Report on Use of AI

1. OpenAI *ChatGPT* (April, 2023 version, ChatGPT-4)
   Query: <Can you expain the detailed rules of tennis, including matches, games and sets?>
   Output:

   < Tennis is a sport played individually against a single opponent (singles) or between two teams of two players each (doubles). The objective is to hit the tennis ball in such a way that the opponent is not able to play a valid return. The player who is unable to return the ball will not gain a point, while the opposite player will. Tennis is played on a rectangular court with a net running across the center. The rules of tennis are universally standardized and are overseen by the International Tennis Federation (ITF), which publishes the Rules of Tennis. Here's a detailed breakdown of the rules, including the structure of matches, games, and sets:

   ### Court

   The game is played on a rectangular flat surface, usually grass, clay, or a hard court of concrete and/or asphalt.

   ### Equipment

   Players use a tennis racket to strike the tennis ball, which is covered in felt over a hollow rubber core.

   ### Scoring

   - **Points:** The score of a tennis game progresses from 0 to 15, 30, and then 40. If both players reach 40, the score is described as "deuce". Following deuce, a player must win by two clear points to win the game.
   - **Games:** A set is won by the first player to win 6 games, provided they are at least 2 games ahead. If the score reaches 6-5, the set will continue until one player wins by 2 games or the score reaches 6-6, at which point a tiebreak is usually played in most formats.
   - **Tiebreak:** In a tiebreak, players score points numerically ("1", "2", "3", etc.). The first player to reach 7 points, provided they lead by at least 2 points, wins the set. The rules can vary in different competitions regarding tiebreaks in the final set.

   ### Match Play

   - **Singles Matches:** One player competes against another. The court dimensions are slightly narrower than in doubles play.
   - **Doubles Matches:** Teams of two compete, with the court width extended to include the alleys on each side.
   - **Mixed Doubles:** This involves teams of one male and one female player, competing under the same rules as doubles.

Serving

At the start of each game, the serve is rotated between players (or teams in doubles). The server must stand behind the baseline, between the center mark and sideline, to serve. The serve must go over the net and land in the diagonally opposite service box. If the serve fails, the server gets a second attempt. If the server fails both attempts, it is a double fault, and the receiver wins the point.

Faults

A serve is a fault if it:
- Fails to land in the opposite service box.
- Hits the net and lands out of bounds (though if the ball hits the net and then lands within the correct box, it's a "let" and the serve is retaken).
- Is not executed from the correct position behind the baseline.

Play

After the serve, players alternate hitting the ball back and forth across the net. A player loses a point if they:
- Fail to return the ball before it bounces twice on their side of the court.
- Hit the ball out of bounds.
- Touch the net with their racket or body during play.
- Hit the ball into the net on their side of the court.

Matches

A match is won by the player or team that wins the best of a predetermined number of sets, typically best of three or best of five.

Etiquette and Code Violations

Players are expected to maintain a high level of sportsmanship. Violations like racket abuse, verbal abuse, and unsportsmanlike conduct can result in penalties, including point penalties and disqualification.

Tennis rules can have variations based on the level of play (amateur vs. professional), the type of competition, and the governing body. However, the basic principles and objectives of the game remain largely consistent.>

2. OpenAI *ChatGPT* (April, 2023 version, ChatGPT-4)
   Query:< Can you show me some matrics of a match that will help to show the momentum of a tennis match>
   Output:
   < In tennis, momentum shifts can significantly influence the outcome of a match. Various

metrics and statistical analyses are used to illustrate these changes in momentum and overall performance. Here are some key metrics that help show the momentum of a tennis match:

1. **Break Points Saved**: This shows a player's ability to save break points against them, indicating resilience under pressure. A high number of break points saved can signify a player's mental toughness and ability to maintain or shift momentum in critical moments.

2. **Break Points Converted**: Conversely, this metric indicates a player's efficiency in converting break points against their opponent. Successful conversion can signal a shift in momentum towards the player capitalizing on these opportunities.

3. **First Serve Percentage**: A higher first serve percentage often correlates with maintaining control of service games, contributing to maintaining or shifting momentum. It reflects the player's effectiveness in starting points off strongly.

4. **First Serve Points Won**: This metric shows the effectiveness of a player's first serve by indicating the percentage of points won off the first serve. Winning a high percentage of points on the first serve can help a player dominate their service games, sustaining momentum.

5. **Second Serve Points Won**: This is crucial for understanding a player's performance under pressure, as second serves are generally more vulnerable to attack. A higher percentage indicates better defense of weaker serves, contributing to maintaining momentum.

