Analyzing Customer Reviews for Music Genre Classification

Customer Reviews, Sentiment, and Semantic Analysis for Music Genre Classification

Enrico Gioia

Objective

This project aims to classify music album reviews into one of eight genres using a combination of Bag-of-Words (BoW), sentiment features, and semantic features

Genre categories

Datasets Overview

Two datasets are used

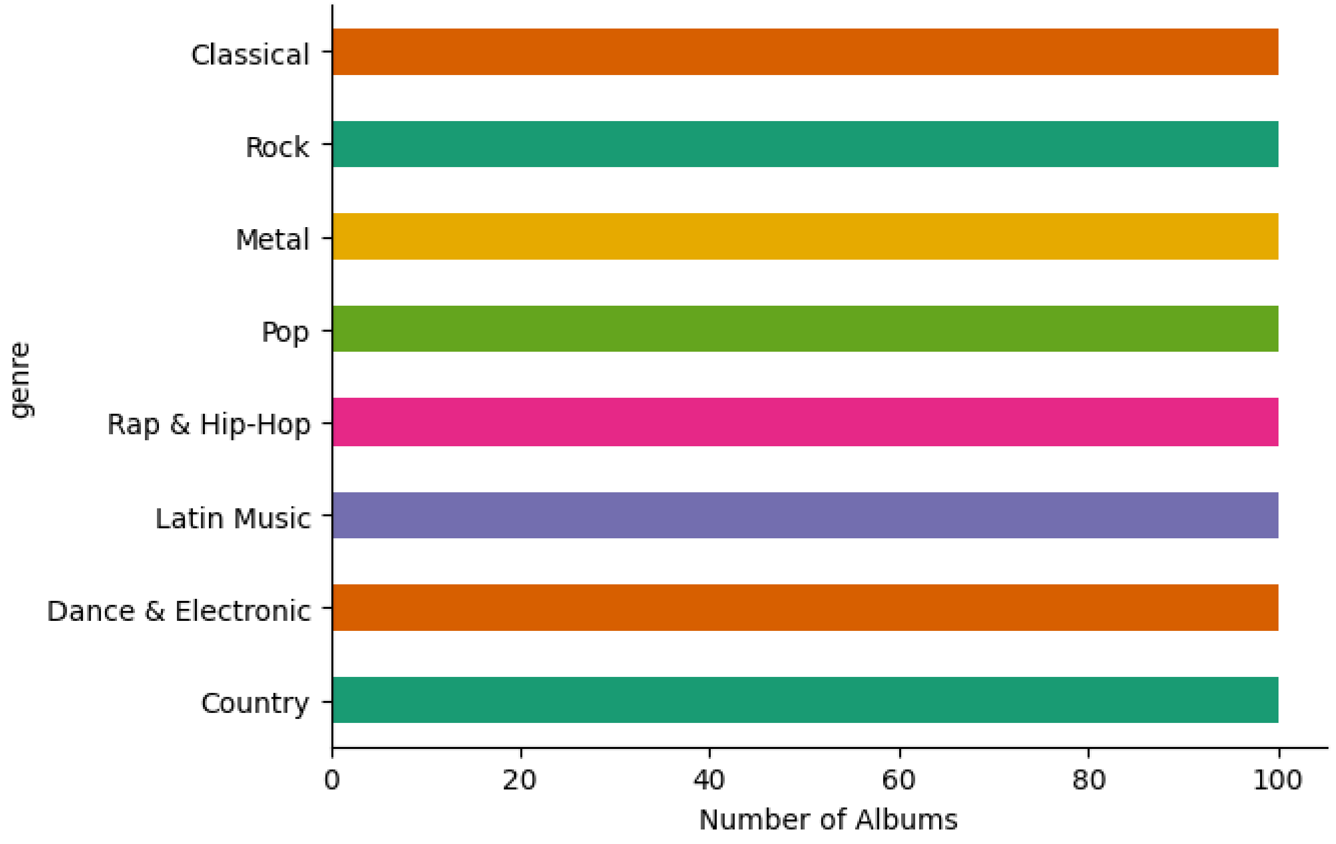
- Album Reviews : textual reviews of music albums, each associated with a specific genre
- Album Semantics : semantic features associated to the music albums

