**Opening statement along with first slide from power point**

In this video, we will be taking a look at how we build the customer feedback sentiment analysis predictive model, using AI and Machine learning and also, we will show this in action.

For this prototype we are using Jupyter notebook environment, including Scikit-learn for classical machine learning and TensorFlow for Deep Learning.

Let’s go through the steps of our framework and see how we build this predictive model using Jupyter notebook.

Stage 1: Business Understanding. This is about building a predictive model that can predict the positive or negative sentiment of customer feedback. We look to achieve accuracy of at least ~85%.

From machine learning view point, this is a binary classification machine learning problem.

Stage 2: Data Understanding which is about understanding the raw data use for building the model. In this case we have customer feedback record data set having 3.4 million of records from Amazon.

Here are two raw customer feedback data point examples

We import the data using Pandas and we set it up appropriate positive or negative reviews so that we can use this for training our model.

If you look at the data, the column overall is the key data point to determine the customer sentiment based on their ratings

Moving into stage 3: Data Preparation. All the ratings generally in the range of 1 to 5.

As this is a binary classification problem, we need to convert ratings to 1 or 0, 1 for positive and 0 for negative, hold the value in a derived column review\_class for to train our model.

In order for this data to make sense to our machine learning algorithm, we’ll need to convert each customer feedback review to a numeric representation, which is called vectorization.

In classification of machine learning, items are represented by their features. In our case, customer feedback reviews are represented by their words, so we will use words as features. Typically, we give appropriate weights to different words, and [TF-IDF](http://en.wikipedia.org/wiki/Tf%E2%80%93idf) is one of the most common weighting schemes used in natural language processing use cases.

In Machine Learning, we always divide our data into training and testing part, that means, we train our model on training data and then we check the accuracy of a model on testing data. We have split our data set as 70:30.

Stage 4 Modeling. For demonstration purpose, we build two models. The first model is classical with Scikit learn and second one is Deep Learning with TensorFlow.

Stage 5 Evaluation. Evaluating machine learning algorithm is an essential part.

This visual called The ROC curve is measure the true positive rate against the false positive rate at various threshold; and Area Under Curve, it is use for binary classification problem.

We are able to achieve 89% accuracy.

This visual is called confusion matrix shows you numerically how the model performed. 11550/80931 true positive and true negative are classified correctly.

The classification report visualizer displays the precision, recall, F1 score, and support scores for the model.

Unit Testing is a good approach to test your model, the data we have prepared for our unit testing, where our model has not shown these data before. I have taken 100 records to unit test our model.

Moving to stage 6 Deployment. The last process of the entire framework is the deployment. We have trained our model and achieved very good accuracy score ~89%.

Now we will use this model for our real time demo.

We have developed a simple API which takes input as customer feedback review text; and pass the information to model to predict

As this is a binary classification, our model will predict the customer sentiment in one or zero. One for positive and zero for negative.

We can see them in action in a moment.

Let’s move into demo. Here is the web application, two models have been deployed, model one is classical and model 2 is deep learning to test the sentiment of customers feedback review using real world data.

Easiest thing I can do is to find some review about BlueShield of California instead of typing. Let’s search yelp review. Here is the positive one.

let’s test in action. Ahha happy customer.

To test negative sentiment, let’s find a negative one, here you go. Pretty sad customer

By applying machine learning model, on our customer data, we can easily find the customer sentiment.