

# Nutrition vs Keto

*Subreddit Classification*





# Data Science Process

**01** \* Define problem.

**02** \* Gather data.

**03** \* EDA , Cleanup & Preprocessing

**04** \* Build Models & Evaluate.

**05** \* Answer problem.

**06** \* Recommendation



## 01. Business Problem:

**We want to help the moderators to automate the classification and this will benefit the maintenance and sanity of each subreddits by posting to the correct group.**

**Can we accurately label if a post is appropriate for Nutrition or Keto?**

# \* Intro to our subreddits

## Nutrition

A subreddit for the discussion of nutrition science. Macronutrients, micronutrients, vitamins, diets, and nutrition news are among the many topics discussed.

**2.3M Members**

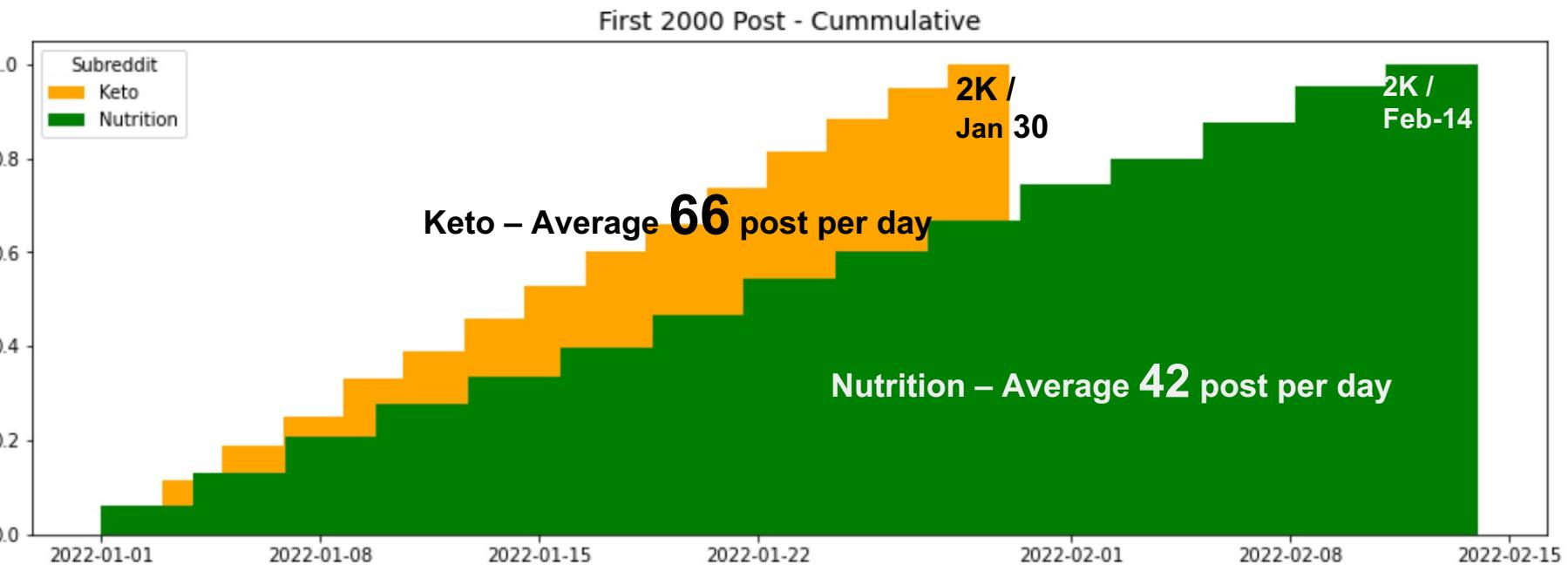


## Keto

The Ketogenic Diet is a low carbohydrate method of eating. Place to share thoughts, ideas, benefits, and experiences around eating within a Ketogenic lifestyle. Helping people with diabetes, epilepsy, autoimmune disorders, acid reflux, inflammation, hormonal imbalances, and a number of other issues, every day.

**2.9M Members**

## ★ 02. Gather Data (Data from Jan to Feb '22) ★



*First 2000 post from Jan 1, 2022:*

Since Keto is more active and have more members, it reached the 2K post on Jan 30, 2022. Nutrition's reached 2K post on Feb 14, 2022.



