

# BRIDGING THE GAP: UNVEILING THE MULTIFACETED DYNAMICS OF PEOPLE ANALYTICS THROUGH FEATURE IMPORTANCE USING NBA 2K DATASET

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## **ABSTRACT**

*This research examines the relationship between various attributes of NBA players, their social media presence, and how it affects their salaries. Drawing from tournament and human capital theories, our investigation stands out by utilizing a dataset derived from the NBA 2K Sports game. This dataset combines on-court performance with off-court personas. Our analysis goes beyond studies that focused narrowly on specific skill-related variables. Instead, we meticulously evaluate metrics associated with each player to understand the connection between their on-field performance and their digital presence. A key aspect of our exploration is understanding the importance of skill attributes compared to their digital persona in determining salaries.*

*The findings from our study provide insights for sports managers and industry stakeholders in assessing players and shaping their career paths. Additionally, these insights have implications for resource and leadership management in general. Our research supports the idea of a measurable approach to evaluating individual abilities and their overall impact. This sets a foundation for future studies in this field.*

## **KEYWORDS**

*NBA, sports games, human resources, human capital, video games, salary determination, social media, tournament theory, feature engineering, feature importance, people analytics*

## **1. INTRODUCTION**

In today's competitive basketball landscape, it is crucial to have a deep understanding of the complex relationship between NBA players' attributes and how their salaries are distributed. Previous studies, such as the ones conducted by Lucifora & Simmons (2003) and Gerrard (2007), have explored this connection. Often with a limited focus on specific on-court skills while neglecting comprehensive performance indicators. Additionally, although Lazear and Rosen (1981) introduced the tournament theory suggesting that salary differences arise from differences in skills rather than marginal productivity, there is a lack of research applying this theory to modern sports, especially when considering off-court factors like social media dynamics (Berri et al., 2015).

This limited exploration reveals a research gap. Strategies, evolving playing styles, and the increasing impact of digital platforms characterize the current sporting arena. Therefore, it is necessary to have an understanding that encompasses both on-court abilities and off-court digital engagements when assessing a player's market value and overall brand.

The evolution of basketball, with its changing playing styles, rule modifications, and nuanced salary structures, emphasizes the need for updated research that fully captures player's contributions (Fenichel, 2021; Pelton, 2022). To bridge the research gap, our study introduces a groundbreaking approach. We utilize tournament and human capital theories, employing techniques in feature engineering. What sets our work apart is the use of a dataset from the NBA 2K Sports game. This dataset provides an understanding of player attributes encompassing their skills on the court as well as their engagements outside of it.

Guided by the theoretical frameworks, we formulate several research questions;

How do skill differentials, as proposed by tournament theory, impact salary distributions in today's NBA, given the evolving dynamics of basketball?

To what extent do off-court attributes, such as social media engagements captured in the NBA 2K dataset, align with tournament theory propositions in influencing salary outcomes?

When comparing on-court skills with off-court digital metrics, which carries more weight in determining player salaries while maintaining consistency with tournament theory emphasis on relative differences?

To address these inquiries, we combine the NBA 2K dataset with a random forest model. Additionally, we leverage the SHAP (Shapley Additive exPlanations) method to dissect and prioritize the significance of these features in determining salaries (Korzynski & Paniagua 2016). We explore the possibilities within the NBA 2K video game dataset, which contains a wealth of information about player's attributes on and off the court. Using analysis techniques, our study examines the various factors that contribute to an athlete's value in today's sports world. Driven by these factors and our desire to shed light on important research questions, we have developed a comprehensive statistical model based on the NBA 2K dataset. This model incorporates analytical tools like SHAP (Shapley Additive exPlanations) to unravel the complex relationship between player attributes and their impact on salaries.

In summary, our research combines tournament theory with the digital structure of the NBA 2K dataset, leading us down an innovative path. The findings we present have the potential to influence contract negotiations for players and extend beyond sports into areas like human resources and leadership management. It offers a framework for evaluating individual talents and their overall contributions to organizational success.

