

# **NBA Network Analysis**

**Emilio Espinosa S.  
Saffian Asghar**

# Table of Contents

**Research & Hypothesis**

**Data**

**EDA**

**Sports Network Analysis**

# Research

Is it possible to analyze synergies between players and their reliances on superstar players?

# Hypothesis

Teams tend to depend too much on star players in order to be successful.



# NBA

- National Basketball Association (NBA).
- Professional basketball league in the United States.
- 30 teams.
- Founded in 1946.

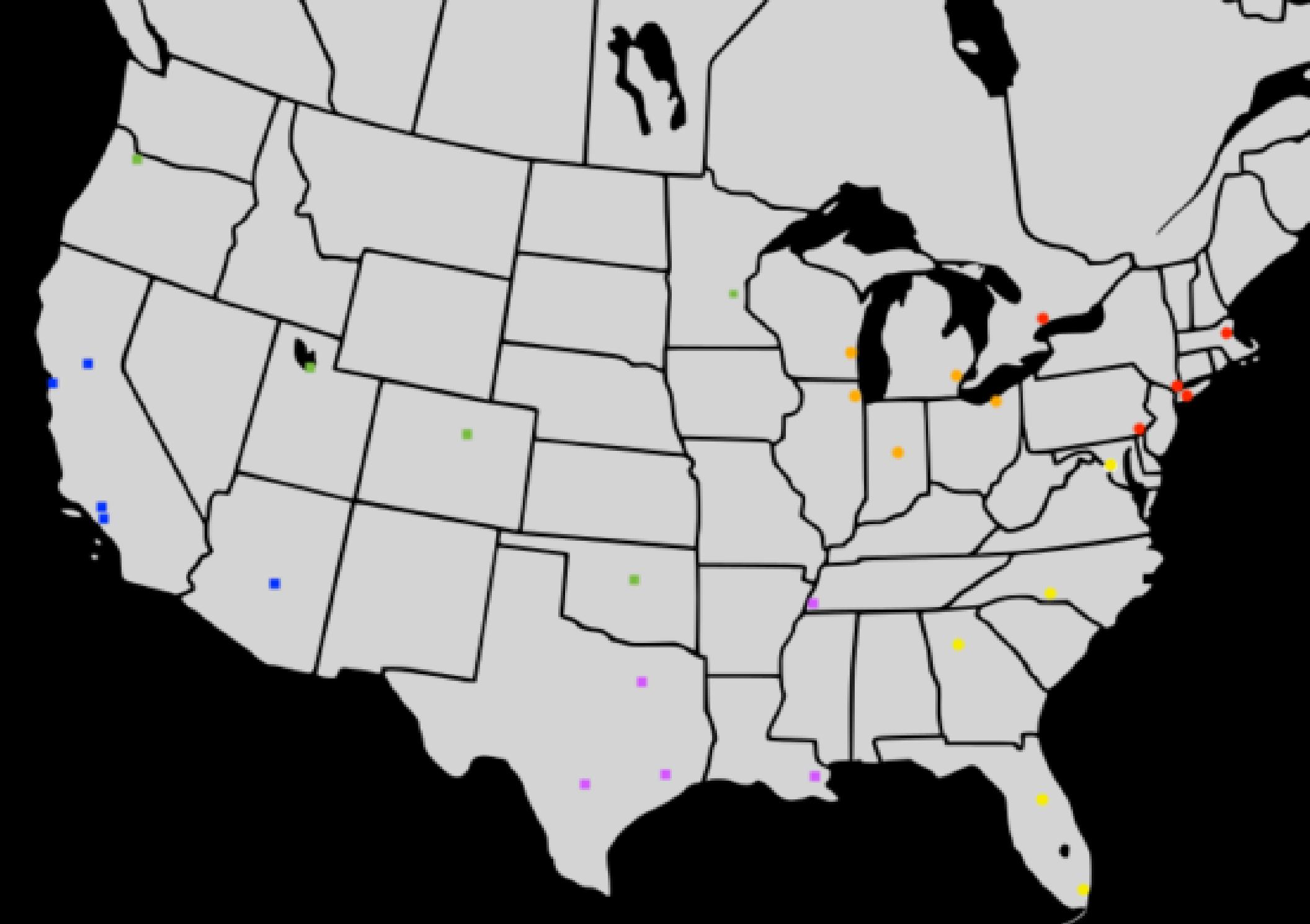


# NBA API

- **nba\_api** is an API Client for [www.nba.com](http://www.nba.com).
- This package intends to make the APIs of NBA.com easily accessible and provide extensive documentation about them.
- 136 Endpoints with Live Data Updates.
- Simple package installation for pip "pip install nba\_api".

# Endpoints Used

- Player.
- Teams.
- PlayerCareerStats.
- PlayByPlayV2.
- PlayerGameLog.
- LeagueGameFinder.



# Data

- Player, PlayerCareerStats and PlayerGameLog provide data related Player Points, Wins, Loses, Games played.
- Teams and LeagueGameFinder provide data related to Team Wins, Loses, Games Played.
- From each of these, we made subset of data for **Los Angeles Lakers** Team for further Network Analysis.
- Where one subset is games played without a superstar, and one played with.

# Our Focus



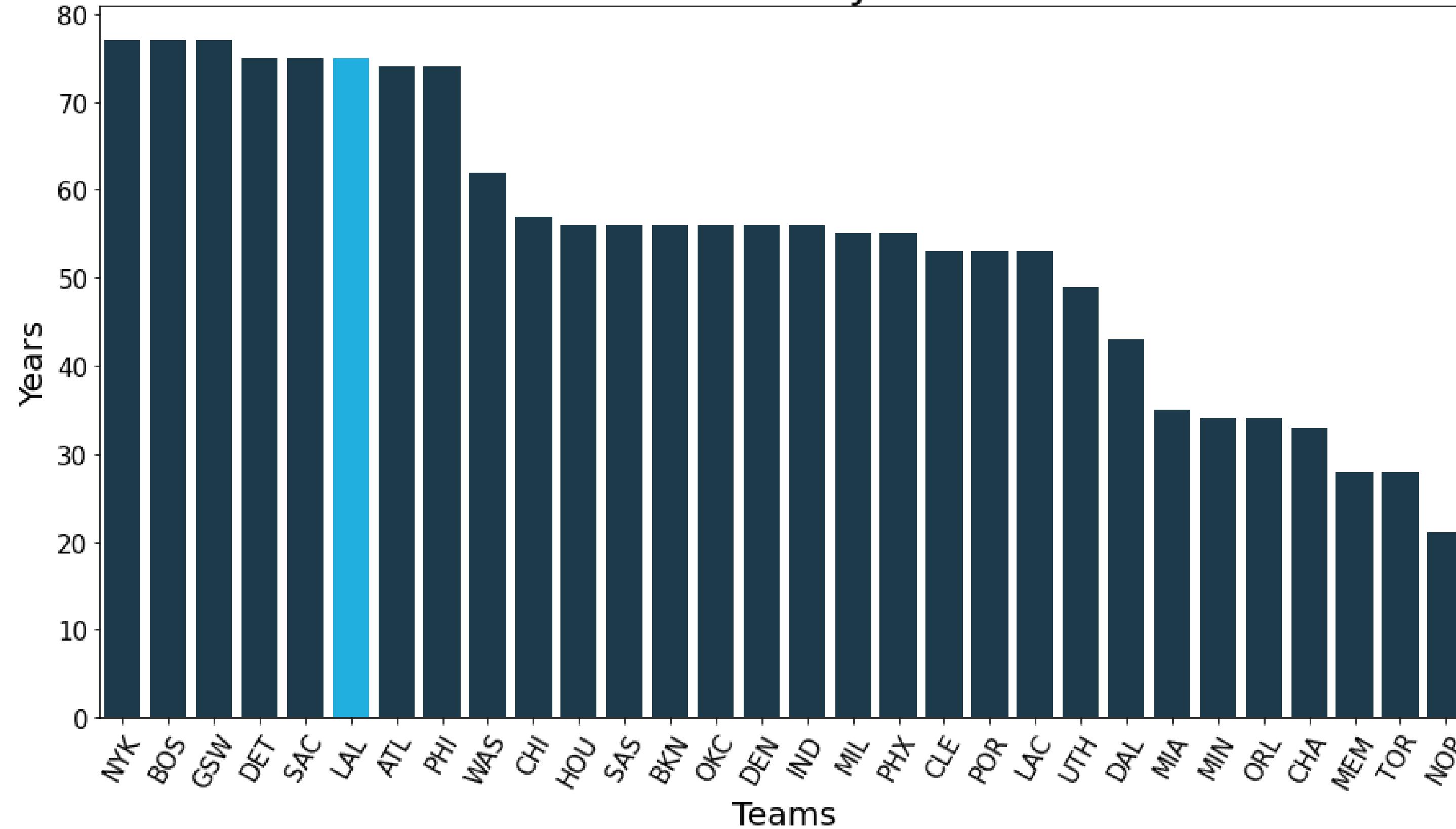
# Los Angeles Lakers

- Professional basketball team.
- Founded in 1947.
- Winningest franchise in NBA history.
- Home of some of the biggest basketball figures:
  - Will Chamberlain.
  - Magic Johnson.
  - Kobe Bryant.
  - LeBron James.
  - Shaquille O'Neal.



