Classification Problem
Learn Python and Learn Programming Subreddit

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Agenda

- Background
- Problem Statement
- Obtaining Data and Cleaning Data
- Exploring Data
- Feature Engineering
- Modelling
- Comparing Top 2 Model
- Model Selection
- Evaluating Model
- Conclusion

Background

- Reddit is a forum consisting different subreddits
- Each subreddits are of a topic of interest
- Users can participate in subreddits which interests them
- Amongst the subreddits there are overlapping topics
- There are also posts which could be placed in more relevant subreddits

Problem Statement

Business Problem:

- We have quite a number of overlapping subreddits. How can we ensure that posts in the subreddits are in the right place?

Data Science Problem

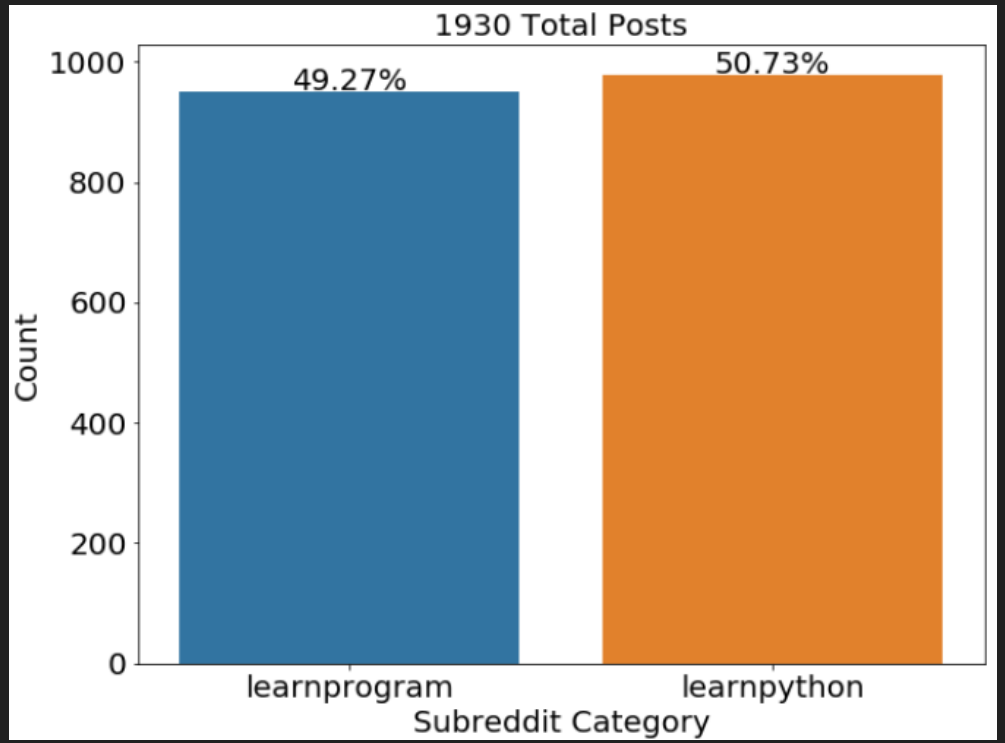
- Use Natural Language Processing
- Identify 2 overlapping subreddits with adequate text
- Create classification models to classify posts to their respective subreddit
- Evaluate the models and select the best model to answer the business problem

Obtaining Data and Cleaning Data

- Subreddit Learn Python and Learn Programming was selected
- Data from both subreddit was scraped using the Requests library
- Column selftext which contains the content of the posts is determined to contain features which will answer our problem
- Data was cleansed using the following libraries
    - BeautifulSoup
    - NLTK (Stopwords)
    - Regex
    - Python’s string manipulation