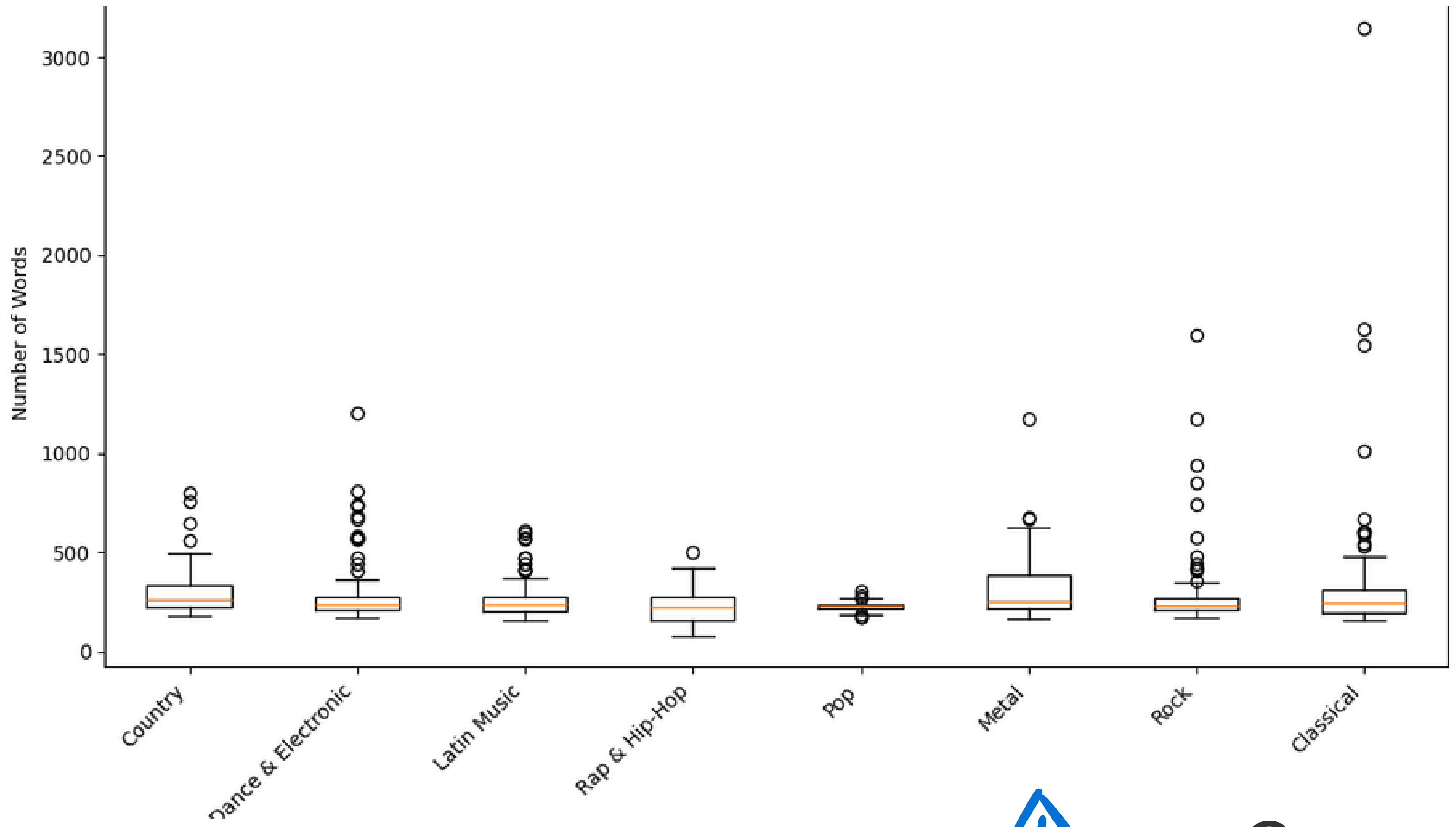
Amazon Product ID : B009XIFF5K

Customer Reviews	Genre
This guy is a genius! His arrangements is splendid. I start my day with his album and end it with samealways take me to a calm and comfortable place ...	dance-electronic

