

MILWAUKEE  
BUCKS  
HACKATHON



Kevin Collins – Benjamin  
Kwin Ryan Quinlan – Dominic  
Ventura





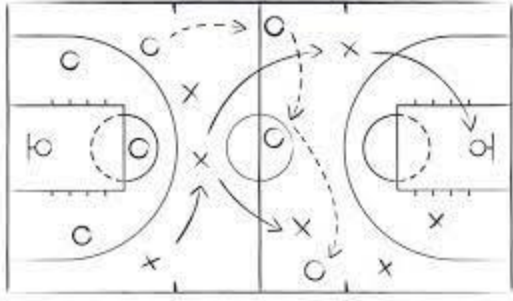
# *Our Objective*

Determine how many premium seating pricing tiers there should be and apply them to the 2023-24 season

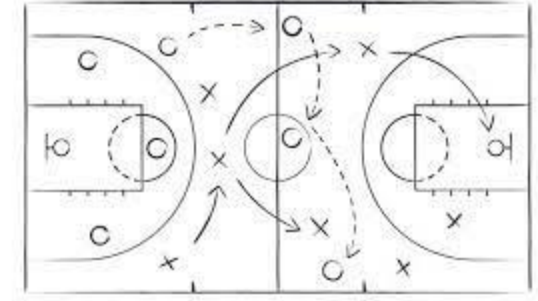


# *Approach*

Develop a model that maximizes the premium seating revenue and can be updated using real-time data



# *Plan*



Predict game-by-game premium revenue for the 2023-24 season



Perform PCA in order to identify the most useful factors for classification



K-Means Clustering to classify games into pricing tiers

# Data Collection



- 2018-2022 Dataset:
  - Given Variables:
    - Year; Opp.Prev.Conference.Finals; Opp.NBA.Finals; Is.Holiday; Opp.NBA.Champs; Premim.Revenue
  - Created Variables:
    - Opening.Day; Days.from.Beg; Opp.Pred.Wpct
- 2023 Dataset:
  - Given Variables:
    - Year; Is.Holiday
  - Created Variables:
    - Opp.Prev.Conference.Finals; Opp.NBA.Finals; Opp.NBA.Champs; Opening.Day; Days.from.Beg; Opp.Pred.Wpct; Premium.Revenue
      - All Researched variables from SportsReference.com



# Projecting Premium Revenue

- Linear model trained on 2018-22 data
- Response: Premim.Revenue
- Stepwise Selection
  - Predictors Considered: Opening.Day, Year, Is.Holiday, Days.from.Beg, Opp.Pred.Wpct, Opp.Prev.Conf.Finals, Opp.Prev.NBA.Finals, Opp.Prev.NBA.Champs
- Final predictors shown in model summary

```
Call:
lm(formula = Premim.Revenue ~ Opening.Day + Year + Days.from.Beg +
    Opp.Pred.Wpct + Opp.Prev.Conf.Finals, data = previous_season)
```

Residuals:

Min	1Q	Median	3Q	Max
-61748	-19063	-2293	15527	104242

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-4.184e+07	3.210e+06	-13.032	< 2e-16 ***
Opening.Day	2.189e+04	1.843e+04	1.188	0.236772
Year	2.071e+04	1.589e+03	13.032	< 2e-16 ***
Days.from.Beg	2.101e+02	5.491e+01	3.826	0.000194 ***
Opp.Pred.Wpct	5.614e+04	2.218e+04	2.531	0.012471 *
Opp.Prev.Conf.Finals	1.359e+04	8.605e+03	1.579	0.116605