## **2. BACKGROUND AND LITERATURE REVIEW**

### **2.1. Literature on Salary Prediction in Sports Industries**

Hall et al. (2002) emphasized the importance of considering market value when determining salaries, as it enables organizations to make informed decisions regarding resource allocation. In basketball, Leeds and von Allmen (2008) found that players' salaries are closely linked to their market value, which is influenced by on-court performance and contributions to team success. Consequently, understanding the relationship between salary and market value is crucial for organizations to make informed decisions about player recruitment and retention (Burger & Walters, 2003).

Scully (1974) and Kahn (2000) argued that the increasing salary disparity among athletes could be attributed to differences in market value and individual performance. They suggested that

team efficiency in utilizing salary resources is a more significant predictor of success than simply paying higher salaries to players. Furthermore, higher wages paid to retain athletes do not necessarily generate enough revenue to cover increased salary expenses and provide an adequate return on investment for sports franchise owners.

Previous research on NBA-related video games, such as the work by Paul et al. (2020), has demonstrated that daily fantasy games for the NBA are inefficient in performance compared to market-set prices (player salaries). They argued that daily fantasy companies do not fully account for the inherent variability in player performance when setting game wages.

While earlier analytical models have explored the determinants of NBA players' salaries, they focus solely on players' on-court performance or in-game analysis without considering the bidirectional or combined effects of in-game and real-life factors. Few studies have investigated how specific players' skill sets or attributes contribute to their salary.

## **2.2. Tournament Theory and Human Capital Theory**

Initially proposed by Lazear and Rosen (1981), Tournament theory is an economic model that elucidates wage differentials within organizations. This theory posits that salaries are determined by the relative differences in skill sets among workers rather than their marginal productivity. Tournament theory has been extensively applied in various contexts, including the sports industry, to investigate wage determination, promotion incentives, and worker competition.

In the realm of sports, Rosen (1986) applied tournament theory to explicate salary distribution among professional athletes. He contended that athletes' salaries are dictated by their performance relative to their peers, as opposed to their absolute performance. Empirical research on diverse sports, such as basketball (Depken, 2000), baseball, and soccer (Szymanski, 2003), has corroborated this notion.

Krautmann and Solow (2009) employed tournament theory to examine the relationship between salary and player performance in Major League Baseball. Their findings indicated that salary differentials between players are more pronounced than what marginal productivity alone would predict. Furthermore, Franck and Nüesch (2012) explored salary determination in European soccer leagues, using tournament theory to comprehend wage structures. Their study revealed that salary differentials were strongly associated with players' relative performance, as gauged by their contributions to team success. This outcome aligned with the predictions of tournament theory, suggesting that wage disparities among soccer players could be attributed to their relative skill levels.

Skills and knowledge are closely linked to salary levels in the sports industry and broader organizational settings, with specialized human capital playing a critical role in determining organizational success (Crook et al., 2011). In the NBA context, each team has distinct requirements and the capability to leverage specific talents. Free agents offer unique skill sets that can be transformed into efficient labor units for each team.

Human capital constitutes a valuable asset for organizations, as investing in individuals' skills or experience can directly or indirectly affect the organization's performance (Becker, 1964). According to human capital theory, investments in individuals primarily result in performance improvements at the individual level, subsequently leading to increased productivity and profitability at the organizational level (Schultz, 1961; Mincer, 1974; Nafukho, 2004). Players (laborers) may face waivers (redundancy) or reduced wages if their skills and abilities do not meet the team's requirements (Sweetland, 1996).

This research aims to bridge the gap between existing literature on NBA players' salaries and the contributions of specific players' skill sets or attributes to their salary determination. Most existing literature has either focused solely on players' on-court performance, used in-game analysis, or examined the impact of market value on salary determination. Unlike previous studies, this research will explore the bidirectional and combined effects of in-game and real-life factors in determining NBA players' salaries.

By taking a comprehensive approach, this study will investigate the unique skill sets or attributes of NBA players and how they contribute to their salaries, expanding beyond the limited scope of prior research. It will also consider the influence of off-court factors like social media impact that might play a role in player compensation. Furthermore, it will integrate human capital and tournament theories to offer a more holistic understanding of salary determination in the NBA context.

