An investigation into r/keto and r/zerocarb

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Context

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- There has been a rise in the popularity of Ketogenic Diets, and Zerocarb or Carnivore diets over the years.

- There are many studies to show that these diets work well

- However this diet is not without its risks

Context

- The rebound
  - Too difficult
  - ‘End of diet’
  - Bingeing

Problem Statement.

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- Our team wants to build a classification model to classify our clients into each group based on subreddit data, and minimize false positives especially when it comes to the **Zerocarb** group.

    - We will be focusing on text data, i.e. subreddit post title text, as well as subreddit post text.
    - The main metric of focus will be the maximizing the precision score which directly reduces the percentage of False Positives. (True Positives/Predicted Positives)

Data Scraping

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- Custom Class to scrape posts from ‘r/keto’ (3M) and ‘r/zerocarb’(120k)
  - Conditions:
  - Not video
  - Not image
  - Not removed
  - Not deleted
  - Not empty

- 10, 000 rows of data (with conditions)

- ‘r/zerocarb’ ran out of posts after pulling 9, 935 posts

Data Cleaning

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- Custom Class resulted in
  - No null or missing values
  - Only text posts

- 2 custom functions for text pre-processing
  - Remove URLS
  - Remove special characters (e.g. :P)

EDA

Data Cleaning and EDA

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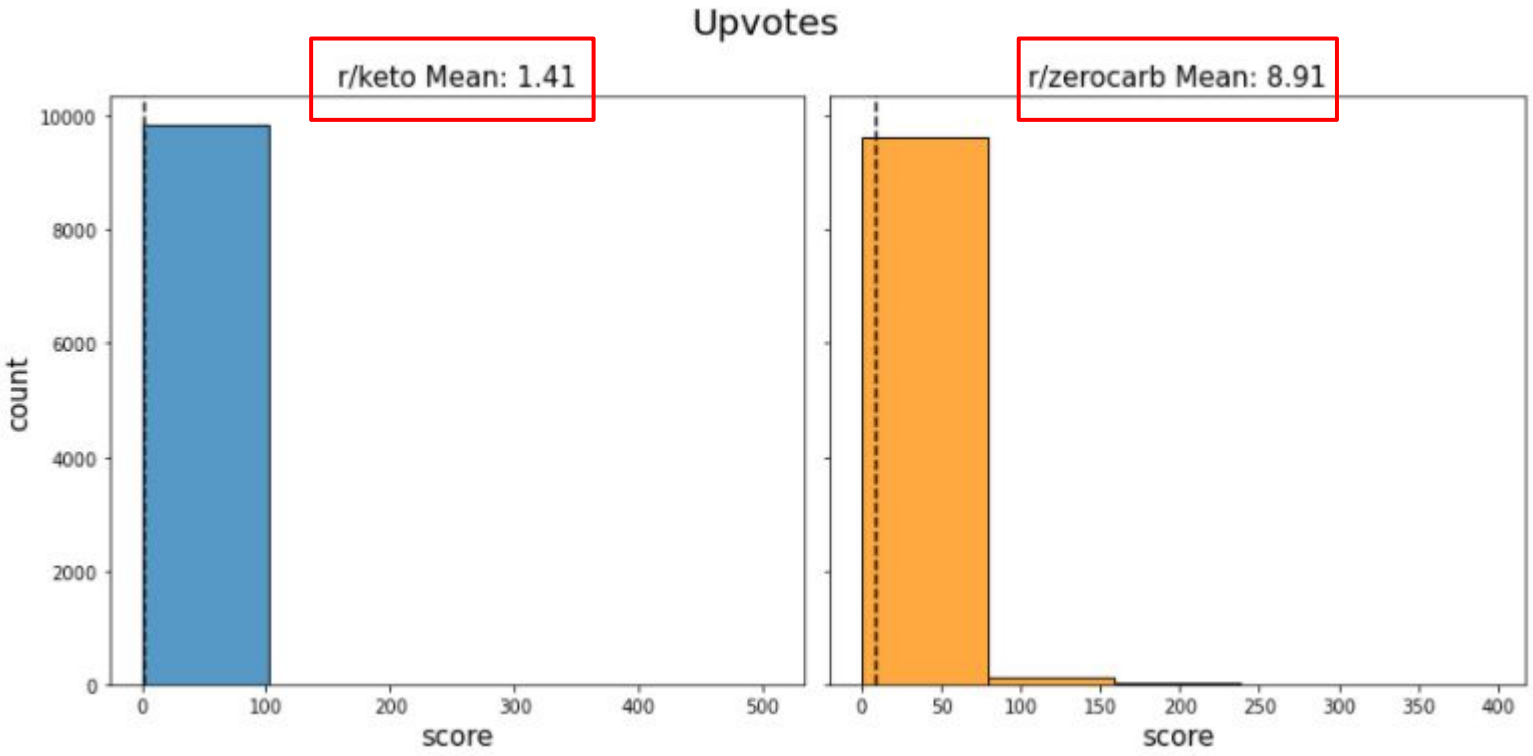

