



LEARNING TEAM 2



# CHANGING THE META

Employing PCA to Uncover Differentiating  
Features among NBA Players across Generations  
(1980s, 1990s, 2000s, 2010s, and 2020s)





# PROJECT OBJECTIVES

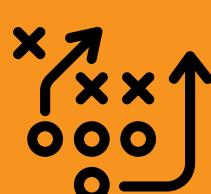
NBA players' **diverse metrics and dimensions pose analytical challenges** in pinpointing similarities and differences.

The project aims to **reduce the amount of noise in player statistics** to **enhance player evaluation and comparison** for teams



## STREAMLINE NBA DATA

Using PCA, **reduce the amount of player statistics** that basketball stakeholders look at **to identify similar and different players**



## SHOW HOW THE META HAS EVOLVED

Examine **how the NBA adjusted its playing styles over the years** by **analyzing the variations in statistics** for different positions.



## BASELINE TO EVALUATE FUTURE META

Assist in **evaluating what the next meta will be** in the NBA through analyzing how datapoints move around the PCA graph.



# DATA SET HISTORICAL NBA PLAYER STATS



## NBA SEASONS FROM 1980S TO 2020S

One season from each decade was selected to represent the whole decade

(1979-80, 1989-90, 1999-00, 2009-10, 2022-23)



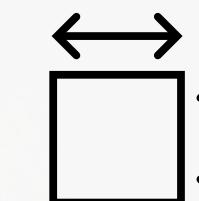
### WEB SCRAPING

Dataset taken from:  
Basketball-Reference.com



### PLAYER STATISTICS

All game statistics from each season was extracted



### DIMENSIONS

31 Columns/features and  
2,088 rows of players



### FILTERS

Players who have at least played half of the season

## ADDITIONAL PRE-PROCESSING

Five columns were removed that were irrelevant to the study.  
('Rk', 'Tm', 'Pos', 'Age', 'GS')



## OFFENSIVE STATISTICS

**PTS**

Points scored

**FG, FGA, FG%**

Field goal metrics

**3P, 3PA, 3P%**

3-point metrics

**2P, 2PA, 2P%**

2-point metrics

**eFG**

Effective FG %

**FT, FTA, FT%**

Freethrow metrics

**ORB**

Offensive Rebs

**AST**

Assists made

**DRB**

Defensive rebns

**TRB**

Total Rebounds

**STL**

Steals made

**BLK**

Blocks made

**G**

Games played

**MP**

Minutes played

**TOV**

Turnovers

**PF**

Personal fouls

## FEATURES

player statistics considered

# METHODOLOGY

01



## EXPLORATORY DATA ANALYSIS

Preliminary exploration on key NBA player statistics through visualization

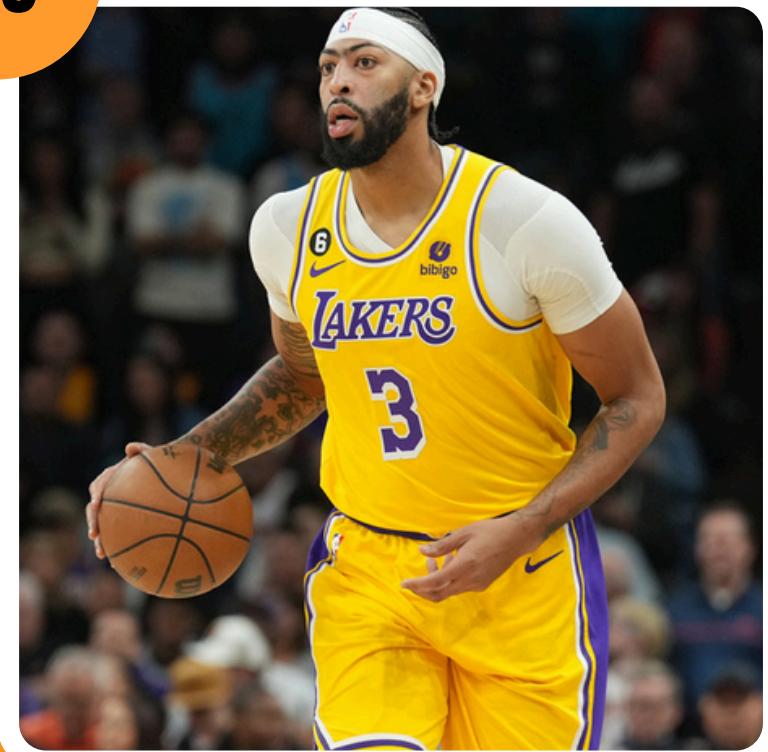
02



## PRINCIPAL COMPONENT ANALYSIS

Identify key player statistics that differentiate players across all generations

03



## GENERATIONAL / POSITIONAL DEEP DIVE

Examine trend by position and generation to check evolving skill set trends

“I believe greatness is an evolutionary process that changes and evolves era to era.”

MICHAEL JEFFREY JORDAN

## EVOLUTION OF NBA SCORING PATTERNS

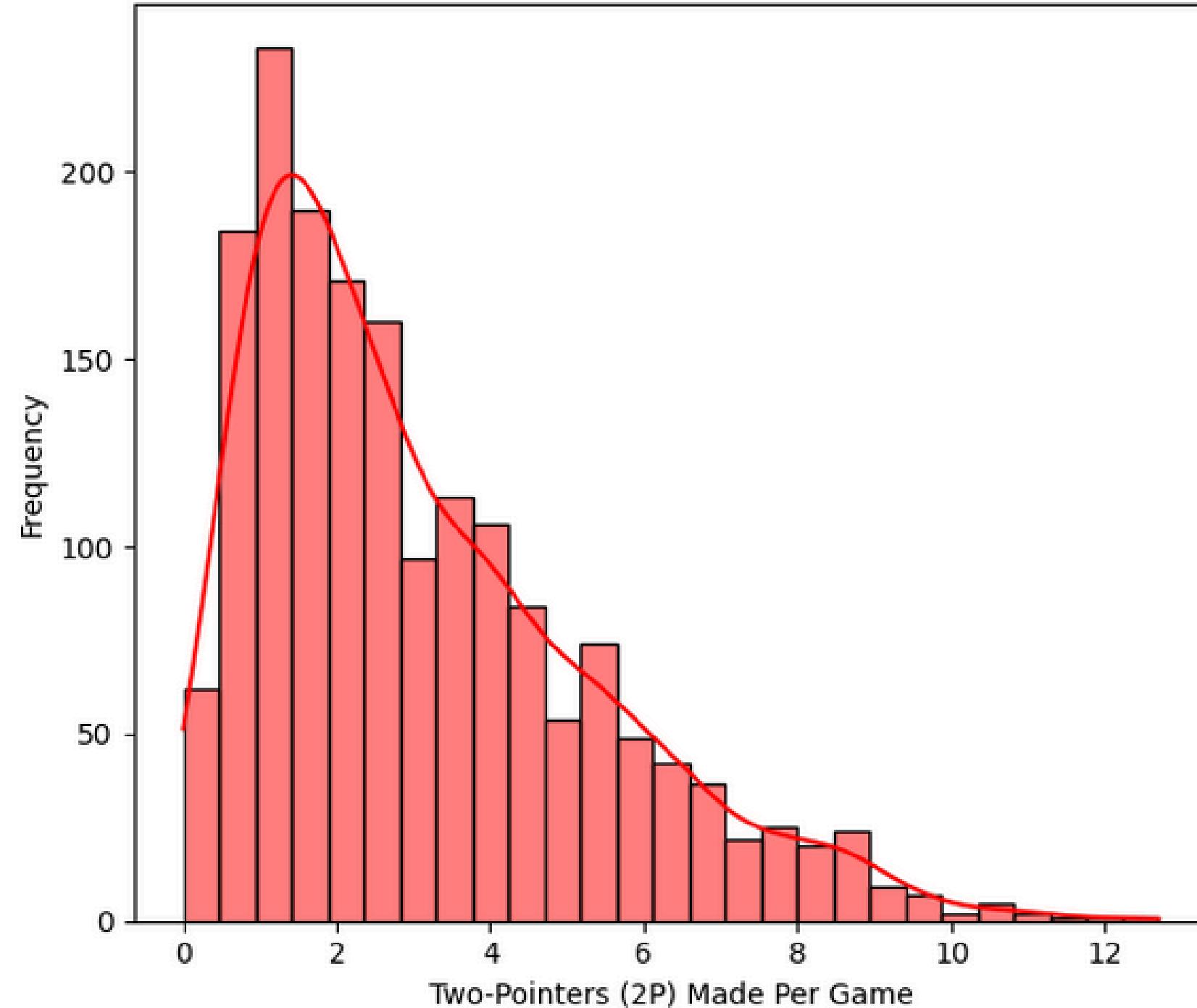
In the myriad of possible player statistics which can be individually evaluated, **scoring patterns have shown significant variance between players as well as through the generations.**



