Passing Networks

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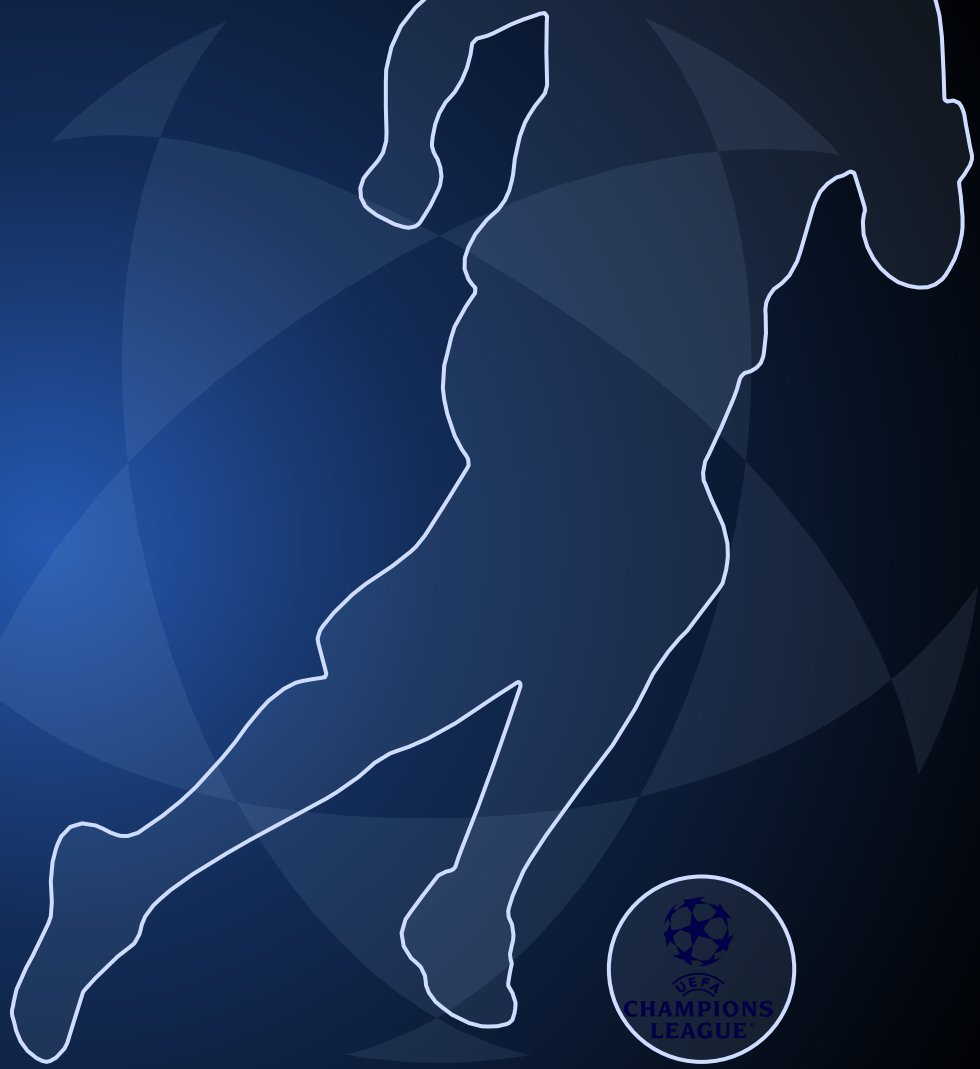
INTRODUCTION

The match I will be analyzing is the 2011 UEFA Champions League Final: **Barcelona vs Manchester United**, where Barcelona won 3-1. This Barcelona team, one of the greatest ever in the history of soccer, completely outclassed Manchester United with almost complete control throughout the course of the entire game.