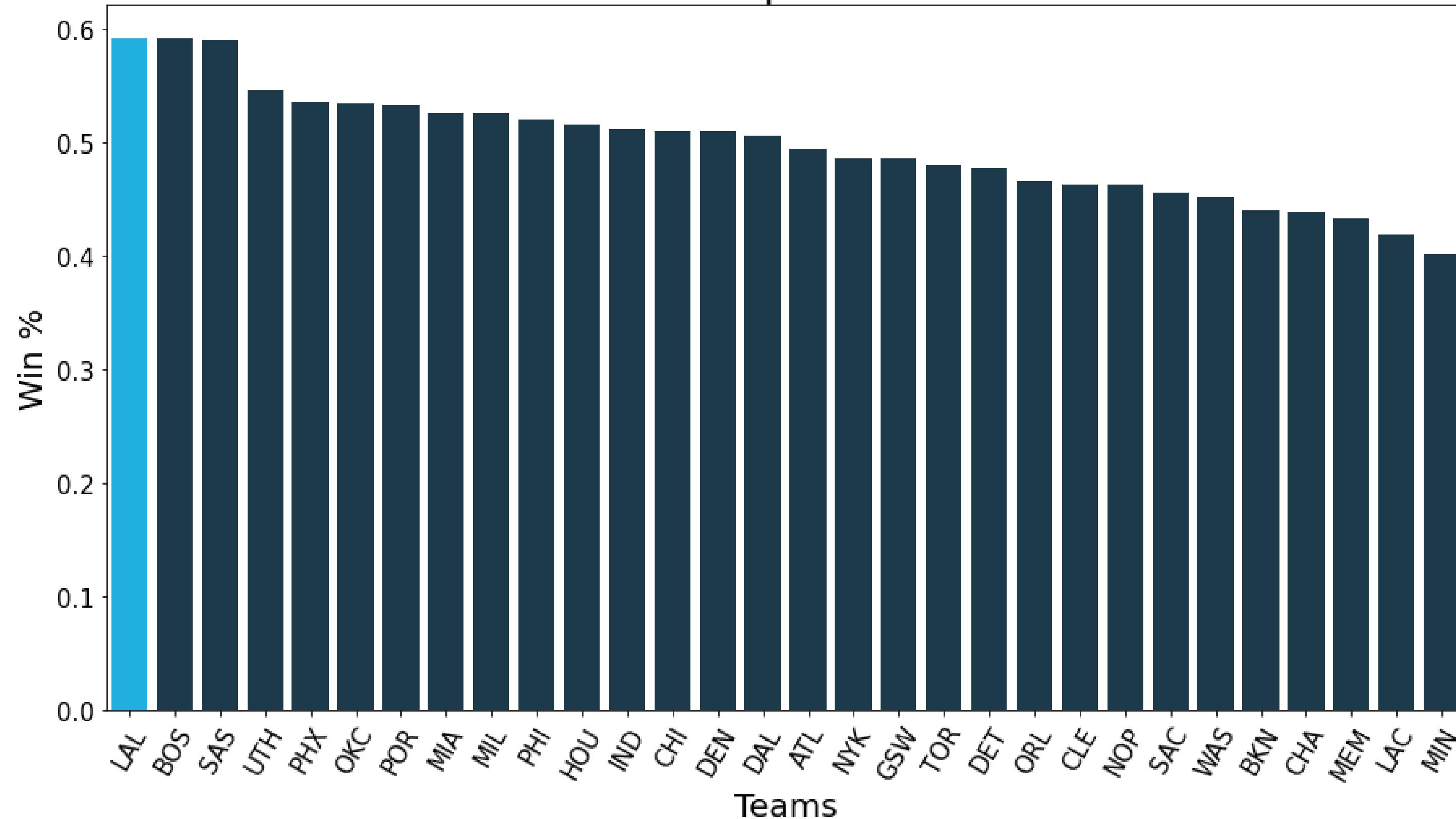
# EDA

Franchise's years



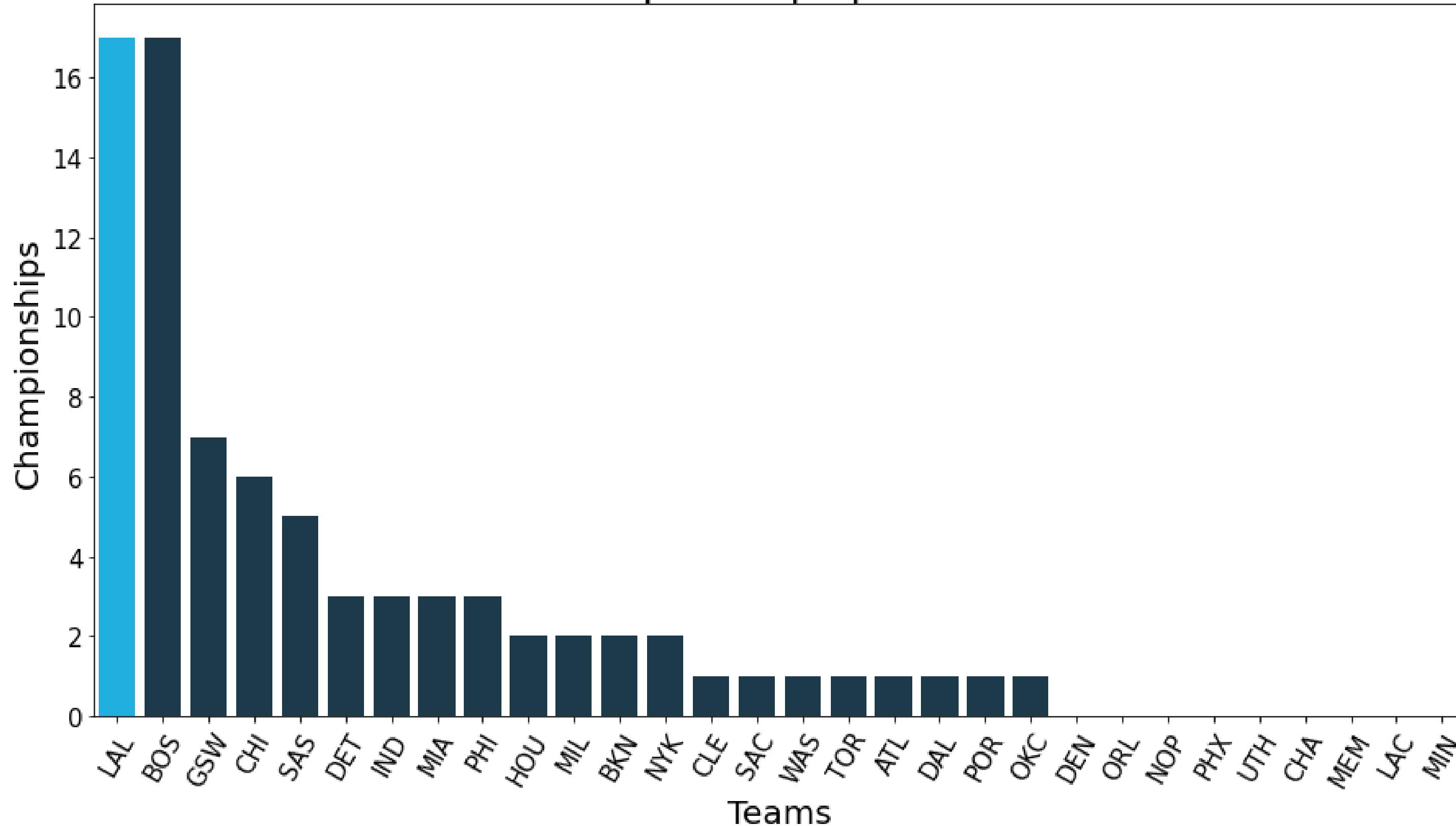
# EDA

Win % per team



# EDA

## Championships per team



# Sports Network Analysis



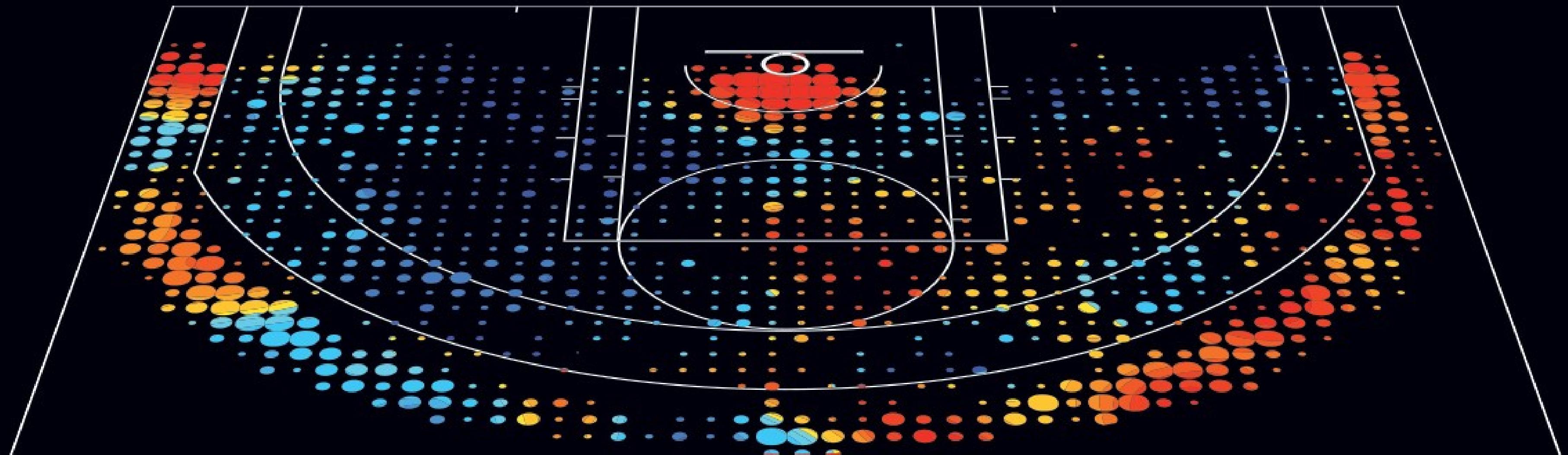
# LeBron James

- NBA Superstar.
- Has been in the league for 19 years.
- Has played for: Cleveland, Miami and L.A.
- 4 x NBA Champion.
- 4 x Most Valuable player.