Data Cleaning and EDA

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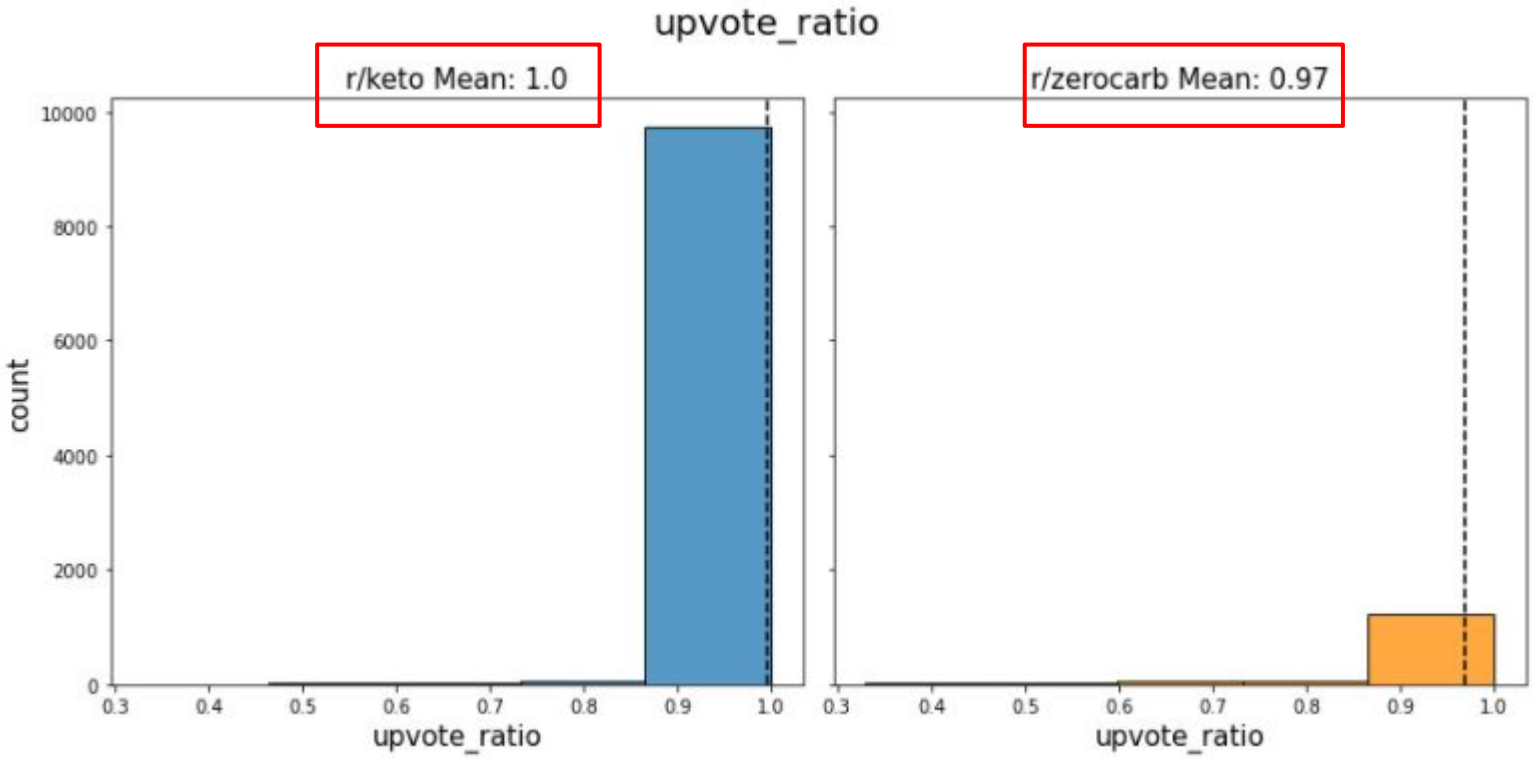
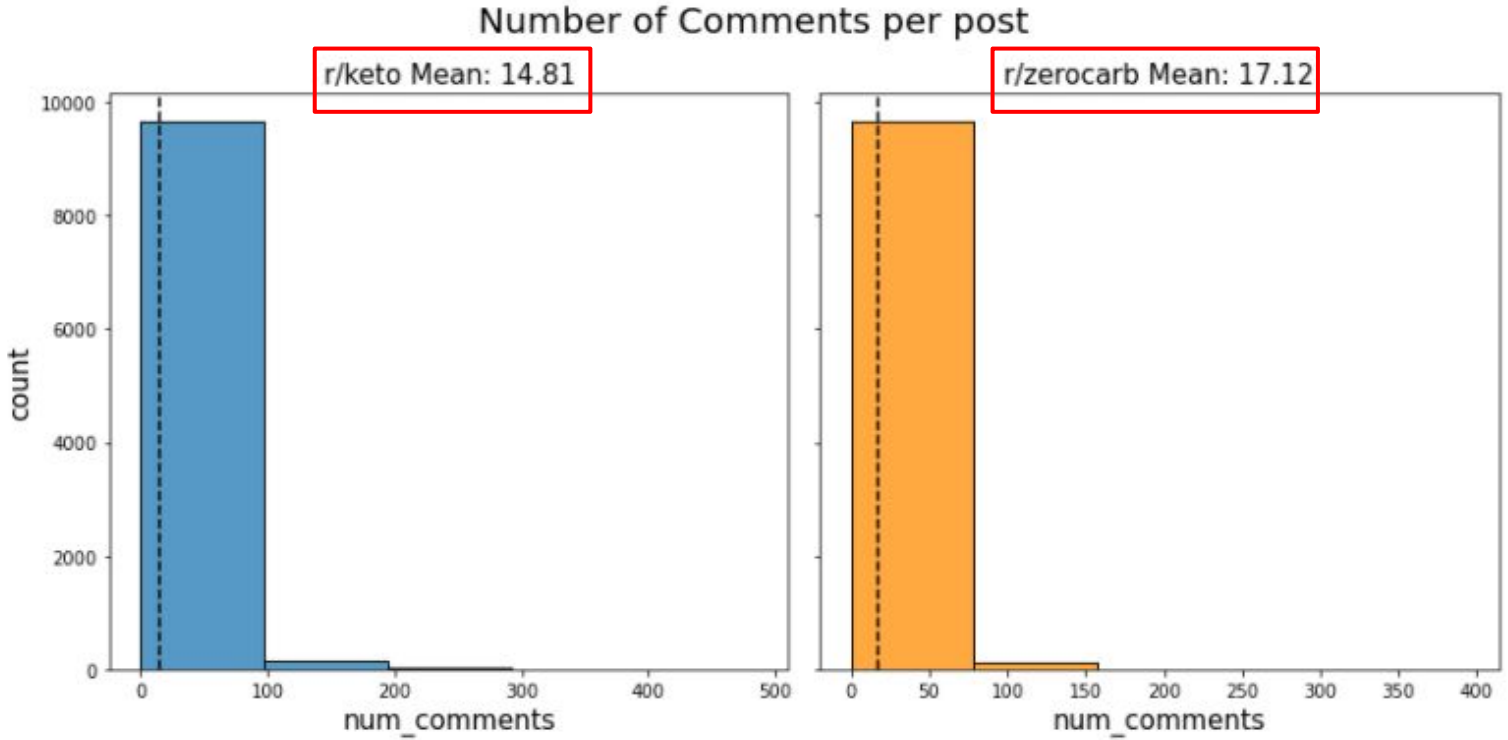