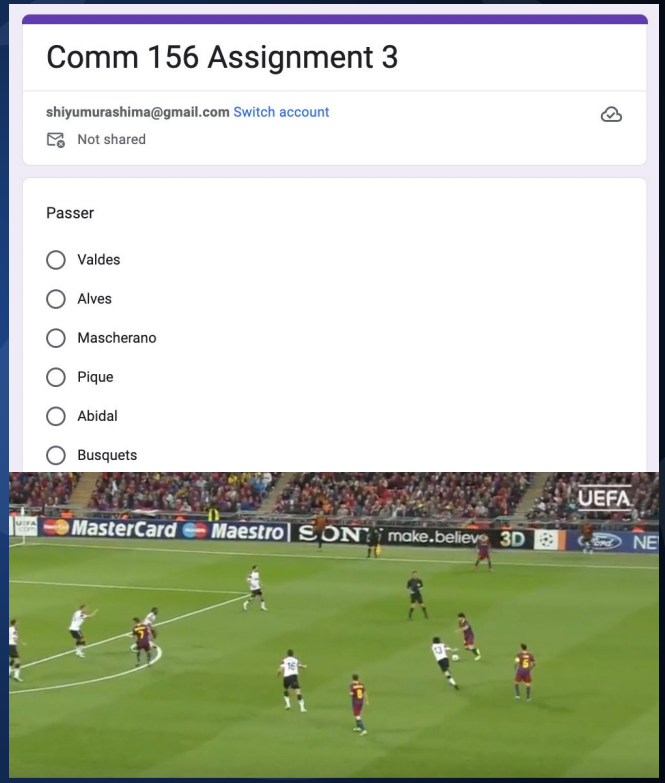
RESEARCH QUESTIONS

1. What passing sequences emerge from the spontaneous dynamics of this match?
2. Which players act as central nodes for passing within a team's network?

Data Collection

Edge List (via Google Form)

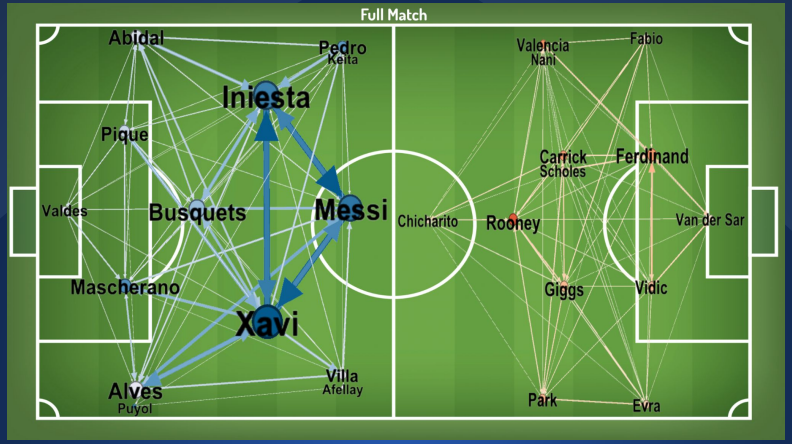
- Question 1: **Source** (Passer)
  - Choose from list of all players who played in the match (starters and subs).
- Question 2: **Target** (Receiver)
  - Choose from list of all players who played in the match (starters and subs).

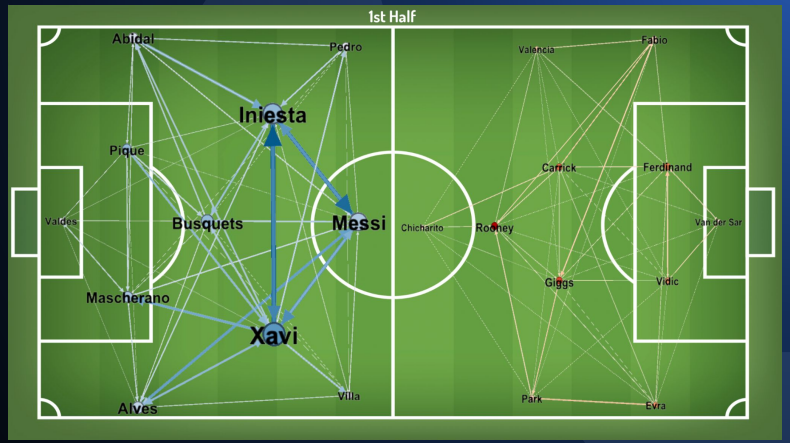


- The form was then linked to a Google Spreadsheet consisting of 3 columns (Timestamp, Source, Target) and 918 rows, corresponding to 918 passes in the match.
- The timestamp column was removed, as it was not necessary for our edge list.
- The full match was additionally broken up into two other sheets: 1st Half with 480 rows and 2nd Half with 439 rows.