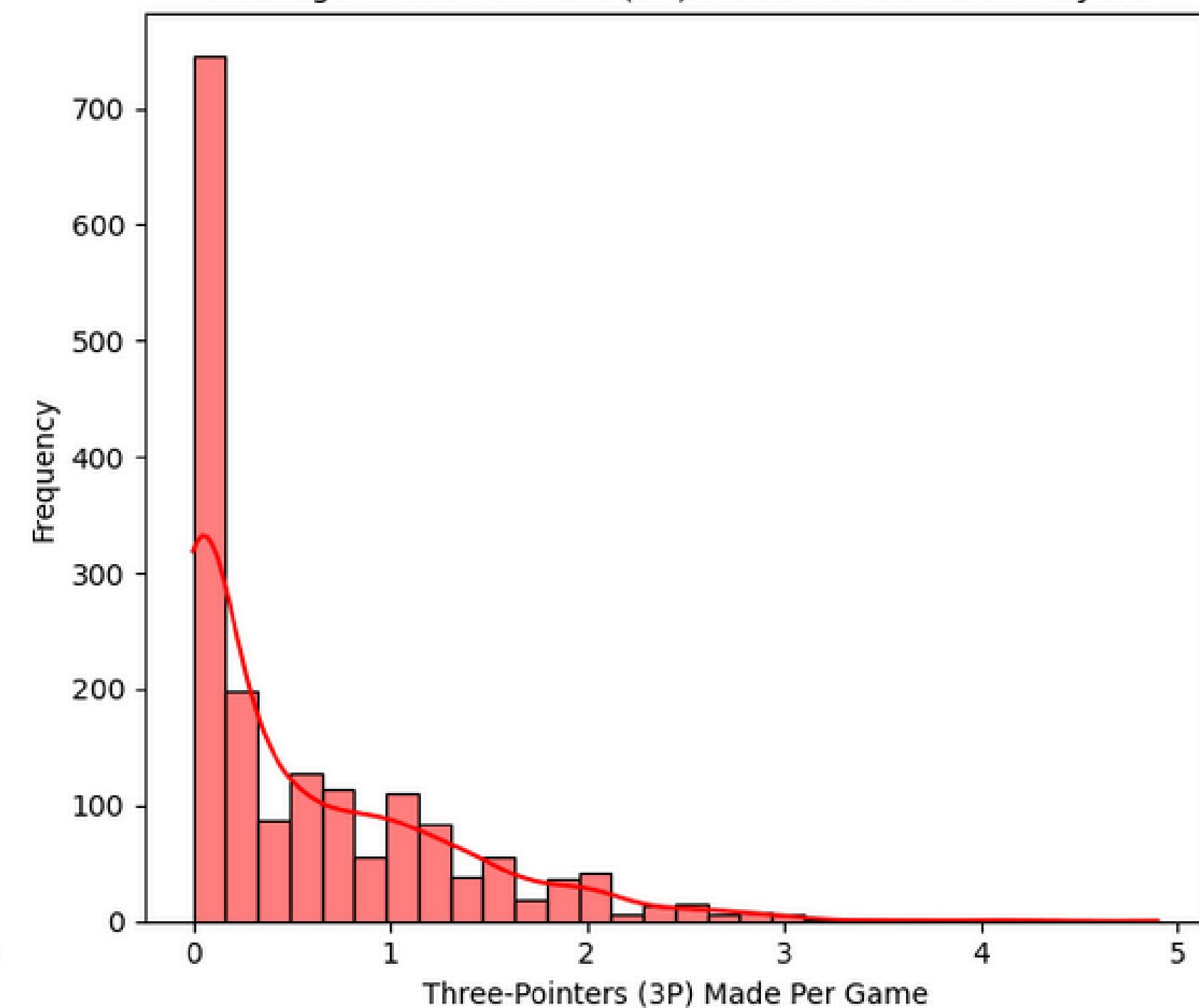
# EXPLORATORY DATA ANALYSIS

# NBA SHOOTING PROFILE DISTRIBUTION

Average Two-Pointers (2P) Made Per Game of Players

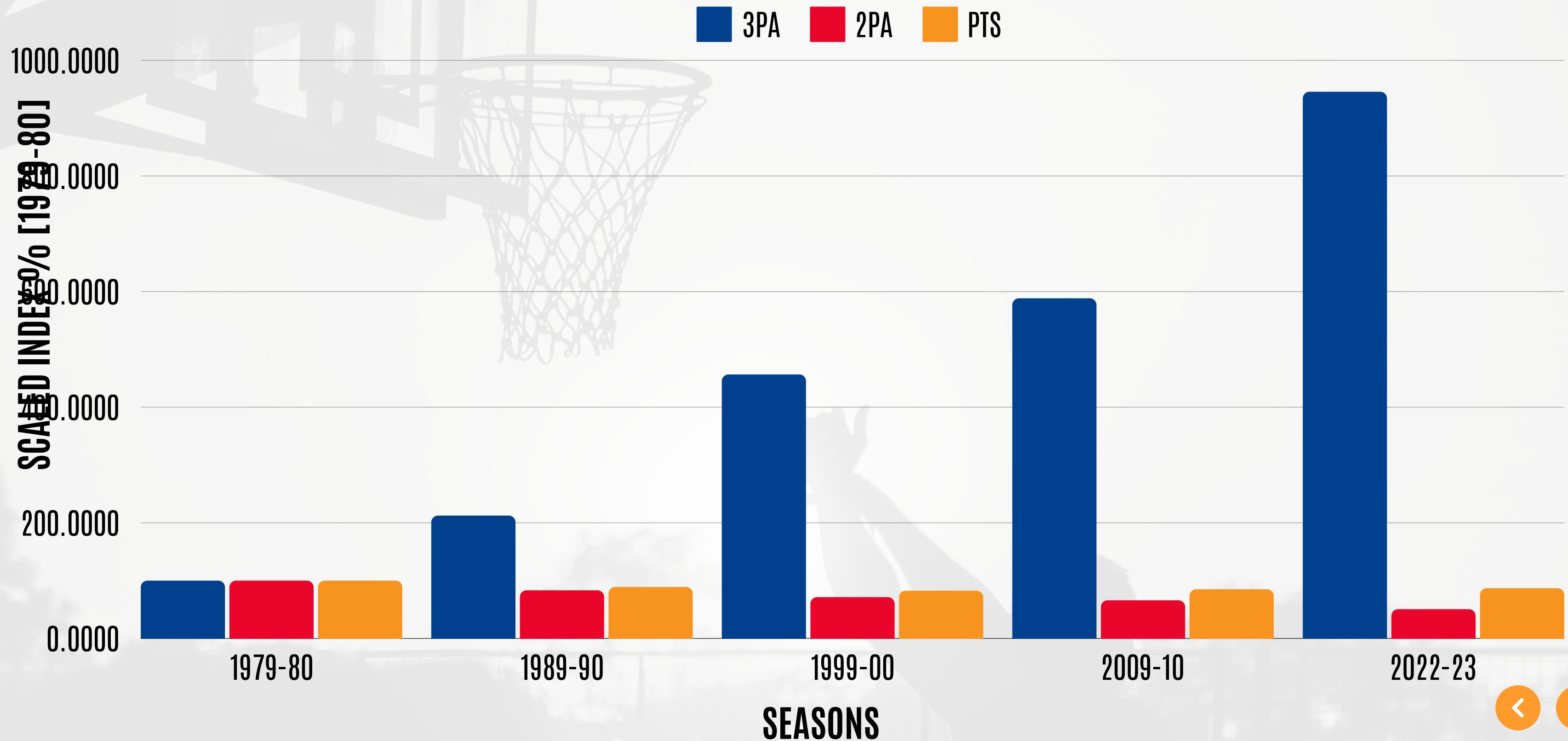


Average Three-Pointers (3P) Made Per Game of Players



# AVERAGE NBA SHOOTING STATS, INDEXED TO 1979-80

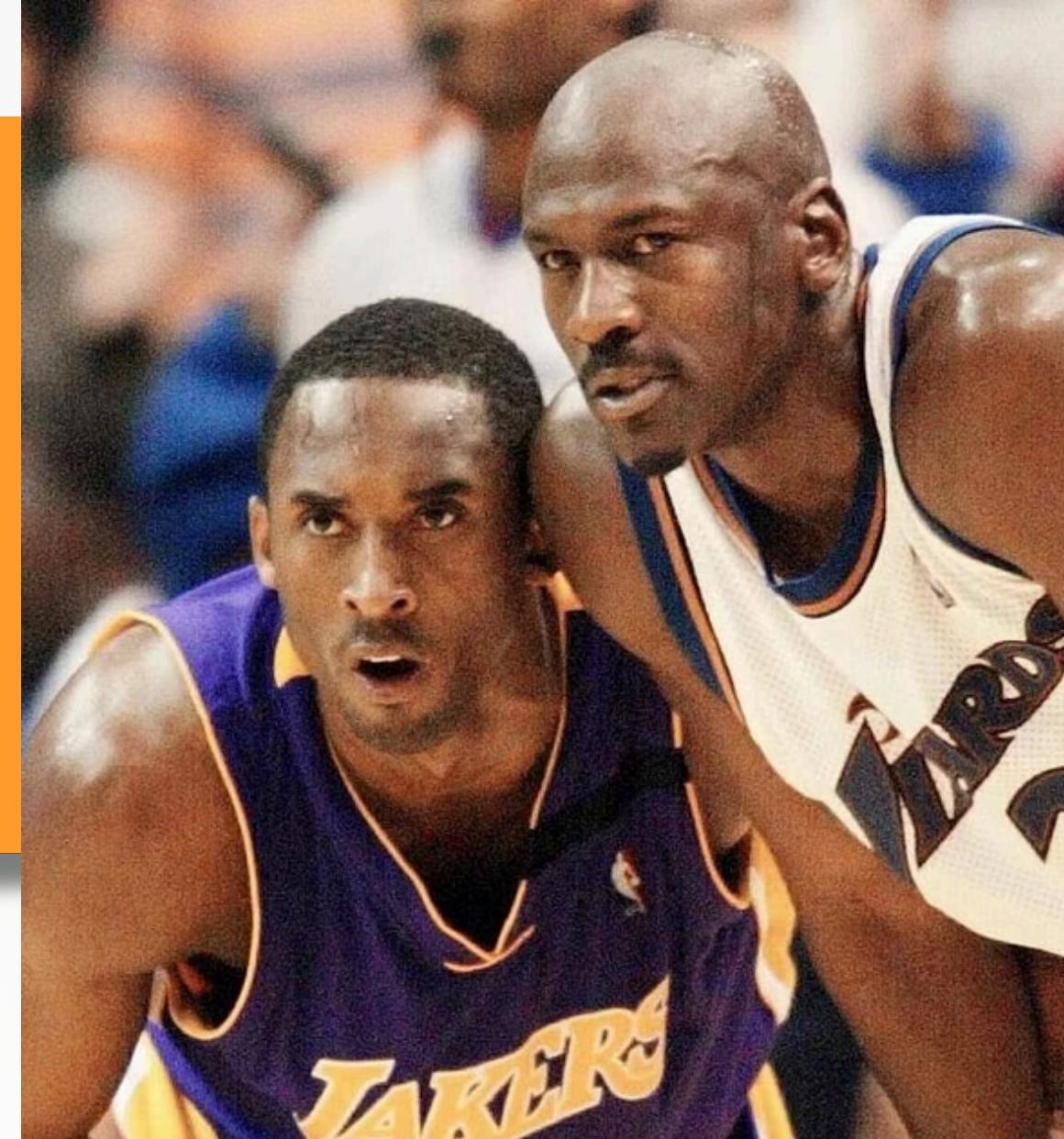
Over the years, it has been observed that more and more emphasis has been placed on 3-pointers. This has become a defining stat that has differentiated players.



