**Summary**This project simulates the Boston Celtics’ playoff performance for the 2023–24 NBA season using advanced box score statistics, distribution fitting, and stochastic modeling. The simulation incorporates performance metrics, team-by-team comparisons, and randomized matchups to evaluate how likely the Celtics are to win a playoff series under various conditions.

**Course Context**This project was originally completed as the final course project for ISYE 6644: Simulation, an operations research elective in Georgia Tech’s Online Master of Science in Analytics (OMSA) program. The project satisfies academic requirements while also serving as a portfolio piece showcasing applied simulation in a real-world sports context.

**Purpose**The goal of this project is to apply data science techniques—specifically simulation modeling—to the domain of sports analytics. By creating a performance equation grounded in real NBA data and using SimPy to simulate playoff series, this project aims to estimate the Celtics’ postseason outcomes and demonstrate how statistical modeling can be used to inform competitive strategies.

**Key Components**

* **Performance Equation**: A formula built from advanced metrics (e.g., Net Rating, Effective Field Goal %, Turnover %, Rebound %, and Pace) that quantifies a team’s overall strength.
* **Distribution Fitting**: The performance scores are modeled using statistical distributions (e.g., normal, gamma) to simulate variability across matchups.
* **Simulation Engine**: Uses the SimPy library to run thousands of simulated playoff games and determine series outcomes based on probabilistic team performance.
* **Exploratory Analysis**: Investigates how the Celtics and four other NBA teams performed during the regular season using advanced stats to inform modeling assumptions.
* **Reporting and Visualization**: Results are shared through clean visualizations, summary statistics, and a written report that outlines assumptions and insights.

**Teams Included**

* Boston Celtics (primary focus)
* New York Knicks, Dallas Mavericks, Denver Nuggets, Oklahoma City Thunder

**Tools & Technologies**

* R (data cleaning, visualization, modeling)
* SimPy (Python-based simulation framework)
* R Markdown (for analysis and report generation)
* Google Drive (organization and documentation)

**Folder Structure**

* **Code & Notebooks** – All R Markdown files for EDA, modeling, and simulation.
* **Data Files** – Advanced box scores for the Celtics and four other teams.
* **Visuals & Reports** – Final charts, plots, and simulation summaries.
* **README** – Basic instructions and project usage guide.
* **Project Overview** – This document, providing a detailed summary of the project.

**Future Directions**

* Incorporate player-level fatigue and injury data to refine simulations.
* Expand to full playoff bracket predictions, including first-round matchups for other teams.
* Improve balance in the performance equation to reduce overfitting toward dominant teams.

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