Data Cleaning and EDA



Data Cleaning and EDA

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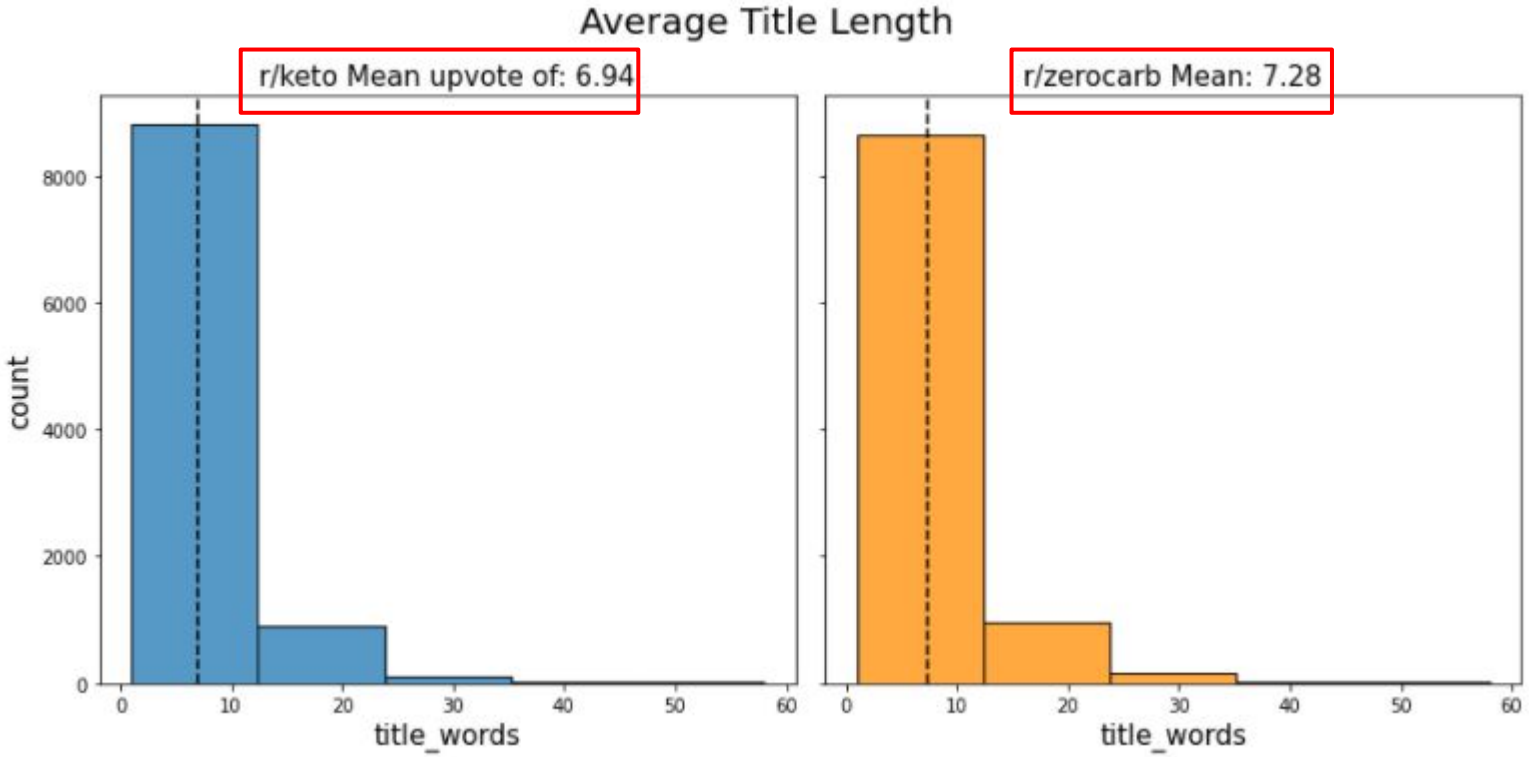