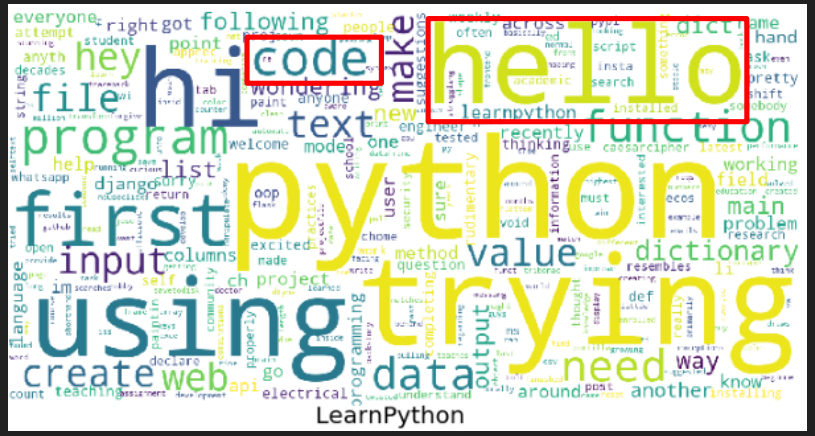
Exploring Data

After Obtaining and Cleaning Data



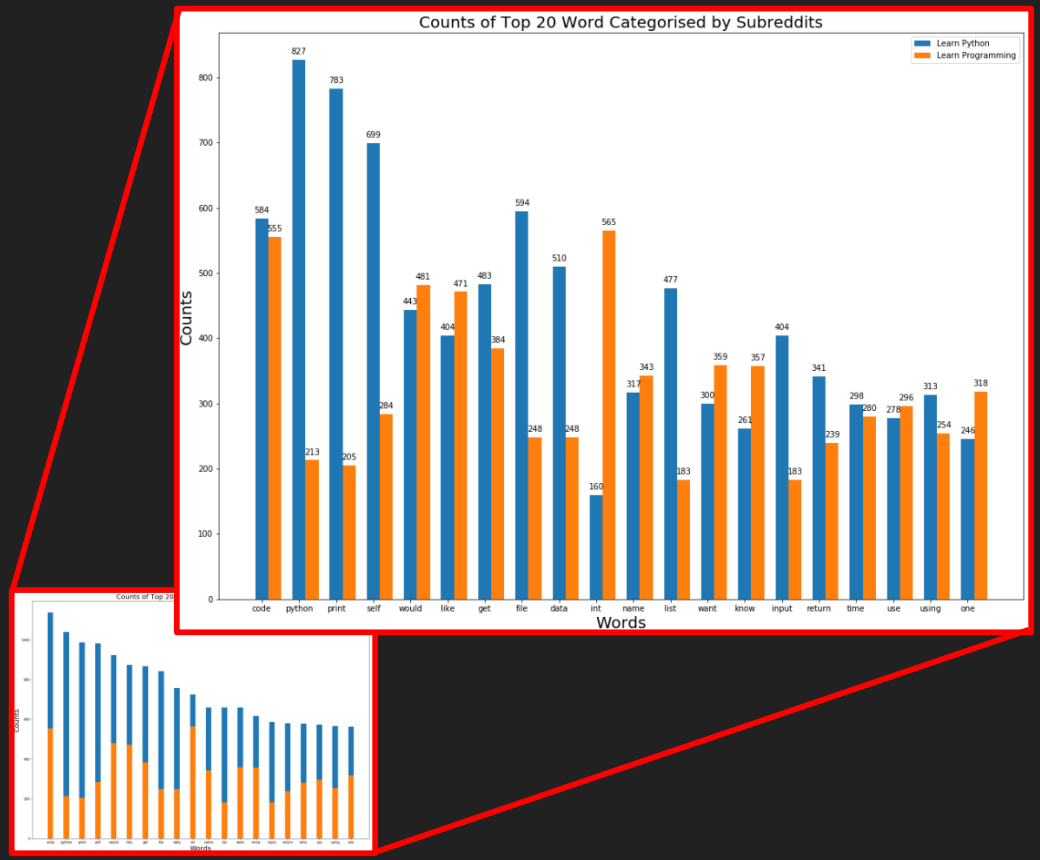
- We have a total of 1930 posts
- A good ratio between the 2 subreddits
- Baseline Accuracy of 50.73%

Exploring Data



- “hello” and “code” are some common words which appears frequently in both subreddits
- We can explore more on such words and put them in a customized stop words

Exploring Data



- Top 20 words appearing in the corpus
- Code is a common word at both subreddit
- Python appeared in both but more in learn python
- Words like code should be included in our customized stopwords

