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Predicting Movie Opening Weekend Sales Using Trailer Content

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Introduction: The Challenges of Box Office Revenue Prediction

- The film industry is known for its high investment and unpredictable nature.
- Despite the significant capital investment, the success and profitability of a movie remain uncertain.
- Many factors, including production and distribution choices, contribute to the uncertainties surrounding a movie's box office revenue.
- The film industry incurs high upfront advertising costs, and marketing through advertising plays a vital role in promoting and generating revenue.

Motivation: The Importance of Movie Trailers

- Pre-release advertising serves the crucial purpose of informing viewers about the movie's distinctive features and attempting to attract potential investors.
- One primary method for pre-release movie advertising is the trailer.
- Trailers are a significant and costly factor influencing movie selection behavior and can significantly impact a film's success at the box office following its theatrical release.
- The effectiveness of a movie trailer can significantly impact a film's success during the crucial opening week of its release.

Objective

This paper aims to answer the following research questions:

- 1. Can trailer content especially facial attributes be used to predict the opening weekend sale of a movie at the box office?

- 2. How do different facial emotions and characteristics in a movie trailer contribute to predicting movie sales?

Contribution

- The study utilizes facial attributes in movie sale prediction for the first time.
- A comprehensive set of facial attributes is generated and engineered using computer vision techniques and pre-trained models.
- Six machine learning algorithms, including Extra Tree, Light Gradient Boosting (LGBR), Random Forest (RF), Bagging, Hist Gradient Boosting (HGBR), and Extreme Gradient Boosting (XGBR), are compared for movie revenue prediction using trailer content.
- The feature permutation technique is used to assess and investigate feature importance.

Experimental Setup: Stage 1

- Use YouTube website to collect trailer information and videos.
- Use IMDB to gather movie information such as genre, production budget, actors and etc.
- Use MojoBoxOffice to gather financial information and number of opening screens.

- Integrate the gathered data sets based on the movie name to create a comprehensive dataset.

Experimental Setup: Stage 2

- Download the highest video format from YouTube.
- Use RetinaFace and DeepFace models to detect faces and facial attributes.
- Use Python to engineer the facial features.

Experimental Setup: Stage 3

- Use control and facial features to predict movie opening weekend sale.
- Employ six different machine learning models.
- Use Optuna to find the best hyperparameters set for each model.
- Use MSE, MAE and R2 as evaluation metric.