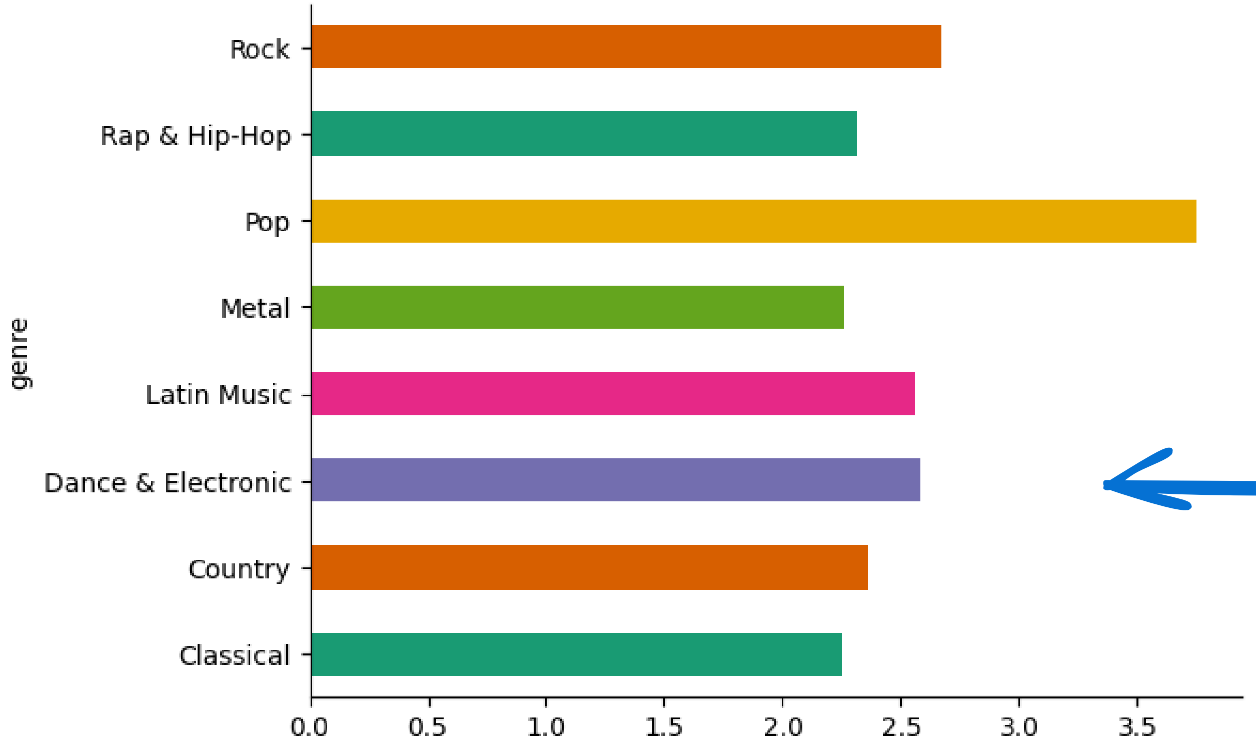
Entities	Categories	Broaders
52753, 186266, 2414, 1271352, 3233191,	1988_video_games', 'Final_Fantasy_games', 'Game_Boy_Advance_games', 'IOS_games', 'Mobile_games' ...	'Austrian_record_charts', 'Optical_disc_authoring_software', 'Podcasting', 'CD_ripping_software', 'IPod', 'Nintendo_3DS_eShop_games', ...