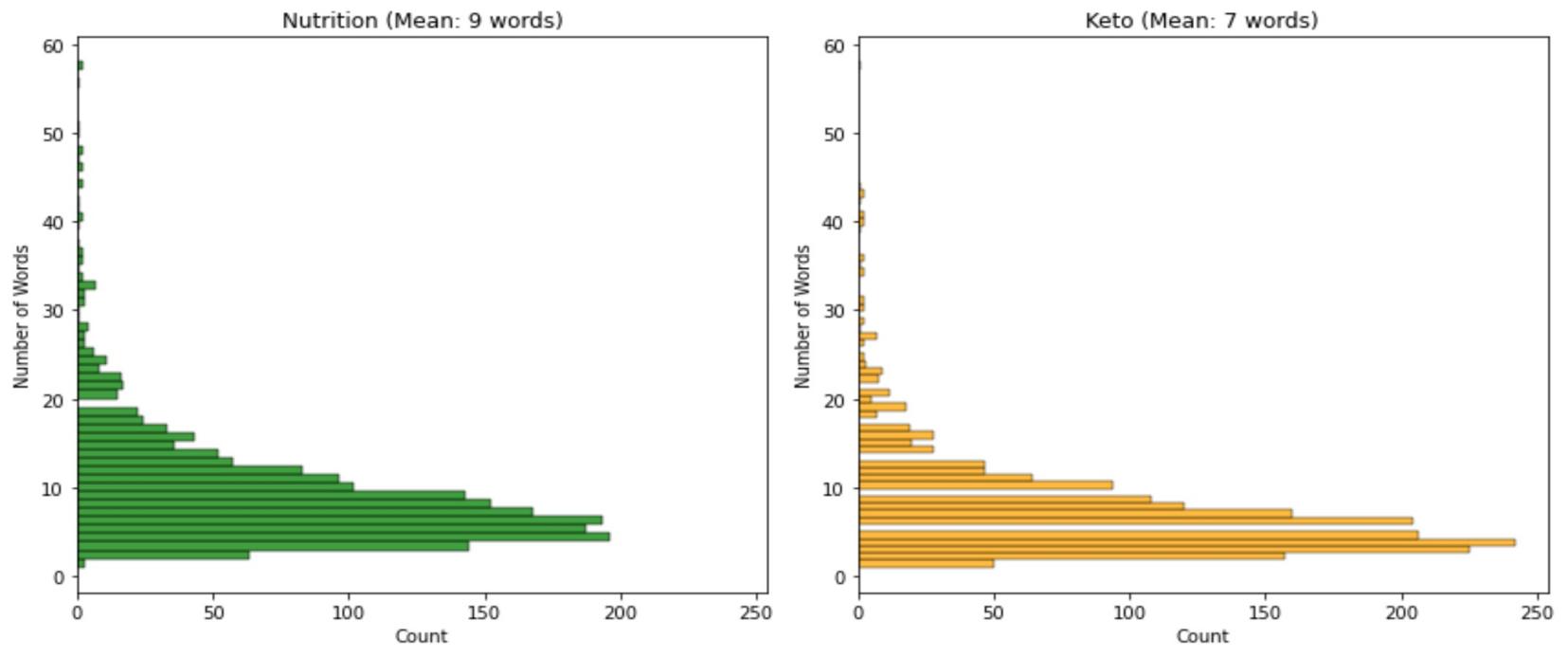
## 03. EDA Feature(s)?

Title or Self-text,  
... Or both?