Data Cleaning and EDA

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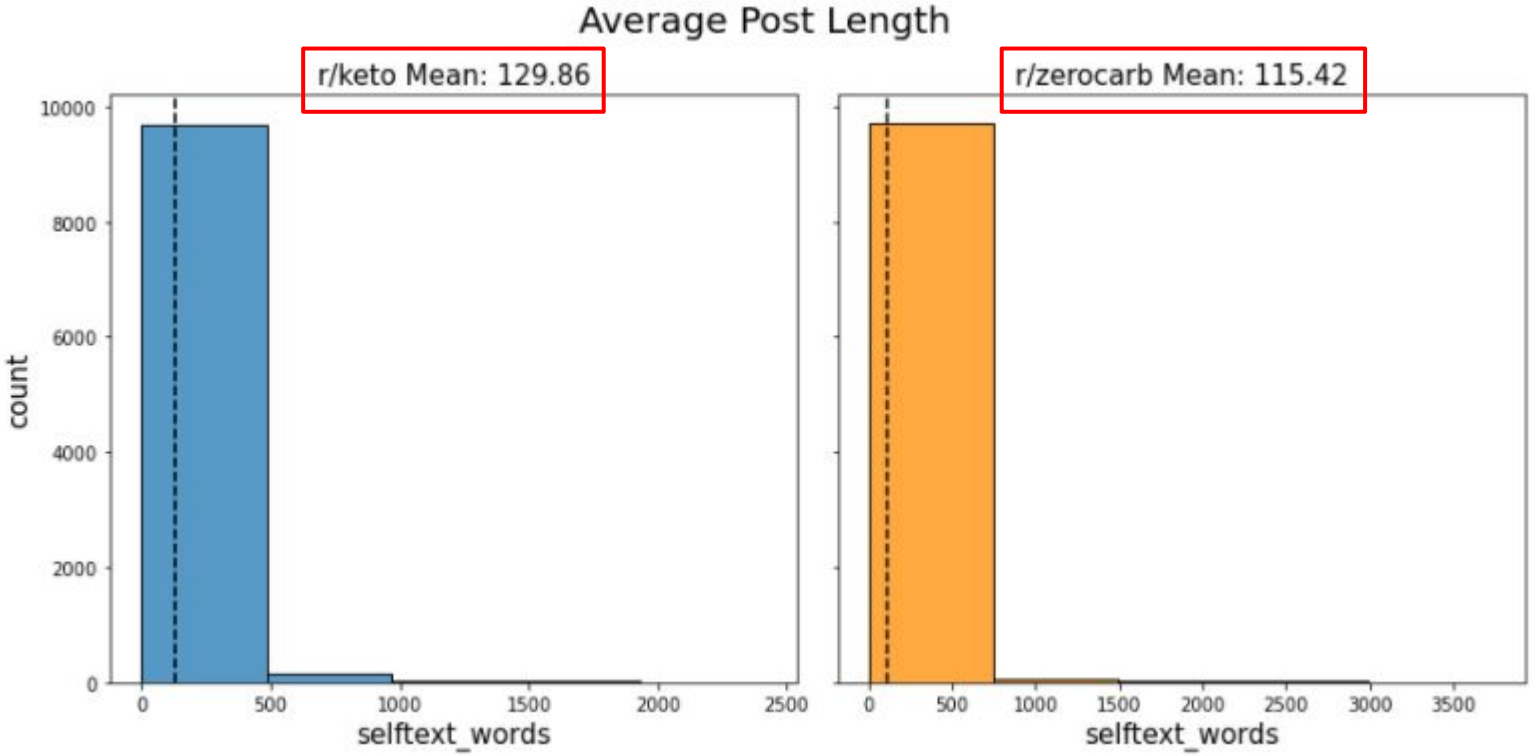