Datasets Overview : Album Reviews





The Album Reviews dataset contains 100 albums per genre class



On average reviews have between 200 and 500 words

On average there are more than 2 reviews per genre

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Datasets Overview : Album Semantics

Semantic Features are attributes providing additional context to music albums, aiding in improved disambiguation

Purpose of Semantic Features

- Enhanced Context
- Improved Disambiguation
- Hierarchical information

Example of semantic features

Golden Retriver	← Entity →	Paris
Dog	← Category →	Cities in France
Mammal	← Broader Category →	Capital cities in Europe

Datasets Overview : Album Semantics

In the specific case of the Album Semantics Dataset

Entities	Categories	Broaders
52753,	1988_video_games',	'Austrian_record_charts',
186266,	'Final_Fantasy_games',	'Optical_disc_authoring_software',
2414,	'Game_Boy_Advance_games',	'Podcasting',
1271352,	'IOS_games',	'CD_ripping_software',
3233191,	'Mobile_games'	'IPod',
	...	'Nintendo_3DS_eShop_games',
		...

Amazon Product ID : B009XIFF5K

Wikipedia pages ID

Wikipedia categories

Wikipedia broader categories

Methodology

The classification is evaluated using different combinations of feature sets : Bag-of-Word(BoW), sentiment, and semantic

Bag-of-Word (BoW)	BoW + Semantics	BoW + Sentiments	BoW + Semantic + Sentiments
Genre Classification based on standard vectorization of review texts	Genre Classification based on standard vectorization of review texts **enriched with** semantic features	Genre Classification based on standard vectorization of review texts **enriched with** sentimental analysis scores of review texts	Genre Classification based on standard vectorization of review texts **enriched with** semantic features **and** sentimental analysis scores of review texts

Classification Models

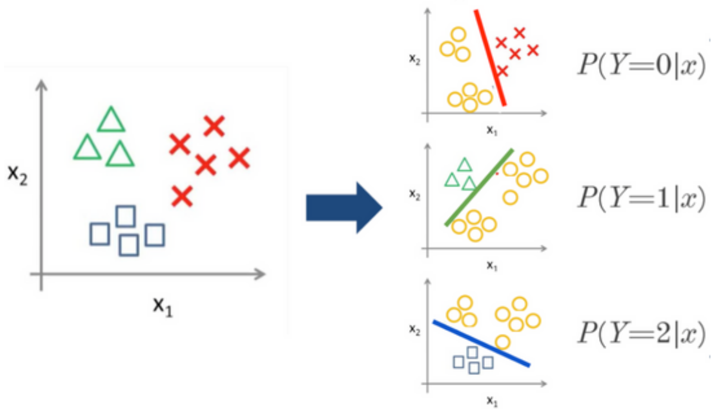
The following models were trained and evaluated using different combinations of feature sets