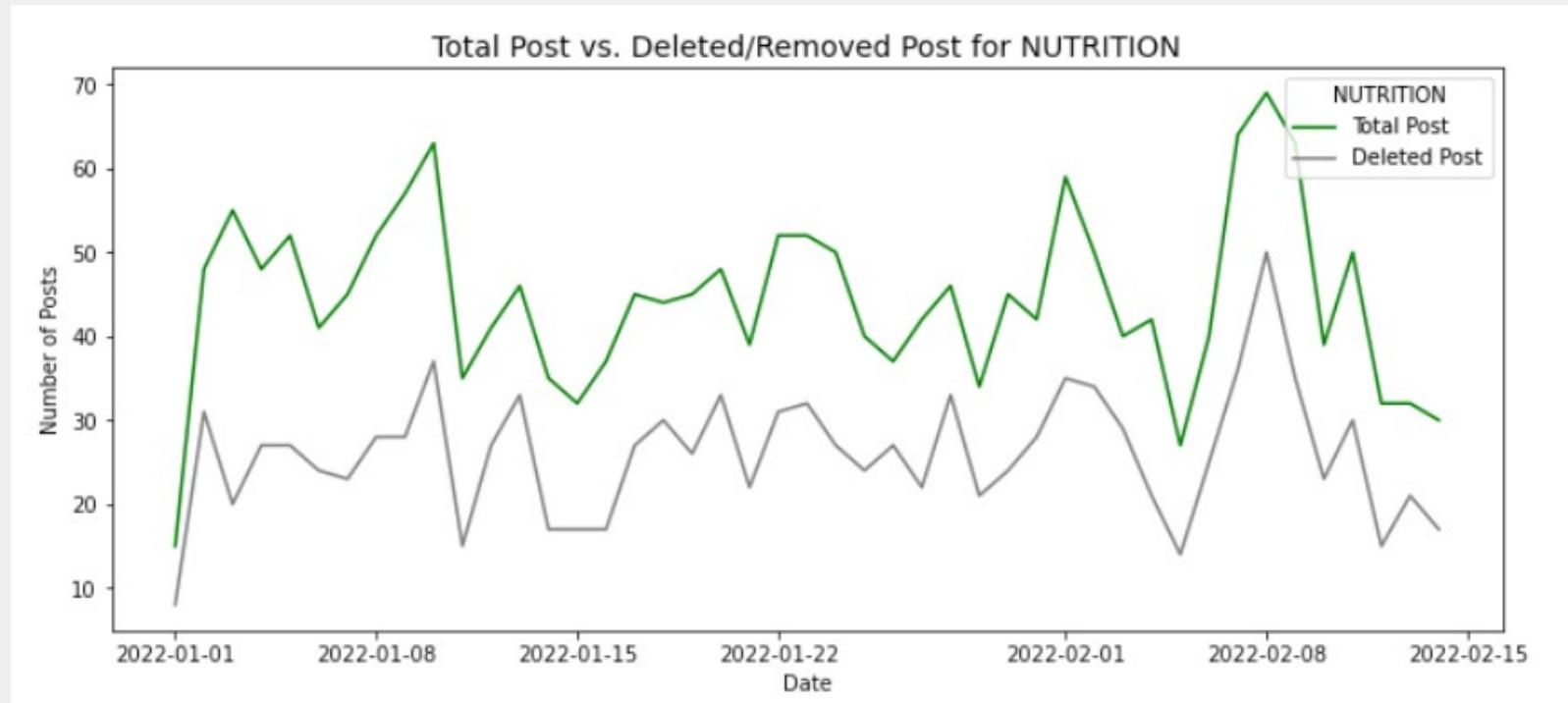
# \* Title Analysis \*

Length of Title by Count of Words



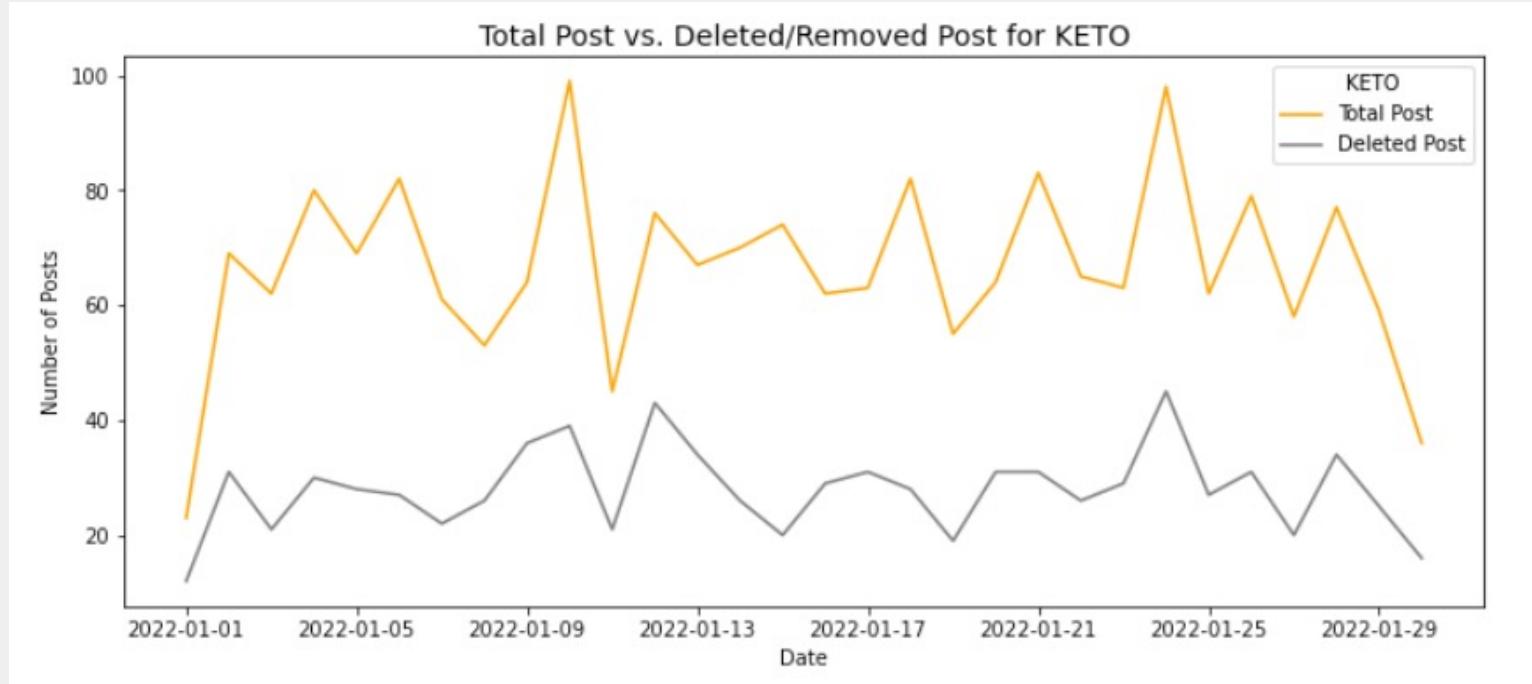
\* Nutrition has slightly higher average count of words, they have (almost) similar distributions \*

# \* Self-Text Analysis - Nutrition



\* 59% of the self-text was removed/deleted

# \* Self-Text Analysis - KETO \*



\* 41% of the self-text was removed/deleted \*



# Feature: **Title**

We use **CountVectorizer** to extract feature from **Title**.. to transform **Title** into a bag of words (in a simple term), or a vector on the basis of the frequency or count of each word that occurs in the entire **Title** (as a technical description)





