

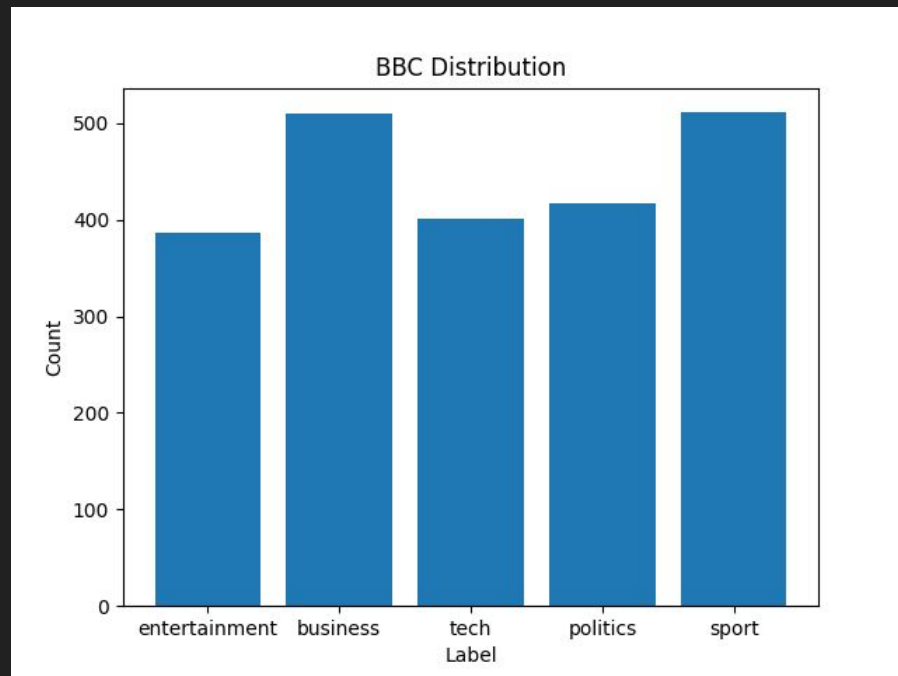
COMP 472 - M1

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Task 1 - BBC

Data Analysis

- Minor bias on business and sport.
- Relatively large dataset size for domain.
- Could overfit to BBC article exerts.



Base MultinomialNB

- High scores in all statistics.
- Even unbiased looking dataset.

	precision	recall	f1-score	support
business	0.97	0.95	0.96	101
entertainment	1.00	0.95	0.97	74
politics	0.96	0.99	0.98	82
sport	1.00	1.00	1.00	106
tech	0.95	1.00	0.98	82
accuracy			0.98	445
macro avg	0.98	0.98	0.98	445
weighted avg	0.98	0.98	0.98	445

Smoothing MultinomialNB

- Relatively same scoring as base.
- Differences are not substantial enough to conclude great improvement.

	precision	recall	f1-score	support
business	0.97	0.93	0.95	101
entertainment	1.00	0.97	0.99	74
politics	0.94	0.98	0.96	82
sport	1.00	1.00	1.00	106
tech	0.96	1.00	0.98	82
accuracy			0.98	445
macro avg	0.97	0.98	0.98	445
weighted avg	0.98	0.98	0.98	445