# Basics to know

- Field goal.
- Assist.
- Scoring opportunity.

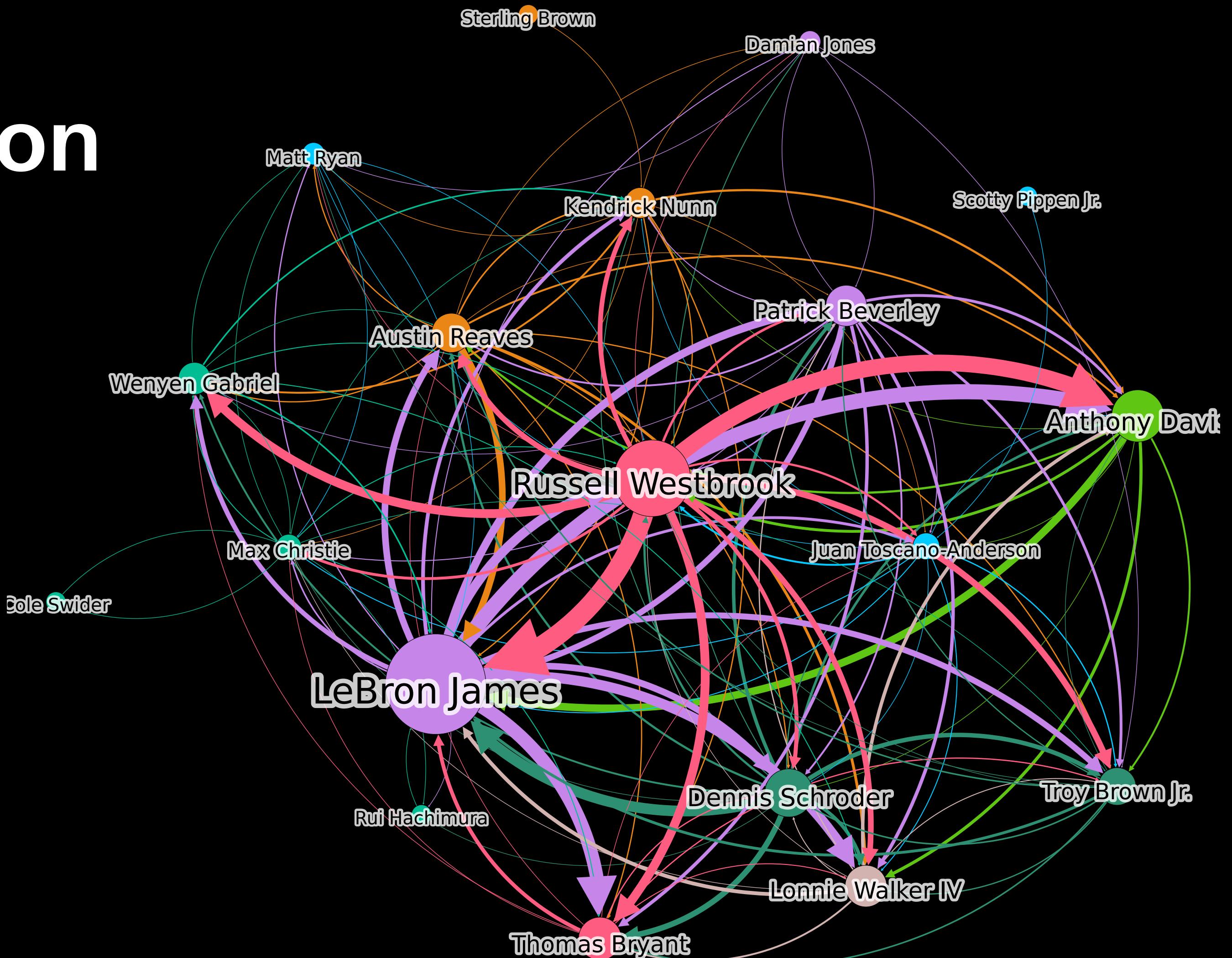


# Synergy Analysis: Lakers With and Without LeBron

- Attributes: assists and field goal.
- Source node for assister and Target node for scorer.
- Weight given by recurring Source, Target event based on Field Goal made.
- Partitioned and Ranked by Weighted Degree.
- Directed Networks:
  - With: 19 nodes and 144 edges.
  - Without: 28 nodes, 154 edges.

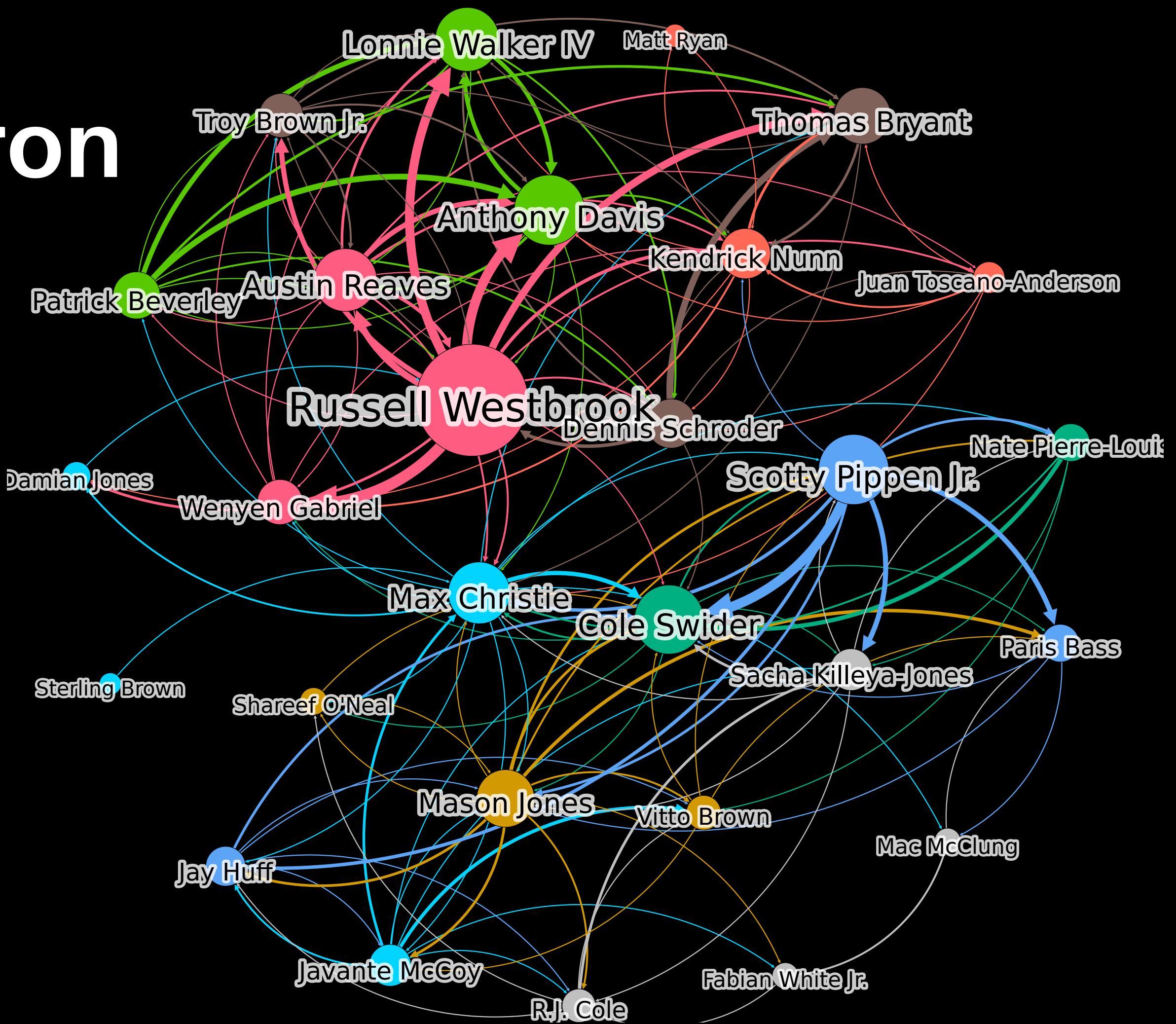
# With LeBron

- Game flows through LeBron and Westbrook.
- Secondary players less involved.
- Bench players almost non-utilized



# Without LeBron

- Increase of Westbrook's role. As well as, Anthony Davis, Austin Reaves and Looney Walker.
- More involvement of bench players.

