ASI Summit Proposal - Winger vs Fullback Matchup

Goal

- Build a model to predict the result of a winger vs fullback battle in the attacking third zone. This model will suggest facts that significantly contribute to the battle result for the coaches.
- Using the model as a baseline, detect and analyze the outperforming and underperforming outliers. This result will assist both coaches and scouters in evaluating teams and players.

Approach

1. Data preparation

Targeted data — Game segments that start from a winger gaining possession of the ball in the attacking third, till an action ending the winger's possession. The segments should meet the following conditions:

- An opponent fullback is in a relevant defense position. This can be filtered by applying the Voronoi graph analysis to identify defenders with instant influence on the winger's freedom of movement at the initial frame.
- The ending action should be either the winger's action (shooting, passing, dribbling out of bounds) or a defender's action (duel, tackle).

Generate metrics from the raw data:

- **Ball Path.** Vectors defined by the ball location at the start and end of the segments.
- **Peak Dribbling Speed & Acceleration. Peak Off-ball Speed & Acceleration.** The median of a player's peak speed & acceleration, on & off the ball, during each game.
- **Passing type.** For segments ended by a pass, whether it's a long crossing or short pass; whether it's forward, horizontal, or backward.
- **Player type.** Apply clustering analysis on the player's location data, the ball path, and the passing type to label wingers (crossing-oriented, dribbling-oriented, inverted, wide, etc.) and fullbacks (high-pushing, deep-staying, inverted, wide, etc.)

Define a successful defense:

- Using the center of the defending team's goal as the origin, define a circle with the distance from the origin to the full-back's initial location as the radius. At the end of the segment, if the ball is within this circle and the attacking team maintains possession, the defense is considered **unsuccessful**. If the ball is outside the circle or possession has been taken by the defending team, the defense is considered **successful**.

2. Exploratory Data Analysis

- Frequency of the targeted segments per game.
- The ratio between successful and unsuccessful defense.
- Rank teams and players based on the success ratio.

3. Model

Target Variable: Success
Boolean variable indicating if the segment ends with a successful or unsuccessful defense.

Features:
Spatial condition - Momentary spatial freedom for the winger when the segment starts, constrained by both the sideline and adjacent defenders. It's an area value calculated by Voronoi graph analysis.
Movement condition - The shortest projected distance after time *t* between the ball and the fullback after the winger's first touch. It is an estimate of the minimal distance two objects can have under their current velocities. A near-zero closing distance indicates the fullback is closing in on the ball, forcing the winger to adjust speed or direction to evade. Alternatively, a high closing distance suggests the fullback needs to adjust their speed or direction to pursue the ball. If the winger's first touch leads the ball in the opposite direction to the fullback's movement, the closing distance is the distance between the fullback and the ball at the moment.
Passing option - The existence of passing lanes for the winger at the start of the segment.
Player distance - The initial distance between the winger and the fullback.
Player type - Players' positioning and action tendency, prepared by applying clustering analysis.
Player condition (multiple) - players' peak speed & acceleration, change of direction frequency/agility, height, age, preferred foot, playing time, etc.

4. Model Interpretation

Observe the explained variance of defensive success based on the selected features. Analyze and visualize the feature's importance. Identify the key conditions that significantly influence defensive success. Identify threshold values for key features that mark a significant change in defensive success rates.

5. Player evaluation

- Rank wingers on creating attacker-preferred spatial conditions and movement conditions. Rank fullbacks on avoiding those conditions.
- Use model residual to detect outperformers and underperformers.
- Dive deeper to analyze individual players' strengths and weaknesses. For example, if a fullback constantly underperforms in defending a winger's attempts to cut inside, the coach can assign specific practice to address this.
- Using available data and other resources (game video) to analyze other potential causes of outperforming or underperforming, for example, player's composure, anticipation, personal techniques, etc.