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Player Pass Map and Team Passing Network

1. Introduction

The aim of this project is to implement two practical visualisations using real football event data:

- **a player pass map:** a field diagram showing all passes made by a selected player in a match;
- **a team passing network:** a network representation of passing interactions between the players of a team.

Both visualizations are produced in Python using Hudl StatsBomb open data and the mplsoccer library for football-specific plotting.

For both parts I use the same match:

- competition_id = 16
- season_id = 1
- match_id = 18245

→ Match: Real Madrid vs Liverpool FC (UEFA Champions League Final 2017 - 18).

2. Part 1 - Player Pass Map

2.1 Data and Method

For Part 1, I selected:

- Match: Real Madrid vs Liverpool FC (match_id = 18245)
- Competition / Season: StatsBomb open data (competition_id = 16, season_id = 1)
- Player: Toni Kroos (Real Madrid)

Using **Sbopen**, I first loaded the competition, season and match list, then retrieved all events for this match with parser.event(match_id). From the resulting event dataframe I filtered rows where:

type_name == "Pass", and

player_name == "Toni Kroos".

Passes were then split into:

Completed passes: rows where outcome_name is null;

Incomplete passes: rows where outcome_name is not null.

The coordinates x, y and end_x, end_y were used as start and end locations for each pass. The final visual was created with mplsoccer.Pitch(pitch_type="statsbomb") on a dark background (pitch_color = "#050816"), plotting:

- blue arrows for completed passes,
- red arrows for incomplete passes,
- a legend indicating both categories.

This produces a single, game-level summary of Kroos' passing actions.