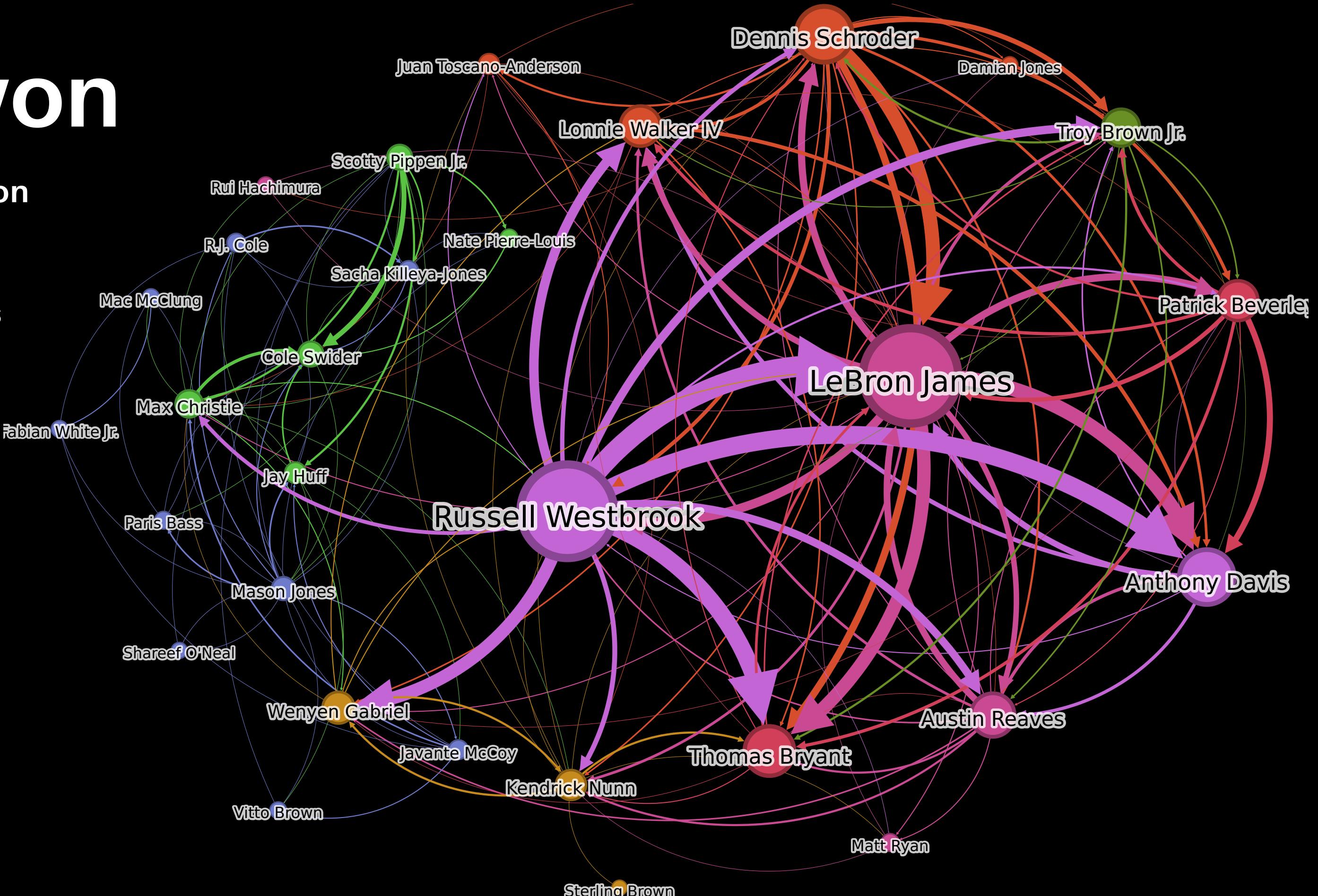


# Synergy Analysis: Lakers Scoring Opportunities

- Attributes: assists and opportunities created
- Source node for passer and Target node for shooter.
- Weight given by recurring Source, Target event based on opportunity created.
- Partitioned and Ranked by Weighted Degree.
- Directed Networks:
  - With: 19 nodes and 144 edges.
  - Without: 28 nodes, 154 edges.

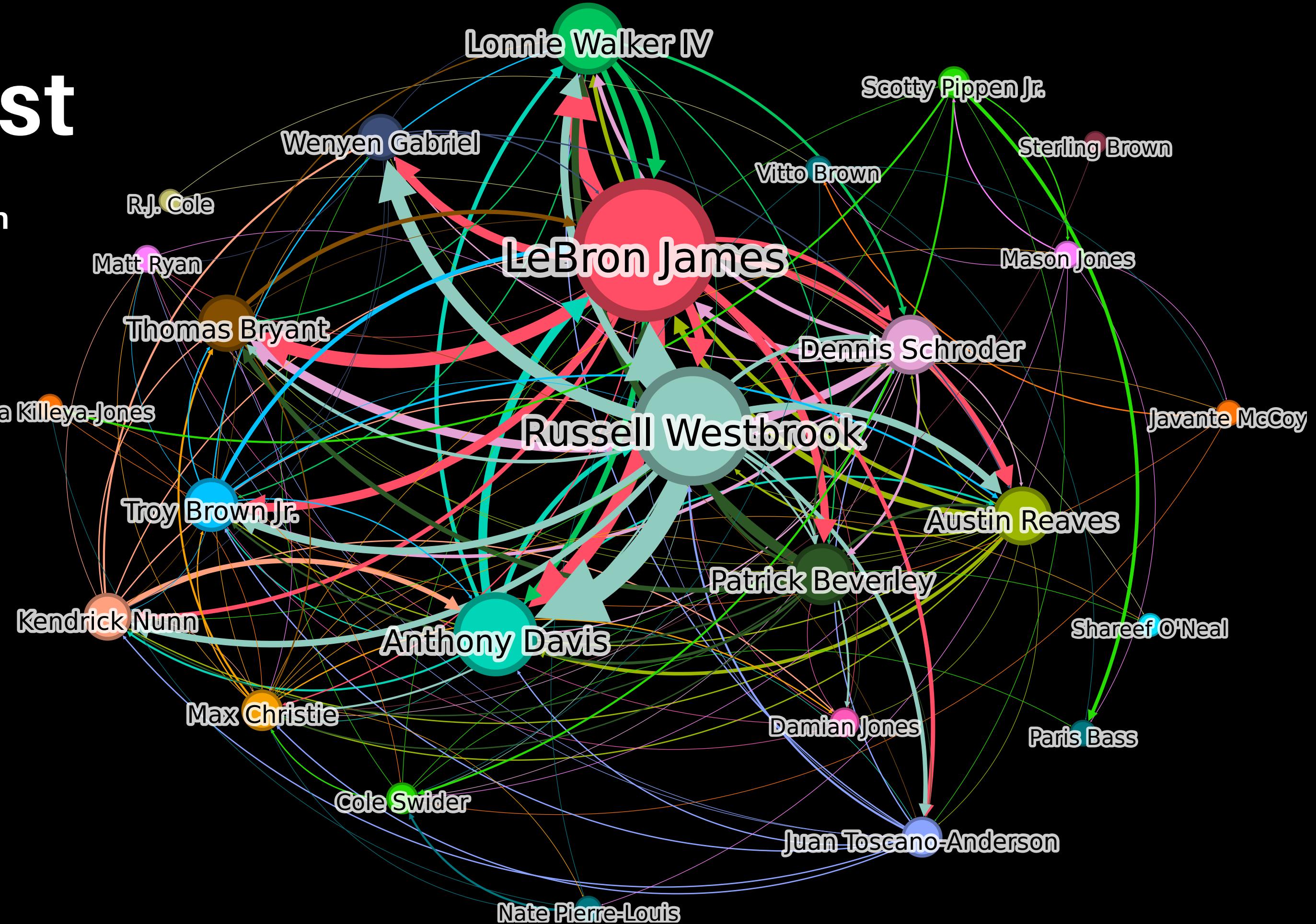
# Games won

- Dependence on LeBron and Westbrook.
- Secondary players less involved.
- Bench players almost non-utilized



# Games lost

- Dependence on LeBron and Westbrook.
- Secondary players have more involvement.
- Bench players have a bigger role.