### **2.3. Social Media Effect on Sports**

In recent years, social media has emerged as a driving force in the sports industry, influencing various aspects, including salary determination. This literature review explores key findings from journal articles that have examined the impact of social media on sports and salary determination, focusing on its role in shaping athletes' market value and salary levels.

Hambrick et al. (2010) conducted a content analysis of athletes' tweets and found that engaging with fans and showcasing their personalities could potentially increase their market value. However, this study does not directly explore the relationship between social media engagement and salary determination. Lebel and Danylchuk (2014) qualitatively examined the use of social media in building personal brands in professional sports. They found that athletes who strategically utilize social media to build their brands can attract higher-paying sponsorship deals, indirectly increasing their overall earnings. However, the study did not directly address the impact of social media on salary determination.

Ruihley and Billings (2013) studied the relationship between athletes' social media use and marketability. They found a positive correlation between social media presence and athletes' market value, suggesting that effective use of social media can enhance an athlete's marketability and potentially lead to higher salaries. While this study highlights the importance of social media in shaping athletes' market value, it does not specifically investigate its effect on salary determination.

Korzynski and Paniagua (2016) analyzed the relationship between social media usage by sports stars and their marketability and performance. The study revealed a positive correlation between effective social media usage by sports stars and improved marketability, subsequently leading to enhanced performance in their respective sports. However, the study does not directly examine the relationship between social media engagement and salary determination and is limited to a single social media platform (Twitter).

The existing literature has explored the effects of social media on athletes' personal branding, market value, and sponsorship deals. However, most studies do not directly address the impact of social media on salary determination, and they often focus on a single platform, such as Twitter. Moreover, most previous research relies on content analysis as the primary method, which may not provide a comprehensive understanding of the relationship between social media engagement and salary determination.

The current study addresses these limitations and research gaps by examining the direct relationship between social media attributes, such as Instagram followers, and salary determination in the sports industry. This study aims to provide a more comprehensive understanding of how social media engagement by athletes can impact their salary levels. Furthermore, the current research extends the scope of analysis by incorporating two major social media platforms, allowing for a more robust examination of the relationship between social media engagement and salary determination.

### **3. DATA AND METHODOLOGY**

#### **3.1. Dataset**

In contemporary sports analytics, NBA 2K, a basketball simulation video game curated by 2K Sports, emerges as a pioneering resource. This game meticulously chronicles the attributes of both current and legacy players, translating on-court performance nuances into parameters like shot IQ, offensive consistency, and defensive consistency. Intriguingly, Gomez (2021) pinpointed that participants boasting elevated emotional intelligence (EI) and EI management metrics commanded higher salaries. Given the inherent complexity of quantifying attributes linked to emotional intelligence – such as potential and defensive IQ – the data from NBA 2K offers an unparalleled avenue for granular analysis.

The NBA 2K data repository is celebrated for its robustness and fidelity, drawing accolades from the scholarly community and avid sports fans. The game's architects relentlessly pursue enhancing data precision and refining game dynamics to mirror real-world basketball intricacies. Such unwavering dedication to authenticity has catalyzed the integration of NBA 2K data into research endeavors, underscoring its distinctiveness and credibility. Contributing to this authenticity is the synergetic collaboration between NBA 2K developers and the NBA establishment. This nexus empowers developers with unfettered access to proprietary league metrics, facilitating a game design congruent with actual team and player trajectories (Wingfield, 2014). Supplementing this is the game's propensity to routinely recalibrate player ratings, capturing the ever-evolving tapestry of the NBA cosmos (Katz, 2020).

One of the salient advantages that NBA 2K data brings to the analytical table is its holistic nature, amalgamating controlled environmental variables, real-time simulation fidelity, and a plethora of customization options (Complex Sports, 2017). The custodians at Visual Concepts, the intellect behind NBA 2K, employ a judicious mix of quantitative and qualitative metrics to sculpt player ratings, encapsulating elements like player dynamism, strategic inclinations, and inherent propensities. Complementing this data-driven approach, developers maintain an active dialogue with the gamer diaspora, NBA alums, incumbent players, and league cognoscenti, ensuring that the game remains anchored to the ground truths of basketball (Complex Sports, 2017).

