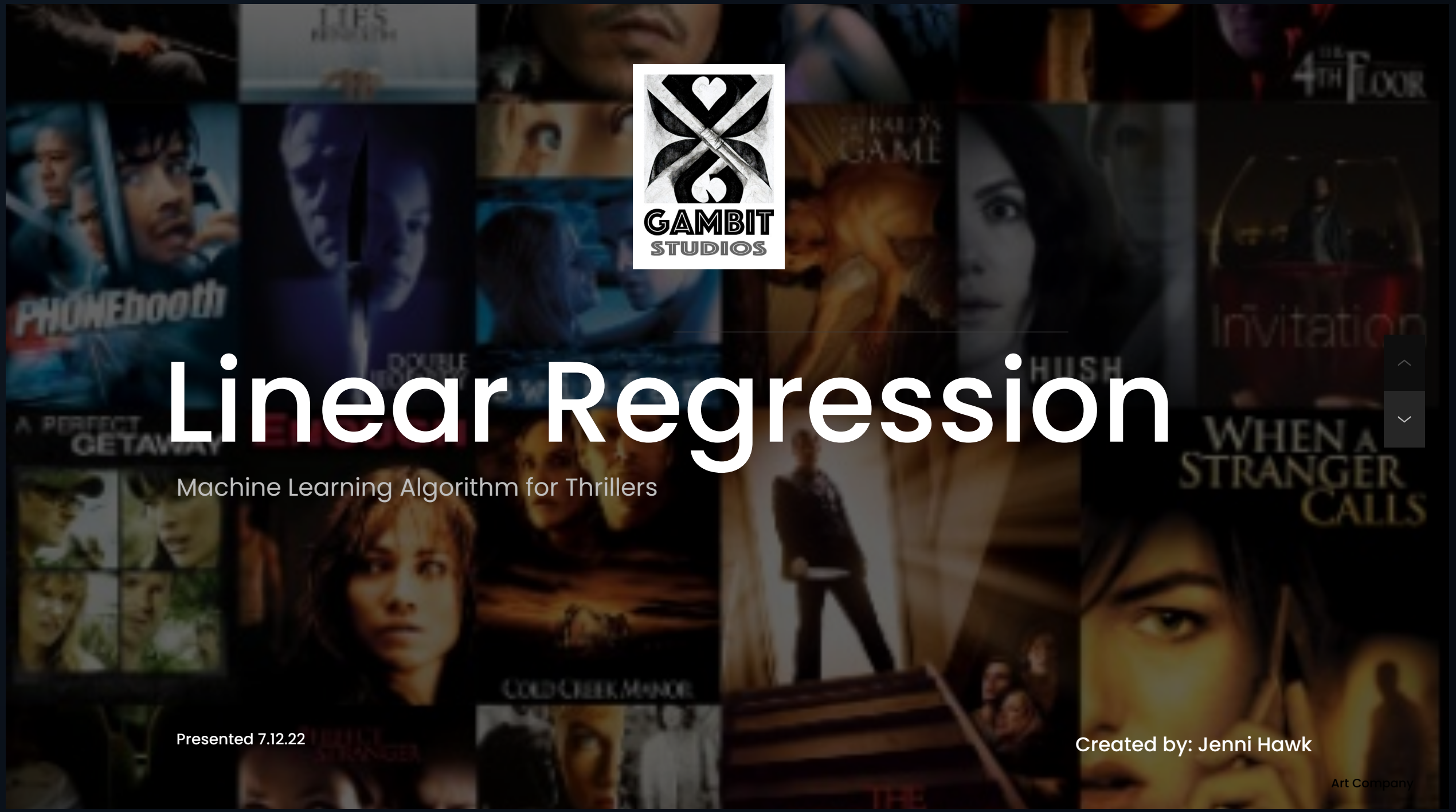


Linear Regression

Machine Learning Algorithm for Thrillers

Presented 7.12.22

Created by: Jenni Hawk

Art Company

Business Situtation

A newly emerged production studio plans to make movies in the thriller genre and would like to know which characteristics of thrillers are predictors of US Box Office Gross.

Key Questions:

Does a set of features do a good job in predicting US Gross for thrillers?

Which features are significant predictors of US Gross for thrillers?

Project Steps

ACTION	TOOLS USED
WEBSCRAPING • Scraped IMDB Thrillers for target and feature data • 1100 thriller titles, 16 potential predictor variables	Request Module, BeautifulSoup Library
EDA & REGRESSION VIABILITY • Ensure data correct and appears as expected. • Data cleanup, address missing values, etc • Correlation matrix, reg plots, R^2 score • Feature engineering	Pandas, Seaborn, Statsmodels cpi library (to apply inflation to budget based on year)
DETERMINE BASELINE MODEL • Tested log transform vs no transform • Tested regularization methods • Identified features with meaningful coefficients	Pandas, Sklearn
TRAIN – VALIDATE - TEST • Utilized cross validation • Tested two models	Sklearn

