Data Science in Business:
Text Analytics

Dr. Peter Molnar

Sarah Zeis

Carly Wieting

Georgia State University | J. MACK ROBINSON COLLEGE OF BUSINESS

Robinson

Course Overview

Class 1: Introduction to Machine Learning and Set-Up Python

Class 2: Data Exploration

Class 3: Machine Learning Models (Decision Tree and KNN)

Class 4: Text Analytics

Class 5: Forecasting with Facebook Prophet

Goals and Takeaways

- Understand Natural Language Processing & data preprocessing requirements
- Topic Modeling Process & Applications
- Sentiment Analysis & Applications
- Python Notebook Lab

Natural Language Processing

Natural Language Processing (**NLP**) is the extraction of **meaning** and **information** from text documents.

Information: words as a vector, # of times words were used

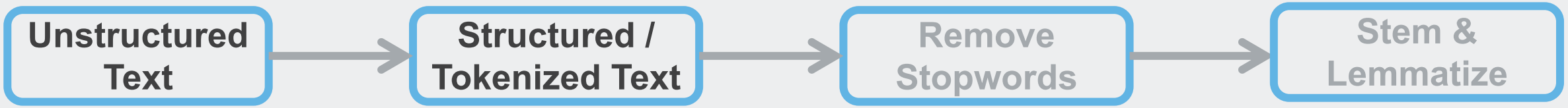
Meaning: Positive, joy, anticipation

NLP Pre-processing

NLP Requires Structured Data

Text is aggregated and stored as unstructured data.

NLP requires data pre-processing to turn blocks of text into a structure.



NLP pre-processing is typically initiated with by adding structure with **tokenization**.

The Tokenization Process

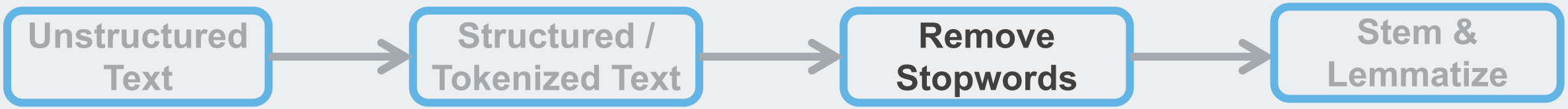
Tokenization breaks a sentence (or block of text) into its individual components.

Use sentence breaks to turn an **unstructured** block of words **into a list**

[‘Tokenization’, ‘breaks’, ‘a’, ‘sentence’, ‘or’, ‘block’, ‘of’, ‘text’, ‘into’, ‘its’, ‘individual’, ‘components’]

Now that we have a list, we have added structure to our data.

Removing Stopwords



Removing stopwords removes general language terms that do not add value to the information in your text.

Stopwords in the above sentence: [’do’,‘that’, ‘to’, ‘the’, ‘in’, ‘your]

Sentence after removing stopwords: Removing stopwords removes general language terms not add value information text

Stopwords can be identified by creating a list or using an existing package that can provide a list of stopwords.

Stemming & Lemmatization

Unstructured Text → Structured / Tokenized Text → Remove Stopwords → **Stem & Lemmatize**

Stemming

Removing common endings from words by defining rules

Ex: ly, ing, er, es, s, ed

Lemmatization

Using language & grammar rules to identify the roots of words

Ex: best -> good, lying -> lie

Stemming & Lemmatization

Which transformation was used in the below word examples:

Adjustable	→	Adjust
Better	→	Good
Meeting	→	Meeting
Airliner	→	Airlin

Bag of Words

Bag of Words: Converting pre-processed text into a dictionary that counts how often a word occurs.

Example

Sarah likes to run. Carly also likes to run. They run in the city.

↓ Tokenize & remove stopwords

[sarah, like, run, carly, like, run, they, run city]