Data Cleaning and EDA

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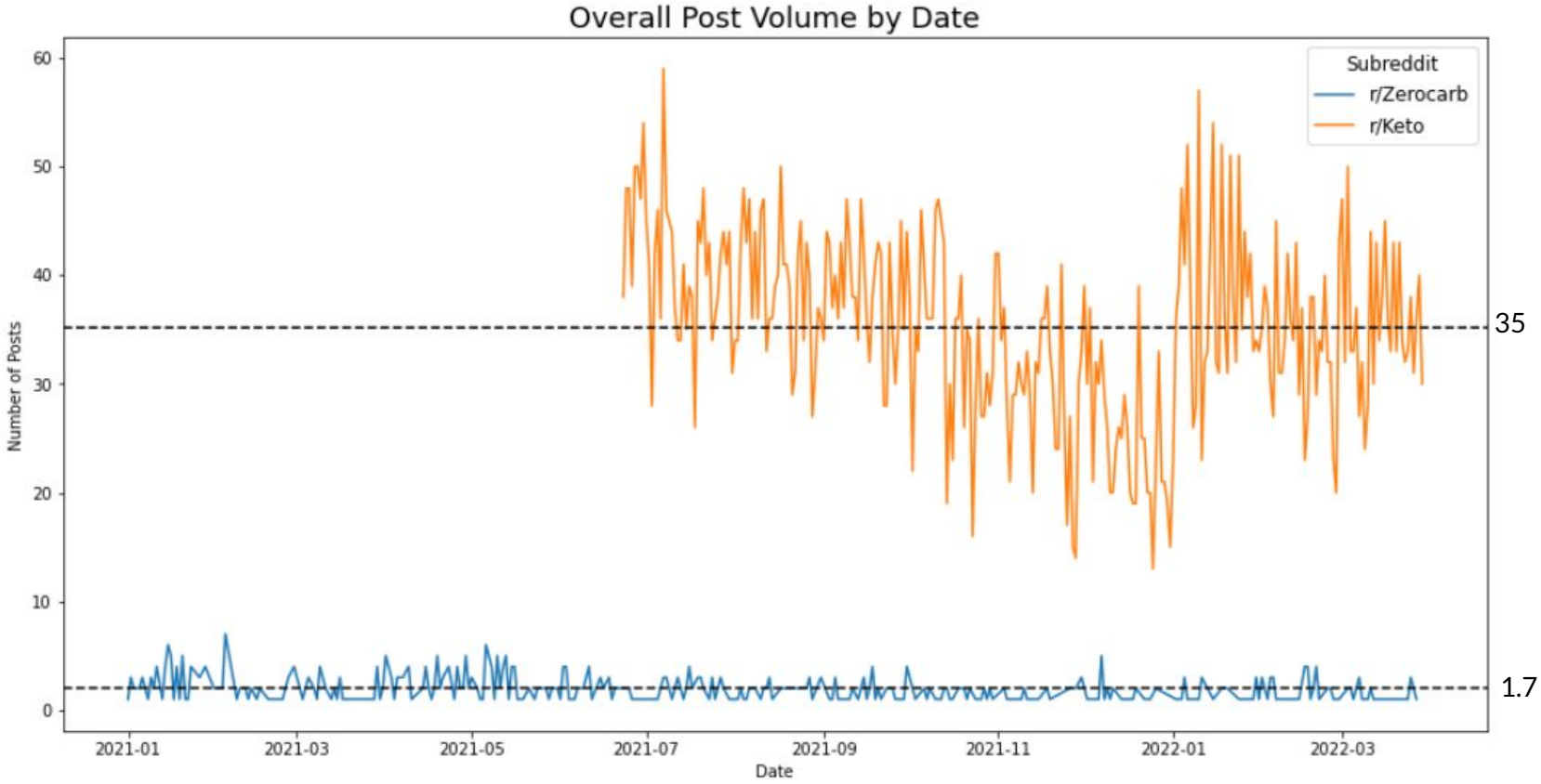