# Cleanup and Pre-processing

## Cleanup Author:

Keto- >AutoModerator,  
Basic\_Site5449

1.5%

Nutrition >AutoModerator  
Disastrous-Drop-8085

2.0%

## Remove Duplicate:

Title

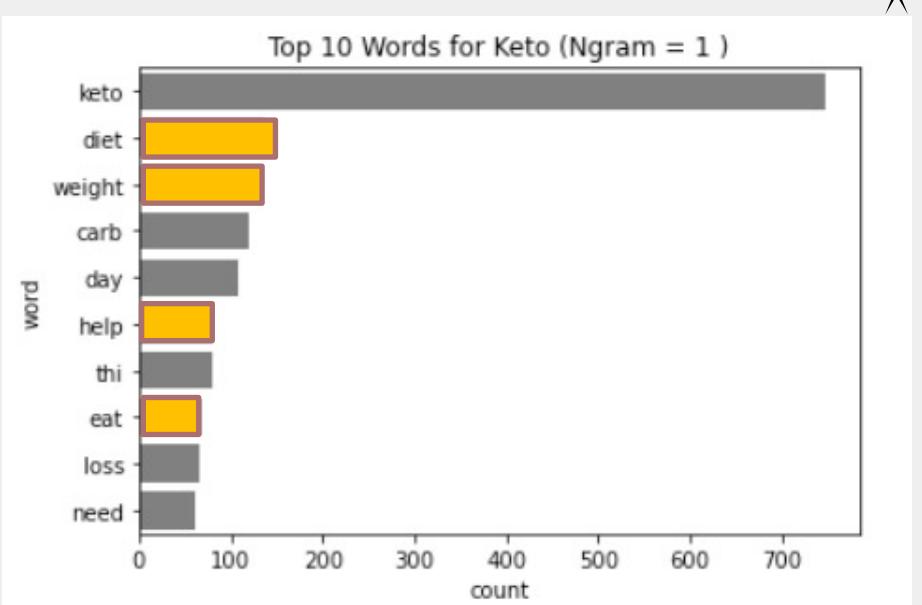
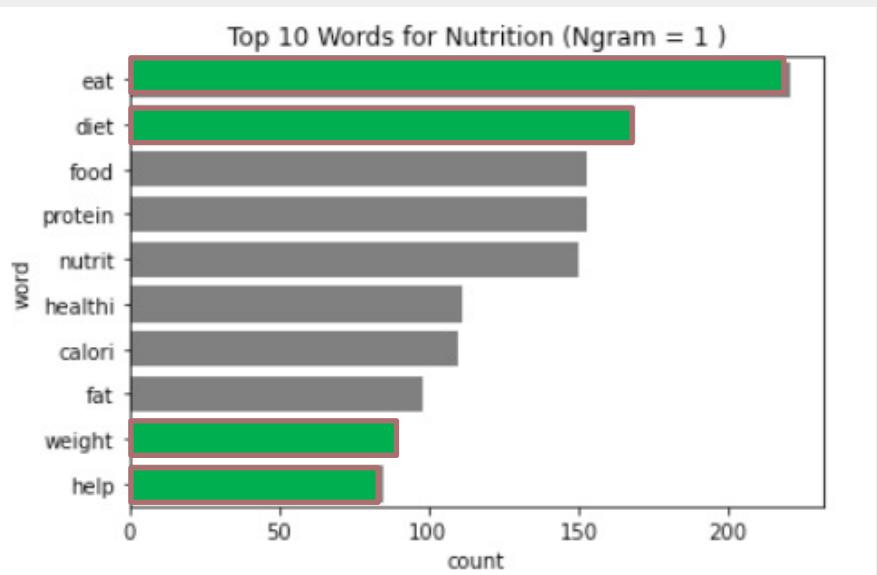
2.0%

- **Tokenizing** (lower case and removed punctuations)
- **Stemming** (transforms a word into its root form, e.g. *eating/eats* to *eat*, *losing/loses* to *lose*, *why* to *whi*, *does* to *doe*)

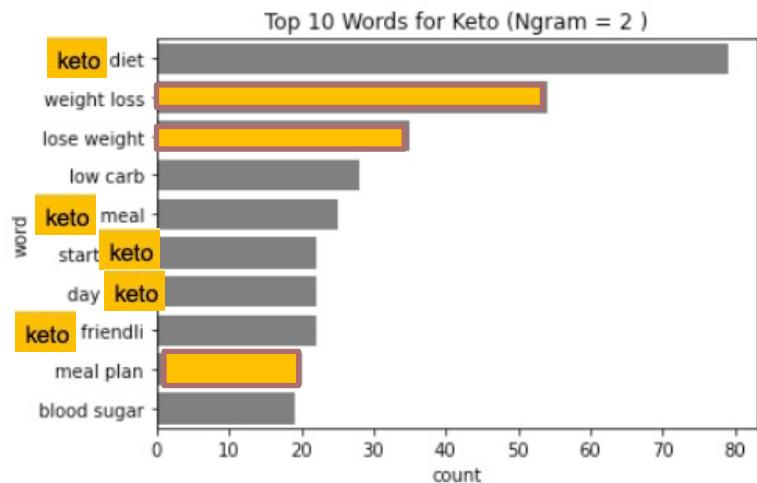
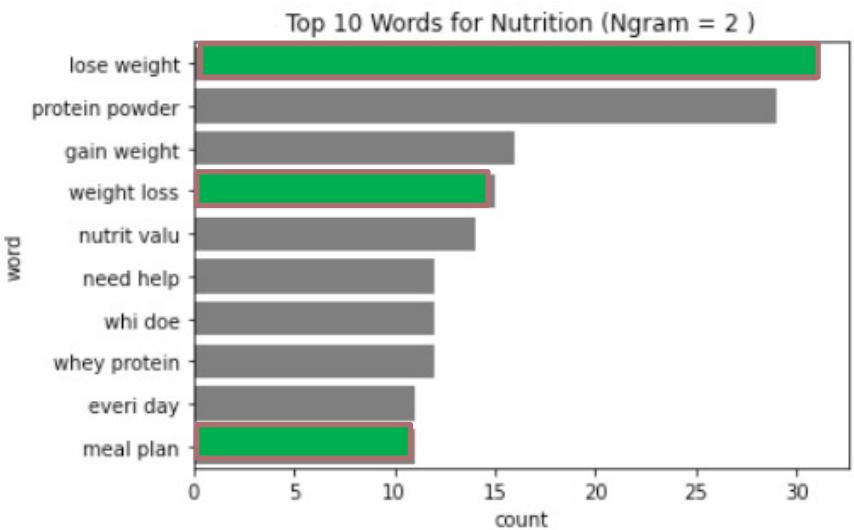


