Predicting NBA Game Outcomes Using Machine Learning

By
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The Problem:

Can we build a model as good or better than current models which predict outcome of NBA Games

The Solution:

Test and tune various models and identify the most predictive precise model

The Data

	Date	GameID	season	H_Team	A_Team	H_Team_Elo_Before	A_Team_Elo_Before	H_Team_Elo_After	A_Team_Elo_After	H_Last_10_gm_avg_PTS	.
0	2008-10-30	20081030PHO	2008-09	PHO	NOP	1508.416895	1508.416895	1493.762230	1523.071560	103.0	.
1	2008-10-31	20081031PHI	2008-09	PHI	NYK	1486.830104	1505.657856	1505.383439	1487.104521	84.0	.
2	2008-10-31	20081031TOR	2008-09	TOR	GSW	1513.169896	1491.583105	1517.801701	1486.951300	95.0	.
3	2008-10-31	20081031MIA	2008-09	MIA	SAC	1494.342144	1496.115314	1510.314181	1480.143277	115.0	.
4	2008-10-31	20081031BOS	2008-09	BOS	CHI	1505.657856	1509.8509	1517.162690	1498.346066	90.0	.
...	...	...	...	...	...	...	...	...	...	...	.
14134	2020-08-13	20200813BKN	2019-20	BKN	POR	1518.795548	1528.36943	1514.104890	1533.060088	117.9	.
14135	2020-08-14	20200814TOR	2019-20	TOR	DEN	1683.137229	1548.559957	1687.014564	1544.682622	111.0	.
14136	2020-08-14	20200814IND	2019-20	IND	MIA	1563.263075	1566.395438	1575.196348	1554.462166	110.4	.
14137	2020-08-14	20200814LAC	2019-20	LAC	OKC	1642.593683	1586.866995	1646.563430	1582.897248	118.8	.
14138	2020-08-14	20200814HOU	2019-20	HOU	PHI	1569.491973	1533.078029	1534.811696	1567.758306	114.8	.

14139 rows × 58 columns

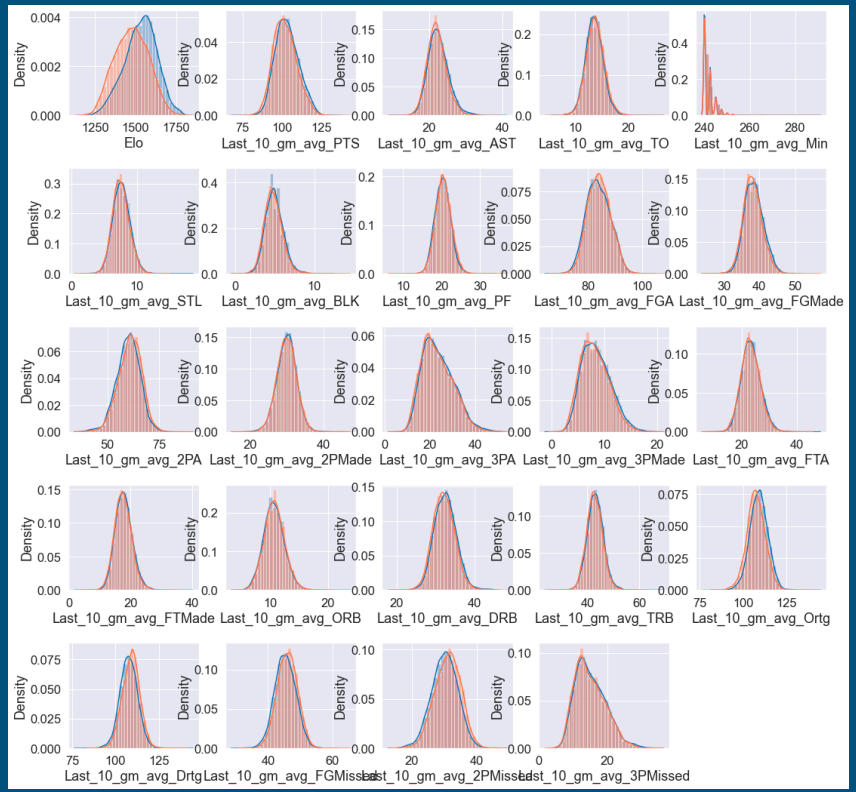
Data Source: https://www.kaggle.com/heeebsinc/nbaseasonstats201820, https://www.kaggle.com/rafaelgreca/nba-games-box-score-since-1949