It's noteworthy that NBA 2K's contribution to realism isn't merely an academic curiosity. Multiple reports, including a discourse by Forbes, accentuate that NBA franchises actively harness this game's dataset to inform pivotal decisions and calibrate evaluations for prospective draft acquisitions (Fay, 2019). This seamless entwining of a video game's virtual realm with professional sports strategy elucidates the unassailable reliability and singularity of NBA 2K's dataset.

This research leverages a comprehensive dataset of NBA player attributes and compensation to elucidate the factors influencing player salaries. We compile granular attribute ratings for all NBA players from 2019-2022 editions of the popular NBA 2K video game series, including 27

skill variables rated on a 0-99 scale that assess abilities such as shooting accuracy, athleticism, and basketball IQ. The full table of attributes is omitted for brevity, given the extensive number of individual variables. These detailed player assessments from NBA 2K are augmented with official NBA salary data from those seasons and social media followership metrics for each player. The large sample size and inclusion of on-court talent variables and off-court factors related to marketability and fan reach provide a uniquely holistic perspective into the key attributes rewarded in player salaries.

Incorporating these diverse data sources, we conduct a rigorous feature analysis to quantify the relationships between player attributes, social media metrics, and salary. Our methodology employs multivariate regression modeling to unravel the multifaceted interplay of factors that underlie player compensation. This approach represents a pioneering advancement within sports analytics, extending its purview beyond conventional metrics such as points and rebounds. Detailed summary statistics and definitions for the social media-related variables can be found in Tables 2 and 3.

Table 1.

	Player	Shot Close	Shot Mid	Shot 3pt	Shot IQ	Free Throw	Offensive Consist	Driving Layup	Standing Dunk	Driving Dunk	Draw Foul	Post Moves	Post Hook	Post Fade	Hands
0	Steven Adams	83.3 166 7	62.0 416 7	35.6	79. 075	56.9 666 7	67.9416 7	72. 058 33	82.86 667	73.76 667	65.79 167	73.5 583 3	73.5 5	59.80 833	86.3 6667
1	Bam Adebayo	89.5 595 2	79.1 726 2	69.8 333 3	80. 785 71	77.5 952 4	84.7321 4	83. 404 76	87.53 571	81.04 167	81.23 81	78.3 869	82.1 309 5	79.48 214	92.7 5595
2	LaMarcus Aldridge	91.2 381	90.3 730 2	83.1 309 5	77. 333 33	85.6 944 4	89.3968 3	76. 638 89	76.02 778	72.63 492	78.73 81	91.1 230 2	91.4 960 3	91.79 762	90.8 6905
3	Nickeil Alexander-Walker	68.4 5	68.1 583 3	72.8 083 3	88. 225	68.2 916 7	68.1916 7	71. 708 33	36.00 833	56.50 833	53.30 833	59.7 583 3	49.8 083 3	53.80 833	91.7 0833
4	Grayson Allen	77.1 375	75.9 791 7	81.2 583 3	87. 341 67	84.0 791 7	77.8208 3	76. 325	28.33 333	73.80 833	65.19 583	42.7 625	36.4 416 7	45.40 833	84.3 0417
5	Jarrett Allen	83.3 125	68.1 666 7	59.0 416 7	82. 416 67	72.3 333 3	84.8958 3	76. 020 83	85.22 917	78.08 333	78.22 917	76.8 125	73.9 791 7	63.37 5	91.3 125
6	Al-Farouq Aminu	61.8 5	50.7 5	68.9 5	95. 2	69.2	65.35	70. 25	53.45	68.05	53.55	53.6 5	47.3 5	62.25	79.1 5
7	Kyle Anderson	85.6 041 7	76.9 583 3	72.8 541 7	86. 166 67	70.1 458 3	71.2083 3	78. 604 17	54.06 25	48.25	66.08 333	39.7 5	44.0 833 3	47.08 333	82.1 25
8	Ryan Anderson	83	90.5	92.5	63. 5	88	94	69. 5	77.5	57.5	66	82.5	80.5	89	84
9	Giannis Antetokounmpo	90.1 704	80.5 563 7	71.8 644 2	82. 382 71	79.3 415 3	91.8440 3	93. 701 1	84.76 219	92.05 497	93.17 279	82.8 867 4	82.0 168 2	79.14 266	95.6 1565
10	Kostas Antetokounmpo	74.0 833 3	58.6 25	43.8 333 3	65. 541 67	58.4 583 3	59.1666 7	71. 5	83.45 833	81.04 167	66.04 167	50.1 666 7	55.1 666 7	42.54 167	76.4 5833
11	Thanasis Antetokounmpo	75.6 5	65.8 916 7	68.9 125 83	73. 645 83	63.7	65.0416 7	77. 166 67	47.94 583	86.97 5	72.57 083	49.0 125	46.4 875	47.12 5	73.5 2083
12	Carmelo Anthony	88.9 723 9	89.5 441 1	89.2 532	84. 655 89	87.6 168 4	91.6969 7	85. 177 78	66.66 397	82.30 303	78.07 407	86.3 165	75.1 589 2	89.07 811	89.8 5926
13	OG Anunoby	75.4 833 3	77.5 583 3	83.5 833 3	74. 425	78.2 5	78.2083 3	80. 05	60.28 333	84.40 833	65.37 5	49.7 25	48.1 583 3	47.33 333	91.3 5
14	Ryan Arcidiacono	48.3 333 3	80.2 5	77.1 666 7	88. 916 67	70.3 333 3	51.1666 7	73. 916 67	25	29.08 333	43.58 333	36.6 666 7	26.6 666 7	36.66 667	77