2.2 Result and Interpretation

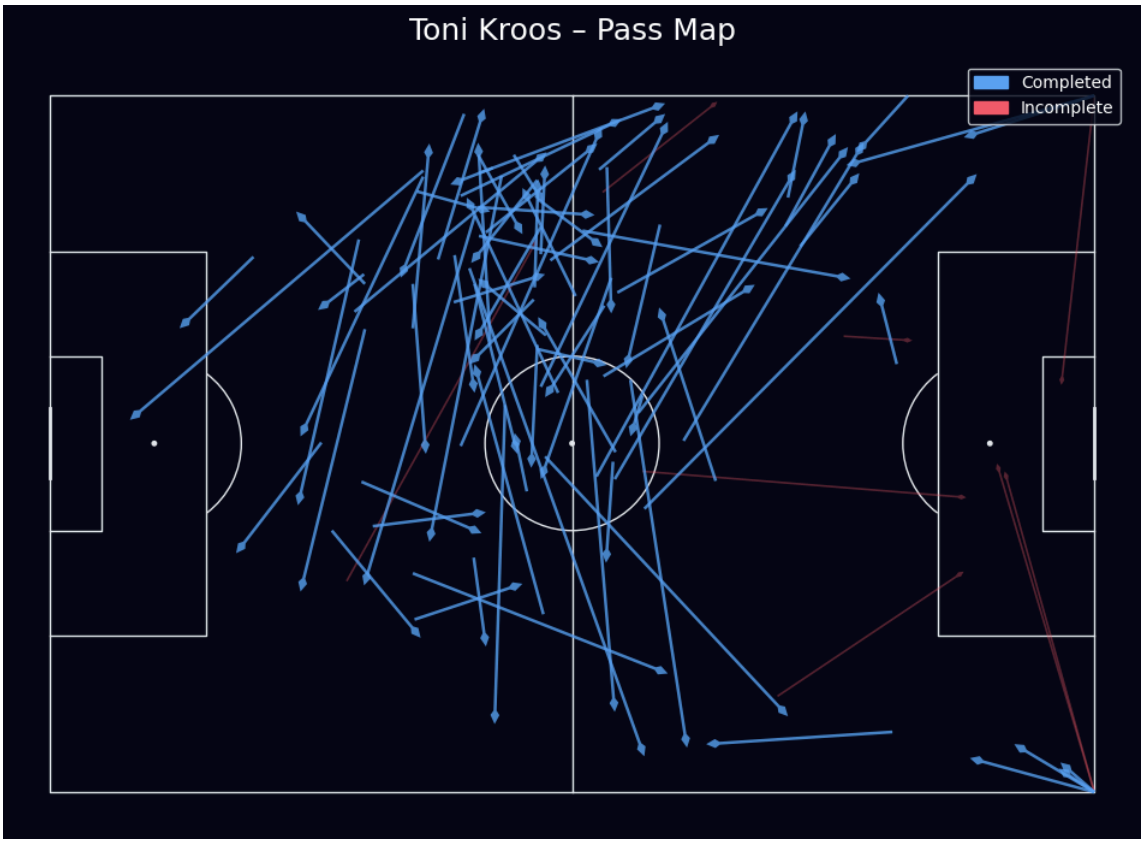

Figure 1 shows the pass map for Toni Kroos in Real Madrid vs Liverpool FC.

The visualization provides a clear overview of Kroos' passing behaviour in this game:

- It highlights the areas where he most frequently receives and plays the ball, mainly in deeper central zones and half-spaces rather than in advanced positions.
- The mix of shorter arrows around the centre and longer diagonals towards the flanks illustrates the balance between circulation passes and progressive switches of play.
- Incomplete passes (in red) indicate where more ambitious or risk-tolerant actions occurred, often when trying to break lines or change sides.

Overall, the pass map condenses every pass into one figure, making it easy to understand Kroos' volume, direction and zones of influence in possession for this specific match.

3. Part 2 – Team Passing Network

3.1 Data and Method

For Part 2, I used the same match and focused on Real Madrid as the analysed team.

Again, events were loaded via Sbopen. The construction of the passing network followed these steps:

1. **Filter event data**

   From the full event dataframe I kept only actions where:

   - type_name == "Pass"
   - team_name == "Real Madrid"
   - the pass was completed (outcome_name is null)
   - and, optionally, only open-play passes by removing rows where sub_type_name is not null (set pieces such as free kicks, corners, throw-ins, etc.).

2. **Build player nodes**

For each Real Madrid player I grouped passes by player_name and computed:

- the average pass start location (x, y) as the node position;
- the number of passes made (passes_made) as a measure of node size.

To provide tactical context, I derived each player's on-ball position from StatsBomb's position_id. For each player, the most frequent position_id in the match was mapped to a standard position abbreviation (e.g. GK, RB, LCB, LCM, CDM, CAM, ST). These abbreviations are displayed inside the nodes, while the player's surname is shown below the node.

3. Build pass links (edges)

I then grouped by (player_name, pass_recipient_name) and counted the number of completed passes between each pair of players (pass_count). To reduce clutter, only links with pass_count ≥ 3 were retained, keeping the focus on stable and recurrent connections rather than rare combinations.

4. Visualisation

The network was plotted on a dark statsbomb pitch using mplsoccer.Pitch:

- nodes in light teal (#5BA2F4), sized proportionally to passes_made and outlined in white;
- edges in pink (#F45B69), with line width proportional to pass_count;
- position abbreviations (e.g. LCB, LB, LCM, CDM, CAM, RCF) centred in each node and surnames placed just below.

This approach transforms the event-by-event data into a compact representation of Real Madrid's passing structure in this match.