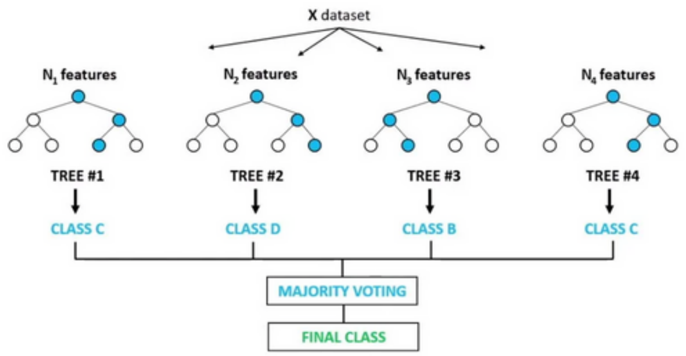
Logistic Regression

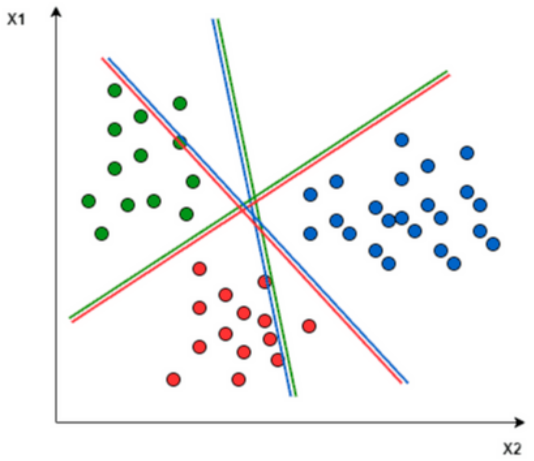
Random Forest

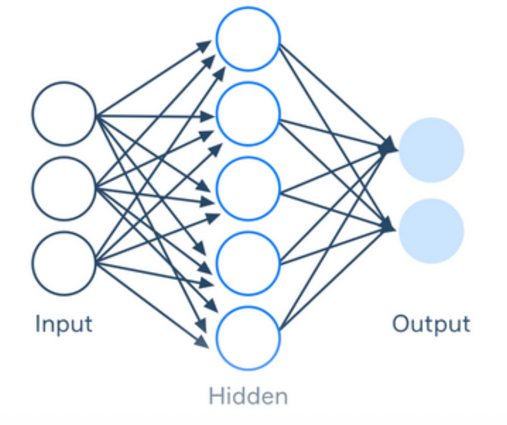
Linear SVM

Neural Network









Experiment: BoW

The following models were trained and evaluated using BoW only

Logistic Regression	Random Forest	Linear SVM	Neural Network
Accuracy: 0.63	Accuracy: 0.57	Accuracy: 0.67	Accuracy: 0.65

Linear SVM shows better accuracy with BoW

Experiment: BoW + Semantics

The following models were trained and evaluated using BoW and Semantics features

Logistic Regression

Accuracy: 0.67

Random Forest

Accuracy: 0.66

Linear SVM

Accuracy: 0.71

Semantic features boost accuracy of BoW only

Neural Network

Accuracy: 0.62

Sentiment Features

Two approaches were used to extract sentiment features:

NRCLex: Extracted emotional scores (anger, joy, sadness, etc.) from the BoW

Extracted anger, joy, sadness, and other emotional scores using NRCLex from reviews

Custom Features: Designed metrics like eStrength, eRatio, and posToAllRatio to evaluate sentiment intensity, the ratio of emotional words to total words, and the positivity balance

Advantages

- Produces domain-specific and interpretable features
- Reduces dimensionality compared to NRCLex
- Introduces new metrics that are more discriminative than raw emotion counts

Experiment: BoW + Sentiments

The following models were trained and evaluated using BoW and Sentiments

Logistic Regression	Random Forest	Linear SVM	Neural Network
Accuracy: 0.64	Accuracy: 0.68	Accuracy: 0.69	Accuracy: 0.6