# PRINCIPAL COMPONENT ANALYSIS

## HOW CAN PCA REDUCE NOISE AND DIFFERENTIATE PLAYERS?

NBA players are judged on scoring, rebounding, assists, and defense. Analyzing these can be complex. **PCA helps identify the key components influencing the most significant variances in players' skills.**



# EXPLAINING VARIANCE

## FIRST TWO PRINCIPAL COMPONENTS

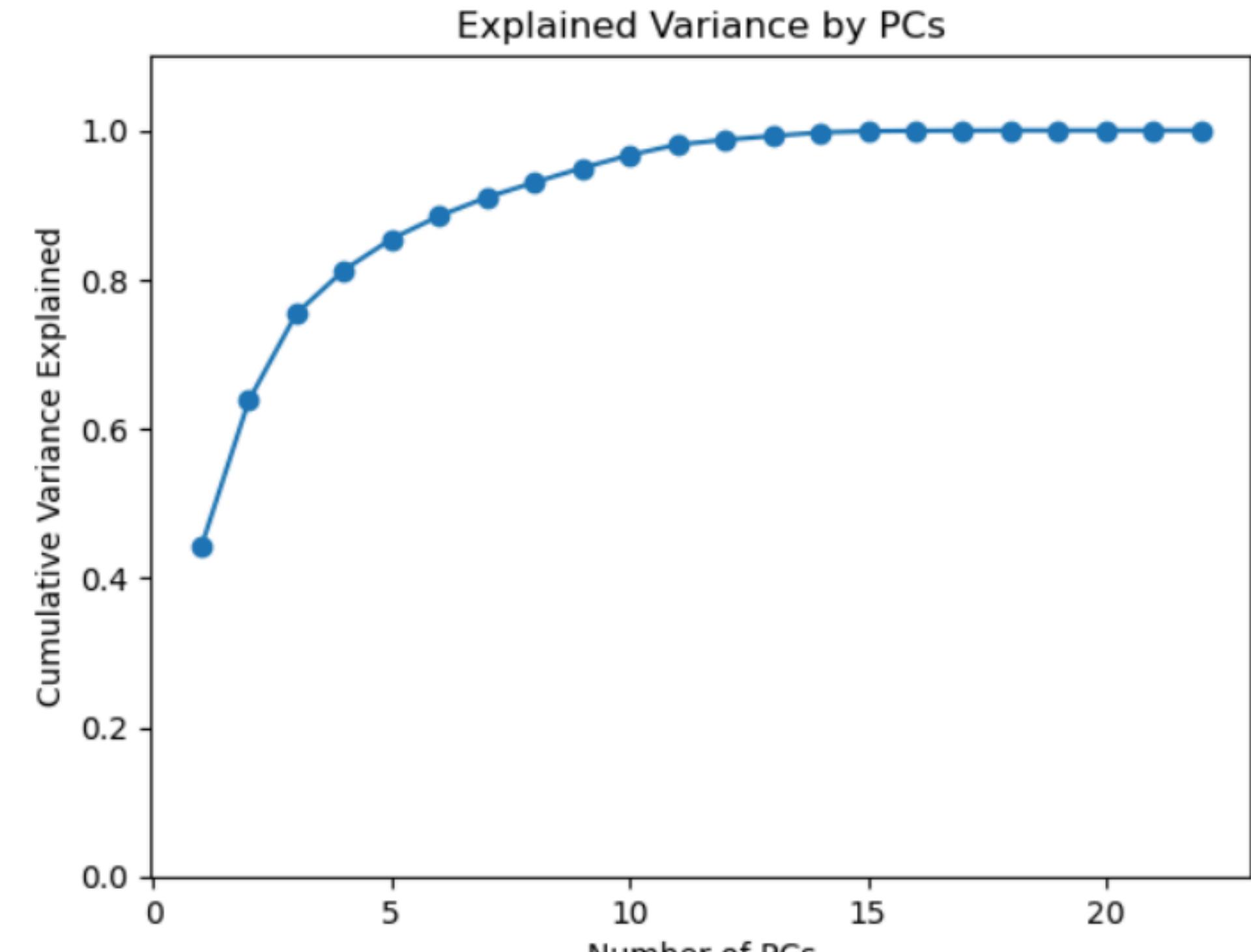
Out of the 22 possible principal components, **using only the first two explained the majority (64%) of the variance** in the data.