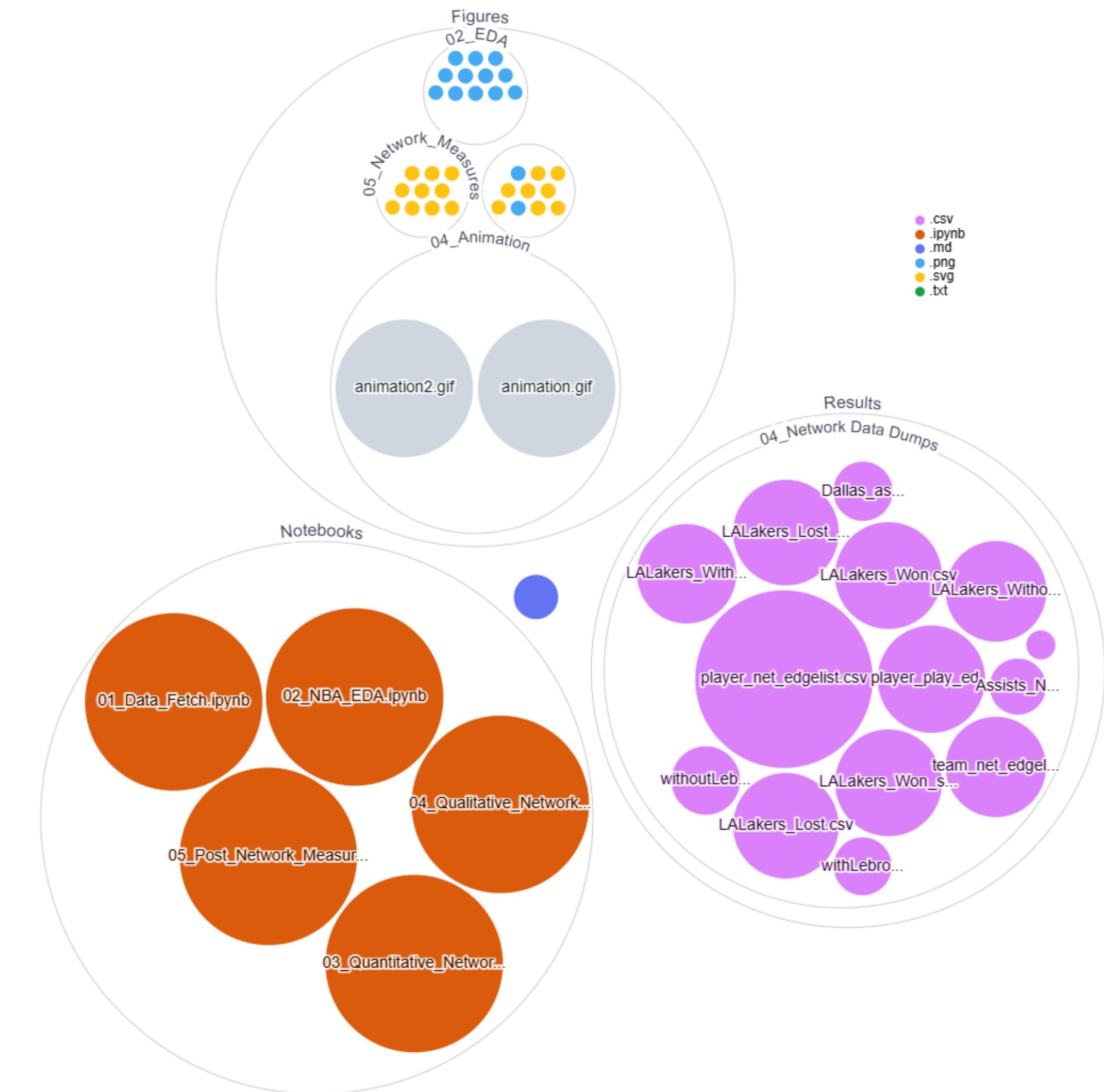
# Limitations

- API Restricted at 500 Calls per day on one IP Address.
- No data for each pass during game.
- API has several issues in meeting standard guidelines such as No Pagination, different naming schemes within endpoints, Timeout protocols, and insufficient or not satisfactory documentation.

# Further Analysis

- Game on game analysis.
- Network analysis by positions.

# Github Repository



# Resources

- [https://github.com/swar/nba\\_api](https://github.com/swar/nba_api)
- <https://www.basketball-reference.com/>
- [https://www.researchgate.net/publication/316709317\\_Social\\_network\\_analysis\\_in\\_sport\\_research\\_an\\_emerging\\_paradigm](https://www.researchgate.net/publication/316709317_Social_network_analysis_in_sport_research_an_emerging_paradigm)
- [https://www.researchgate.net/publication/313728507\\_Team\\_Sports\\_Performance\\_Analysed\\_Through\\_the\\_Lens\\_of\\_Social\\_Network\\_Theory\\_Implementations\\_for\\_Research\\_and\\_Practice](https://www.researchgate.net/publication/313728507_Team_Sports_Performance_Analysed_Through_the_Lens_of_Social_Network_Theory_Implementations_for_Research_and_Practice)
- <https://githubnext.com/projects/repo-visualization/>

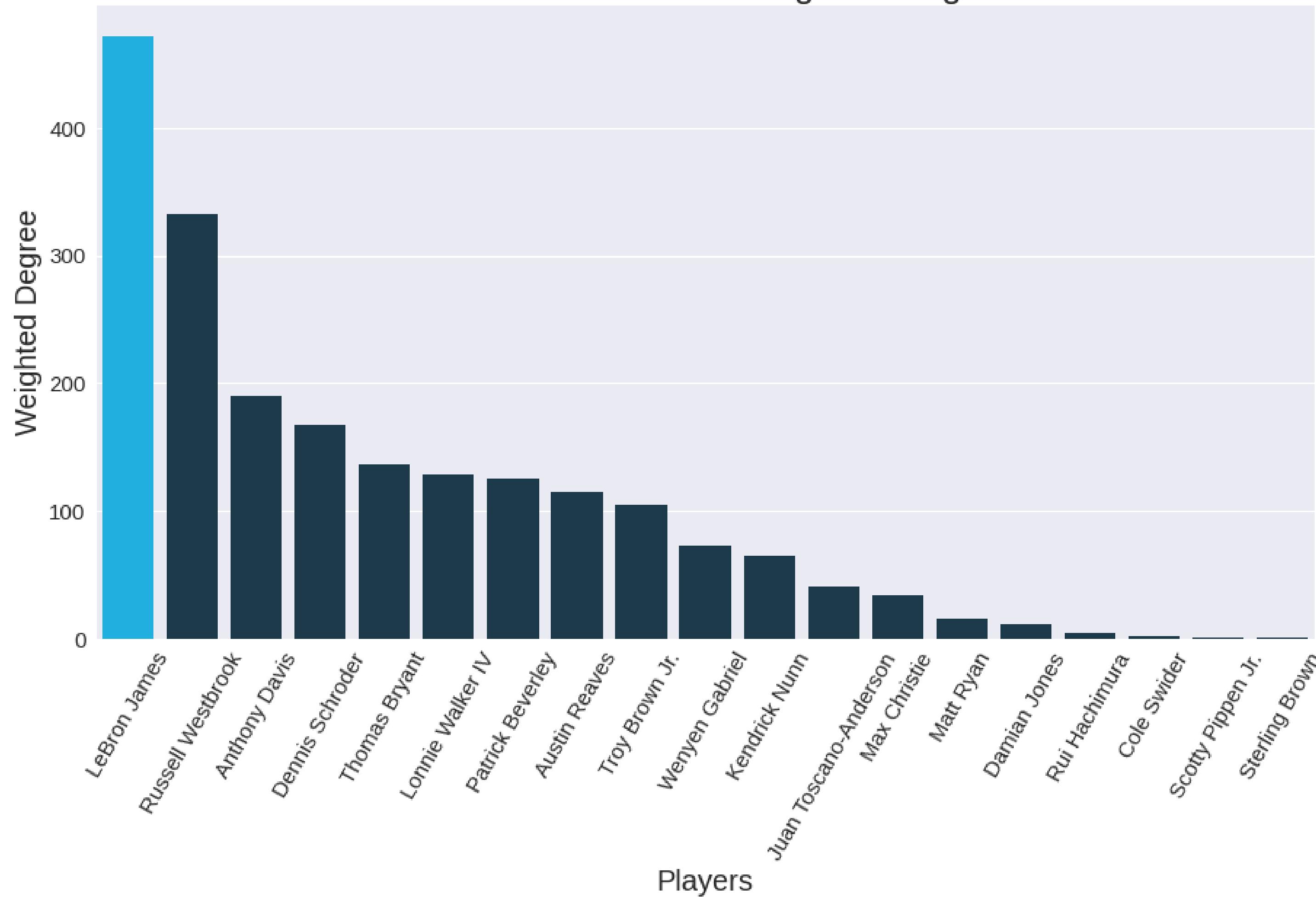
# Thank you!