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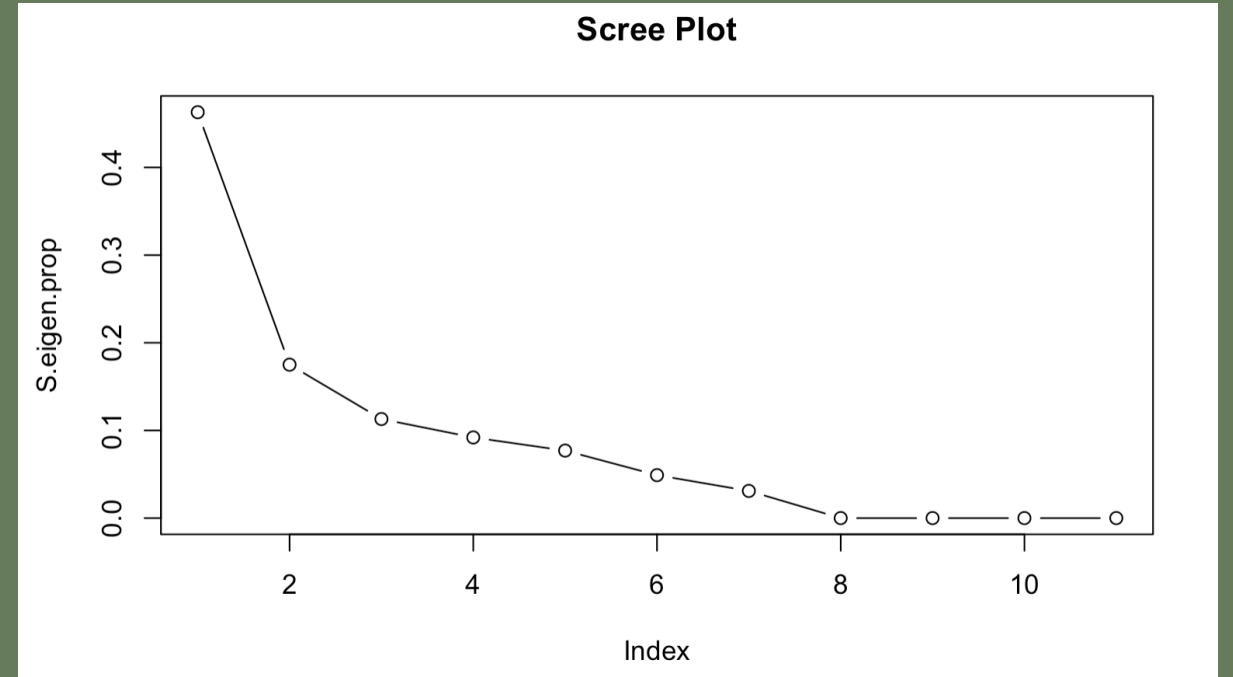
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 30590 on 142 degrees of freedom  
Multiple R-squared: 0.5936, Adjusted R-squared: 0.5793  
F-statistic: 41.48 on 5 and 142 DF, p-value: < 2.2e-16

# PCA



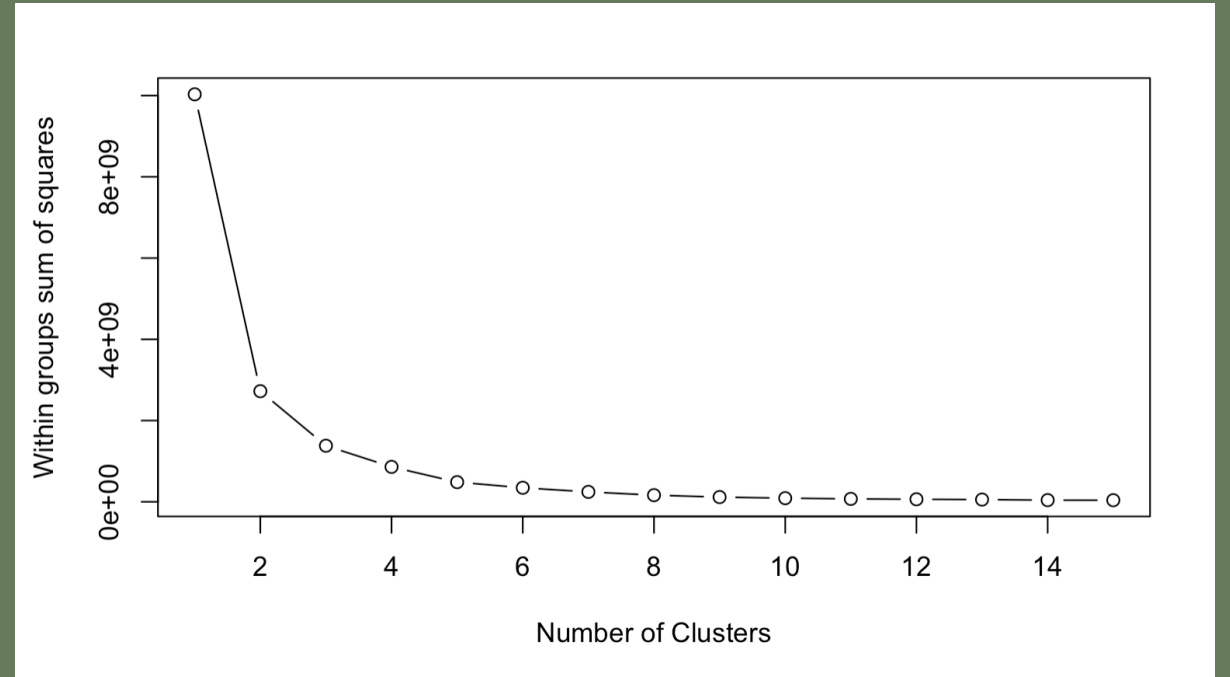
- Reduce the 2023-24 data to the most important factors
- Scree Plot: 5 Principal Components
  - Prem.Rev.Pred, Opp.Pred.Wpct, Opp.Prev.Conf.Finals, Opening.Day, and Opp.Prev.NBA.Finals