Table 2.

	Count	Mean	Std	Min	Max
Twitter Followers_count	652	422,269.14	2,540,627.05	0	52,673,676.00
Twitter Following count	654	531.81	2403.35	0	60,080.00
Twitter count	654	5161.26	11405.23	0	246,000.00
Twitterduration	654	6.81	2.91	0	15
Instagram Followers	653	898,629.55	4,131,774.69	0	67,300,000.00
IGPostCount	654	222.31	474.02	0	5477
IGduration	654	5.22	2.13	0	10.8
IG_following	654	649.93	783.03	0	7352
Salary (10K)	654	741.02	931.96	6.992.31	4855.35

Table 3.

Name	Definition	Measurement	Source
Twitter Followers count	Number of player's followers on Twitter	Count	Twitter
twitter_duration	Duration of the player's Twitter using year	Count	Twitter
twitter_following	Number of following on the Twitter	Count	Twitter
twitter_count	Number of posts on Twitter	Count	Twitter
Salary	Player's salary in one season	Count	<a href="https://hoopshype.com/salaries/players/">https://hoopshype.com/salaries/players/</a>
IG Duration	Duration of the player's IG using the year	Count	Instagram
IG Postcount	Number of posts on Instagram	Count	Instagram
IG following	Number of following on the Instagram	Count	Instagram
Instagram followers	Number of player's followers on Instagram	Count	Instagram
Race	Race of each player	Binary variable	African American is 0 or is 1
Nation	Nationality of each player	Binary variable	US nation is 0 or is 1
Sensitive	Players post sensitive information on social media or not	Binary variable	No post is 0 or 1

### 3.2. Feature Engineering and Feature Importance

Our investigation adopted the Random Forest Regressor, a sophisticated ensemble machine learning algorithm, to elucidate the nuanced interplay between NBA player attributes and their commensurate salaries. Our chosen configuration consisted of 200 decision trees, renowned for delivering enhanced predictive accuracy. The model was meticulously trained on a curated dataset, enabling it to extract and understand the underlying relationships between player attributes and the associated salary scales.

Performance assessment is pivotal to the success of any model. Our study employed the Mean Squared Error (MSE) metric, which robustly evaluates the predictive disparities. The advantage of MSE is that smaller values suggest better predictive alignment with the actual data. We also computed the Root Mean Squared Error (RMSE) to provide a more interpretable measure of the discrepancies.



A Support Vector Regressor (SVR) was also implemented as a comparative benchmark for comprehensive analysis. However, preliminary evaluations showed that the Random Forest Regressor outperformed the SVR regarding both MSE and RMSE. Consequently, the former was selected for its superior capability in predicting NBA salaries within our dataset.