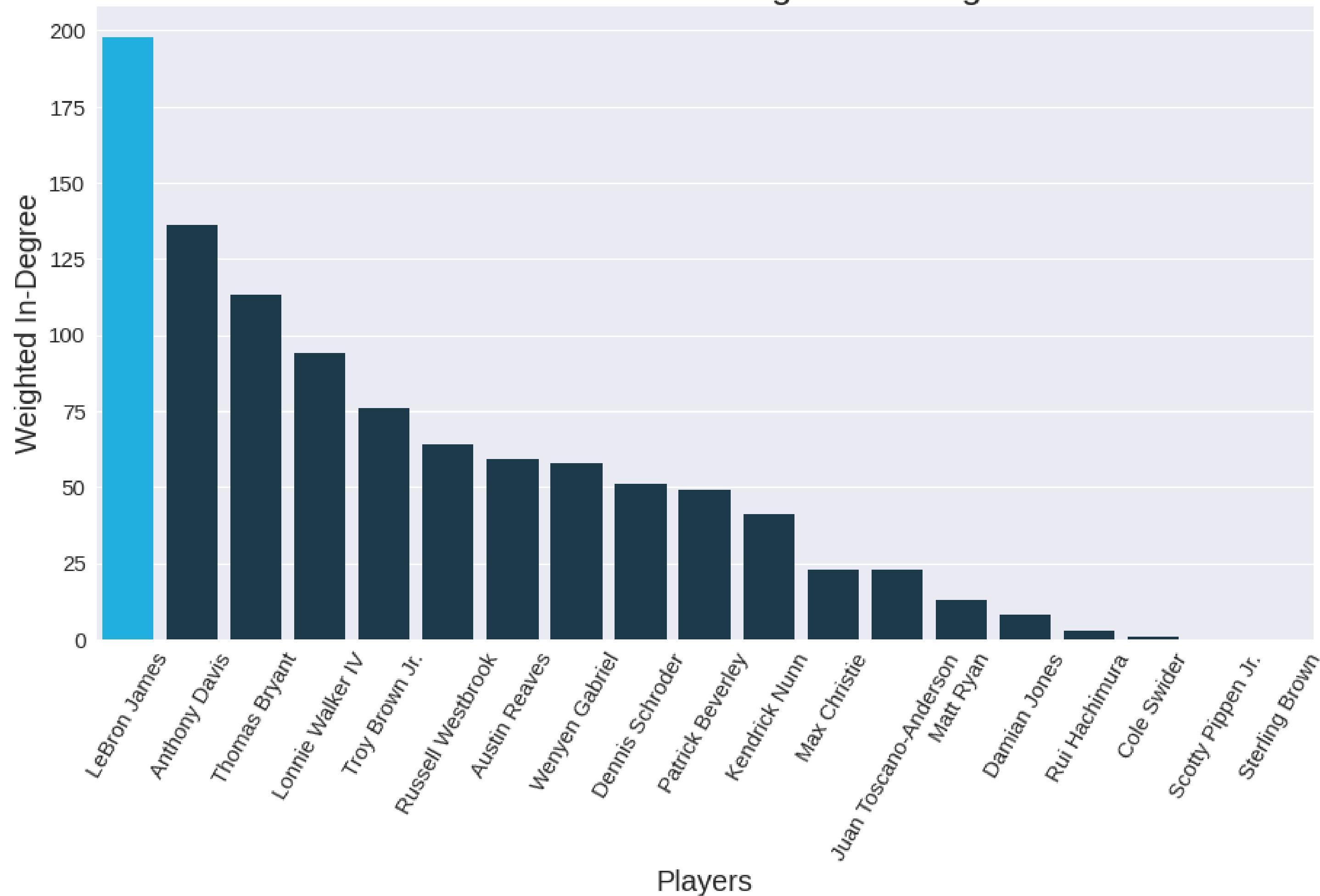
# **Annexes**

# **With Lebron Measures**

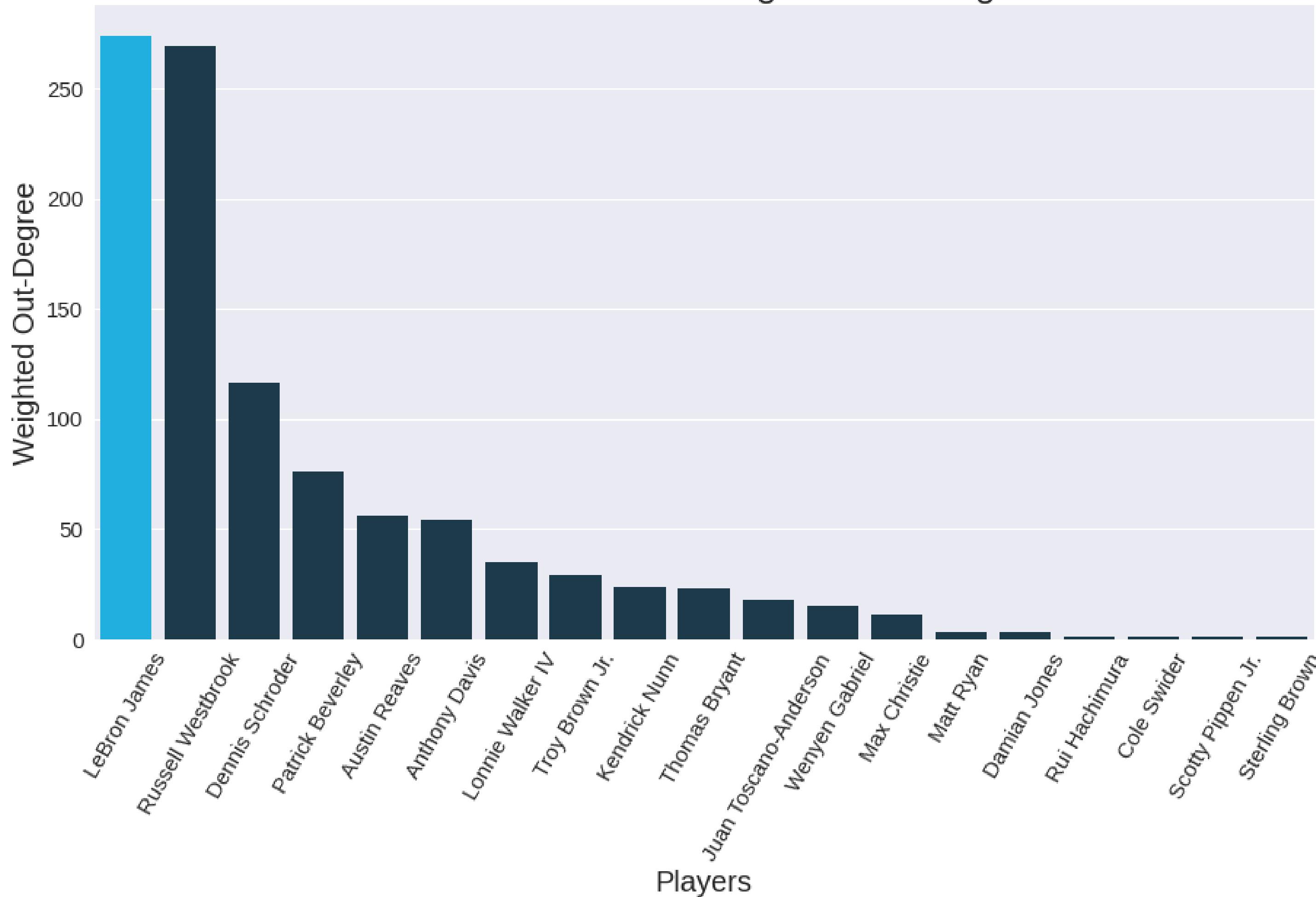
## Network Measures - Weighted Degree



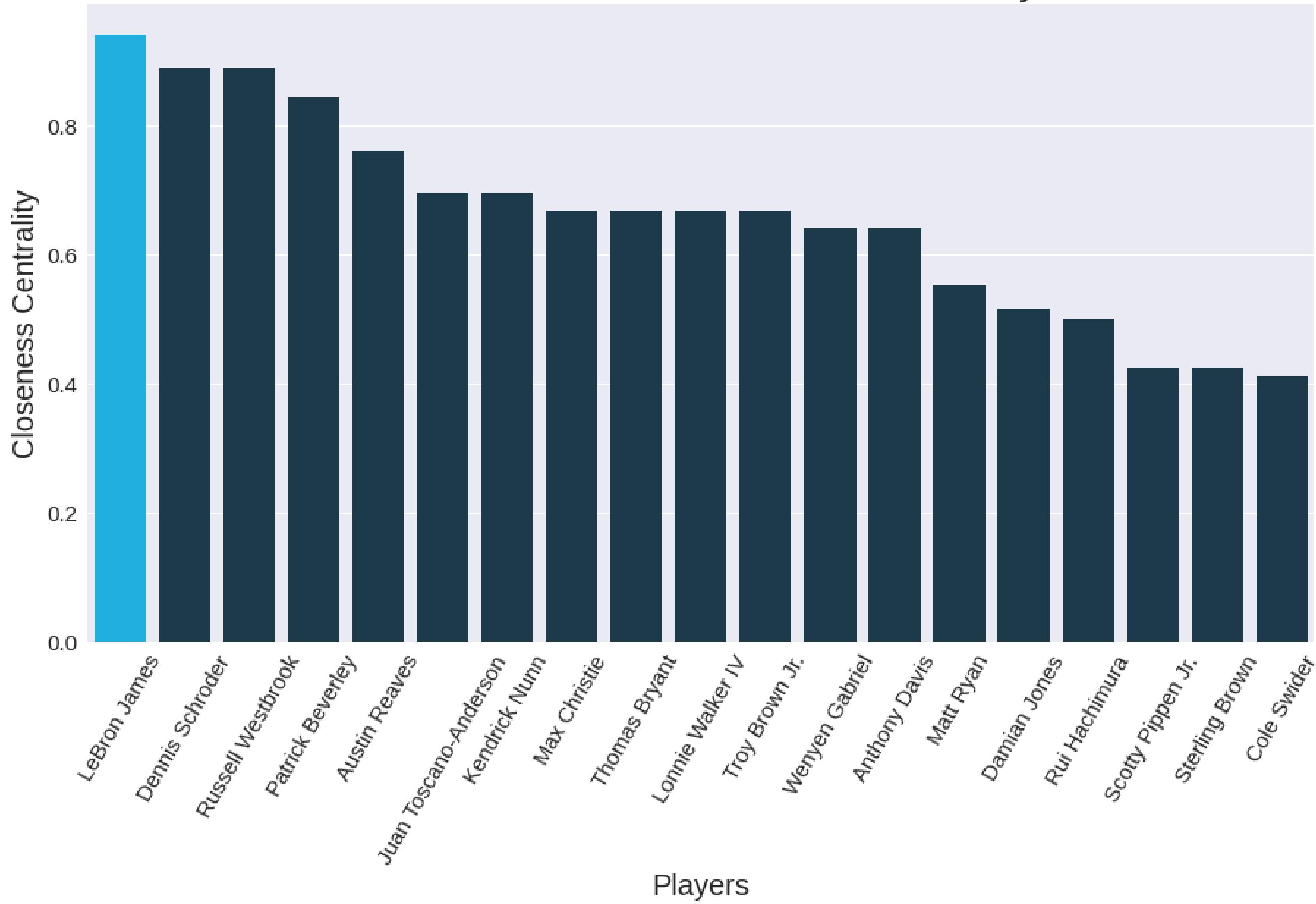
## Network Measures - Weighted In-Degree