## HOW ABOUT THE OTHER PCs?

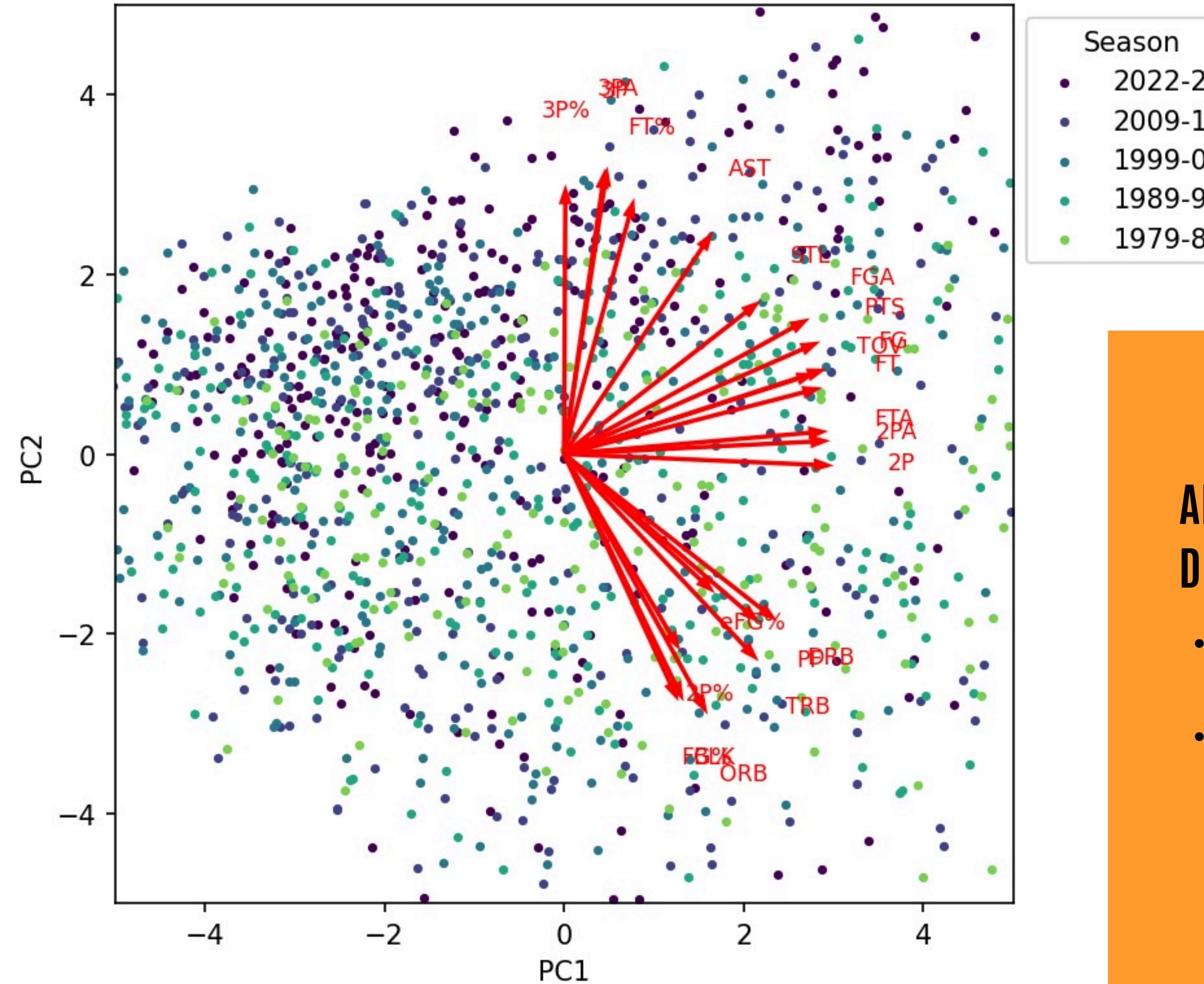
Additional principal components offered **only minor incremental improvements**.

## BEST FOR INTERPRETATION

For interpretability, **only two principal components were used**.