Features Scraped From Thriller List IMDB

IMDB: Thrillers Categorized by Genre

- Features scraped

Today

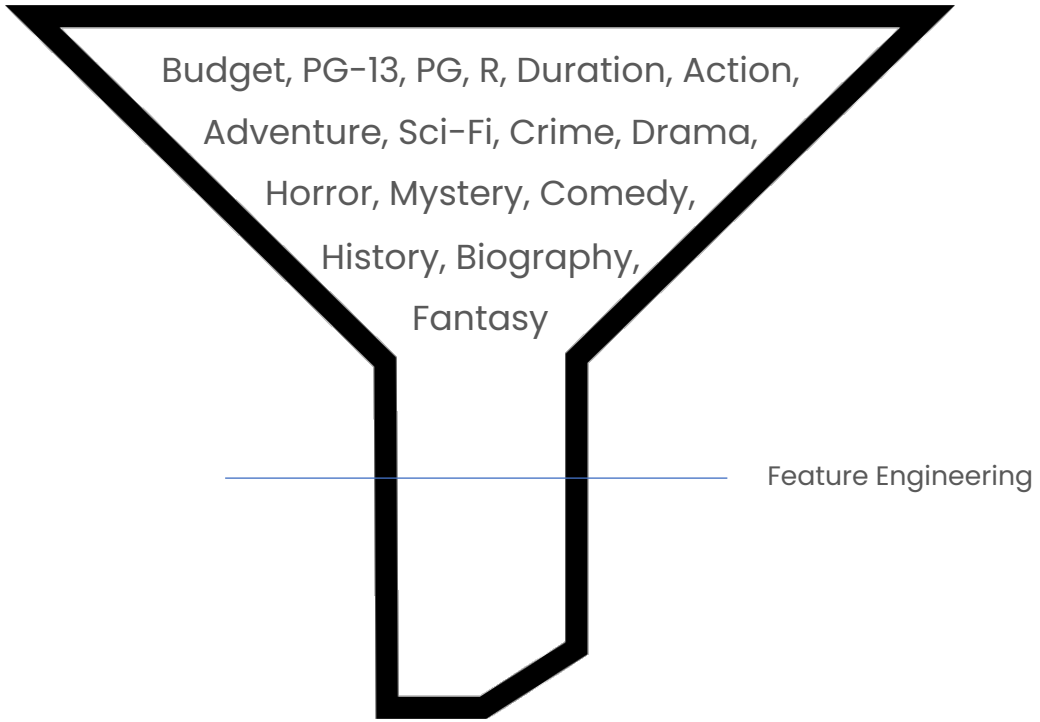
Discuss key insights from each phase of the Linear Regression process.

Today

Discuss key insights from each phase of the Linear Regression process.

Determine Features for Model Inclusion

All Features



Strongest Features

Budget | PG-13 | Duration | Action-Adventure | Adventure-SciFi

Methodology:

- Correlation Heatmap
- Features must have strong correlation with US Gross
- Addressed collinearity amongst action + adventure by combining


REGRESSION VIABILITY
MODEL + OPTIMIZATIONS
QUESTIONS ANSWERED

Tested Log Transform vs No Transform

No Transform performed slightly better than Log Transform

R^2 of model with cross validation

Log Transform	vs	No Transform
R^2		R^2
0.184		0.195

Predictor Variables Included:

- Action_Adventure
- Budget
- PG-13
- Duration

Does Lasso increase performance?

	Train R^2 Score	Test R^2 Score
Linear Regression	0.213	0.178

- While there's not obvious overfitting of the model, Lasso was conducted to determine if score could be made better

Regularization

	Train R^2 Score	Test R^2 Score
Lasso	0.212	0.179

- Lasso made a very small improvement in prediction equation

Predictor Variables Included

- Action_Adventure
- Adventure_Scifi
- Budget
- PG-13
- Duration

How well is the model predicting?

How close the prediction is against the real value

	MAE (Mean Absolute Error)
Linear Regression	$52,916,385

- Tells us the average difference between the actual data value and the value predicted by the model
- Establishes baseline metric to be used in further model testing
- Goal is to improve this model by reducing this error

While the model may be far from perfect, let’s see what we’ve learned…


REGRESSION VIABILITY
MODEL + OPTIMIZATIONS
QUESTIONS ANSWERED

Does a set of features do a good job in predicting US Gross for Thrillers?

Answer: The current set of features do not do a good job of accurately predicting US Gross.

Which features are significant predictors of US Gross?

Answer: The current set of features do a partial job in predicting US Gross

What else can we say?

Coefficient Analysis Provides Meaning

When reviewing movie projects:

- A PG-13 rating should be preferred over R Rating
  - When possible + When it works with larger business strategy
- Lean more into Thrillers that are Action-Adventure and Adventure-SciFi versus other genres
- Budget and Duration also indicated positive per-unit impact on US Gross. Further analysis required to provide actionable insight

Can we make a relationship between categorical value and target which is a quantitative value?

Positive Per-Unit Impact on US Gross

Feature	Coefficient
PG-13	1.02
Action_Adv	8.17
Adv_Scifi	2.76

Categorical variables - binary values

- US Gross prediction to increase by $1.02MM with PG-13
- US Gross prediction to increase $8.17MM with Action_Adv
- US Gross prediction to increase $2.76 with Adv_Scifi

Positive Per-Unit Impact on US Gross

Feature	Coefficient
Budget	5.09

Dollars - Continuous values

- US Gross prediction to increase by $5.09MM for every dollar increase in budget given all variables remain the same

Positive Per-Unit Impact on US Gross

Feature	Coefficient
Duration	9.34

Minutes - Integer

- US Gross prediction to increase by $9.34MM for every minute increase.

Will likely remove from final – practicing interpretation here

Discussion

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