# Word Analysis

## Top 10 words

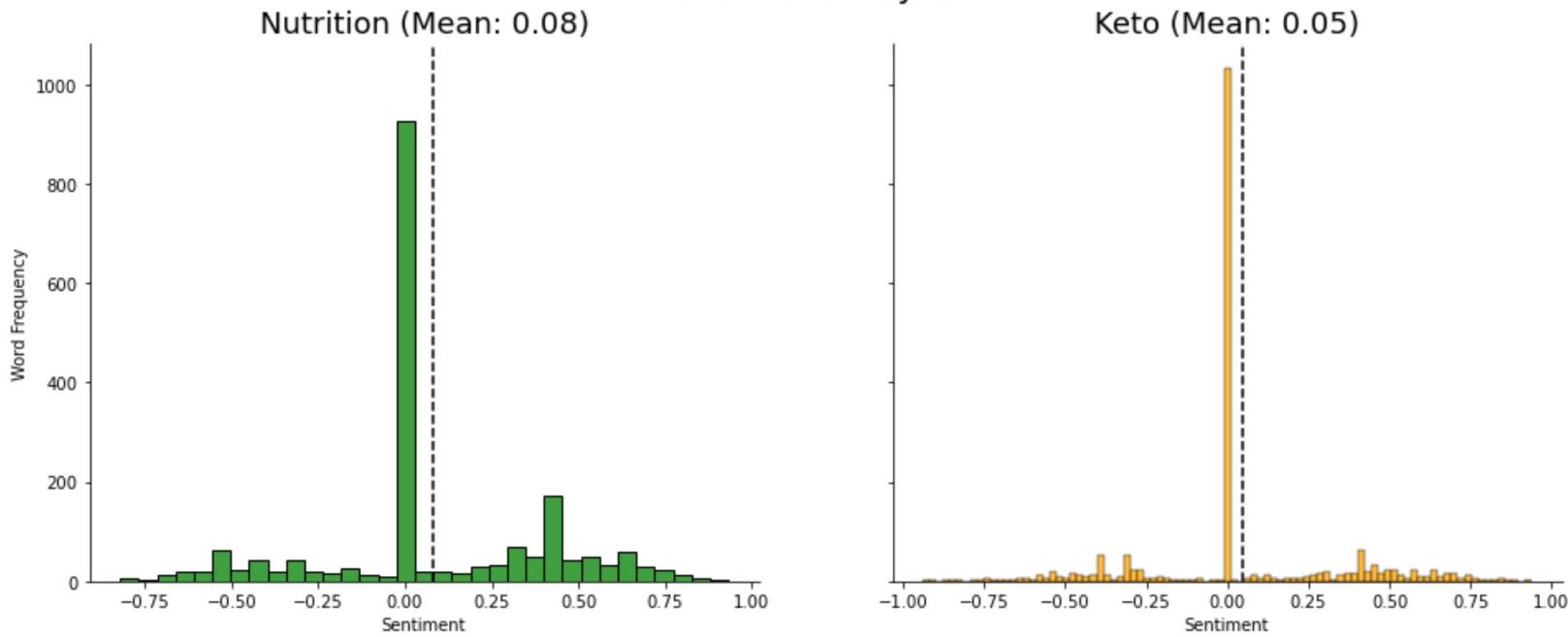


# Word Analysis (BiGram)



# \* Sentiment Analysis using VADER \*

Sentiment Analysis



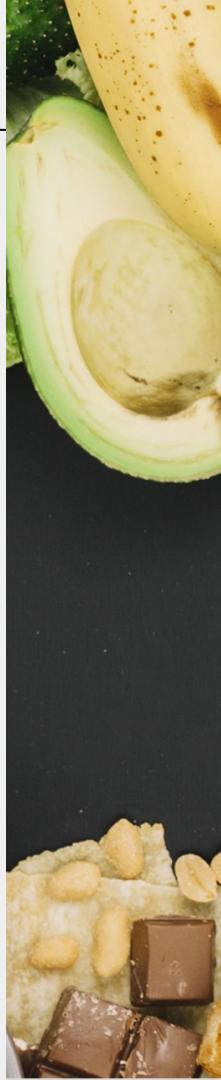
Keto has higher “Neutral”  
Nutrition has more positive sentiments than Keto.

# \* Nutrition



'What are some of the **best healthy** foods to eat to boost appetite and sustain energy?'