6. **Winners to Unforced Errors Ratio**: This ratio highlights a player's overall match play quality. A higher number of winners to unforced errors suggests that a player is in control and likely dictating the pace and momentum of the match.

7. **Net Points Won**: For players who employ serve-and-volley tactics or often approach the net, a high percentage of net points won can indicate successful offensive plays, shifting momentum in their favor.

8. **Total Points Won**: Ultimately, the player who wins the most points wins the match. Viewing the total points won can provide a straightforward insight into who had the momentum for the majority of the match.

9. **Comeback from Set Down**: Winning a match after being a set down demonstrates a significant momentum shift in favor of the comeback player. It's a testament to a player's mental and physical resilience.

10. **Games Won Consecutively**: Identifying periods within a match where a player wins multiple games in a row can illustrate clear shifts in momentum. It shows dominance over a segment of the match.

11. **Tiebreak Performance**: Winning tiebreaks often requires mental toughness and

clutch performance, making tiebreak records during a match a good indicator of momentum shifts.

12. **Shot Placement and Depth Charts**: Advanced analytics often include heat maps or shot placement charts that show where a player's shots are landing. Consistently deep and well-placed shots can pressure opponents and shift momentum.

These metrics, when analyzed together, can provide a comprehensive picture of a match's dynamics, including how momentum shifts between players. Coaches, analysts, and fans often use these statistics to assess performance, strategize, and predict outcomes.>

3. OpenAI *ChatGPT* (April, 2023 version, ChatGPT-4)

Query:< What's the advantage and disadvantage of the SHAP value, XGBoost, Entrophy weight method respectively>

Output:< The SHAP (SHapley Additive exPlanations) value, XGBoost (eXtreme Gradient Boosting), and Entropy Weight Method are all powerful tools used in data science, each with its specific applications, advantages, and disadvantages.

SHAP Value

Advantages:
- **Interpretability:** SHAP values provide detailed explanations for the predictions of machine learning models, including complex ones like deep neural networks and ensemble models. This helps in understanding how each feature contributes to the overall prediction.
- **Fairness and Transparency:** By breaking down predictions to the contribution of each feature, SHAP values can help identify biases in models, promoting fairness and transparency.
- **Consistency:** SHAP values ensure that if a model changes in a way that makes a feature more important, the attributed importance of that feature will not decrease, which aligns with human intuition.

Disadvantages:
- **Computational Cost:** Calculating SHAP values, especially for complex models and large datasets, can be computationally expensive and time-consuming.
- **Complexity for Large Models:** For models with a very large number of features, the interpretation and visualization of SHAP values can become overwhelming and less intuitive.

XGBoost

Advantages:
- **Performance:** XGBoost is known for delivering high performance and accuracy in many predictive modeling tasks, outperforming other types of algorithms on a variety of benchmark datasets.
- **Scalability and Efficiency:** It is highly scalable and efficient, making it suitable for handling large datasets and high-dimensional feature spaces.

- **Flexibility:** XGBoost can be used for regression, classification, ranking, and user-defined prediction problems. It supports various objective functions and evaluation criteria.

Disadvantages:
- **Overfitting:** Without proper tuning of its hyperparameters, XGBoost can easily overfit, especially on small datasets.
- **Complexity:** The complexity of the model, with many hyperparameters to tune, can make it challenging for beginners to optimize effectively.
- **Computational Resources:** Training an XGBoost model, especially on large datasets, can be resource-intensive, requiring significant computational power and memory.

Entropy Weight Method

Advantages:
- **Simplicity and Effectiveness:** The entropy weight method is relatively simple to understand and implement. It effectively evaluates the importance of each criterion (or feature) in multi-criteria decision-making problems.
- **Objectivity:** It provides an objective basis for assigning weights to criteria based on the diversity of information they provide, reducing subjective bias in decision-making.
- **Versatility:** Can be applied across various fields, such as risk assessment, resource allocation, and performance evaluation, where decision-making involves multiple criteria.

Disadvantages:
- **Sensitivity to Data Variability:** The method's effectiveness can be sensitive to the variability and distribution of the data. Uniformly distributed data can lead to less meaningful weight distinctions.
- **Assumption of Independence:** It assumes that the criteria are independent, which may not always be the case. Interdependencies between criteria can affect the reliability of the weighting.
- **Limited to Quantitative Data:** The entropy weight method is primarily applicable to quantitative data, limiting its use in contexts where qualitative assessment is crucial.

Each of these methods has its place in data science and decision-making, with the choice among them depending on the specific requirements of the task, including the need for model performance, interpretability, or decision-making objectivity.>