3.2 Result and Interpretation

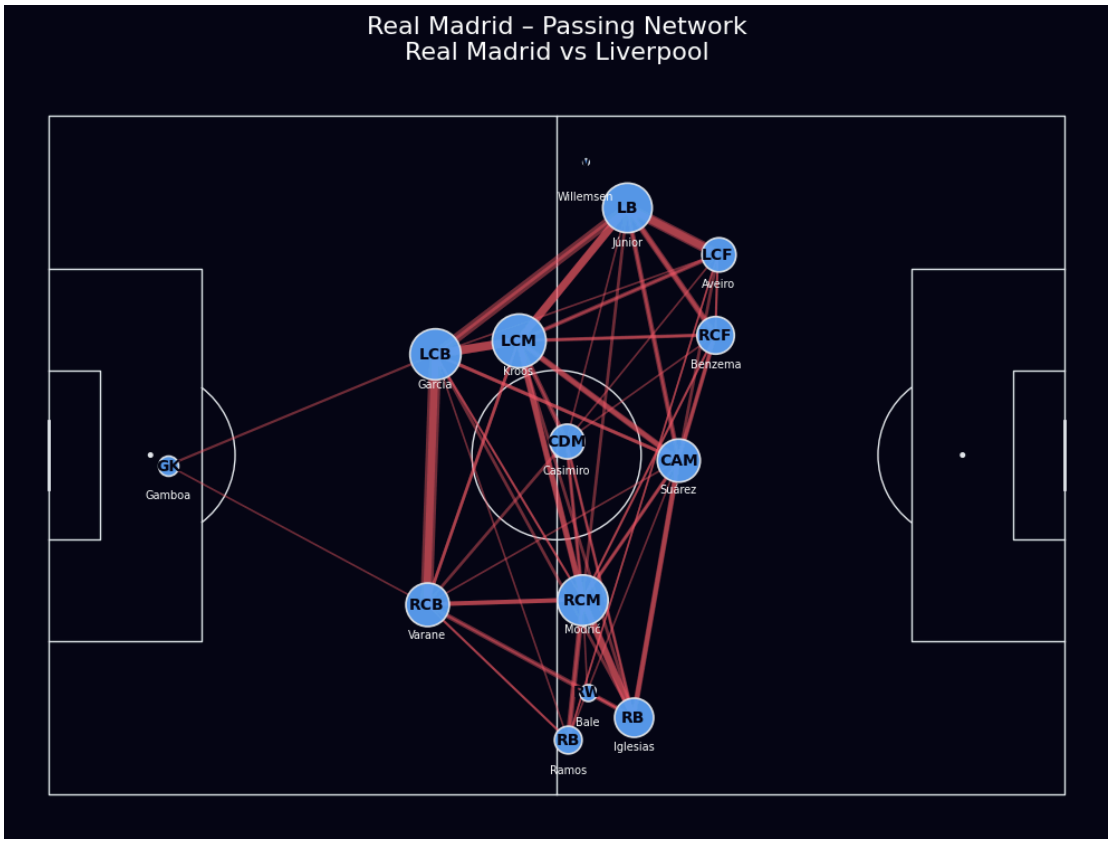

Figure 2 shows the resulting passing network for Real Madrid in this match.

Several patterns emerge from the network:

- **Back-line and left-side dominance:**

  The largest nodes appear in the defensive line, in particular the left centre-back (LCB: Ramos García) and the left-back (LB: Marcelo Júnior). Ramos García has multiple thick links to Júnior, to the central midfielders and to the right centre-back (RCB - Varane), indicating that a large proportion of Real Madrid's circulation in this match flowed through the left of the back line. Júnior acts as a key outlet on the flank, connecting the defence to midfield and the advanced players.

- **Midfield connectivity with differentiated roles:**

  Kroos (LCM) and Modrić (RCM) function as the main connectors in midfield, linking the back four to the attacking midfield and forwards. Kroos has a relatively large node and several strong connections, reflecting his role as a central organizer in possession. Casemiro (CDM), in contrast, has a smaller node and fewer connections, suggesting a more defensive and stabilizing role with less involvement in ball circulation.

- **Advanced link player and forward behaviour:**

  The attacking midfielder (CAM) Isco receives many passes but makes comparatively fewer, which points to a role as an advanced receiver between the lines rather than as a primary distributor. The centre forwards (LCF and RCF) show small nodes and thin outgoing edges: they are mostly targets for progression, rather than being heavily involved in deeper passing sequences.

Overall, the network reflects a patient, possession-oriented build-up in which Real Madrid rely strongly on the left side and on the central defenders to circulate the ball, with Kroos and Modrić providing the main midfield links and the forwards acting primarily as receivers of final-third possession.

4. Conclusion

This project demonstrates how event-level football data can be transformed into informative visualisations using Python.

- The player pass map condenses every pass made by Toni Kroos into a single figure, allowing a quick assessment of his volume, direction and preferred zones in possession.
- The team passing network abstracts thousands of individual events into nodes and edges, highlighting Real Madrid's internal passing structure, main distribution hubs and dominant channels of progression in the match against Liverpool FC.

Both approaches are intentionally transparent and based on simple filtering and grouping operations, yet they already provide insight that can support coaches, analysts and data scientists when assessing individual roles and team behaviour in possession.