# K-Means Cluster



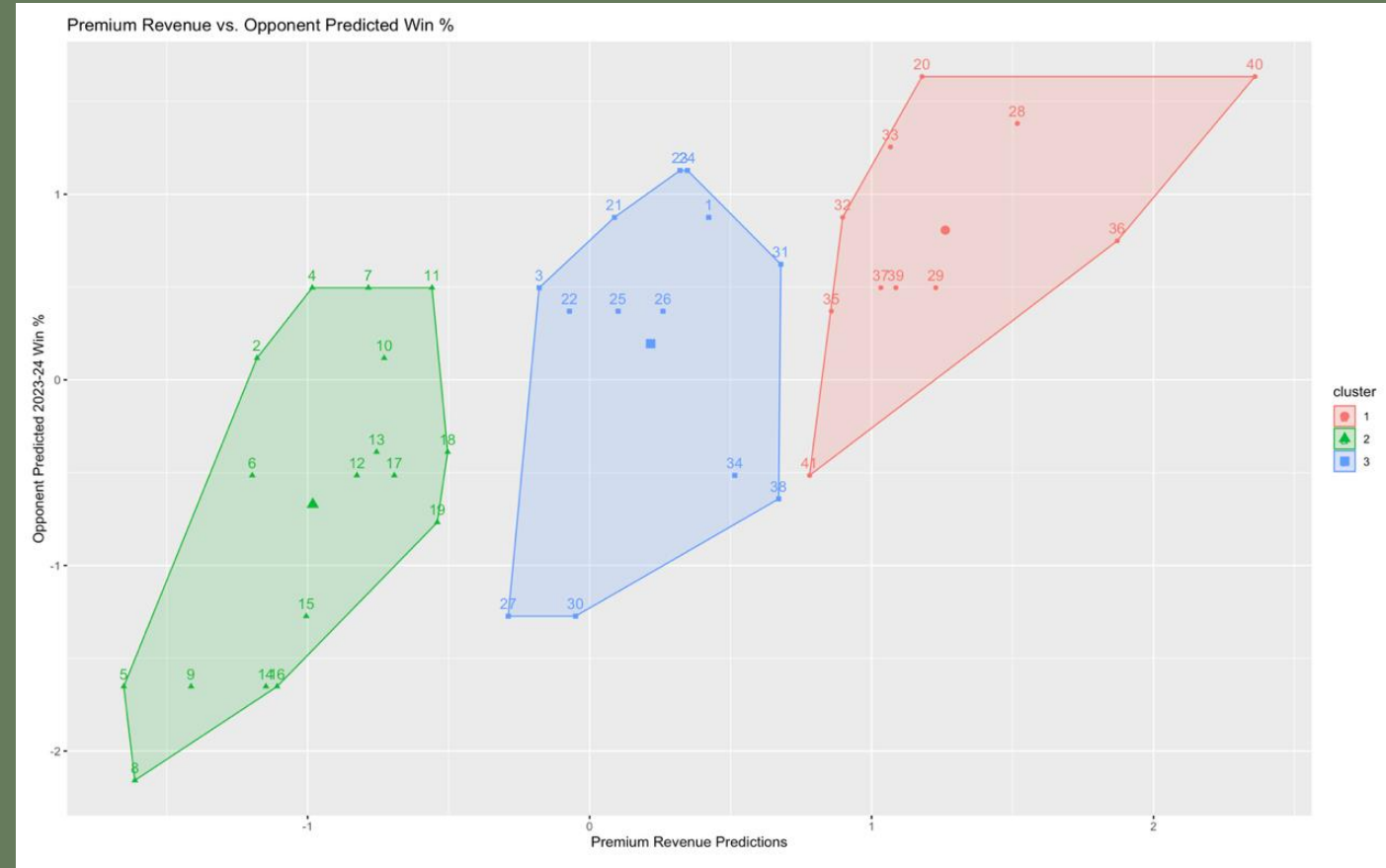
- Select the number of clusters
  - Identified elbow points
  - 3 clusters was ideal
    - A, B, C Tiers