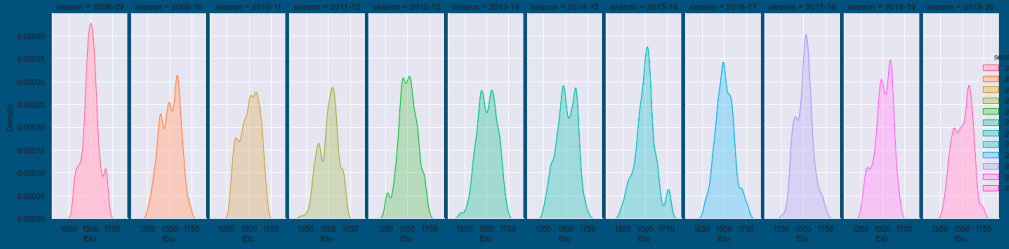
Data Wrangling

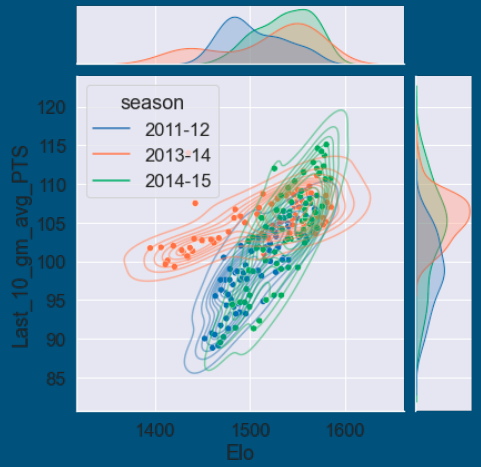
Original datasets:
Team stat (15348, 124)
Player stats (37369, 26)

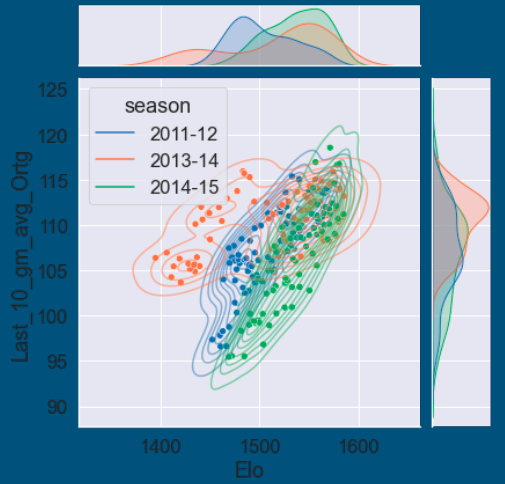
- Only consider data from regular season
- Drop irrelevant column, and % columns
- Drop rows 0 minute NaN's
- Created Game ID for both data frames that is joinable
- We ended data wrangling with cleaned player stats (291008, 24), and cleaned team stats (14348, 80)

