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# Introduction

In an economy increasingly driven by e-commerce, optionality for consumers has never been greater [SOURCE]. Furthermore, the structure of online reviews allows consumers unprecedented access to information about prospective products and services. In order to compete in the digital age, companies must be able to analyse these customer reviews to evaluate and improve their digital image and reputation. In the context of “stars” or a rating system, this is a fairly trivial matter. However, when no such linear system exists, it becomes a much more challenging and ambiguous task. To properly categorize reviews at scale, a potential solution is to employ sentiment analysis to ascertain the relative quantity of positive to negative reviews. Due to the subjective and specific nature of sentiment analysis, this is a potential application for a machine learning model. Therefore, this project will aim to create a model to classify online customer reviews. To restrict the investigation scope, this project with only explore the potential for decision-tree models.

This model will be constructed from one such dataset of unlabelled customer reviews sourced from TrustPilot, an online review platform. These reviews pertain to a company called ASOS. Given that the model will be used to drive aggregate information about a large corpus of data, success criteria for this project will be creating a model that can classify consumer reviews as ‘positive’, ‘negative’, or ‘neutral’ with an accuracy of at least 80%.

# Background

## Sentiment Analysis

Sentiment Analysis is a form of Natural Language Processing (NLP) that works to identify and classify opinions expressed in text.

Challenges related to the subjective nature

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## Decision Trees

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## Lexicon-Based Labelling

This project will employ a lexicon to label the training data. A lexicon is a corpus of words and phrases associated with a sentiment value on a certain scale. One such lexicon is the AFINN lexicon. Developed at the Technical University of Denmark in 2011, the AFINN lexicon was specifically developed for sentiment analysis of “microblogs”, or short chunks of text casually posted online [SOURCE]. AFINN was developed using twitter posts from 2009, then refined against leading lexicons at the time such as ANEW.

## Term Frequency & Inverse Document Frequency

Term Frequency - Inverse Document Frequency (TF-IDF) is..

# Method & Approach

## Project Plan

This project can be broken down into three distinct problems. First, the training data must be properly labelled to facilitate supervised learning. Then, the data must be cleaned and transformed into a format that can be modeled. Finally, the appropriate model must be built and refined using these preprocessed data.

To label the training data, a combination of a manual and lexical labelling will be employed. Approximately 10% of the given data will be initially labelled manually. Then the AFINN lexicon will be applied across all instances to the review title and review contents separately. The relative distribution of the scores for labelled instances will be analysed, moderating for the given label, to determine logical boundaries for the classification. These boundaries will then be applied across all instances to label the training data.

To transform the data into a workable format, TF-IDF vectorization will be applied to the preprocessed tokenized data. This will yield a set of features that represent important tokens across the dataset.

Finally, to build and refine the model, attribute selection will first be applied to the TF-IDF results to significantly reduce dimensionality. Once this has been performed, the selected decision tree model will be applied and then fine-tuned to produce the most promising result

## Preprocessing

* Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.
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* Do not mix complete spellings and abbreviations of units: “Wb/m2” or “webers per square meter”, not “webers/m2”. Spell out units when they appear in text: “. . . a few henries”, not “. . . a few H”.
* Use a zero before decimal points: “0.25”, not “.25”. Use “cm3”, not “cc”. (*bullet list*)

## Modeling

Given the restriction of the project scope to decision tree models, the optionality for potential models is naturally limited. Three common approaches to decision trees include the C4.5, random tree, and random forest algorithms.

## Evaluation

* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum **0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
* In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
* A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
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* Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
* Do not confuse “imply” and “infer”.
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* There is no period after the “et” in the Latin abbreviation “et al.”.
* The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [7].

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2. Example of a figure caption. (*figure caption*)

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##### Acknowledgment *(Heading 5)*

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