# Results



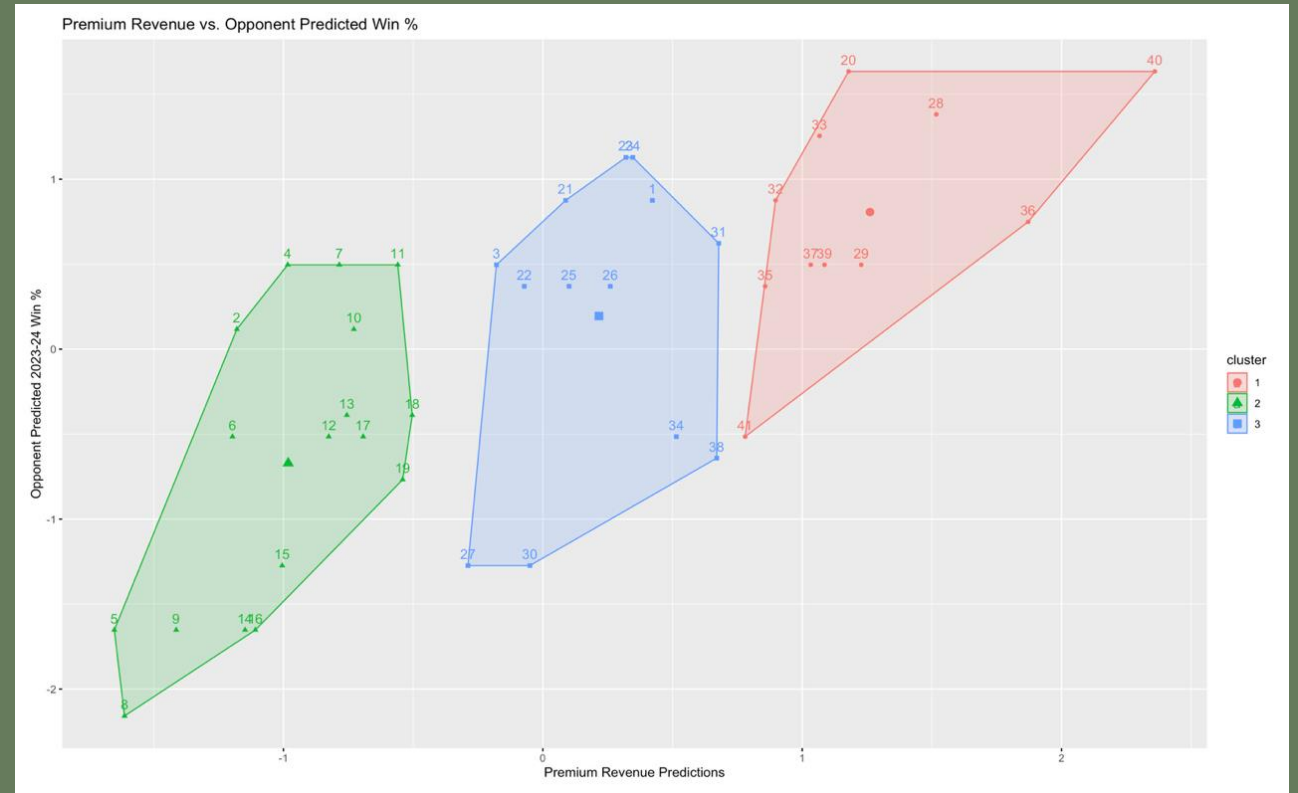
- A Tier
  - Home Games 20,40: Boston Celtics
  - Home Game 28: Denver Nuggets
- B Tier
  - Home Games 23,24: Cleveland Cavaliers
  - Home Game 25: New Orleans Pelicans
- C Tier
  - Home Game 5: Detroit Pistons
  - Home Game 8: Washington Wizards