↓ Transform into bag of words

{“sarah”: 1, “carly”: 1, “run”: 3, ”like”: 2, “city”: 1}

Machine Learning Models

Topic Modeling

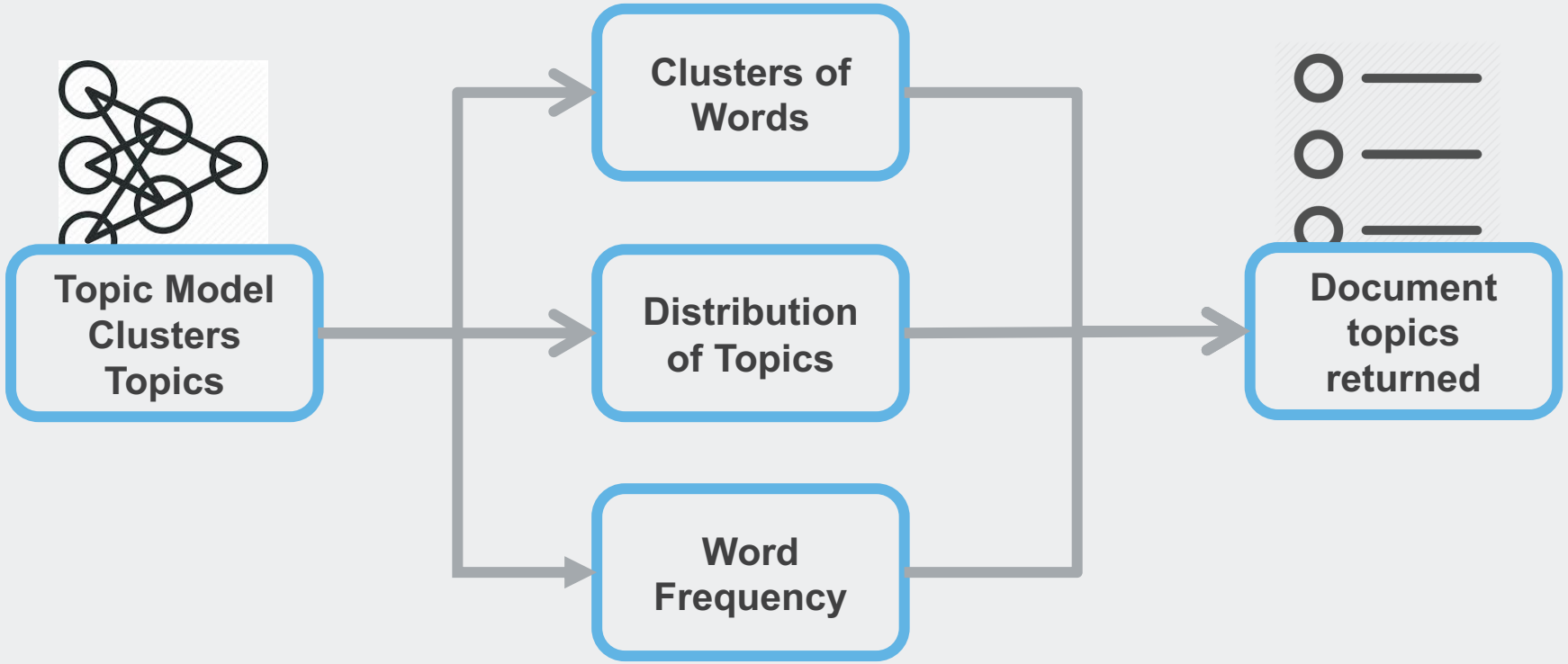
Topic Modeling is a method of statistical modeling for identifying the general topics within a document. Topic modeling is <u>unsupervised</u> because the topics in the documents are unknown.

Example: I am looking for a common theme across multiple text documents for a legal case.

Topic Modeling Process

Modeling Overview & Outputs

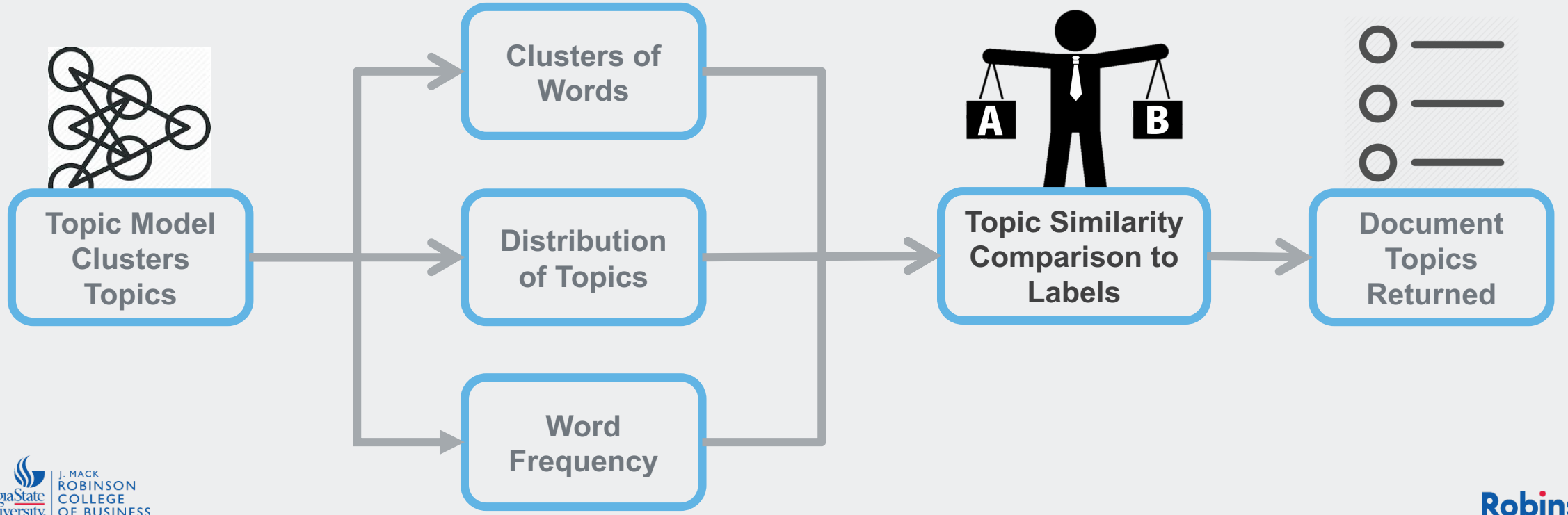
Model identifies topics present in a document (unstructured text) by deriving patterns in the document.