Feature Engineering

- Lemmatizing
  - Reduce words to their root keeping its context e.g. better → good
- Stemming
  - Removes suffixes and prefixes and may lose context e.g. care → car
- Customized Stopwords

```
common_cv = common_cv.groupby('subreddit').sum()
common_words = []

for words in common_cv:
    if (abs(common_cv[words].loc[0] - common_cv[words].loc[1]) < 30):
        common_words.append(words)
```

```
len(common_words)
```

```
646
```

Modelling

- 4 Models Was Built
  - Model 1 - Count Vectorizer with Naive Bayesian's MultinomialNB
  - Model 2 - Tfidf Vectorizer with Naive Bayesian's MultinomialNB
  - Model 3 - Count Vectorizer with Logistics Regression
  - Model 4 - Tfidf Vectorizer with Logistics Regression
- Model 2 and Model 3 were overfitted
- We will take a closer look into Model 1 and Model 4

Comparing Model 1 and Model 4

Model 1

```
56489 features were selected
Cross Validated Mean Train Score is: 0.7712720437726344
Test Score is: 0.7805383022774327
```

	pred learn programming	pred learn python
actual learn programming	192	46
actual learn python	60	185

	precision	recall	f1-score	support
0	0.76	0.81	0.78	238
1	0.80	0.76	0.78	245
accuracy			0.78	483
macro avg	0.78	0.78	0.78	483
weighted avg	0.78	0.78	0.78	483

Model 4

```
56489 features were selected
Cross Validated Mean Train Score is: 0.7851084474885845
Test Score is: 0.7743271221532091
```

	pred learn programming	pred learn python
actual learn programming	183	55
actual learn python	54	191

	precision	recall	f1-score	support
0	0.77	0.77	0.77	238
1	0.78	0.78	0.78	245
accuracy			0.77	483
macro avg	0.77	0.77	0.77	483
weighted avg	0.77	0.77	0.77	483

- Model 4 has a higher mean score between train and test
- Model 1 has higher precision

Model Selection

- We are looking to classify a post and move them to the correct subreddit.
- A post from learn python appearing in learn programming subreddit is reasonable as python is a programming language while the vice versa is not
- From this, we can see that the cost of false positive is higher than the cost of false negative.
- When the cost of false positive is high, precision is a good metrics to follow