Top Trigrams

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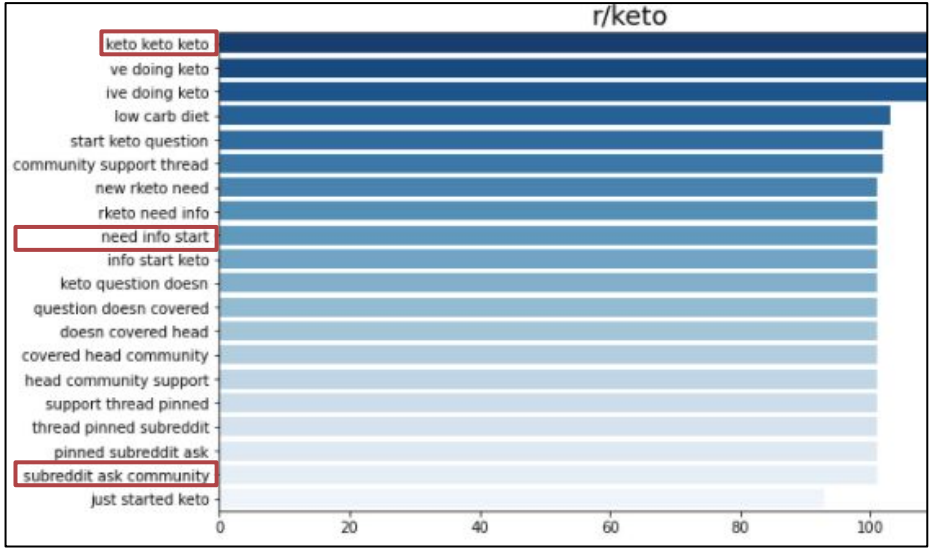

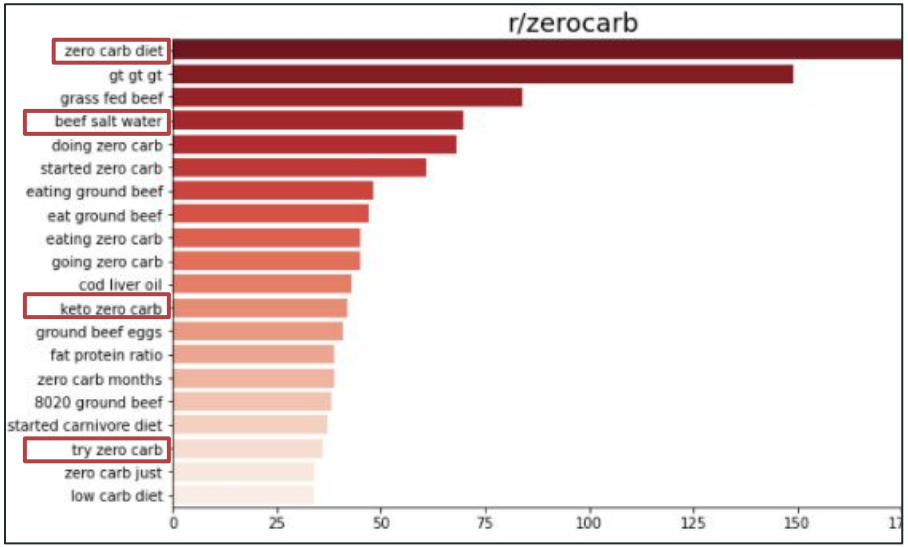

Top Trigrams - Custom Stop Words

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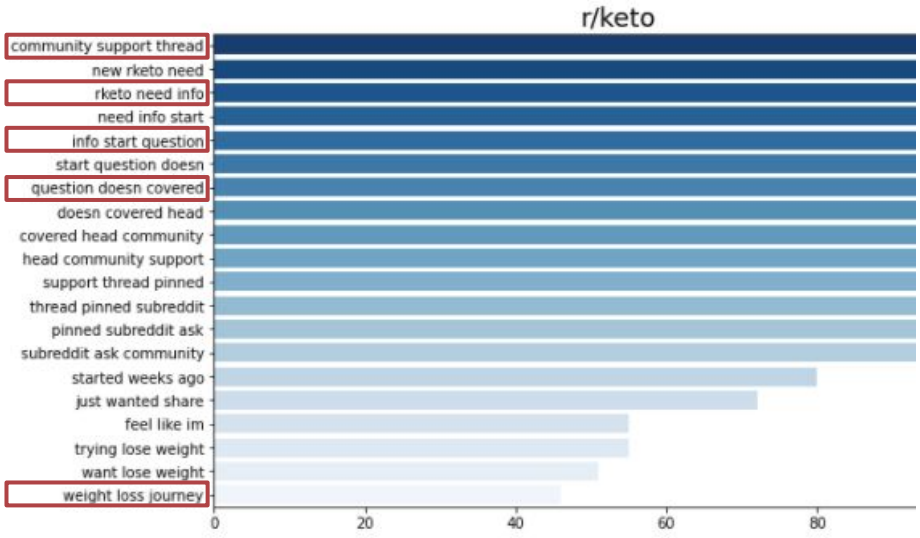