In our investigation of the factors influencing NBA player salaries, we harnessed the capabilities of SHAP (Shapley Additive exPlanations) values for a nuanced feature importance analysis. SHAP values, distinct in their approach, enable the decomposition of each predictor's influence on the model's final prediction, providing transparent insight into their contributions to the predicted salary (Lundberg & Lee, 2017). Anchored in the principles of game theory, SHAP values ensure a systematic computation of each feature's contribution to the prediction. This methodology aids in capturing each attribute's marginal contribution across a comprehensive spectrum of potential coalitions, thereby offering a holistic understanding of their significance in the model (Lundberg et al., 2020).

Initially, the mean absolute SHAP value for every feature was calculated, presenting a measure of each feature's influence on the model's predictions. These SHAP values were further normalized using the softmax function to enhance clarity and to understand the relative significance.

Our results show two categories of feature importance: unnormalized ("feature\_importances") and normalized ("feature\_importances\_norm"). The unnormalized data showcased features based on their raw influence via mean absolute SHAP values. In contrast, the normalized data encapsulated these findings in a comparative format.

Both categories were ordered in descending significance and tabulated for succinct presentation and ease of interpretation. This rigorous methodological approach enriched our insights, offering a panoramic view of the myriad factors that sculpt the salary contours in the NBA.

## 4. RESULT

In our research, we utilized a tree-based ensemble approach to determine SHAP values, which are visually represented in Figure 1 and Table 4. This method permitted us to gauge the marginal contribution of each basketball attribute across various potential coalitions, referencing the methodology delineated by Lundberg et al., 2020. The resultant SHAP value summary chart brought forth several insights:

The attribute "Block" held the most pronounced positive influence on our predictive model, with a mean SHAP value of 8.1181. This was followed by "Hands" and "Shot Close," which had SHAP values of 7.0048 and 6.9327, respectively. This observation underlines the importance of blocking capability, handling ability, and short-range shooting in our model's prediction paradigm.

Analyzing further, it was evident that offensive attributes such as "Shot Close," "Free Throw," and "Shot 3pt" play a significant role in player evaluations. These skills are indispensable in a player's offensive toolkit and directly correlate with their ability to contribute points to their team. From a playmaking perspective, attributes like "Passing Accuracy," "Pass Perception", and "Passing Vision" surfaced as crucial determinants. These metrics highlight players' ability to create opportunities for their teammates, a pivotal aspect of team dynamics and strategy.

Delving into physical attributes, "Vertical," "Stamina," and "Strength" emerged as significant. These features underscore the necessity of athleticism and physical conditioning in the high-paced environment of professional basketball.

While our model was largely centered on on-court performance metrics, social media did surface, albeit not prominently within the top attributes. This suggests that while off-court marketability, including social media presence, may have some bearing, the primary drivers remain rooted in tangible basketball skills and attributes.

Furthermore, attributes like blocking, hand skills, and shooting from close range are essential to a player's on-court success. Their prominence in our model underscores their value in assessing player performance and potential team outcomes.

Leveraging SHAP values in our analytical framework has enriched the interpretability of our model, providing a granular understanding of the multifaceted elements shaping basketball players' performance evaluations. In contrast to traditional OLS coefficients, SHAP values present a reliable, locally accurate, and intuitive metric of feature significance, thus facilitating a more nuanced appreciation of our dataset (Lundberg & Lee, 2017).

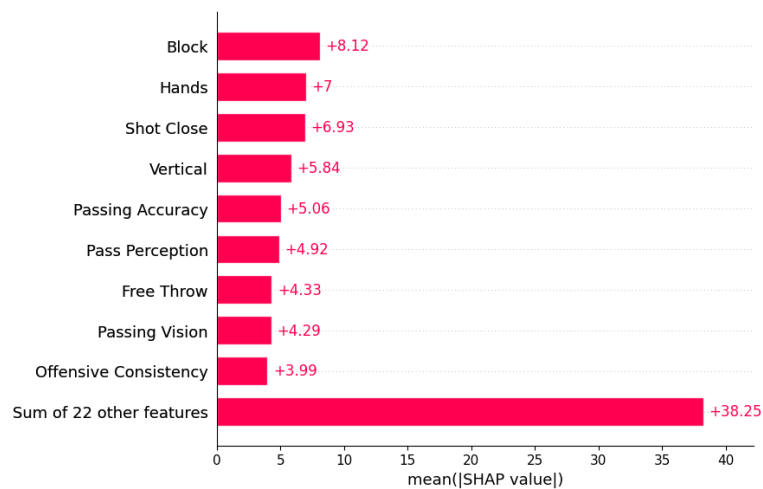


Figure 1.

