Using AI for Sentiment Analysis of customer reviews

INTRODUCTION

If you are running an e-commerce website then it can be a huge challenge to discover what is being said about your brand, product and services. Even harder is to sort and make sense of the volumes of feedback that exists online in the form of unstructured data and draw upon granular levels of feedback from within the data.

Sentiment analysis is the process of determining the emotional tone behind a series of words, used to gain an understanding of the attitudes, opinions and emotions expressed within an online mention.

OBJECTIVE

Mining vast volumes of unstructured data to drive actionable insights, using sentiment analysis

DATASET

One Million + customer reviews from booking.com, about experience of their stays at hotels in Europe.

APPROACH

We first have to preprocess the data to enable it to be read by our modelling code. Models cannot work directly with text data. Then we will use machine learning classification algorithms and neural networks to classify the models and compare the accuracy and results. Lastly , we will segment our reviews into a smaller number of buckets and use AWS to deploy our model for further learning

ML CLASSIFICATION MODELS

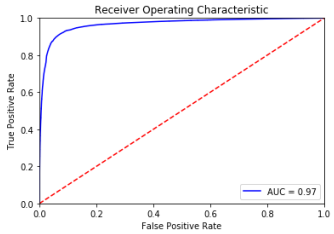
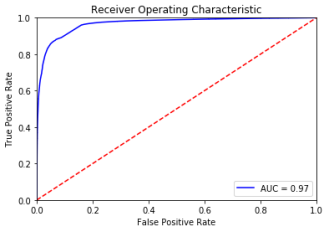
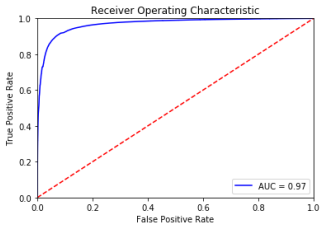
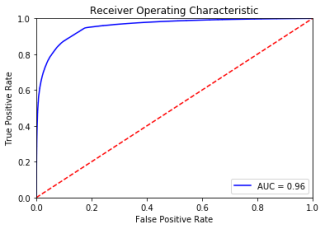
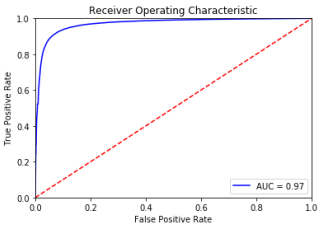
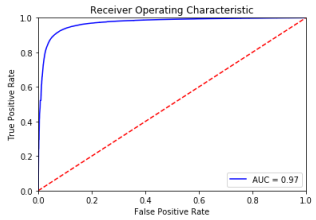
We used the following Uni-grams (one word), Bi-grams (Double words) and TF-IDF for preprocessing

In combination with them we used ML Classification models for classifying reviews as "positive" reviews and "negative" reviews

	NLP METHODS		
	Uni-grams	Bi-grams	TF-IDF
Logistic Regression	92.2	86.6	92.0
Multinomial Naïve Bayes	91.6	90.6	91.3
Support Vector Machines	92.5	86.4	92.5

Logistic Regression is the simplest ML Classifiers and SVM is the most complex. Accuracy is highest with SVM - Unigrams

These are the respective AUC plots for Multinomial Naive Bayes and Logistic Regression models. AUC represents degree or measure of separability. It tells how much model is capable of distinguishing between classes. Higher the AUC, better the model is at predicting negatives and positives accurately

	Uni-grams	Bi-grams	TF-IDF
Multi-NB			
Logistic Regression			

FEEDFORWARD NEURAL NETWORKS

With ML Classification models we were getting an classification accuracy between 86% to 92%. We will now build a model, a Neural Network and try to get even higher prediction accuracy. A Neural Network "learns" recursively from the error and tries to minimize it with each iteration called an epoch. In the second variant we introduce time reducing steps to enhance efficiency

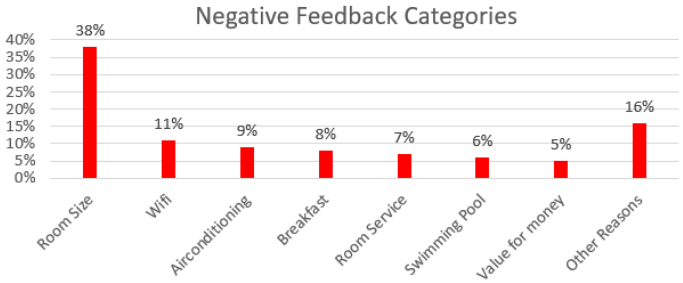
Model Name	Number of Hidden Layers	Hidden Nodes	Train Accuracy	Test Accuracy	Time Taken
Feedforward Neural Network 1	1	10	97.5	96.1	8678 seconds
Feedforward Neural Network 2	1	10	97.2	95.9	215 seconds

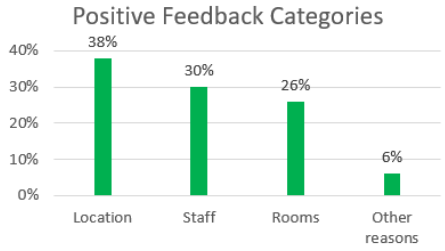
SEGMENTATION OF REVIEWS

After classifying reviews into positive and negative classes we want to group them into categories to get insights and take decisions

Category	Words used	Category	Words used
Room size	Small room, small size, small bed, small bathroom	Room Service	Poor room service, order service, order late
Wifi	poor wifi, wifi didn't work	Swimming Pool	swimming pool small, pool cold, sauna
Aircon	AC not working, hot air, hot room, room cold	Value for Money	poor value for money, expensive
Breakfast	Breakfast Expensive, Small Breakfast, Breakfast poor	Other Reasons	

Category	Words used
Location	Great location, excellent location, near metro, near market
Staff	Staff friendly, staff helpful,
Rooms	Rooms clean, room tidy, room comfortable, bed comfortable
Other reasons	





DEPLOYMENT

Deployment to production is a method that integrates a machine learning model into an existing production environment so that the model can be used to make decisions or predictions based upon data input into the model.

In the project we will build the architecture around the deployment