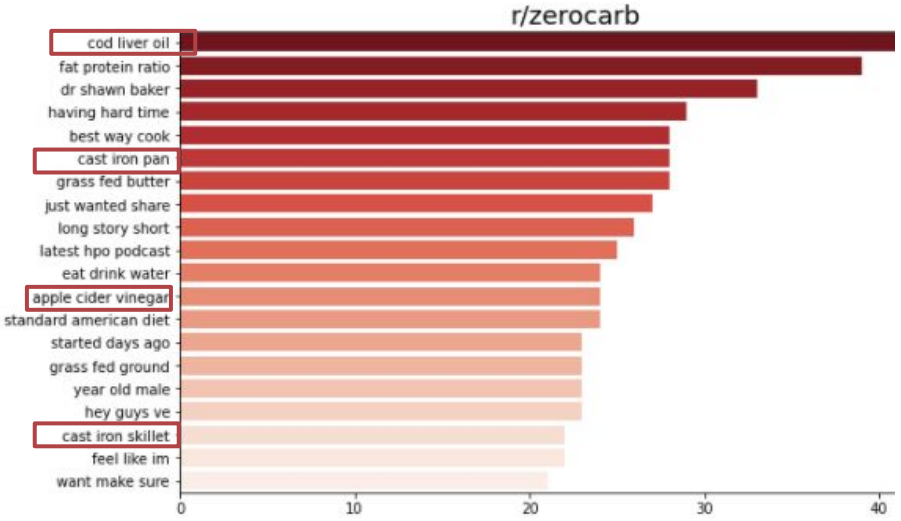

Modeling

Modeling

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- 3 different models were picked for this process:
  - Logistic Regression
  - Multinomial Naive Bayes
  - Random Forest Trees

	model_name	model	vectorizer	test_score	precision	is_tuned
3	tvec_nb	nb	tvec	0.827402	0.873543	False
6	tvec_lr_gs	lr	tvec	0.847229	0.859408	True
1	tvec_lr	lr	tvec	0.847483	0.856096	False
2	cvec_nb	nb	cvec	0.830452	0.845251	False
9	tvec_nb_gs	nb	tvec	0.838332	0.843799	True

Final Model

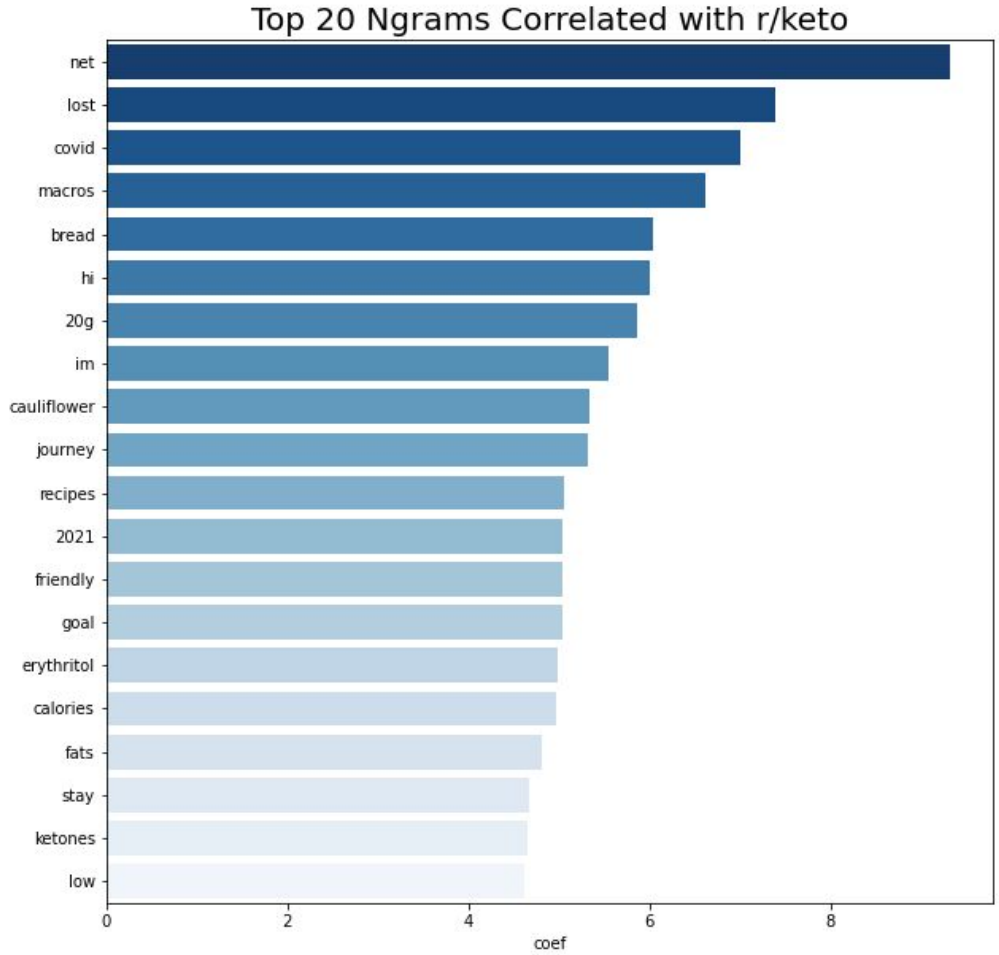
	model_name	model	vectorizer	test_score	precision	is_tuned
17	tvec_lr_gs_V6	lr	tvec	0.840366	0.85471	True
18	tvec_lr_gs_V7	lr	tvec	0.840366	0.85471	True
19	baseline_model	nb	tvec	0.813670	0.86547	False

