.358455       0.874080                4
1    model_2  2 layers median length   0.416498       0.839970                3
2    model_3     3 layers max length   0.335516       0.873328                3
3    model_4  3 layers median length   0.407456       0.841322                3
```

Model used to predict sentiment of social media reviews

```
In [482]: print('Origional review', df_sm['review'][num_index], '\n')
     ...: print('Predicted:', 'Negative' if df_sm_predictions[num_index][0] >= 0.5 else 'Positive', 'review')
Origional review McDonald\x92s is one of my favorite burgers

Predicted: Positive review
```

Customer Satisfaction of the data calculated to be 48%

```
In [483]: csat_satisfied_df_reviews = sum(df_reviews['rating'] == 1)

In [484]: csat_satisfied_df_sm = sum(df_sm['model_3_prediction'] == 1)

In [485]: csat_all_df_reviews = len(df_reviews['rating'])

In [486]: csat_all_df_sm = len(df_sm['model_3_prediction'])

In [487]: csat = (csat_satisfied_df_reviews + csat_satisfied_df_sm) / (csat_all_df_reviews + csat_all_df_sm) * 100

In [488]: print(f'CSAT score: {round(csat,2)}%')
CSAT score: 48.01%
```

LIMITATIONS OF TOOLS AND TECHNIQUES

Dataset is small at 33,396 rows and 33 rows respectfully

Fine tuning of the model

Only four models evaluated

```
In [433]: model_3 = Sequential()
     ...: model_3.add(Embedding(input_dim=15232, output_dim=11, input_length=273))
     ...: model_3.add(Flatten())  # https://keras.io/api/layers/reshaping_layers/flatten/
     ...: model_3.add(Dense(100, activation='relu'))
     ...: model_3.add(Dense(50, activation='relu'))
     ...: model_3.add(Dense(25, activation='relu'))
     ...: model_3.add(Dense(2, activation='softmax'))
     ...: model_3.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])
     ...: print(model_3.summary())
```

PROPOSED ACTIONS

Gathering more reviews with star ratings to use to train the model, and more social media reviews should be gathered to be evaluated

Hyper tune the model

Design a pipeline

EXPECTED BENEFITS

With the speed of the internet and influencers, a written word can have an outsized impact faster than ever before. This project provides a means and method to collect all those written words, analyze them as positive or negative, and feed that information into a commonly understood metric: customer satisfaction score.

Taken in aggregate, this metric informs company leadership at a wholistic level how the company is perceived. Paired with location data it brings this insight down to the store level where local store leadership can immediately review and act upon it.

Once implemented in a production landscape and paired with a dashboard this model is expected to provide the near real time feedback required to increase customer satisfaction which will ultimately drive repeat and incremental sales.

THANK YOU

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