Link to match: https://www.uefa.tv/video/vod/146331/?playlistId=5727

The Network


Full Match
Abidal
Pedro
Keita
Iniesta
Pique
Valdes
Busquets
Messi
Mascherano
Xavi
Alves
Puyol
Villa
Afellay
Valencia
Nani
Fabio
Carrick
Scholes
Ferdinand
Chicharito
Rooney
Van der Sar
Giggs
Vidic
Park
Evra


1st Half
Abidal
Pedro
Iniesta
Pique
Valdes
Busquets
Messi
Mascherano
Xavi
Alves
Villa
Valencia
Fabio
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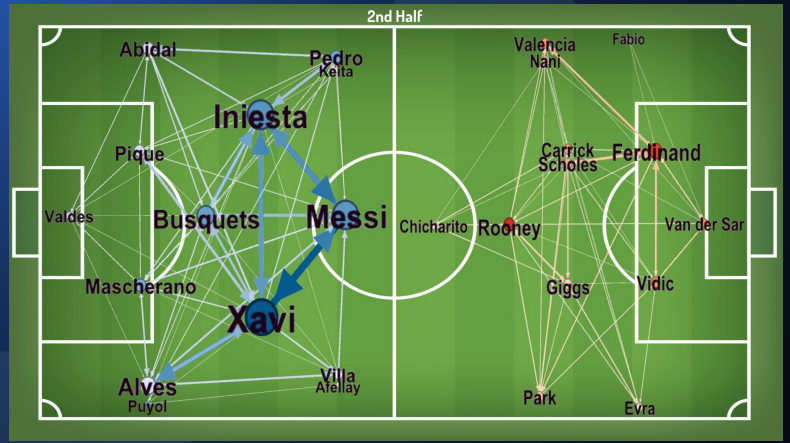
2nd Half
Abidal
Pedro
Keita
Iniesta
Pique
Valdes
Busquets
Messi
Mascherano
Xavi
Alves
Puyol
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Methodology

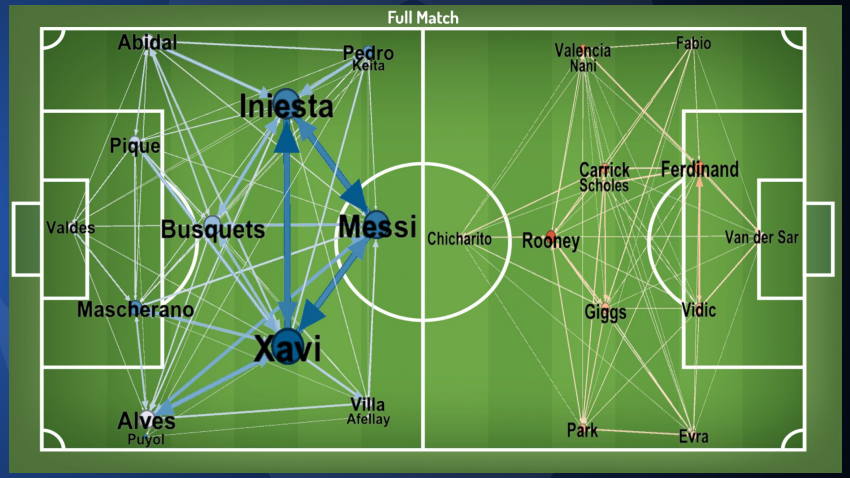
Nodes: Players
Links: If one player completes a pass to another player.
- "Two players are connected if they complete a pass from one to the other."

Layout: Force Atlas
- Force Atlas first creates two separate clusters, then players are manually organized into their positions.