Table 4.

Block -> 8.1181 (softmax = 0.5161)
Hands -> 7.0048 (softmax = 0.1695)
Shot Close -> 6.9327 (softmax = 0.1577)
Vertical -> 5.8378 (softmax = 0.0528)
Passing Accuracy -> 5.0613 (softmax = 0.0243)
Pass Perception -> 4.9238 (softmax = 0.0212)
Free Throw -> 4.3325 (softmax = 0.0117)
Passing Vision -> 4.2940 (softmax = 0.0113)
Offensive Consistency -> 3.9913 (softmax = 0.0083)
Help Defense IQ -> 3.3589 (softmax = 0.0044)
Driving Dunk -> 3.1935 (softmax = 0.0037)
Stamina -> 2.9961 (softmax = 0.0031)
Shot 3pt -> 2.8826 (softmax = 0.0027)
Lateral Quickness -> 2.1303 (softmax = 0.0013)
Shot Mid -> 2.0533 (softmax = 0.0012)
Acceleration -> 2.0417 (softmax = 0.0012)
Driving Layup -> 1.8746 (softmax = 0.0010)
Interior Defense -> 1.8358 (softmax = 0.0010)

Shot IQ -> 1.7756 (softmax = 0.0009)
Ball Handle -> 1.6732 (softmax = 0.0008)
Strength -> 1.6694 (softmax = 0.0008)
Perimeter Defense -> 1.5956 (softmax = 0.0008)
Steal -> 1.5933 (softmax = 0.0008)
Speed -> 1.5063 (softmax = 0.0007)
Defensive Consistency -> 1.3861 (softmax = 0.0006)
Standing Dunk -> 1.2061 (softmax = 0.0005)
Draw Foul -> 0.9705 (softmax = 0.0004)
Offensive Rebound -> 0.9159 (softmax = 0.0004)
Passing IQ -> 0.7781 (softmax = 0.0003)
Defensive Rebound -> 0.7422 (softmax = 0.0003)
Speed With Ball -> 0.0733 (softmax = 0.0002)
Block-> 8.1181(softmax =0.5161)
Hands -> 7.0048(softmax = 0.1695)
Shot Close -> 6.9327 (softmax = 0.1577)
Vertical-> 5.8378(softmax = 0.0528)
Passing Accuracy -> 5.0613 (softmax = 0.0243)
Pass Perception -> 4.9238 (softmax = 0.0212)
Free Throw -> 4.3325 (softmax = 0.0117)

## 5. DISCUSSION

The findings of our study shed light on the relationship between different aspects of basketball and how they affect NBA players salaries and presence on Instagram. It was particularly fascinating to see that defensive abilities have an influence on salaries compared to shooting skills. This observation can be understood within the changing landscape of the NBA, where rules are constantly evolving and team preferences are shifting.

Over the course of history the NBA has undergone rule changes that have placed more importance on defensive strategies (Nourayi & Singhvi 2021). Measures have been taken to improve the flow of the game reduce fouls and minimize free throws. However these changes have unintentionally led to a pace in games. As a result, possession durations have become tactical play has diminished in significance. This has created an environment characterized by turnovers and dynamic transition plays (Mandic et al. 2021). These developments have undoubtedly influenced team strategies when it comes to player draft selections and contract negotiations. The current style of play values players who excel in defense due to their ability to adapt to this paced game.

The current trend towards "basketball" highlights the importance of versatile players who excel in both offense and defense. Current team recruitment methods heavily favor players who possess comprehensive skill sets, which further reinforces our observation that strong defensive abilities are closely linked with higher salaries.

Cultivating defensive skills is rare and often seen as complex, which can greatly increase their value in the NBA. Exceptional defenders have an advantage in a league dominated by offensive powerhouses, and this is reflected in the higher salaries they command.