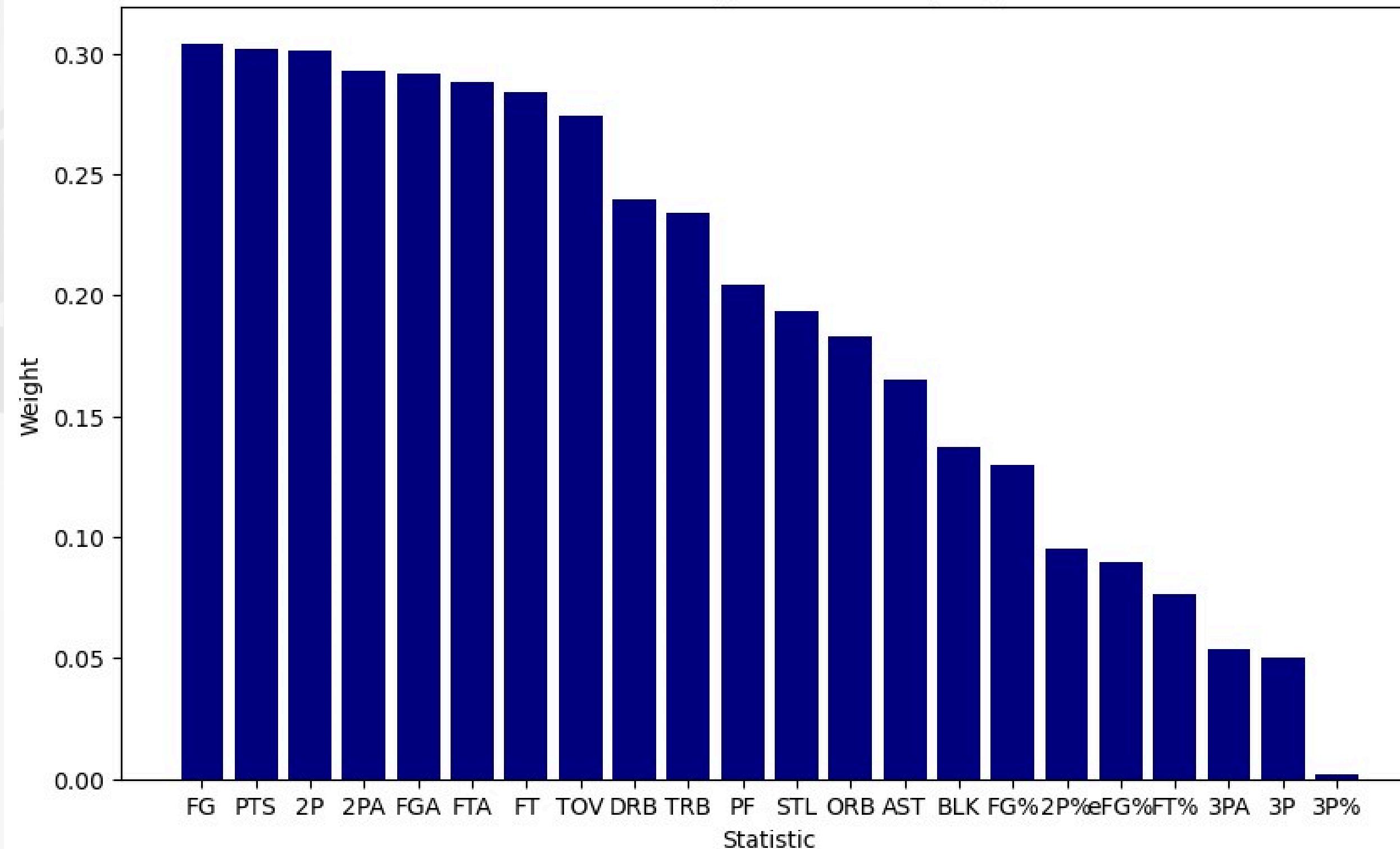
# PCA: All Players



## ANALYZING ALL PLAYERS OVER THE DECADES:

- All 22 features shared positive correlations with other features
- Certain features were negatively correlated, which indicates that these can also be combined and described with fewer principal components, thereby reducing dimensionality.

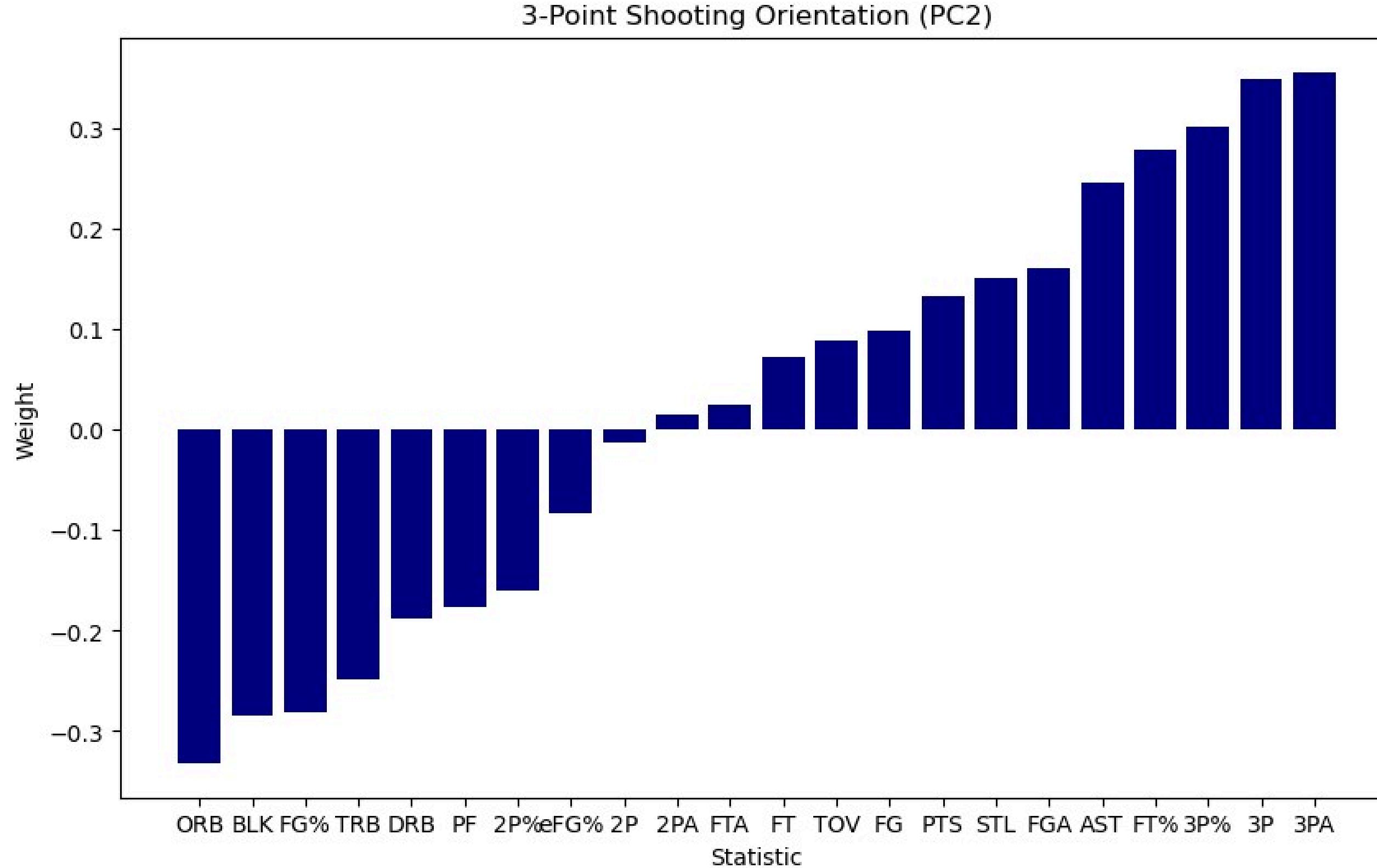
## Inside Scoring Performance (PC1)



## PRINCIPAL COMPONENT 1: INSIDE SCORING PERFORMANCE

- PC1 can be described as a general axis for **inside scoring performance** due to the features that are most aligned with it.
- This component includes **positively correlated features**, meaning they generally move together. When one feature increases, the others also tend to increase, and vice versa.

