

Applied Data Science

«Tactical Digital Twin in Football»

General Guidelines

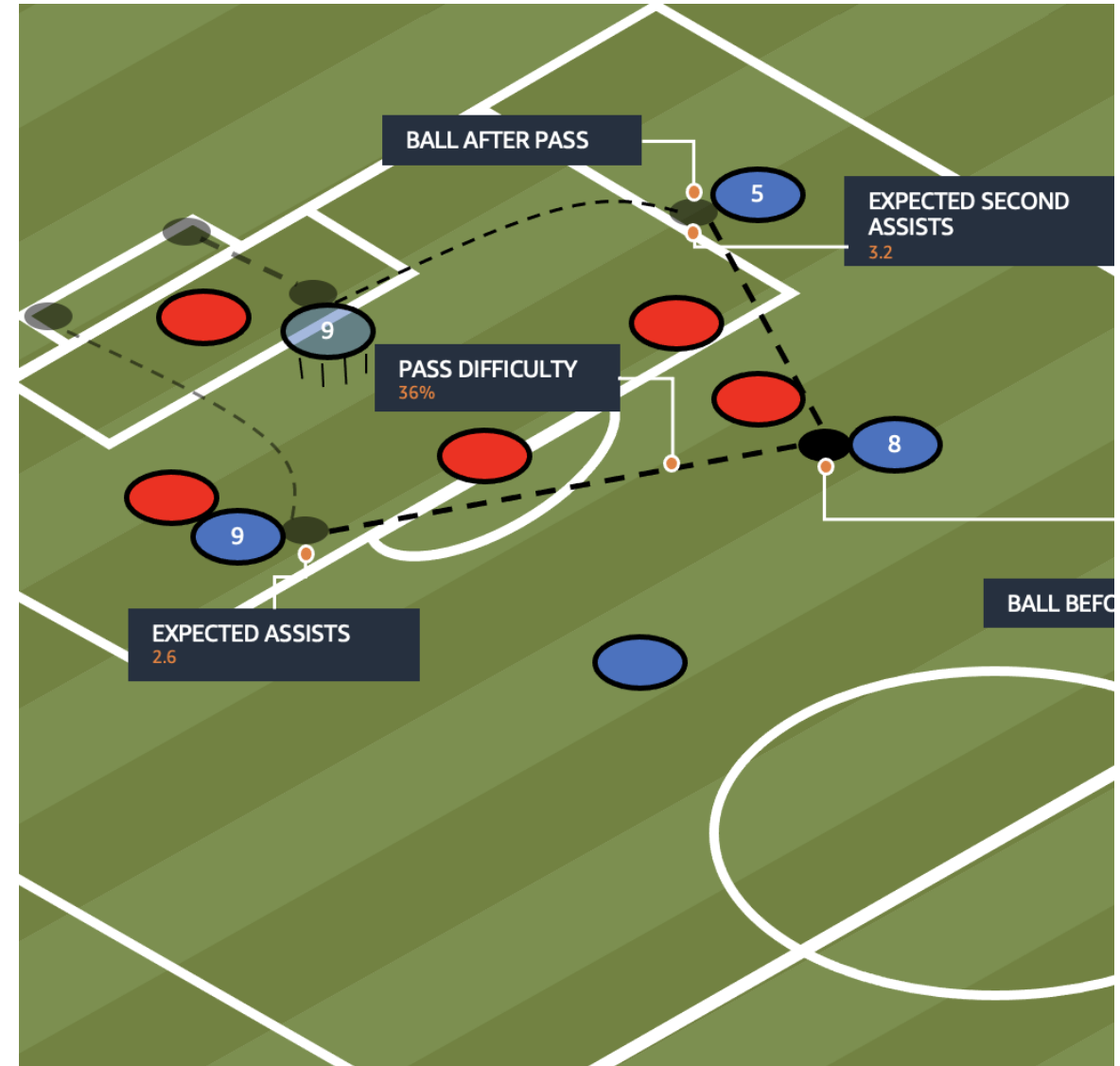
Overview

- Modern football increasingly relies on data-driven decision-making. Quantitative simulation of tactical scenarios provides a new competitive edge by enabling teams to test strategies, assess performance, and optimize coordination beyond descriptive analytics.
- **Core idea**
 - Build a digital twin capable of simulating tactical scenarios using event and tracking data.
 - Explore multi-agent Reinforcement Learning (RL) and alternative approaches (imitation learning, offline RL, generative models) to study tactical decision-making and counterfactuals ("what if" situations).
- **Why it matters**
 - Helps coaches and analysts **quantitatively evaluate tactical decisions**, simulate alternative strategies, and understand cause–effect relationships beyond descriptive analytics.
- This project supports **Goal 9 (Industry, Innovation, and Infrastructure)** by promoting cutting-edge AI applications in the sports engineering sector, helping to improve infrastructure and innovation in performance optimization technologies.

Task

- Develop a **reproducible framework** for analyzing and comparing tactical decisions under realistic constraints, using real or synthetic data.
- Implement and compare decision models to reproduce or optimize tactical behaviors.
- Integrate real tracking or event data (e.g., from public datasets like StatsBomb¹) for validation and calibration.
- Design **evaluation metrics** to assess tactical effectiveness and realism

¹<https://github.com/statsbomb/open-data>



Expected outcome

- Consistent **literature review** and related work exploration, based on reliable and valid scientific sources.
- Repository with the proposed pipeline/framework and **final model**.
- A fully functional model at least for one or more specific tactical scenarios.
- Demonstration of the effectiveness of implemented tools.
- Testing and validation of the implemented methodology, possibly with **comparative analysis**.
- Solid analysis of the obtained results and comments on **limitations** and constraints.

Light mentoring

- Support during the laboratories of the course
- Off-line support via mail



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