Exploratory Data Analysis

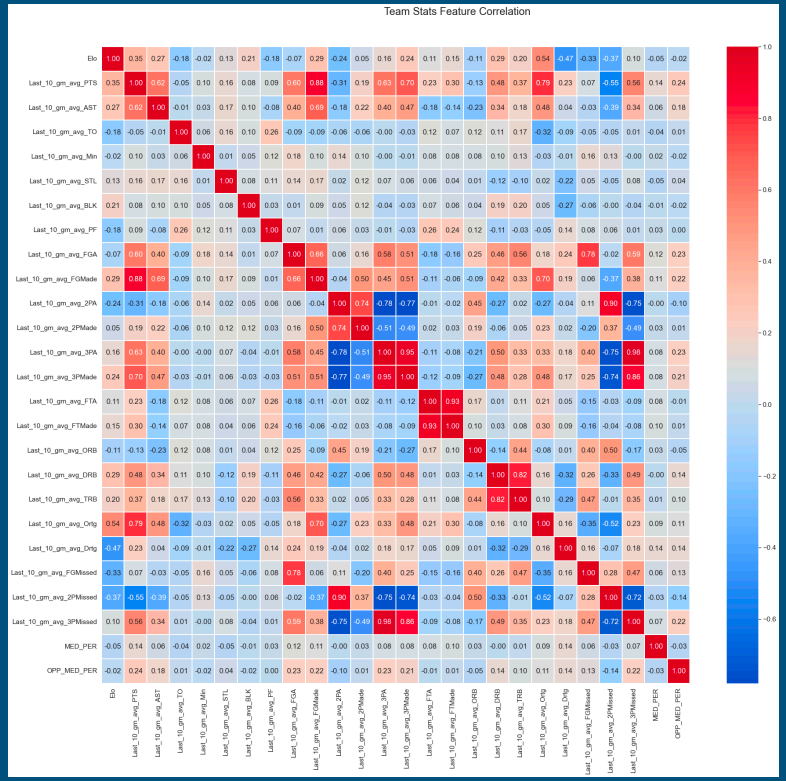


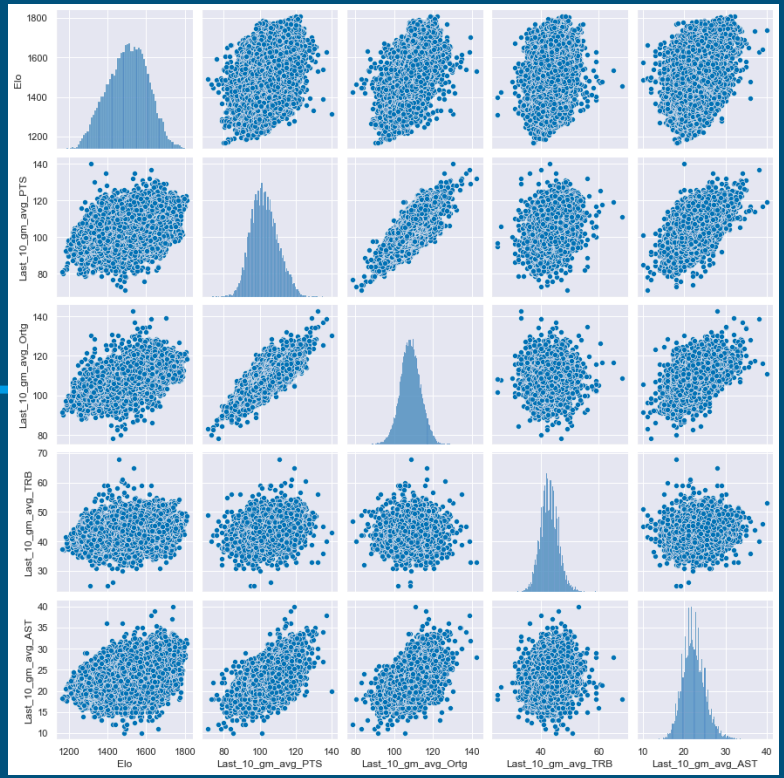






Exploratory Data Analysis Cont.

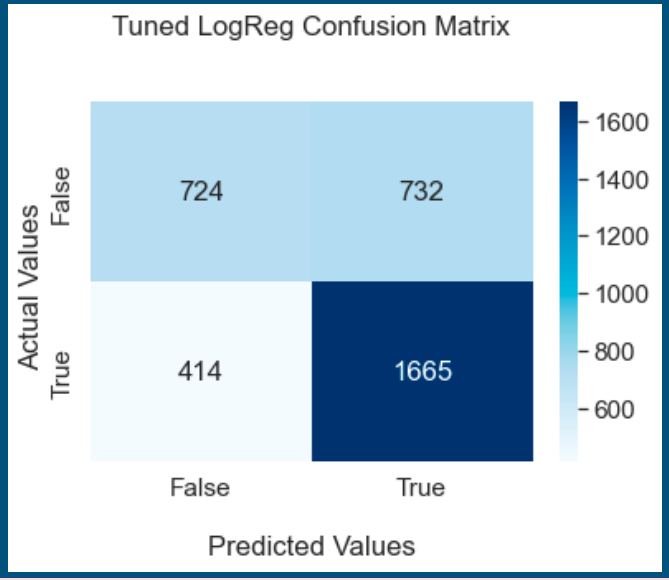




Model Selection

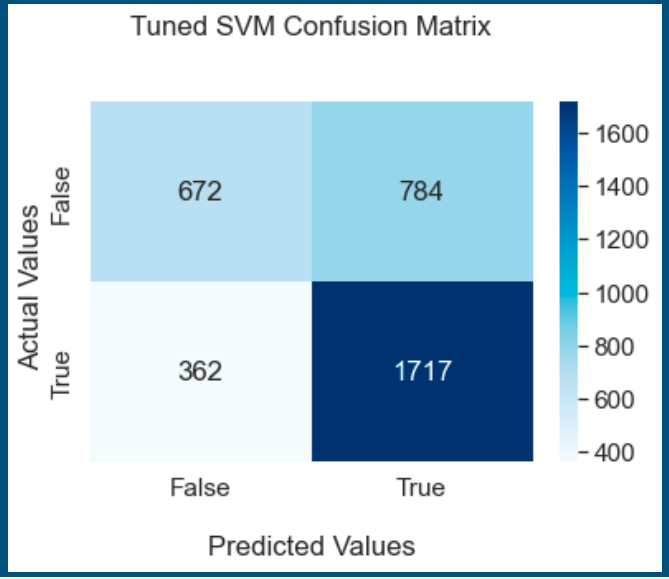
- Logistic Regression
- Random Forest Classifier
- Support Vector Machines
- K-Nearest Neighbor
- Gradient Boost

Model Comparisons: Precision and F1 Score



0.6758132956152758

	precision	recall	f1-score	support
0	0.64	0.50	0.56	1456
1	0.69	0.80	0.74	2079
accuracy			0.68	3535
macro avg	0.67	0.65	0.65	3535
weighted avg	0.67	0.68	0.67	3535



0.6758132956152758

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weighted avg	0.67	0.68	0.66	3535

Hyperparameter Tuning

Grid Search Cross Validation with Logistic Regression Model

Precision Increase by Site

- Accuracy: 0.6752 to 0.6758
- Precision: 0.63 to 0.64
- F1: No Change 0.56 to 0.56

Takeaways

- Logistic Regression was consistently best model, but SVM is competitive
- Summarizing Stats are helpful, but only if focused on offense or defense, not together
- A lot of features are redundant

Future Research

- Increase collection of data especially the player defensive data for building defensive summarizing features
- Create features that utilize progress stats with seasonal averages to determine player/ team progression trend.
- Build a player career trajectory model to used with progression trend.

Thank You!

NBA enthusiast for collecting and organizing NBA Game Statistics Datasets, and Kaggle for hosting.

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Questions?