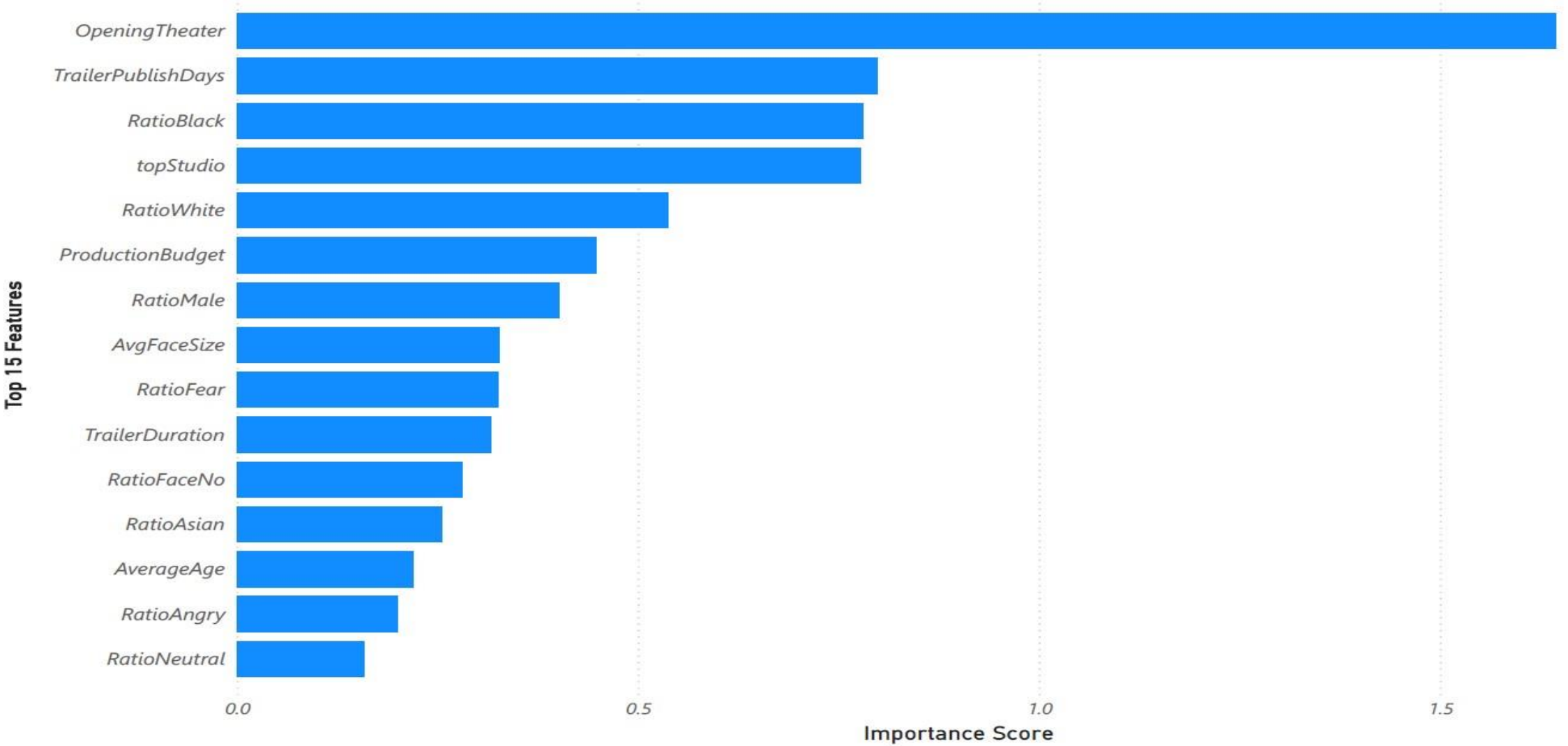
Experimental Setup: Stage 4

- Find the best performing model
- Use feature permutation to find the feature importance score

Result

Metrics	*Feature Set*	*ExtraTrees*	*LGBR*	*RF*	*Bagging*	*HistGBR*	*XGBR*		*Average*
R2	Control	0.9058	0.9045	0.9084	0.9112	**0.9121**	0.9100		0.9087
	Control + Trailer	0.9188	0.9173	0.9189	0.9223	**0.9240**	0.9212		0.9204
MSE	Control	0.4108	0.4169	0.3996	0.3876	**0.3836**	0.3925		0.3985
	Control + Trailer	0.3542	0.3610	0.3537	0.3391	**0.3317**	0.3436		0.3472
MAE	Control	0.4912	0.5016	**0.4753**	0.4806	0.4838	0.4908		0.4872
	Control + Trailer	0.4511	0.4723	0.4568	0.4616	**0.4443**	0.4449		0.4552

Result: Feature Importance



Conclusion

- Previous research has shown that pre-released movie metadata and social media content can predict a movie's success.
- YouTube trailers can be used as an effective data source for predicting movie revenue.
- Trailer content, particularly facial attributes, can predict a movie's opening weekend performance.
- This has significant implications for marketing and business intelligence.

Conclusion

- The study investigated how different facial emotions and characteristics in a movie trailer contribute to predicting movie sales.
- Certain facial features, age, gender, and face size were important predictors of movie sales.
- Control features such as the number of opening theaters, production budget, and the movie's production company were significant factors in predicting movie sales.
- The study's findings offer a novel approach to predicting movie sales and have implications beyond the movie industry.