Sentiment features slightly outperform BoW

Experiment: BoW + Sem + Sent

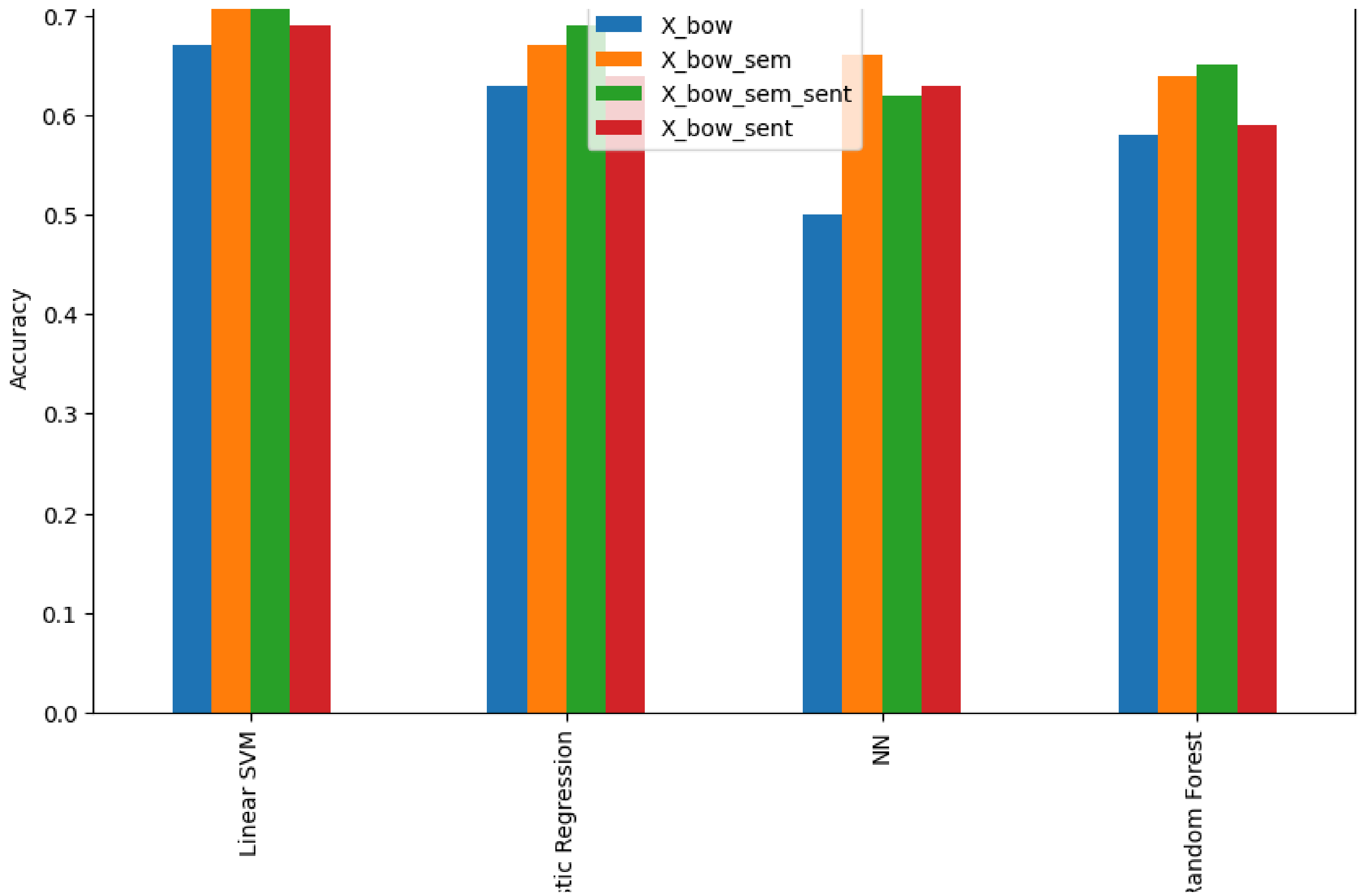
The following models were trained and evaluated using BoW, Semantics and Sentiments features

Logistic Regression	Random Forest	Linear SVM	Neural Network
Accuracy: 0.69	Accuracy: 0.66	Accuracy: 0.72	Accuracy: 0.64

Semantic and sentiment features combined show the best accuracy

Results Visualization

	X_bow	X_bow_sem	X_bow_sem_sent	X_bow_sent
Linear SVM	0.67	0.71	0.72	0.69
Logistic Regression	0.63	0.67	0.69	0.64
NN	0.50	0.66	0.62	0.63
Random Forest	0.58	0.64	0.65	0.59