## PRINCIPAL COMPONENT 2: THREE POINT SHOOTING



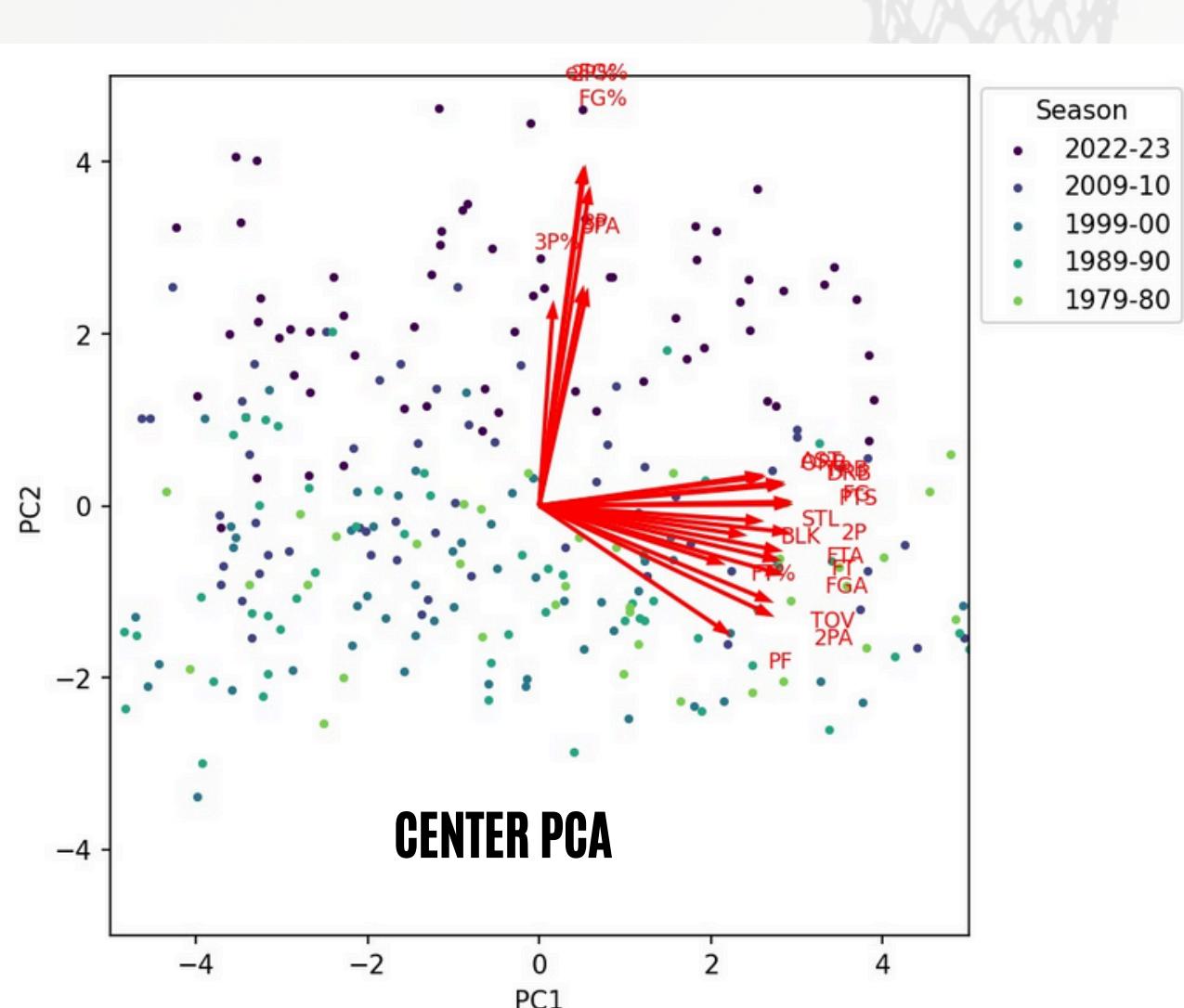
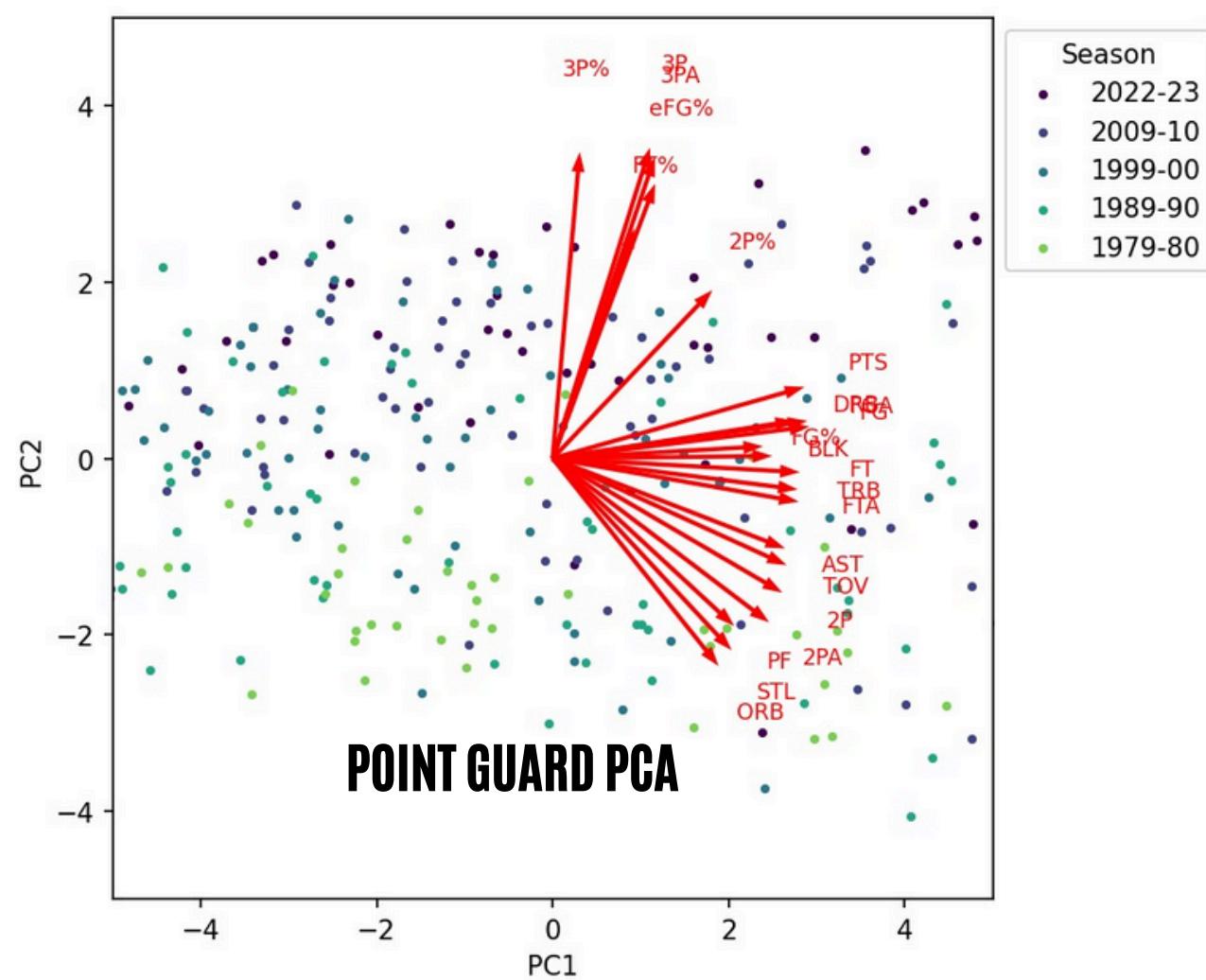
- PC2 can be described as a player's orientation towards **3-Point Shooting**, given the features which contribute most to PC2
- PC2 includes features closely aligned with the principal component, some with a negative correlation like **3PA** and **ORB**, indicating players often prioritize one set of features over the other.

## CAN PCA IDENTIFY POSITIONAL AND GENERATIONAL TRENDS?

Examined subsets for positional differences in principal components, indicating specialization.  
Analyzed average player statistics by position and generation to check for evolving skill set trends.



# POSITIONAL/GENERATIONAL DEEP DIVE



# APPLYING PCA BY PLAYER POSITION



For all positions, PC 1 and PC 2 continue to describe **Inside-Shooting Performance and 3-Point Shooting Orientation**

**3**

A key feature that continues to be significant in all are **three point metrics which are significant in all positions**



**Centers have more closely correlated features** than other positions. These skills are more pronounced and emphasize their specialization