- Penalty Type: l2
- Inverse Regularization Strength: 6
- Max_features: None
- Max_df: 0.3
- Min_df: 2
- Ngram_range: (1, 2)

Error Analysis

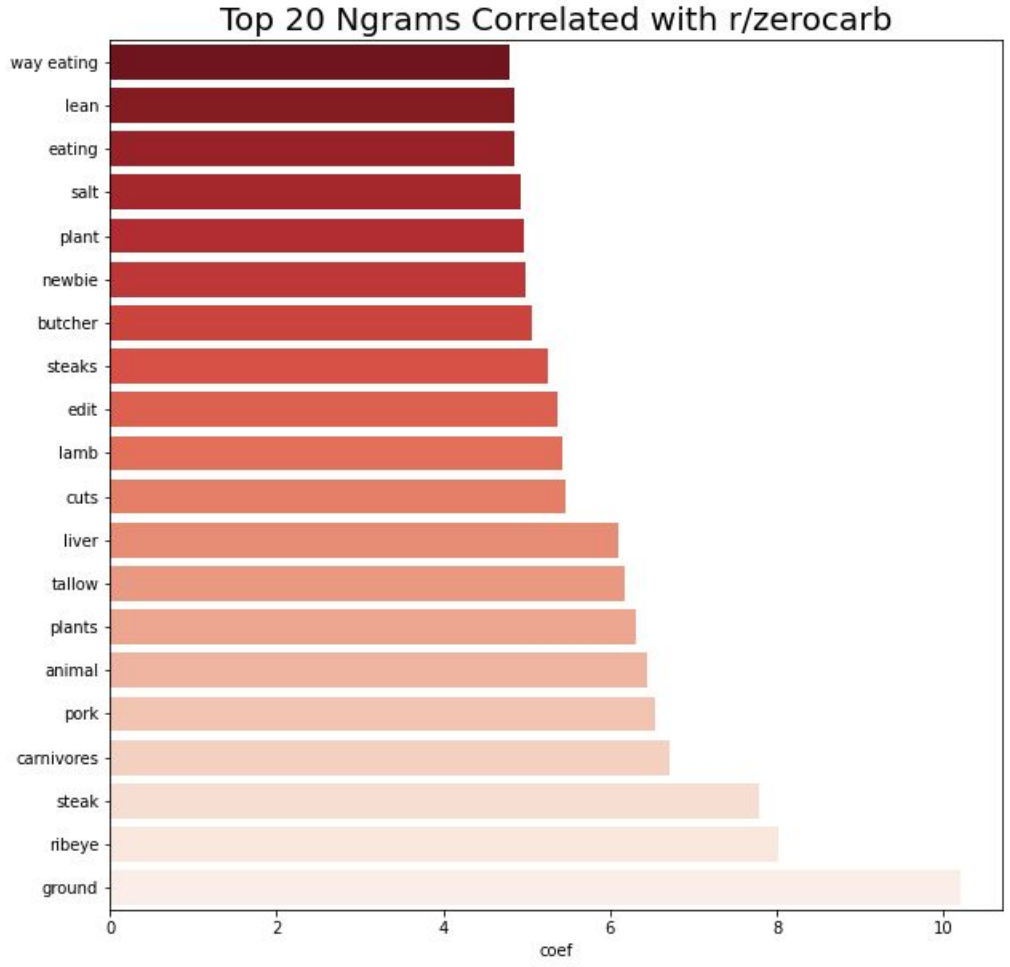
r/keto

- Diet Terminology
- Goals
- Weight Loss
- Progress
- Covid



r/keto

- Ground Beef
- Animal
- Pork
- Organs
- Newbie
- Way Eating
- Cuts
- Butcher
- 30 Days



Limitations, Improvements and Recommendations

Model Limitations

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- Goal: Reduce false positives (i.e. wrongly classify clients as **Zerocarb** to avoid potentially hazardous rebound
- Model grasps specificity of **Zerocarb** well, i.e. animal products, organs, meat etc.
- Similarity between **Keto** and **Zerocarb**
- The model can be thrown off by specific words like ‘bone’, and mentions of ‘discussions of where to buy meat’

Model Improvements

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- Test other models: Support Vector Machines, deep learning models
- Adjust the threshold for the classification of **Zerocarb**, making this an imbalanced classification.
- Inclusion of other features in our model, other than just text, sentiment analysis for example

Model Shortcomings and Improvements.

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- Our current model performs 2% better than our baseline model on accuracy.

- Borderline classification e.g. 51% vs 49%, classifiying those as `keto`. False Negative preferred to False Positive

- Review clients put on **Zerocarb** within one month. Might not be too late to move them to `keto` diets and prevent a rebound from happening. (if required)

Thank You!
QnA