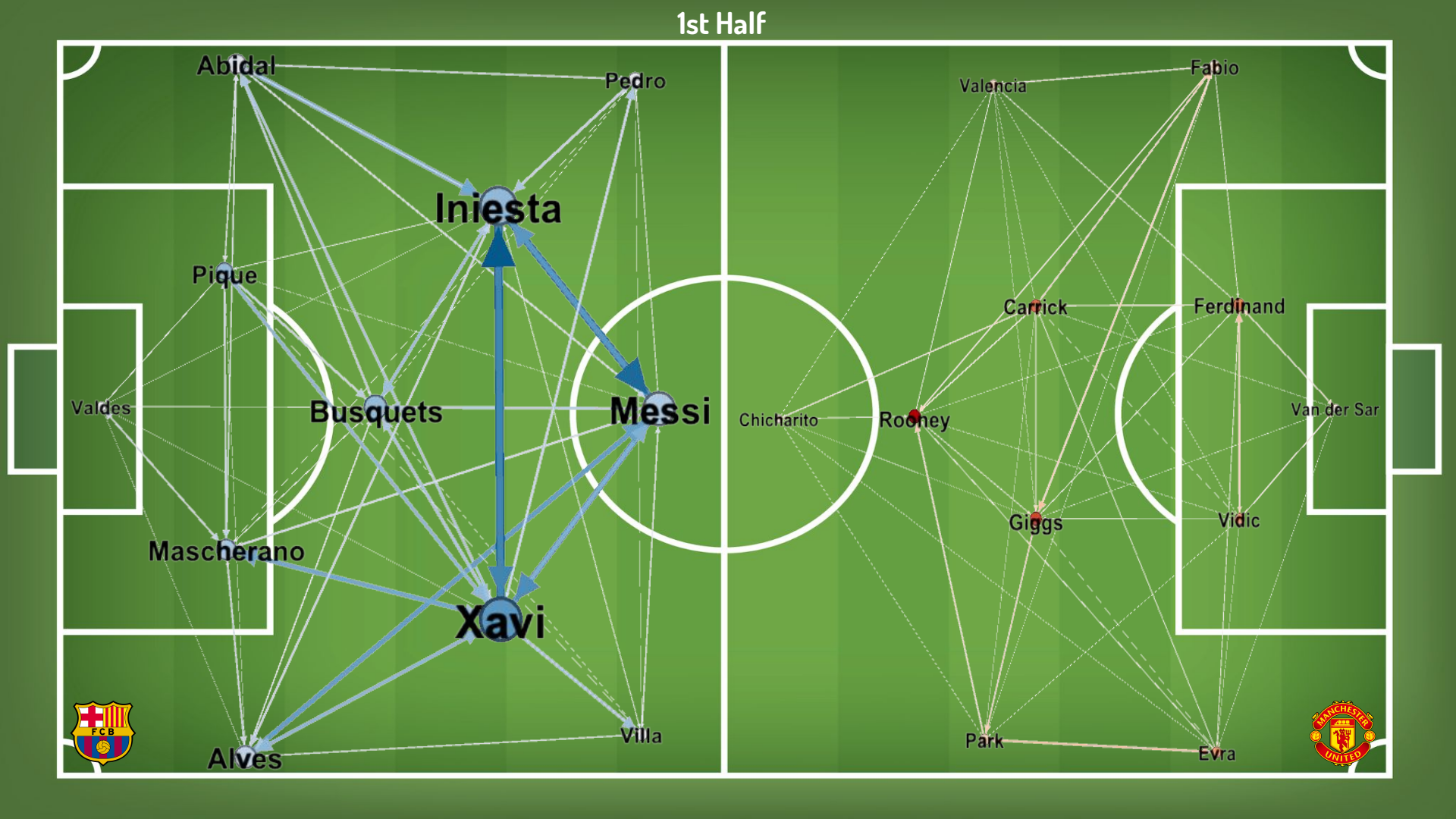
Node Color: Ranked by betweenness centrality.
- Darker blue for Barcelona and darker red for Manchester United indicates higher betweenness centrality.
- Betweenness centrality helps identify key playmakers in a passing network, as players with high betweenness are often crucial in facilitating the flow of the game by ball distribution.