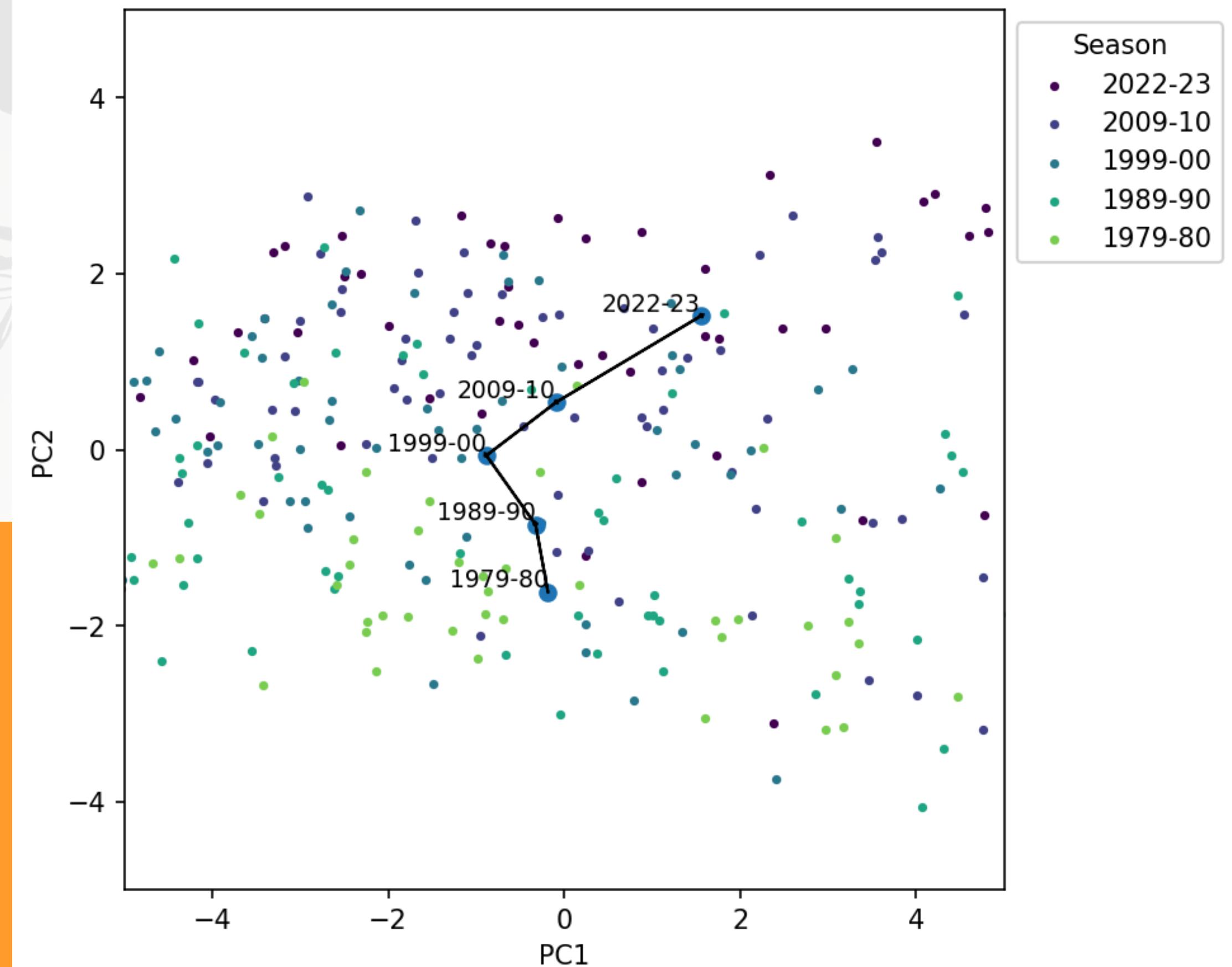


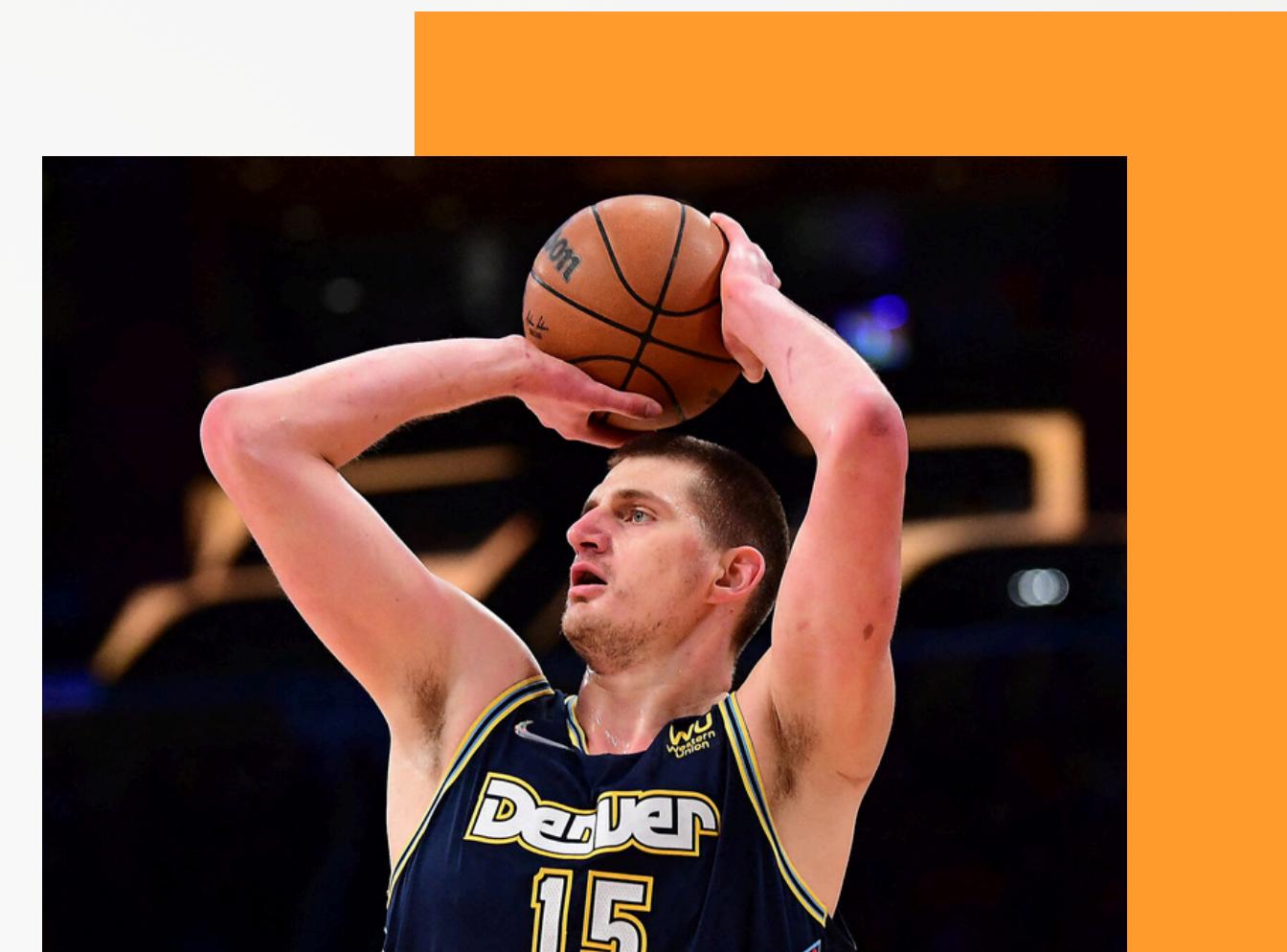
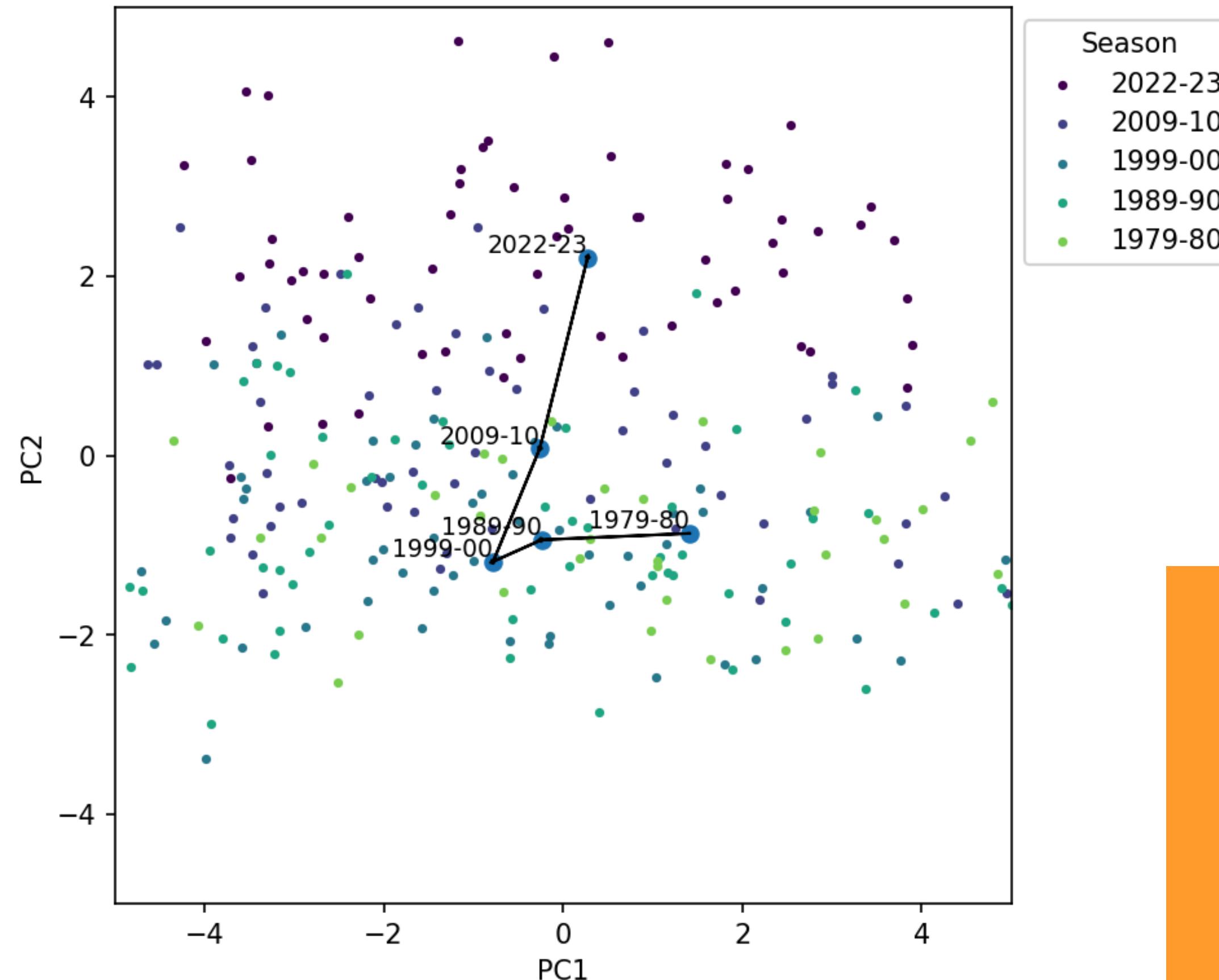
**PC2 for Centers is an exception, with a high emphasis on accurate shooting in general, but not necessarily attempting more 2-point shots**