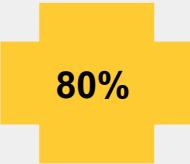
'Best liver care for high alcohol consumption'



-70%

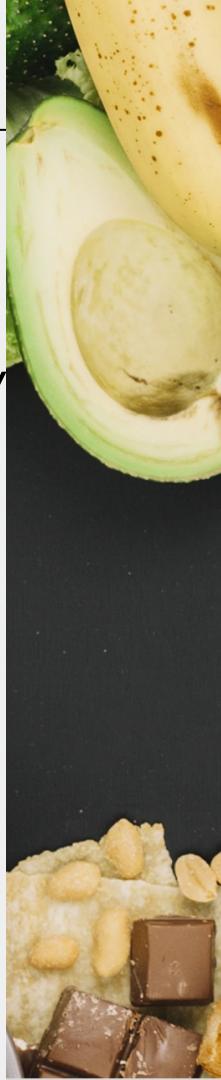
"I **screwed up** and ate 40 to 60 grams of saturated fat everyday for 2-3 years while bulking. Have I caused irreveisable damage to my body?"

"I'm **Scared** My Diet Is Going To **Kill** Me Early"



"The **best** fish I've ever eaten!! What is your **best** food?"

*"That **feeling of bliss** when you cook a new recipe/dish for the first time and it's **so good** it brings a tear to your eye..."*



-80%

*'Do You Make These Four Common Diet **Mistakes** That **Sabotage** Your Health and Stall Fat Loss?'*