Node Size: Ranked by weighted degree.
- The frequency of passes between players.
- High weighted degree corresponds to high possession retention and an active role in ball distribution.

Edge Color/Width: Ranked by weight.
- The total number of successful passes to a player.



*In the next slides, we will first analyze the networks by 1st and 2nd half, then the full match.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1st Half Analysis

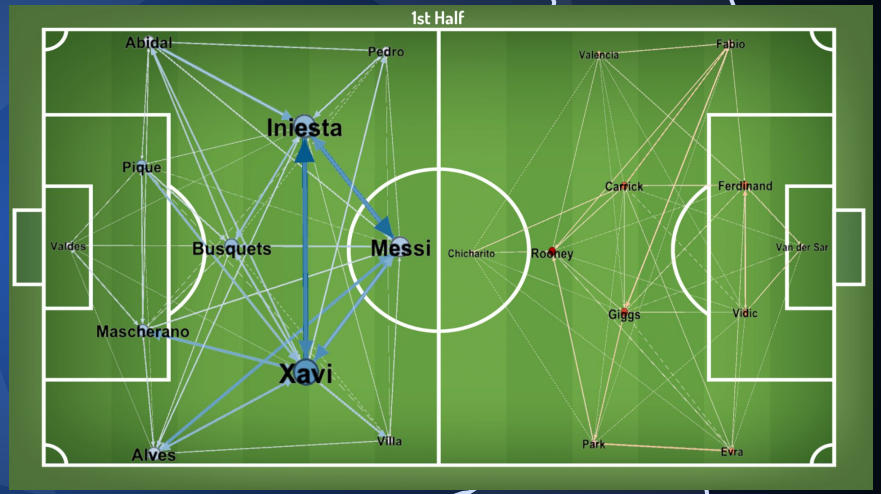
Score: 1-1 (Pedro 27', Rooney 34')