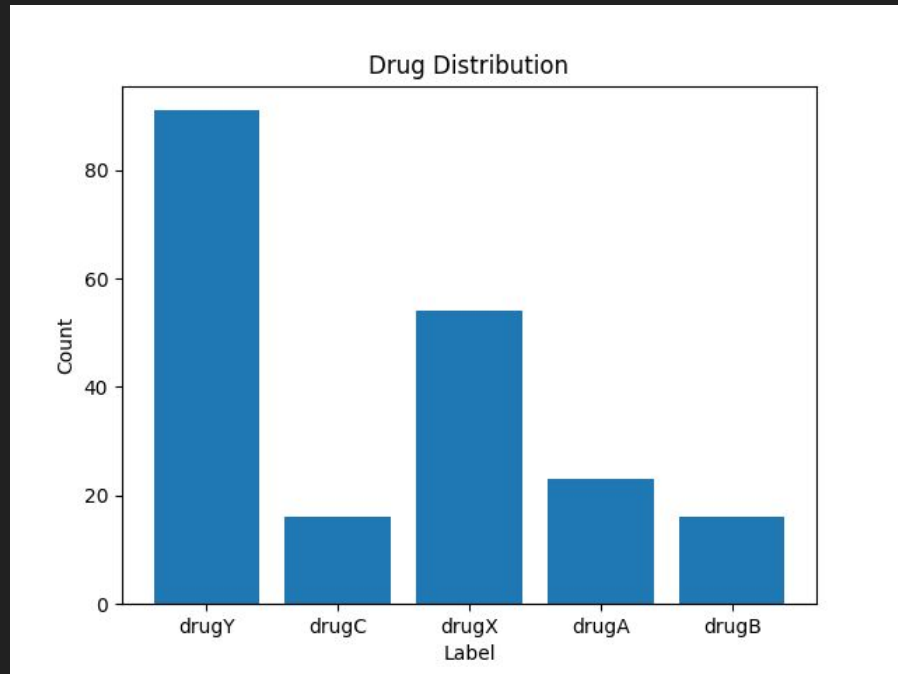
Conclusion

- The performance is identical between the base Naive Bayes models because they are deterministic models instead of random.
- The performance is different for smoothed models. Compared to in class, this benefit is very minimal in this dataset.
- The Naive Bayes classifier is effective at basic text categorization.

Task 2 - Drug

Data Analysis

- Minor bias against drugC and for drugY.
- Will have an impact on the precision and recall.



MultinomialNB

- A decent model over the dataset.
- Higher precision for features with higher representation.

	precision	recall	f1-score	support
drugA	0.60	0.50	0.55	6
drugB	0.75	1.00	0.86	3
drugC	0.50	1.00	0.67	2
drugX	0.80	1.00	0.89	12
drugY	0.83	0.59	0.69	17
accuracy			0.75	40
macro avg	0.70	0.82	0.73	40
weighted avg	0.77	0.75	0.74	40

Decision Tree

- Represented with high accuracy.
- Considered near perfection for dataset.
- Potentially overfit to this dataset?

	precision	recall	f1-score	support
drugA	1.00	1.00	1.00	6
drugB	1.00	1.00	1.00	3
drugC	1.00	1.00	1.00	2
drugX	1.00	1.00	1.00	12
drugY	1.00	1.00	1.00	17
accuracy			1.00	40
macro avg	1.00	1.00	1.00	40
weighted avg	1.00	1.00	1.00	40

Grid Search Decision Tree

- Near identical results to the base model.
- Same observations can be made.

	precision	recall	f1-score	support
drugA	1.00	1.00	1.00	6
drugB	1.00	1.00	1.00	3
drugC	1.00	1.00	1.00	2
drugX	1.00	1.00	1.00	12
drugY	1.00	1.00	1.00	17
accuracy			1.00	40
macro avg	1.00	1.00	1.00	40
weighted avg	1.00	1.00	1.00	40

Perceptron

- Mediocre representation of low represented features.
- Warnings about having a hard time to converge.
- Potentially not very linear features.

	precision	recall	f1-score	support
drugA	0.00	0.00	0.00	6
drugB	0.67	0.67	0.67	3
drugC	0.29	1.00	0.44	2
drugX	0.52	0.92	0.67	12
drugY	0.89	0.47	0.62	17
accuracy			0.57	40
macro avg	0.47	0.61	0.48	40
weighted avg	0.60	0.57	0.53	40

Multi-Layer Perceptron

- Lack of representation of low representation features.
- Warnings about having a hard time to converge.
- Potentially not very linear features.

	precision	recall	f1-score	support
drugA	0.00	0.00	0.00	6
drugB	0.00	0.00	0.00	3
drugC	0.00	0.00	0.00	2
drugX	0.54	0.58	0.56	12
drugY	0.63	1.00	0.77	17
accuracy			0.60	40
macro avg	0.23	0.32	0.27	40
weighted avg	0.43	0.60	0.50	40

Grid Search Multi-Layer Perceptron

- Significantly better performance than the base model.
- Potentially better convergence algorithm.
- Indicates that there is significance of tweaking for more complex models.

	precision	recall	f1-score	support
drugA	1.00	0.67	0.80	6
drugB	1.00	0.67	0.80	3
drugC	1.00	1.00	1.00	2
drugX	1.00	0.92	0.96	12
drugY	0.81	1.00	0.89	17
accuracy			0.90	40
macro avg	0.96	0.85	0.89	40
weighted avg	0.92	0.90	0.90	40

Conclusion

- Despite the AI industry moving toward ML, more “primitive” models appear to be more efficient on these simple classifications.
- More complex models require a lot more intensive tweaking of hyperparameters to give a promising result.

Thank You