*'I want to stick to keto so **bad**, but I keep finding myself **cheating**'*



## 04. Model with data & Evaluate model.

**Our baseline model:**

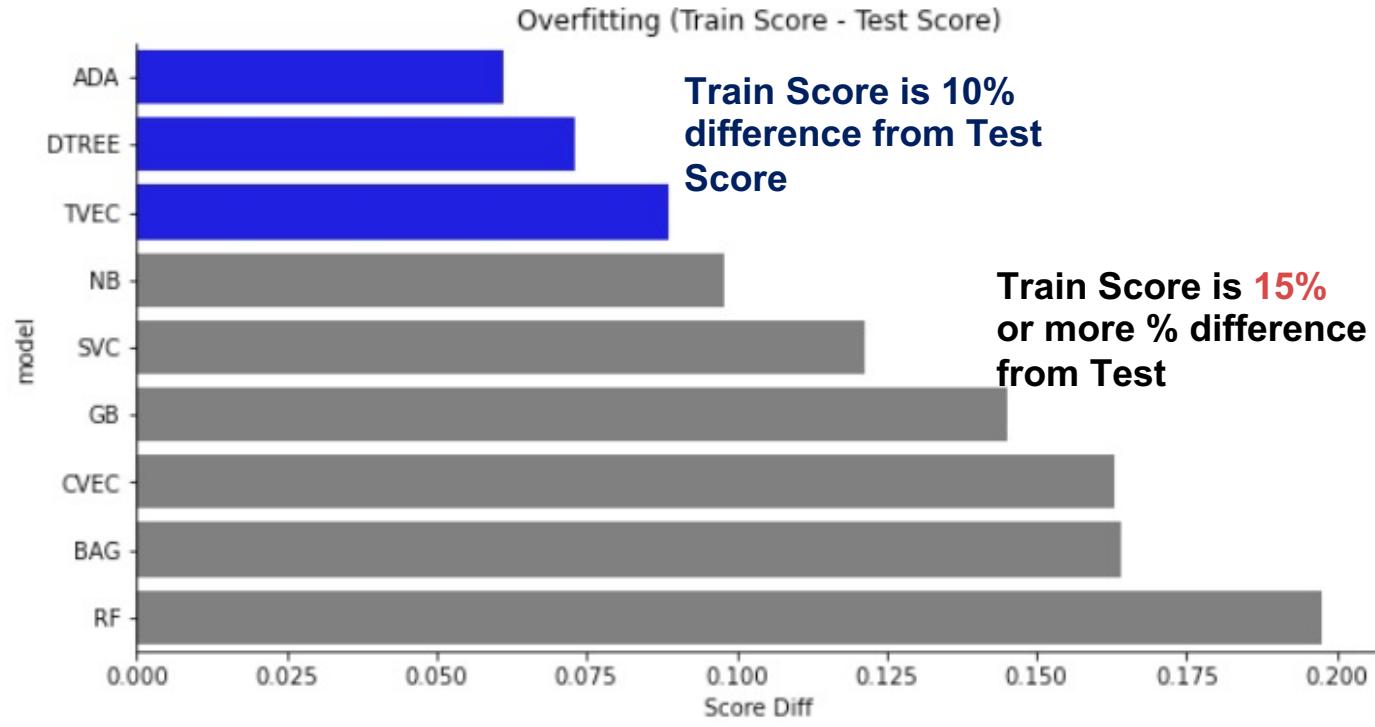


**50%**



## Challenges:

### 1. Overfitting problem



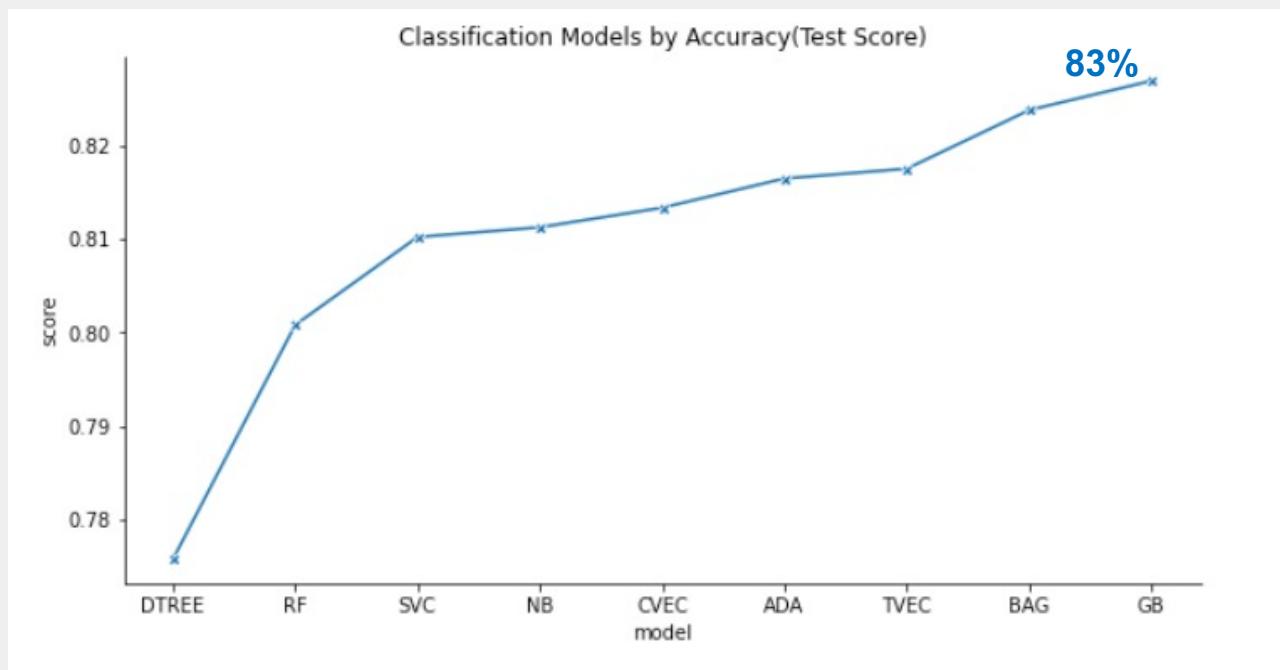
2. Time to run GridSearch using hyperparameters: Boosting is slowest amongst all models, as it builds the model in sequential way (compared to Bagging where it trains in parallel or independently) so tuning the hyperparameters can take longer time for Boosting



# MODEL's Accuracy

9 Classification Models:

**DecisionTree**  
**RandomForest**  
**SVC**  
**NaiveBayes**  
**CountVectorizer**  
**AdaBoost**  
**TFIDF Vectorizer**  
**BaggingClassifier**  
**GradientBoost**





# Classification Models – Ensemble Technique

## Gradient Boost Classifier

**Boosting** is a method of converting weak learners into strong learners. Boosting takes a weak base learner and tries to make it a strong learner by retraining it on the misclassified samples.

In **gradient boosting**, it trains many model sequentially. Each new model gradually minimizes the loss function of the whole system using Gradient Descent method.

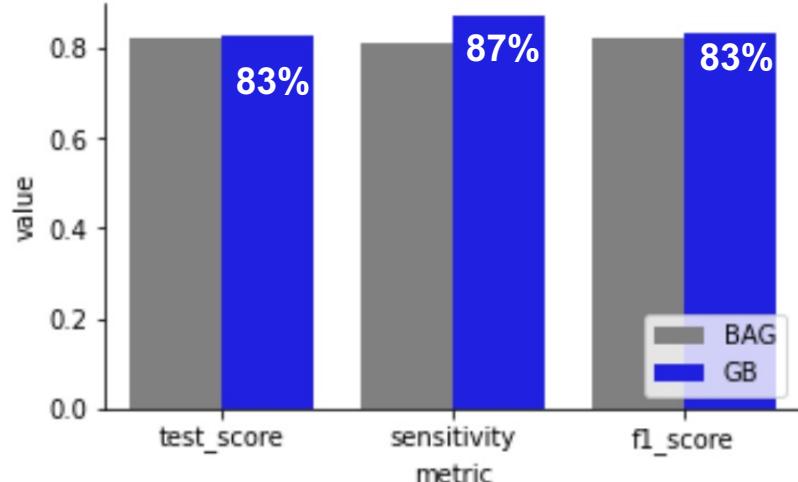
## Bagging Classifier

**Bootstrap** - means random resampling of data and we control whether samples and features are drawn with or without replacement.