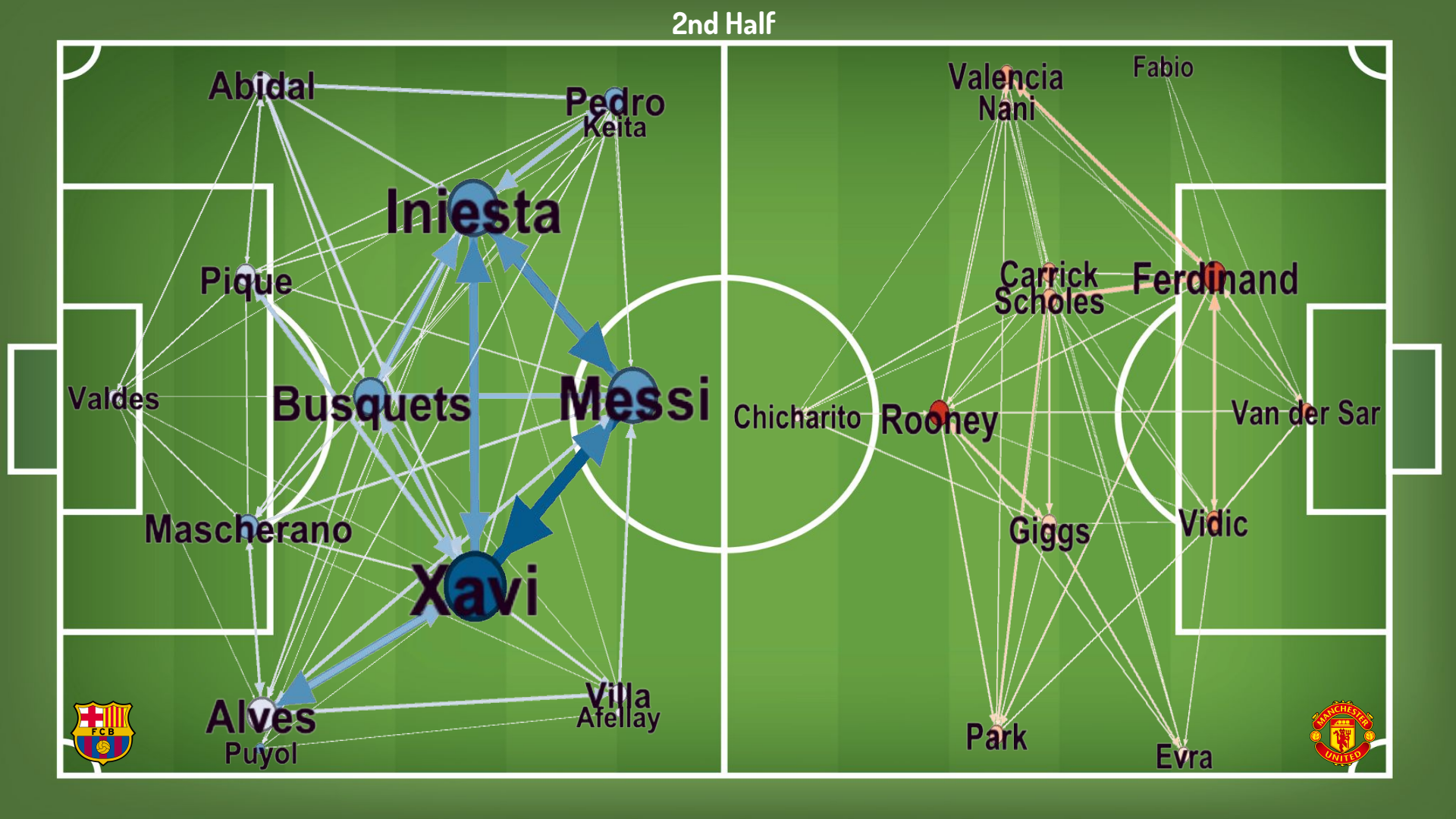
Match Statistics

- **Barcelona**: 67% possession, 8 shots
- **United**: 33% possession, 2 shots

Network Insights:

- Barcelona attack build up seems to begin with Xavi, Iniesta, and Messi (based on weighted degree). Rooney had the highest weighted degree for United.
- Xavi had the highest betweenness centrality for Barcelona, while Rooney was highest for United.
- Edge width greatest for links between Iniesta and Xavi / Messi.

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Xavi
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Evra

2nd Half Analysis

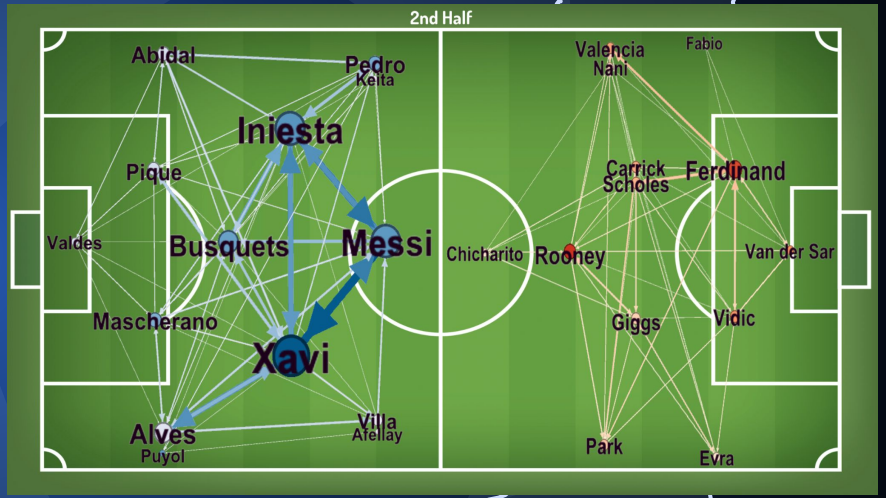
Score: 2-0 (Messi 54', Villa 69')