Supervised Topic Modeling

Supervised Topic Modeling is referred to as Topic Classification

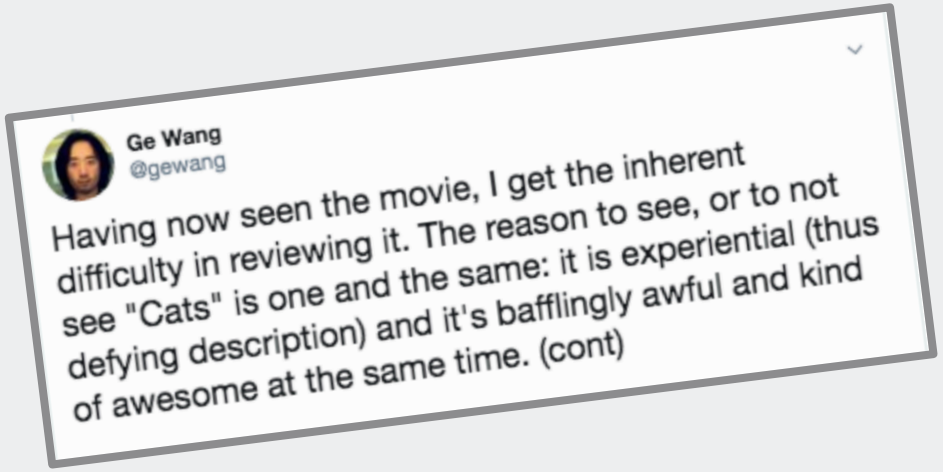
Topic modeling can be trained with labels as well. This allows the user to have the algorithm pre-identify clusters or distributions of topics present in each document.

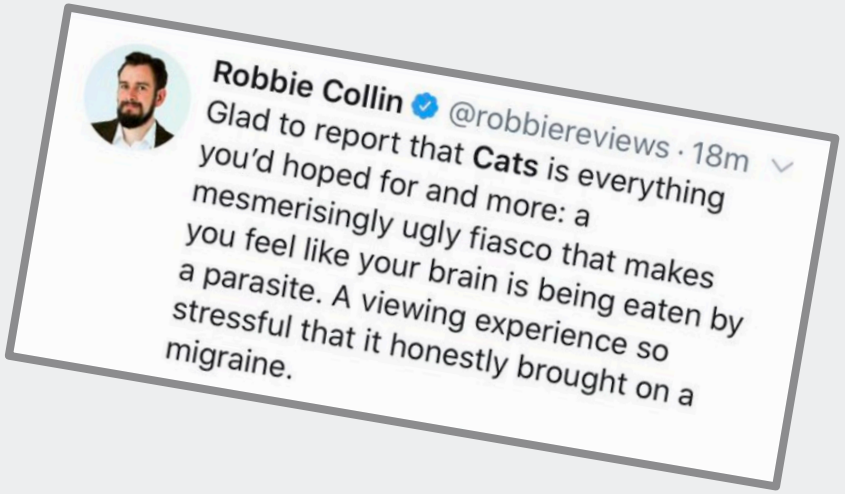


Sentiment Analysis

Determining whether a response or statement is **positive**, **negative** or **neutral**.

Sentiment can be difficult for humans to detect.