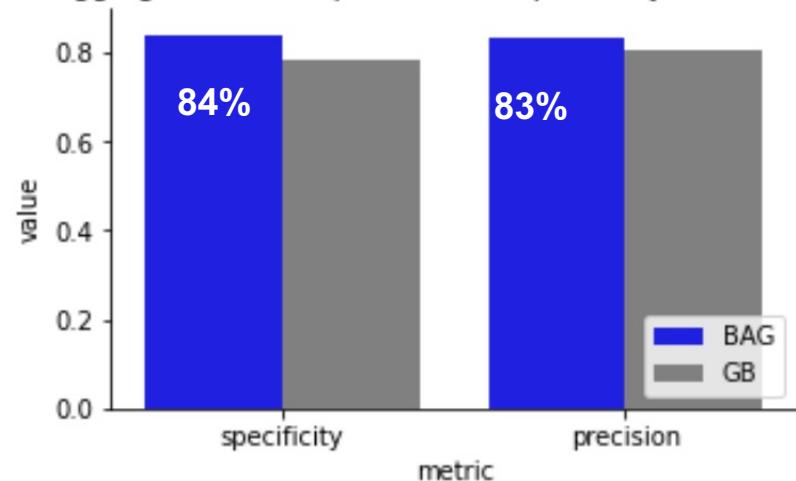


## Other Metrics :

GradientBoost Metrics - Accuracy, Sensitivity and F1 Score



BaggingClassifier Tops Metrics - Specificity and Precision



**GradientBoost wins  
Accuracy, Sensitivity and F1  
Score**

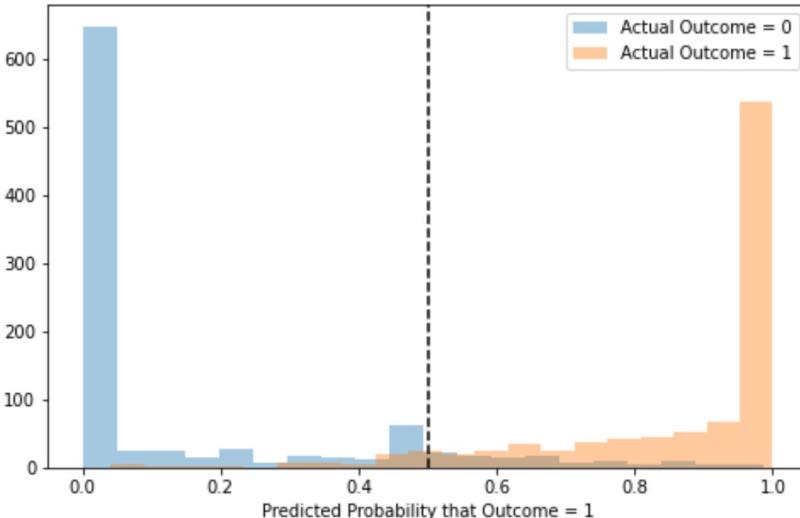
**BaggingClassifier wins  
Specificity and Precision**



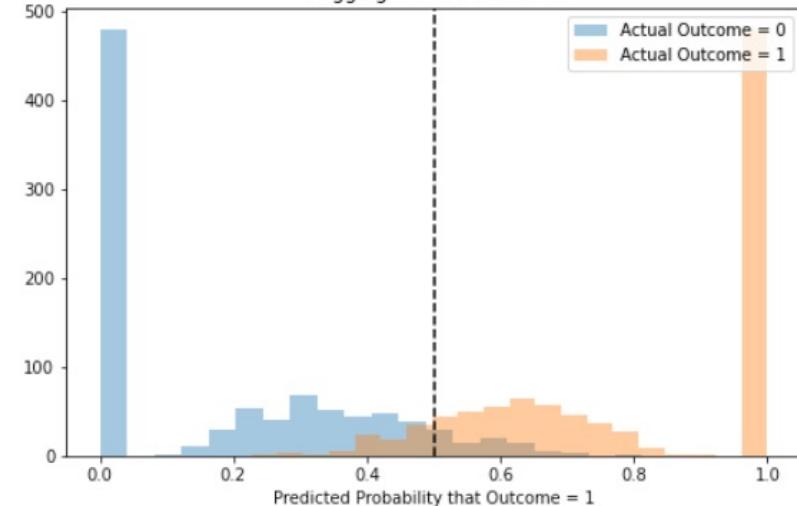
# Distribution of Probabilities

Nutrition is our positive class  
Keto is our negative class

GradientBoost Classifier



Bagging Classifier MODEL





## Selected Model: *Bagging Classifier*

**Reason:** We selected ***Bagging Classifier*** as our best model for this classification project, though GradientBoosting Classifier tops Accuracy and F1, it wasn't that much difference. The major difference is in Sensitivity and Specificity, we want our negative class to be predicted more accurately, as **Keto** is strict diet and should not be classified under the **Nutrition** subreddit. Bagging Classifier is highest in this metric with 83.5% rate compared to Bagging Classifier with only 78.5%

Metric:	Bagging Classifier Metric %	Difference from Gradient Boosting
Test Score (Accuracy)	82.30 %	-0.31
Sensitivity	81.25 %	-5.63
Specificity	83.50 %	+5.00
Precision	83.16 %	+2.96
F1 Score	82.19 %	-1.21



# Model Insight: Misclassified Post (Bagging Classifier Model)

## False Negative

	title	actual	predict
the fastest method to lose weight https://shrinke.me/lqwFdwjU	Nutrition	Keto	
New member i need halp	Nutrition	Keto	
36F with PCOS, trying Low carb intermittent fasting - so tired, how can I fix this?	Nutrition	Keto	
Keto Diet and its health benefits	Nutrition	Keto	

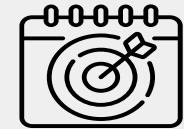
## False Positive

	title	actual	predict
Great Value chia seeds nutritional info vs other sources of nutrition	info	Keto	Nutrition
For the purpose of blood sugar/insulin regulation, how important is it to eat protein	protein	Keto	Nutrition
I'm making chicken teriyaki tomorrow, can someone recommend a side that will complement it well?		Keto	Nutrition
How many calories	calories	Keto	Nutrition



## 05. To answer our Business Problem:

**Yes, we have selected Bagging Classifier as our model that can label posts as Keto or Nutrition based on the TITLE with 82% Accuracy.**





## 06. Recommendation:



Tuning of hyperparameters to overcome overfitting



Include other features like self-text and probably sentiment analysis score might improve our metrics.



Include images or videos in our analysis for more accurate prediction (which requires more knowledge on different ML domains)

# A PICTURE IS WORTH A THOUSAND WORDS -- #WORDCLOUD