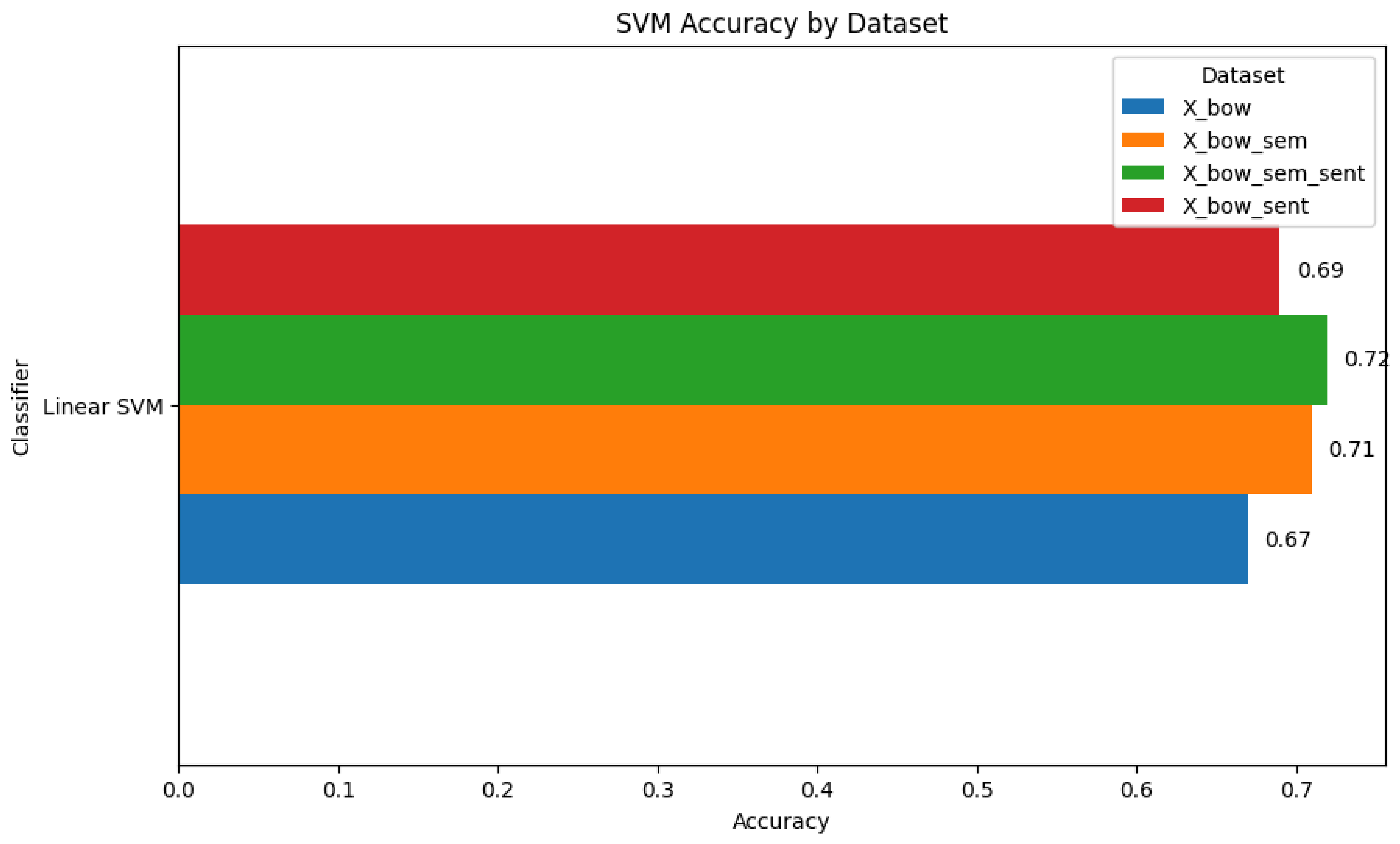
- The Bag-of-Words (BoW) approach yielded a moderate performance, with the Linear SVM model achieving the highest accuracy of 67%. This validates BoW as a reliable baseline for text classification tasks
- Incorporating semantic features into BoW improved classification accuracy across most models. The Linear SVM again performed best, with an accuracy increase from 67% to 71%
- Adding sentiment features provided a slight performance boost compared to BoW alone
- Combining all feature sets yielded the best performance. The Linear SVM achieved the highest accuracy of 72%, illustrating the synergy between semantic and sentiment features when integrated with BoW

Conclusions

This study demonstrates that enriching traditional text classification techniques with semantic and sentiment analysis enhances the predictive accuracy of music genre classification.

Semantic features improve the contextual understanding of text, while sentiment analysis captures emotional tones relevant to genre characteristics.

The results emphasize the importance of a multi-faceted approach in text-based classification tasks.



Conclusions and Future Work

This study demonstrates that enriching traditional text classification techniques with semantic and sentiment analysis enhances the predictive accuracy of music genre classification

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Future Work

Advanced Feature Engineering: Exploring deep learning-based embeddings like BERT or GPT to capture deeper semantic and syntactic relationships

Cross-Domain Applications: Applying the methodology to other domains, such as movie or book reviews, to validate its adaptability and scalability

Thanks!