## EVOLUTION OF POINT GUARDS

- PC2 tells a better story on how different positions in the NBA have evolved from 1980s to the 2020s
- All the other positions follow the same evolution as point guards. There has been more emphasis on three point metrics now.





## CENTERS EVOLVED SIGNIFICANTLY

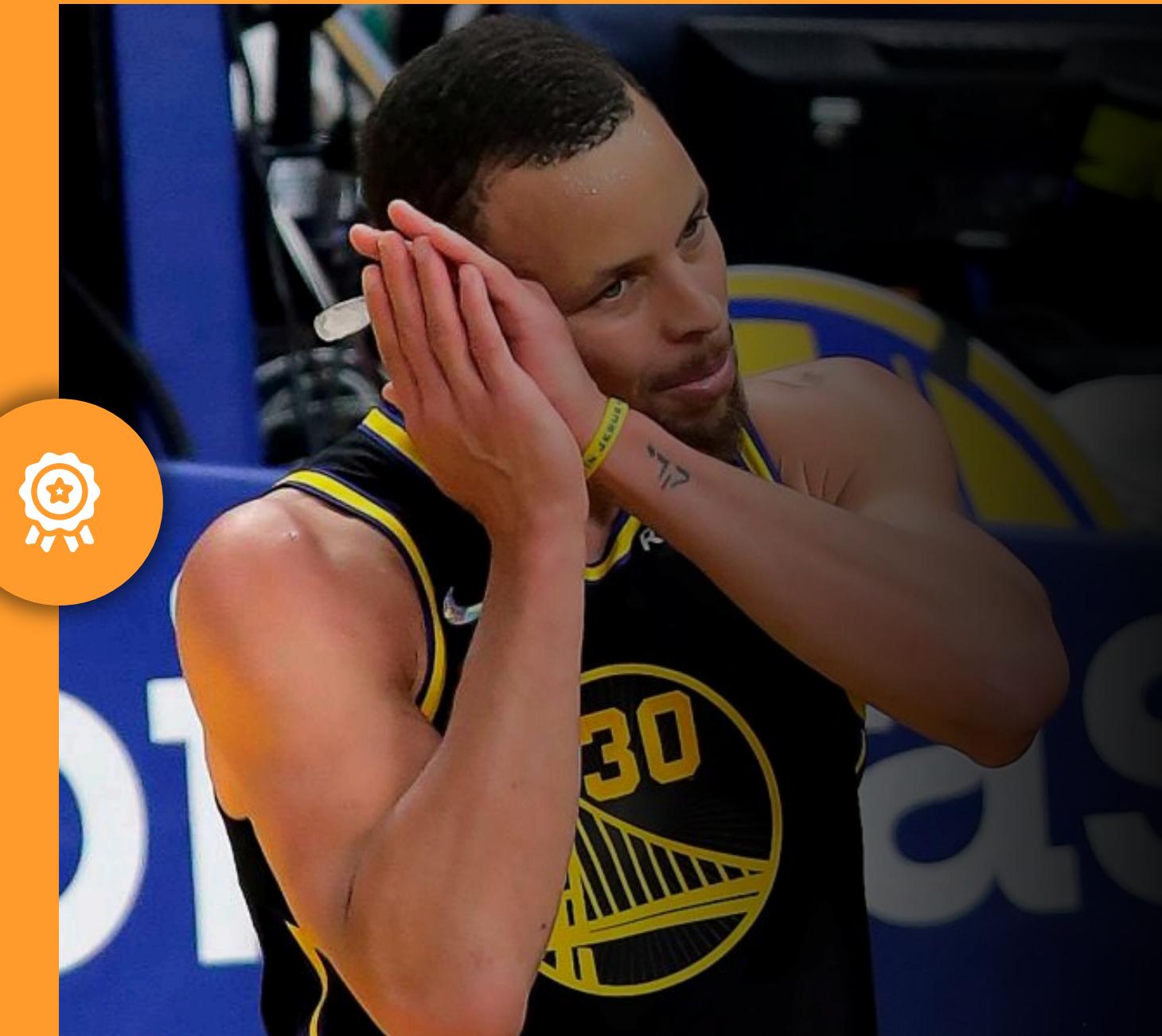
- There has been a **pronounced shift towards accurate shooting and scoring among centers**
- Centers have become more efficient in their scoring, showcasing **higher FG% and 2P%**.

# CONCLUSIONS AND RECOMMENDATIONS

PCA is a valuable tool that should be used for analyzing NBA player data as it can effectively summarize and differentiate players based on their statistical features, especially when dealing with correlated variables.

## THE CHANGING META

While average performance and variance along the inside-scoring component remains relatively unchanged, the latest generations of NBA players have placed greater and greater emphasis on 3-Point Shooting orientation.



# USE CASE

## COACHING AND SCOUTING

Coaches and scouts from the NBA and other leagues internationally can use these insights for adjusting game strategy and identifying players whose playing style can fit today's brand of basketball.



## CONTENT CREATION

Data from this project can be used as talking points in podcasts, sports shows, and other platforms.

Backed with data, content can be used for storytelling and further analysis.



## BUILDING TEAMS

Fantasy basketball fans and pro teams can use this project to build both fantasy and real teams. It emphasizes player differences, helping create diverse and well-rounded rosters.



# THANK YOU.

## TEAM INFO



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