**NBA Basketball Database Project Report**

Joshua Penner, Jacob Seraspi, Sahil Sharma  
Department of Computer Science, University of Manitoba

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**Dr. Heather Matheson**  
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**Project Introduction –**

This project, the NBA Basketball Database, was developed for COMP 3380 and is an interactive interface to manage and query an NBA database. The database includes extensive information about games, players, teams, officials, and different statistics about the games. This project was in collaboration with my peers Josh, Jacob, and Sahil, who were a great help in the design, implementation, and testing of the system. It allows analysts and enthusiasts to fetch actionable insights about NBA games and players through an easy-to-use console interface. It has an intuitive and user-friendly interface that allows users to ask interesting queries with ease. This system ensures security against SQL injection attacks by parameterizing the queries, thereby improving the overall reliability and safety. Finding data for your favorite players, teams, and games will only take a few moments.

**Database Overview**

This database is designed using **Microsoft SQL Server** (MSSQL). It utilizes SQL Server's advanced querying functionalities such as subqueries, joins, and aggregate functions for the computing and storage of data. The schema includes tables for games, teams, players, draft\_picks, officials, and so on, all interconnected in capturing the relationships between games, players, and their performance metrics. The database also integrates features like WITH clauses and views to simplify complex analytical queries. A **JDBC driver** of Java connects it to the database while making sure that the application is safely and reliably communicating with the server of the database.

**Interface Description**

The application interface is a console-based system built in Java. It provides the means for the user to communicate with the database through the command-line interface (CLI). It is designed in such a way that the user will be able to fetch records, perform analytical queries, and view them in a clean and human-readable format. Programming languages used to create this database are Java, which helps create this interactive console-based interface; Python, which assisted in creating INSERT statements from CSV files to insert bulk data into the database efficiently; and SQL, which is used to execute queries and fetch data from the database, with a focus on security and performance.

**Features:**

* **Help Command:**Users can type **h** to access a manual on how to use the interface.
* **Command Execution:**The interface supports a variety of commands, such as games, officials, players, and teams, to fetch data and analyze performance.
* **Error Handling:**The system provides meaningful feedback for invalid inputs or missing arguments.
* **Query Results:**Data is presented in a compact, tabular format for easier reading.

**List of Interesting Queries Implemented in the Database**

Below is a list of all the queries implemented in the NBA Basketball Database, their outputs, and why they are useful for analysts:

1. **Display All Games**

**Command:** games

**Description and Interestingness:** Displays records of all games, including game ID, date, home win status, and points scored by both teams. This query is interesting because it allows users to review historical game records and analyze overall team performance. It might also be useful for users who are doing research on the history of basketball, and this query can be useful to compare the games and identify trends over time.

1. **Display All Officials**

**Command:** official

**Description and Interestingness:** Displays information about game officials, such as their ID, first name, last name, and jersey number. This query is interesting because it is useful for analyzing the contribution and activity of officials across seasons and games.

1. **Display All Players**

**Command:** player

**Description and Interestingness:** Displays information about players, including player ID and full name. This query is useful for analysts to find players who will help them to analyze the performance over time.

1. **Display All Teams:**

**Command:** teams

**Description and Interestingness:** Displays team records such as team ID, team name, and abbreviation. This query is useful to analysts for building the performance report for a particular team in different seasons. Moreover, this might be helpful to create a chart showing the best and worst performance by team over time.

1. **Games Where the Home Team Scores More Points**

**Command:** p <points> (<points> in the form of a number. For instance, 50. So, all commands would be like p 50).

**Description and Interestingness:** This query returns games where the home team scored more than the specified number of points, sorted by date. This is an interesting query as it outlines the high-scoring games, allowing analysts to find out the best performances.

1. **Players Drafted by a Specific Team**

**Command: t <team name>**

**Description and Interestingness:** Displays players drafted by a specific team, including their draft round, pick number, and overall pick. This query is helpful to analysts as it provides an understanding of the team’s drafting strategy and the potential of drafted players.

1. **Team Games in Specific Season**

**Command: te <season\_id>**

**Description and Interestingness: Displays teams and the number of games they played in a specific season, ordered by their active status, which is useful to analysts as it evaluates team participation and consistency during a particular season, which is useful to build a performance report for a specific team.**

1. **Team Ranked by Average Points Per Game in a Season**

**Command:** o <season\_id>

**Description and Interestingness:** Organizes teams based on their average points per game during a specific season. This would help analysts and fans spot those teams that consistently provide high scores throughout the season and hence perform well in regular games, not just playoffs. Coaches and managers can also use this to identify scoring gaps and develop strategies for enhancement.

* **Draft Combine Stats for Players Drafted by a Team**

**Command:** d <team\_id>

**Description and Interestingness:** Displays players height and weight drafted by a team, as recorded in the draft combine. This query is useful for analyzing what physical characteristics, such as height and weight, teams look for when choosing players during the draft. This can help identify patterns in player selection and how these choices might relate to the team’s playing style or strategy.

* **Fouls Committed in Each Quarter of a Game**

**Command:** f <game\_id>

**Description and Interestingness:** Count fouls committed during each quarter of a specified game. This query helps understand how teams and players manage fouls during important parts of a game. This can reveal patterns of discipline or pressure handling, especially in close or critical matches.

* **Games Played on Specific Date**

**Command:** g <date> (For instance, the date can be 2008-01-04.)

**Description and Interestingness:** Displays games played on specified dates, including team performance and the winner. This query is interesting because it allows analysts to look at how teams performed on specific dates. This can be helpful for reviewing important games, identifying memorable matchups, or analyzing how teams played during the season.

* **Player Performance Across Games**

**Command: pl <player\_name> (Provide full name for instance—Simone Fontecchio)**

**Description and Interestingness:** Displays the player ID and number of games played by the player. This query might be interesting to an analyst as it helps understand how regularly a player performs well and how

much they contribute to their team’s success.

**13) Count of games officiated by an official**

**Command:** of <official\_id> (Example – of 1962936723)

**Description and Interestingness:** The query will return the number of games an official has refereed. This query is useful for analysts as it helps to see how many games an official has worked. Moreover, it also helps to find out the most experienced or active official, and games may be most experienced official during finals to have a fair competition among the most competitive teams.

**14) Seasons played by a team**

**Command:** s <team\_name> (example - s Charlotte Hornets)

**Description and Interestingness:** Displays all seasons in which a specific team participated. This query allows analysts to see how long a team has been active in the league and which seasons they played. This can be useful to write down the performance report of a team, which can help to compare the performance.

**15) Team Point Stats for a Specific Game**

**Command:** l <game\_id> (example - l 41700103)

**Description and Interestingness:** This query displays point statistics for both teams in a specific game, including opponent details and game date. It helps analyze how a team performed in a specific game, including how well they scored and defended compared to their opponent. This query can help teams to understand where they struggled and where they did well, which assists them to improve their performance for future games.

**16) Players Drafted by a Team in a Specific Season**

**Command:** dr <team\_name> <season> (example – dr Washington Wizards 2020)

**Description and Interestingness:** Displays a list of players drafted by a team in a particular season, including their draft details. This query is helpful for analysts to see how the players a team picked in the draft affected their success in that season. This can show if the draft choices were good and how those players contributed to the team’s performance.