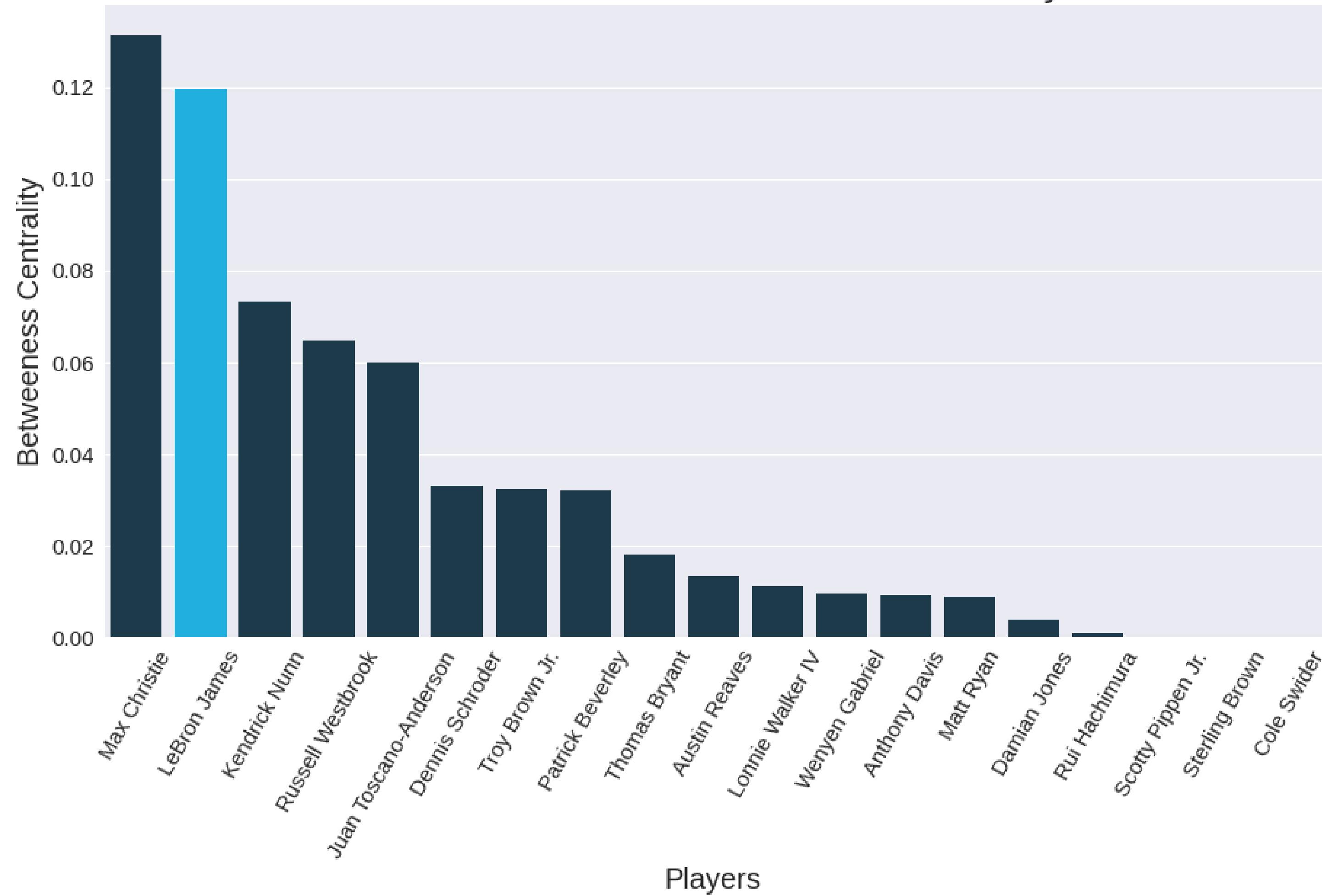
## Network Measures - Weighted Out-Degree