When it comes to media, our study found a clear connection between the number of Instagram followers a player has and their salary. We also observed that there is a beneficial relationship between Twitter and Instagram popularity, indicating that success on one platform can positively impact another. This highlights how important it is for players to be marketable and engage with fans when it comes to determining their salary.

Furthermore, our analysis identified factors that contribute to a player's popularity on Instagram. These include on-court skills like shooting and defense well as effective use of social media strategies across various platforms. Players and their management teams can use these insights to develop strategies that enhance their marketability, increase fan interactions, and ultimately improve their earnings potential and career trajectory.

## **6. FUTURE STUDY**

While our research provides insights into the factors that affect NBA player's salaries and their presence on social media, it is important to acknowledge certain limitations. Our dataset may not fully capture all aspects of a player's performance on the court, intangible qualities like leadership and the ability to perform under pressure. These attributes, although difficult to measure, could greatly influence salary negotiations and social media prominence. Additionally, the cross-sectional nature of our study design prevents us from establishing relationships between the variables we examined.

Building upon our findings, future research could explore performance metrics and their impact on player compensation and social media influence. By adopting designs, we can uncover patterns in player's court achievements and online interactions, shedding light on how these trajectories shape their earning potential and market value over time. To gain a comprehensive understanding of salary determinants, it would be beneficial to incorporate variables such as team performance, coaching quality, and player's injury history.

Supporting our observations, Chmait et al. Highlighted the interconnected relationship between a player's influence on in-person event attendance and their impact on social media engagement. This suggests that analyzing players' social media activities can provide insights into their professional momentum and contractual value.

Building on Korzynski's observations, players have the opportunity to expand their presence in the market by being open and honest about aspects, engaging in meaningful conversations with fans and colleagues, and sharing consistently motivational content across various online platforms, as Shin et al. Point out that utilizing techniques such as machine learning and deep learning algorithms allows for a systematic examination of textual and visual content present on social media. By analyzing and comparing these types of content and assessing their respective impacts on salaries, a more refined approach to player valuation can emerge.

## **7. CONTRIBUTION**

Our study is an effort that combines tournament theory with the principles of capital within a game theoretic framework. Using the NBA 2K dataset, we thoroughly examined how player qualities, along with the impact of social media, affect salary determinations. This innovative approach provides insights for stakeholders, including sports managers, video game enthusiasts, and talent scouts. It equips them with a tool to comprehensively evaluate player's attributes and make strategic decisions based on specific skill requirements and financial considerations.

Beyond the world of sports, our research has implications in fields such as capital management and human resource information systems. Our findings introduce cutting-edge methodologies to assess abilities revolutionizing how organizations perceive, evaluate, and train talent. The unique depth of the NBA 2K dataset allows us to explore the balance between on-field performance and off-field digital influence. From a social media perspective, our study highlights a realization that, in today's interconnected era, creating and sharing engaging content is essential.

Our real-world evidence supports the impact of having a presence on social media, which enhances fan engagement and consequently increases a player's market value. Our investigation also revealed a relationship between platforms like Twitter and Instagram, emphasizing the importance of having a coordinated digital strategy across different platforms.

By combining tournament theory with aspects of player performance and online influence within the NBA 2K dataset, our research offers insights in multiple areas such as sports management, talent development, and human resources. It highlights the connection between skills and one's digital presence. We believe that our research will spark exploration into the aspects of human capital in this digitally interconnected era.

## 8. CONCLUSION

Our research sheds light on how individual player qualities play a role in determining salaries in the NBA 2K sports game dataset. We emphasize the importance of these attributes not only as a way to understand player valuations quantitatively but also to highlight the value of creating content that resonates with diverse audiences. Additionally, we emphasize the significance of having an engaging social media presence that captivates fans and fosters a sense of community.

These findings have implications for stakeholders, including sports managers, dedicated video game players, knowledgeable scouts, and discerning sponsors. Our analytical model serves as a guide for them to assess player qualities thoughtfully and make decisions by aligning skill requirements with financial considerations. In addition to attributes, our research emphasizes the importance of social media strategies in sports marketing. This ultimately leads to a conclusion: skillful use of media has the potential to enhance a player's appeal and subsequently influence salary allocations greatly.

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