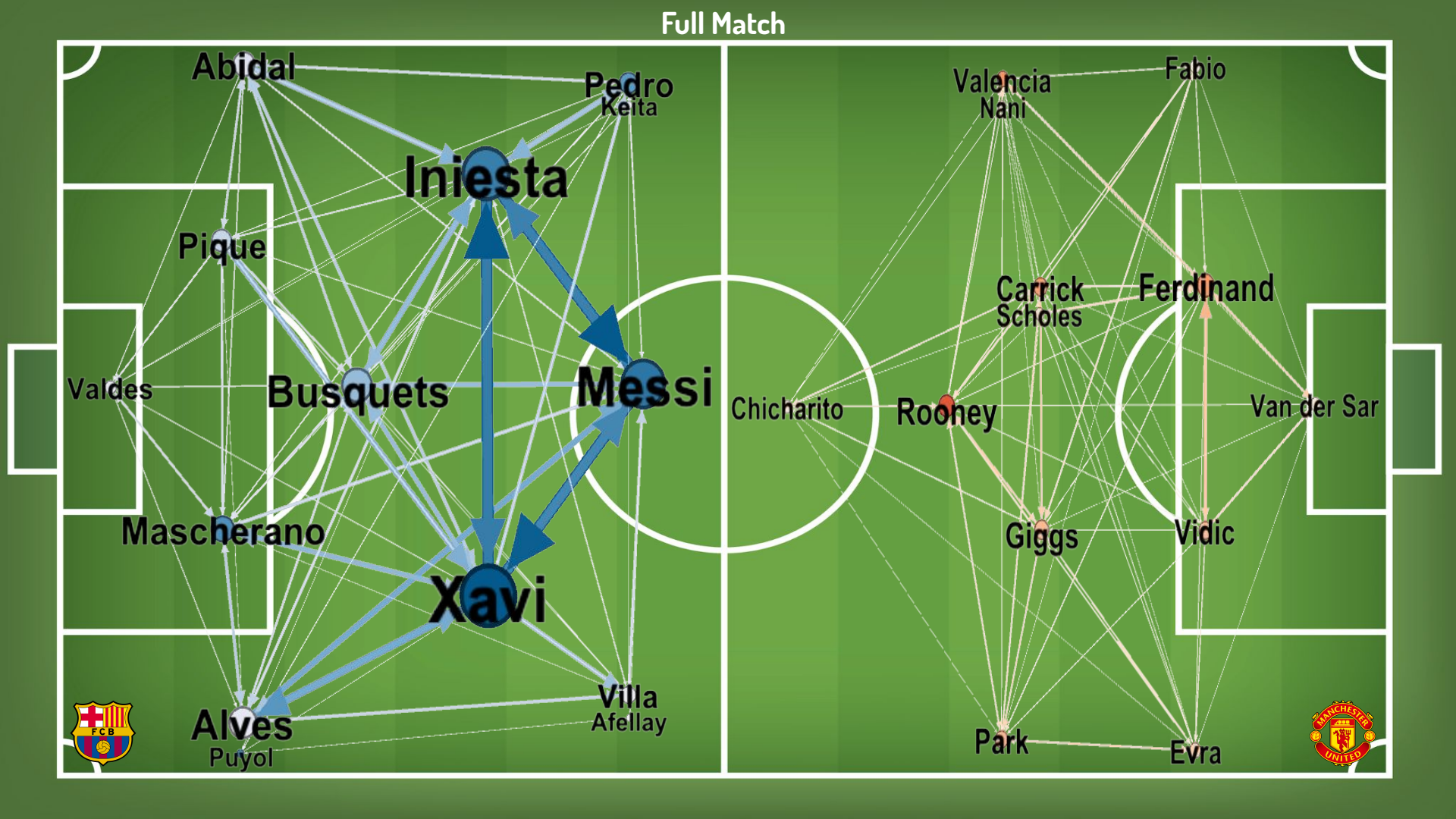
Match Statistics

- **Barcelona**: 62% possession, 11 shots
- **United**: 38% possession, 2 shots

Network Insights:

- Barcelona attack build up again seems to begin with Xavi, Iniesta, and Messi (by weighted degree). Even more domination than in the 1st Half by these 3 players
- Ferdinand has the highest weighted degree for United, closely followed by Rooney.
- Xavi had the highest betweenness centrality for Barcelona, while Rooney and Ferdinand were highest for United.
- Edge width greatest for link between Xavi and Messi. (the one link within the trio that was relatively small in the 1st Half).