Evaluating - Model 1

```
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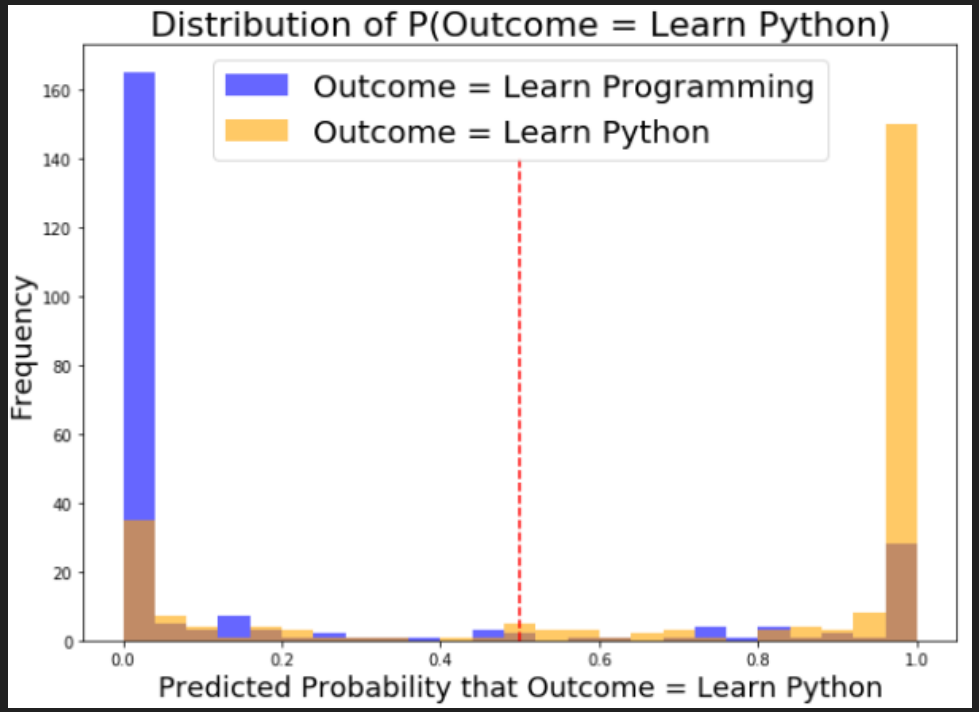
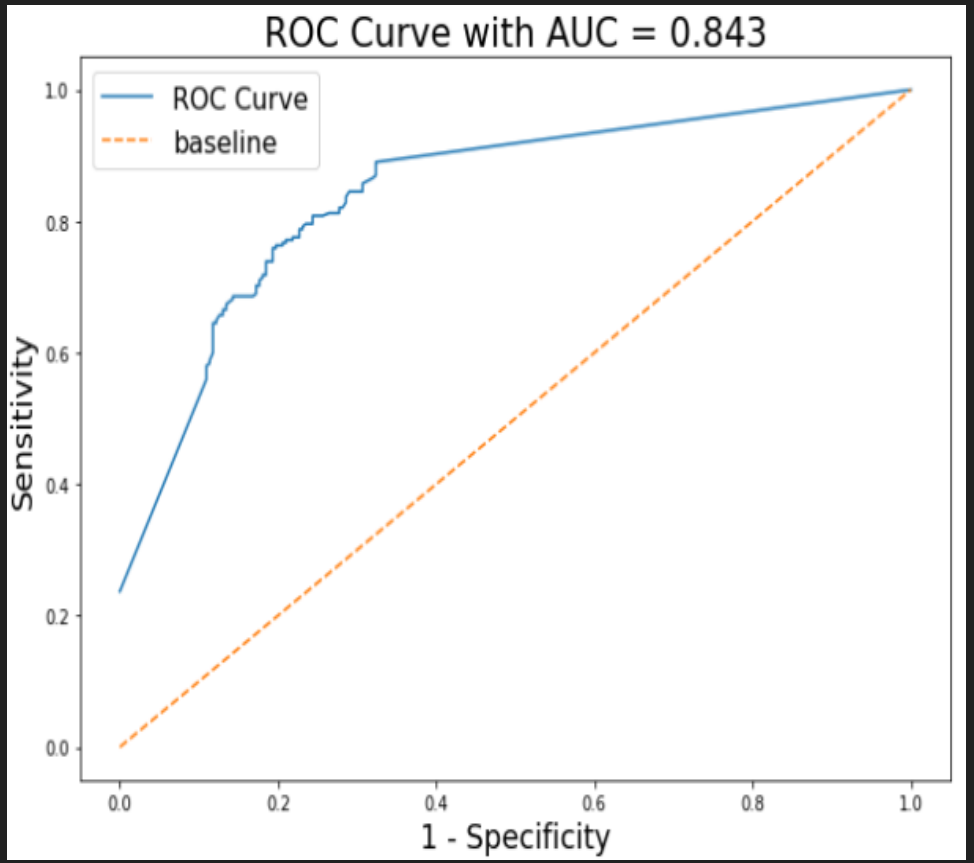
- 192 posts predicted to be from learn programming are from learn programming
- 46 posts predicted to be from learn python are from learn programming
- 60 posts predicted to be from learn programming are from learn python
- 185 posts predicted to be from learn python are indeed from learn python
- This model's precision is 80% and the recall is 76%.

Evaluating - Model 1



- Predicted probabilities distribution
- Bimodal distribution
- Misclassifications
  - Blues appearing at the right of the red line
  - Orange appearing at the left of the red line

Evaluating - Model 1



- A good model's ROC AUC is above 0.5 and close to 1
- A ROC AUC of 0.5, that means that our positive and negative population overlaps perfectly, inferring that the model is bad
- If the ROC AUC is below 0.5, it means that our model inversely classified the observations
- Our ROC AUC is 0.843

Conclusion and Recommendation

- A model with the lower score was selected as it answers the business needs
- For this instance a higher precision and lower false positive
- Business can use this model and move posts for the 2 subreddits
- With lesser overlapping posts we can then run the next iteration and determine if the model improves
- We can perform an analysis on the title, number of comments and author to see if these are good features to be included for the next iteration
- We can explore auto-tagging or subreddit recommender system with improved model