# Network Measures - Closeness Centrality

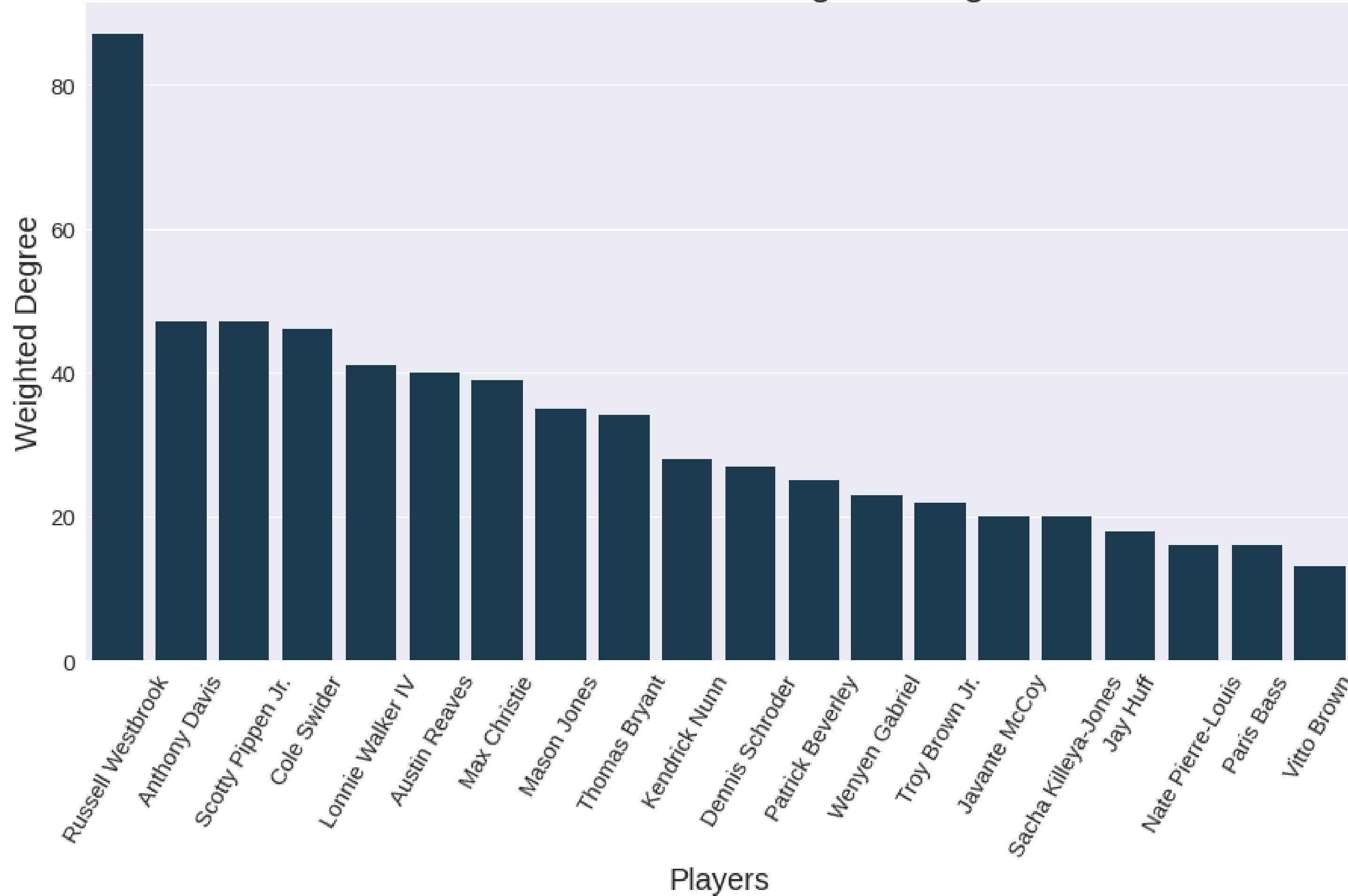


## Network Measures - Betweenness Centrality

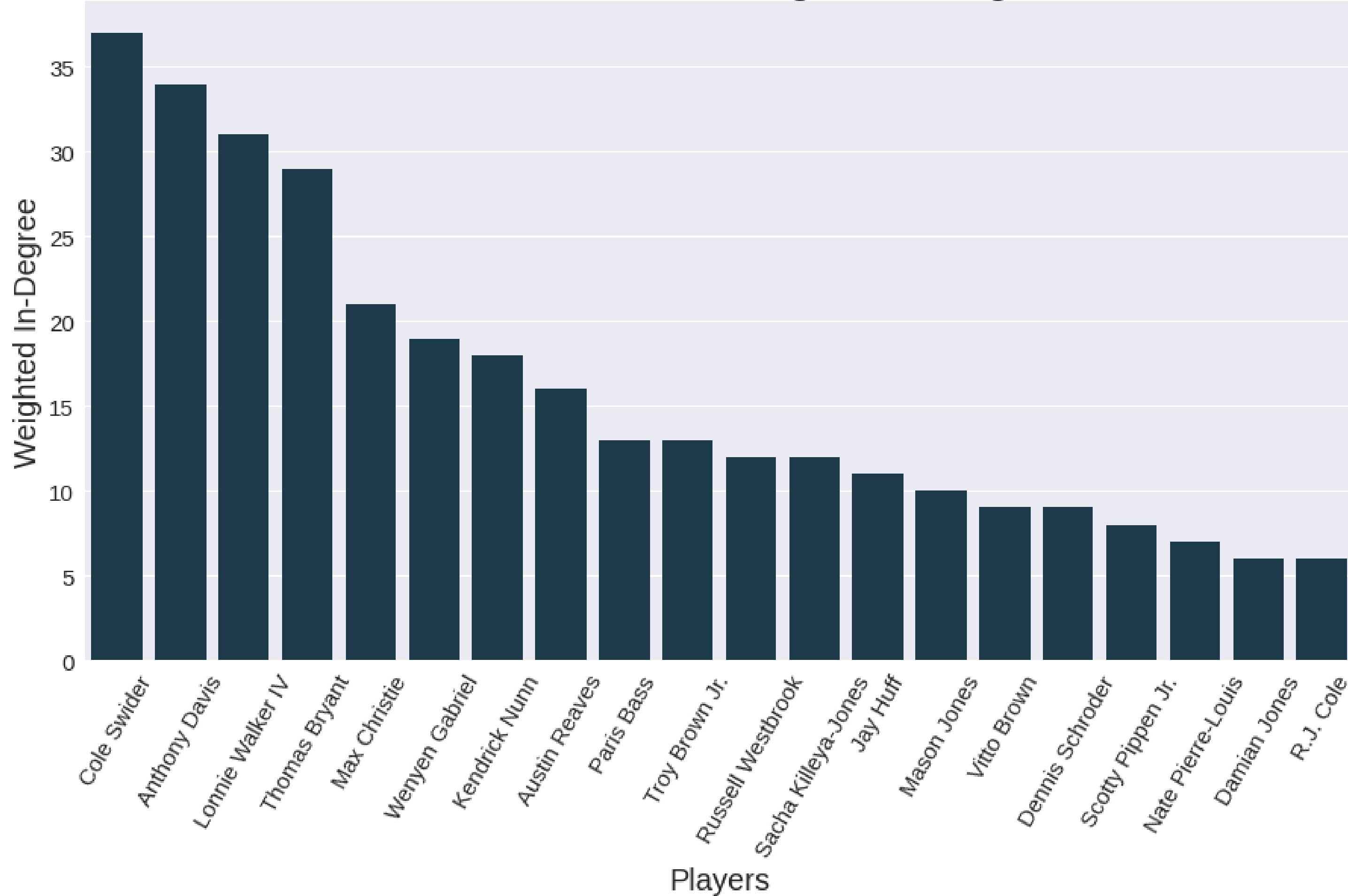


**With Lebron Measures**

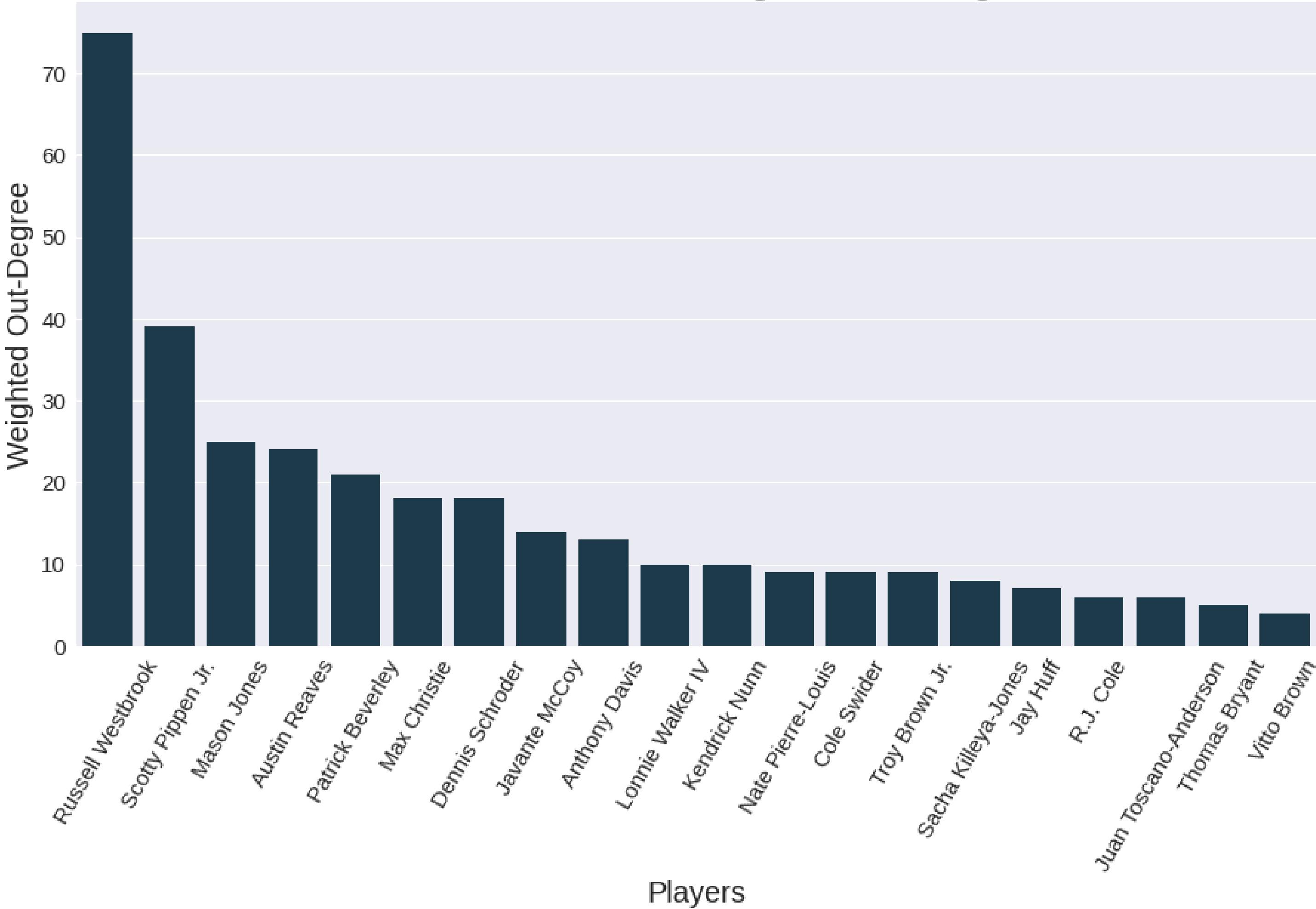
## Network Measures - Weighted Degree



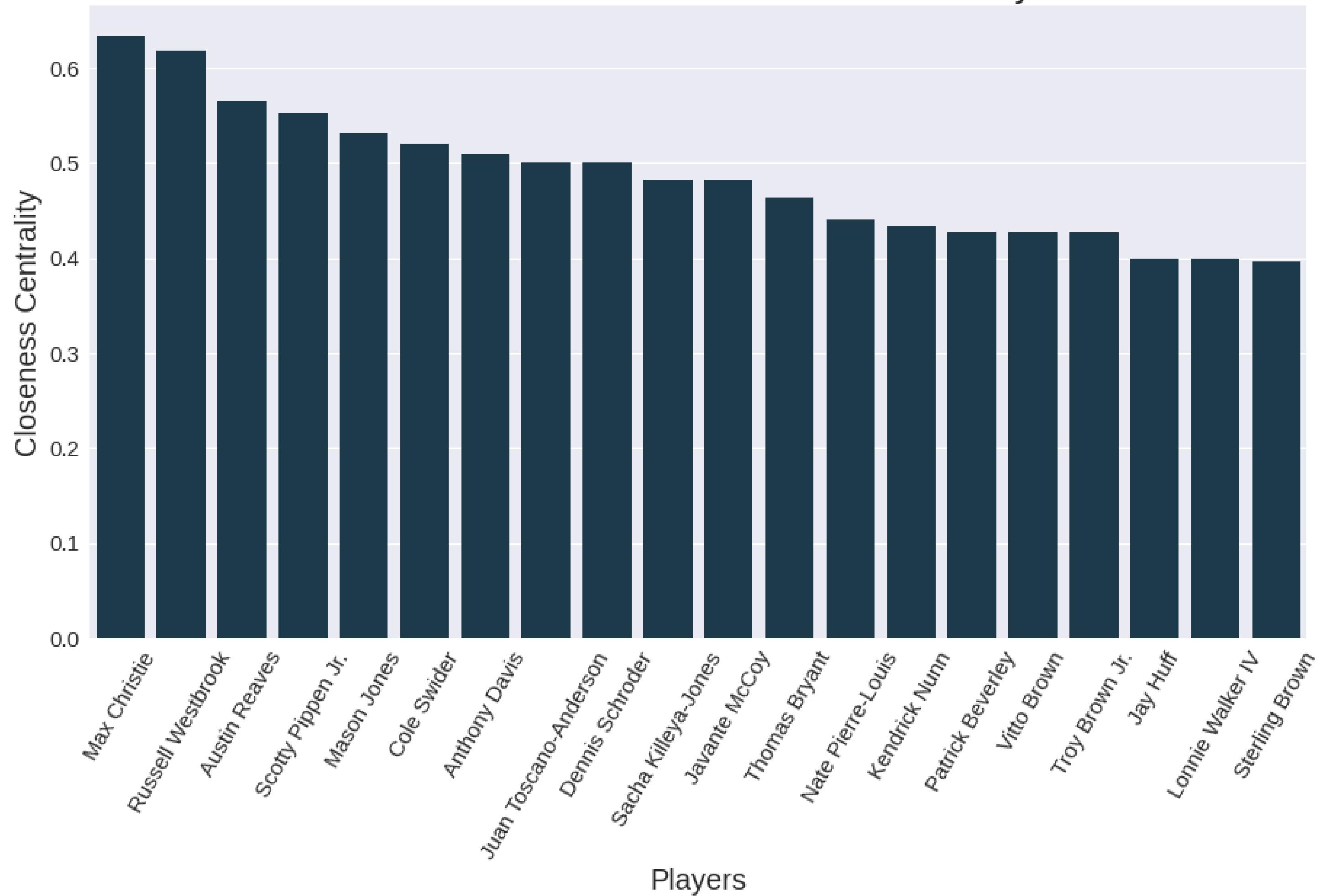
## Network Measures - Weighted In-Degree



## Network Measures - Weighted Out-Degree



# Network Measures - Closeness Centrality



## Network Measures - Betweenness Centrality