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Full Match Analysis

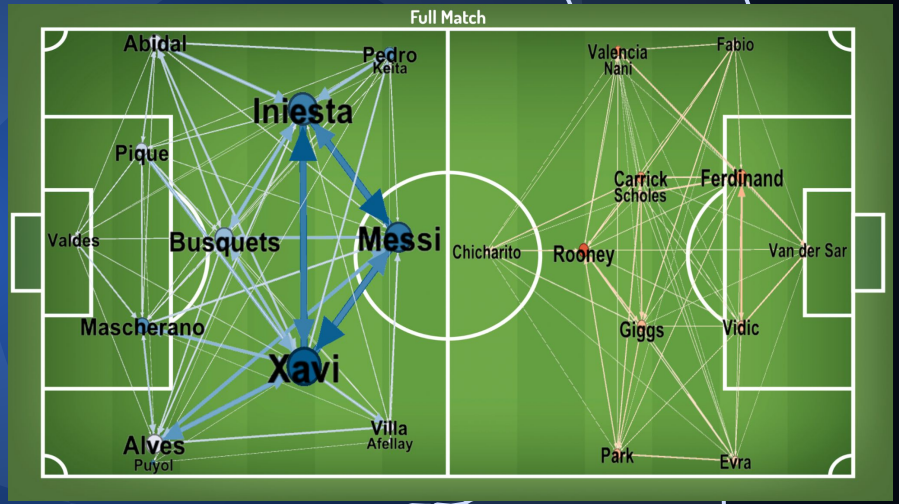
Final Score: 3-1

Match Statistics

- **Barcelona**: 63% possession, 19 shots
- **United**: 37% possession, 4 shots

Network Insights:

- Barcelona attack build up begins with Xavi, Iniesta, and Messi (by weighted degree) and arguably Busquets as well. Rooney had the highest weighted degree for United.
- Xavi had the highest betweenness centrality for Barcelona (followed by Messi and Iniesta), while Rooney was highest for United.
- Edge width greatest between Xavi, Iniesta, and Messi. The trio tends to pass to one another frequently throughout the course of the game.



KEY PLAYERS OF BARCELONA

XAVI

Highest betweenness centrality and weighted degree. 141 completed passes, making up for over 15% of all passes completed in the match.

INIESTA

Third highest betweenness centrality and second highest weighted degree. 107 passes completed.

MESSI

Second highest betweenness centrality and third highest weighted degree. 92 passes completed.

BUSQUETS

A “not so obvious” key player. Fourth highest weighted degree with 77 passes completed. Supported the trio defensively, and supplied them with passes almost evenly, based on the edge width.

MANCHESTER UNITED: WAYNE ROONEY

Highest weighted degree and betweenness centrality within the team. Second highest number of completed passes after Ferdinand, with 33 total.

United only had 4 shots in the entire match, but Rooney was able to convert one of them into a goal. He was the one factor holding Barcelona back from complete domination.

CONCLUSION

1. Xavi, Iniesta, and Messi (and arguably Busquets) were the key players that allowed Barcelona to control the game and win.
    a. Xavi, Iniesta, and Messi also generally made abundant passes between each other, forming a “triangle”. If you add Busquets into the mix, you can form a “diamond”. Triangles and diamond formations are basic key formations in soccer to develop an attack using short passes.
2. If we compare Barcelona and Manchester United overall in terms of betweenness centrality, weighted degree, and weight, Barcelona dominates in each category.

Disclaimer: Completing more passes, and hence having more possession of the ball, does not automatically mean that you will win the game. As demonstrated by Wayne Rooney’s goal in the 1st Half. However, in this match, Barcelona were simply too exceptional at keeping control over the course of the entire game and not making mistakes, leading to their 4th UEFA Champions League title.

Thank you!

Shiyu Murashima