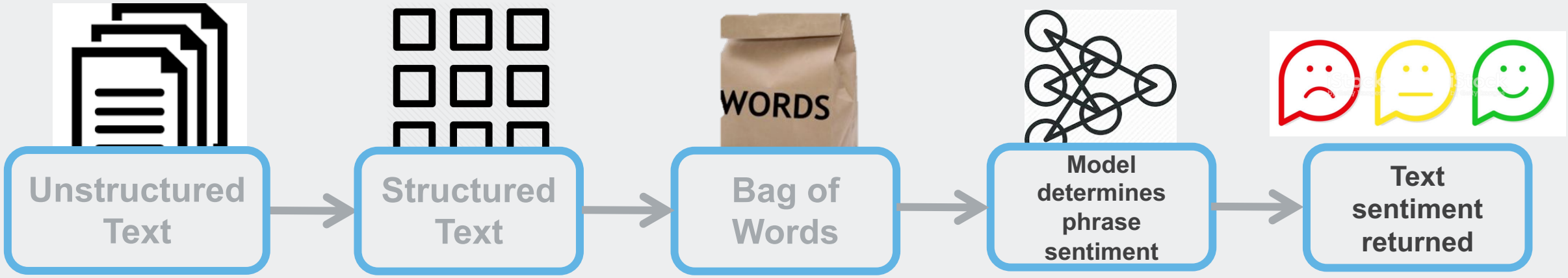




Sentiment Analysis Process

Sentiment is typically classified by using one of two approaches:

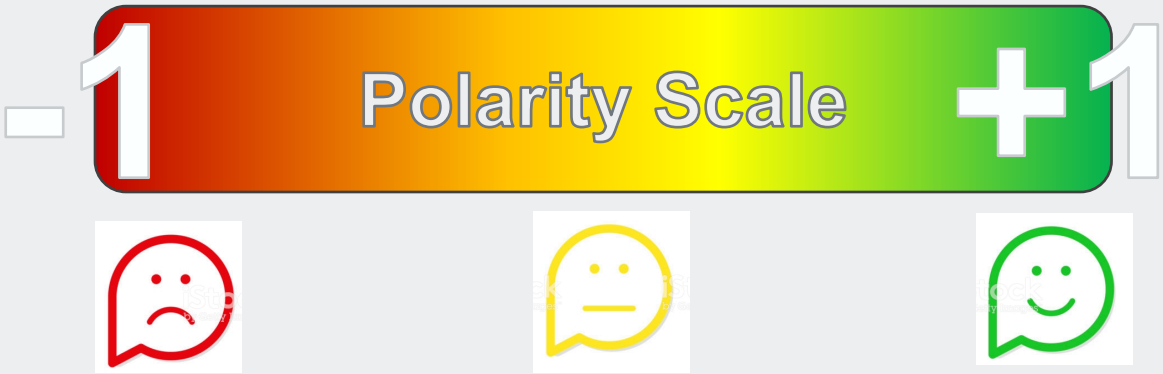
1. A supervised approach with a labeled dataset (ie. Yelp review text w/ a star rating)
2. An unsupervised approach with a pretrained statistical package (ie. Textblob)

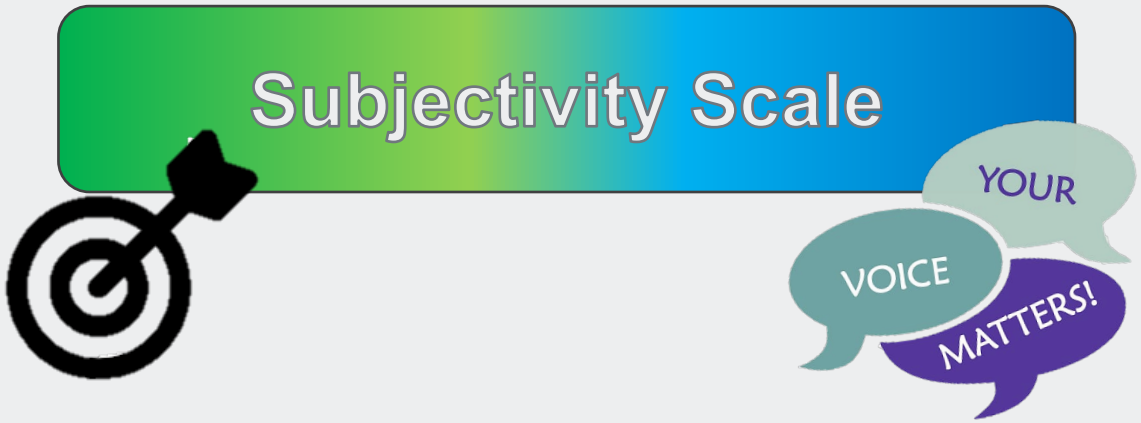


Generating Sentiment Analysis

Sentiment analysis can be supervised or unsupervised. The **textblob** sentiment analysis package will return two values (Polarity, Subjectivity):

1. **Polarity**: score ranges from -1:1. -1 is a negative sentiment, 0 is neutral, 1 is positive
2. **Subjectivity**: score ranges from 0:1. 0 is an objective score; 1 is a subjective score





Natural Language Processing Applications

Voice of the Customer (Customer reviews, customer sentiment)

Legal Analytics (information from lengthy legal documents)

E-mail classification (eg: spam, promotions, social)

Topic Modeling in Pythom

Navigate to the bootcamp Github:

https://github.com/institute4insight/Data-Science-in-Business-Bootcamp

And download today's notebook!