# Conclusion and Applications



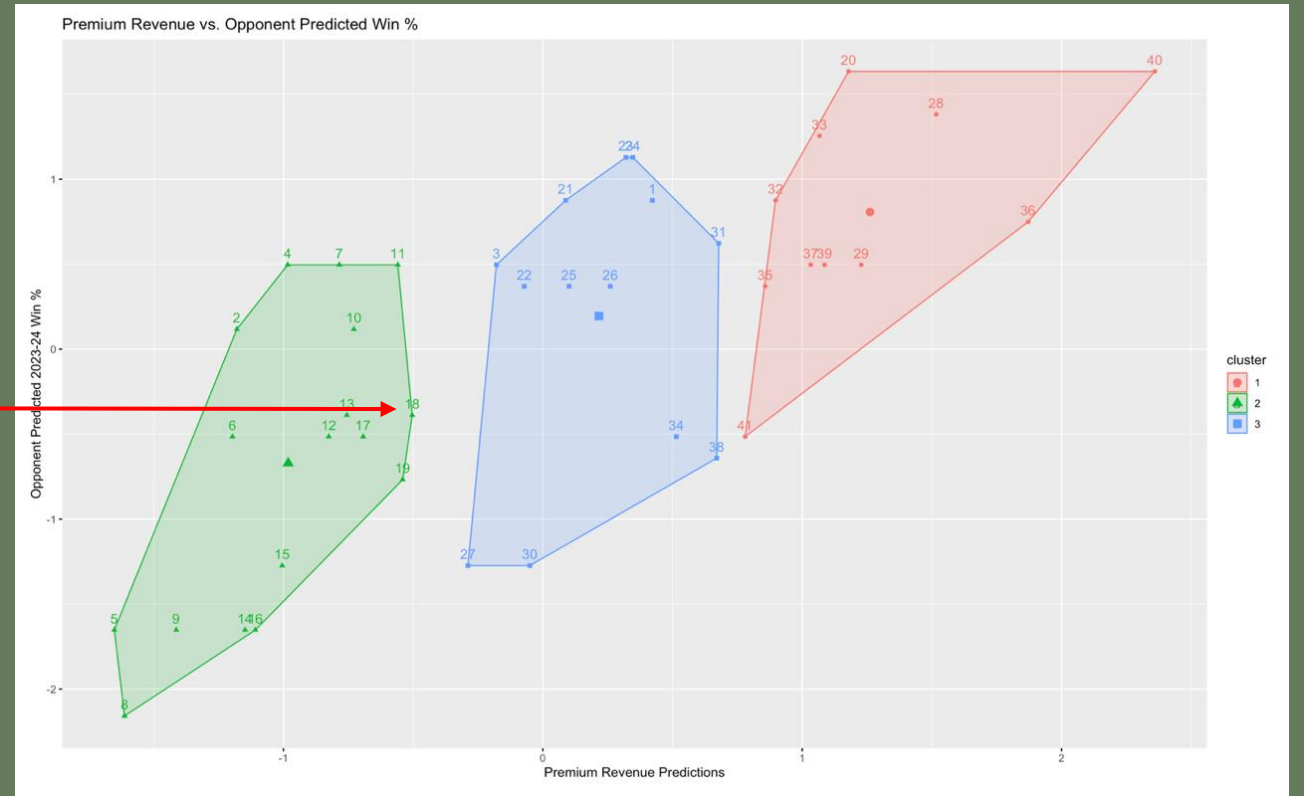
- Created 3 tiers
- Requires easy to find data
- Linear Model can be trained on more data as years go on
- Requires little work to classify games



# Conclusion and Applications



- Dynamic Premium Pricing
  - Observation 18: Pacers
    - Originally Tier C



# References

*All-star starters*. 2023 All-Star Roster | NBA.com. (n.d.). <https://www.nba.com/allstar/2023/all-star-roster>

*NBA team win % - all games*. NBA Stats - NBA Team Win % - All Games | TeamRankings.com. (n.d.). <https://www.teamrankings.com/nba/stat/win-pct-all-games?date=2023-06-13>

Forbes. (October 26, 2023). Milwaukee Bucks franchise value from 2003 to 2023 (in million U.S. dollars) [Graph]. In *Statista*. Retrieved February 29, 2024, from <https://www.statista.com/statistics/194662/franchise-value-of-the-milwaukee-bucks-of-the-nba-since-2006/>