Project Description

Project Theme: In this project, you will **construct football players' passing networks** of a team based on players' Passing Index and **analyze their evolution over time** in a football match of EPL (English Premier League).

- **Main Objective:** The playing formation (https://en.wikipedia.org/wiki/Formation_(association_football)#5%E2%80%933%E2%80%932) of football teams influences how players interact with each other via passing. The project aims to determine the passing characteristics of playing positions within a professional football team and analyze the effect of pass interception on the playing formation and passing network over time in a match. Also, this project requires developing a performance metric formula for pass interceptions by creating a new or modifying the existing formula, such as centrality, betweenness, etc.
- **Due Date**: Submit the following materials via email by **20 November (Mon)**
    - Data files
    - Python code file (in either '***.ipynb' or '***.py' format)
    - Project Report via email to bkim@aurak.ac.ae
- **Regulations**
    - You may work alone or as a group of two. You need to inform your willingness to do the project by the 30th of September.
    - ***Plagiarism*** (https://www.student.unsw.edu.au/what-plagiarism) will not be tolerated.
- **Data and Format:** Watch the football matches assigned to your group and collect passing-index data.
    - Make Pass Matriics for every 10-minute interval, such as 0-10 min, 10-20 min,...,40-45 (First Half), 45 (Second Half Start)-55,...,85-90 (Final), including pass interceptions.
- **Main Reference:** Review the following two articles, which explain the metrics you need to measure players' performance.
        - "A network theory analysis of football strategies (https://arxiv.org/pdf/1206.6904.pdf)"
- Another reference is below:

KANDASWAMY-SENIORTHESIS-2020.pdf

- **Main Tasks**

    a. **Data Collection:** The instructor will assign EPL football matches to each group. Watch the football matches assigned to your group and collect passing-index data in the format explained above.

b. **Data Analysis**

- Compute all the performance measures (Closeness, Betweenness, PageRank, Clustering Coefficients as in the main reference article) per each time interval, 0-10 min, 10-20 min,...,40-45 (First Half), 45 (Second half Start)-55,...,85-90 (Final).
- Analyze passing-index data in line with **the project aim.**

- **Project Report:** Each student or group will write a report (font size 11 pt and no multiple columns). The report should also include a page describing each member's project contribution. The paper should be professionally written (e.g., see the main reference paper) and should provide a succinct analysis of the evolution of players' passing networks over time in a football match. This also should include, but is not necessarily limited to:
  - Graphical representations of the passing networks
  - Centrality measures (degree, betweenness, closeness, PageRank, etc)
  - Clustering effects in the network: average clustering coefficient, transitivity, clustering coefficient distribution, clique, etc.
  - Comparison and analysis of the evolution of two teams' passing networks over time in each match. Also, analyze how the play formation has affected the team's passing network.
  - You may also want to experiment with other measures not covered in the primary reference paper, such as Graph density; Community structure (modularity); etc.
- **Data File Example**

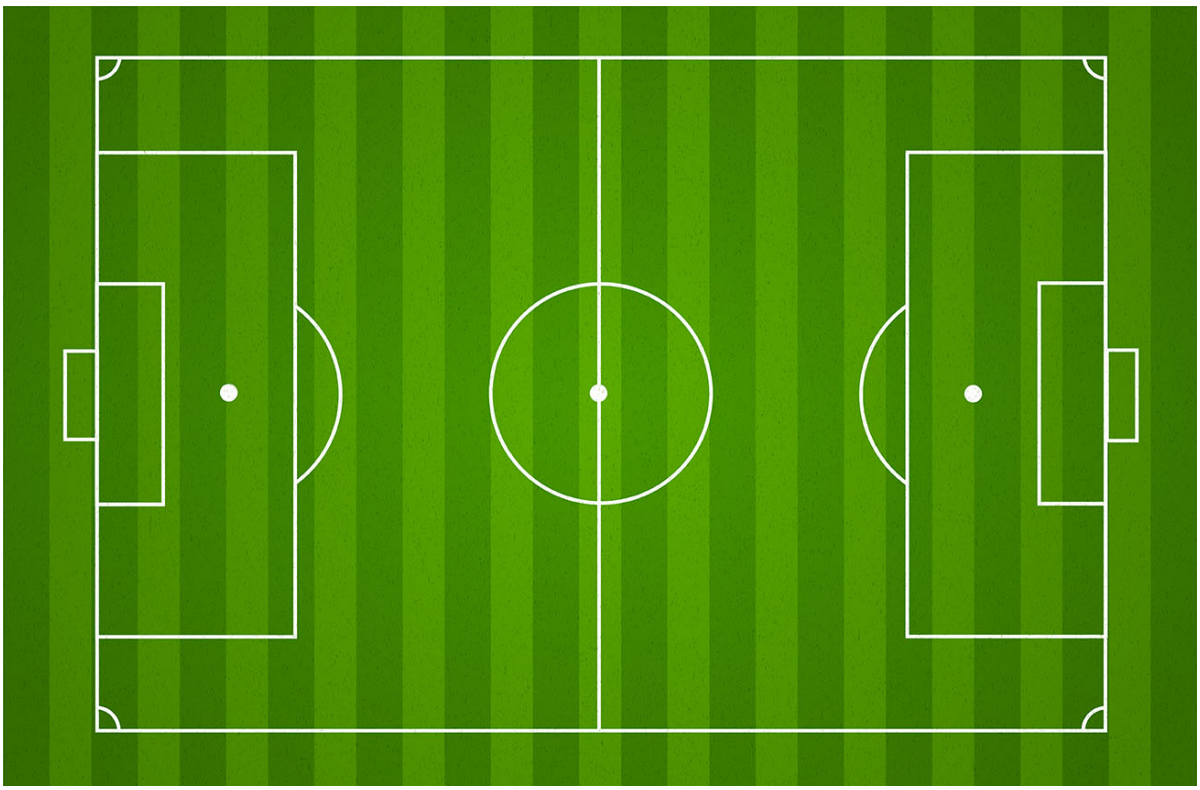
data_file_example.xlsx

This includes only passes among players. You need to find a way of inserting pass interceptions and clinical passes. Or, you create your own data file format.

- **Python Code Example**

Network_Analysis.ipynb

This python code needs the football pitch picture below:



- **Project Report Example**: This report example will be used as a criterion for evaluating your report. If your report matches the level of the example report, your project mark will be "B (80%)".
    - Project Mark Scale: A+ (100), A (95), A- (90), B+ (85), B(80), C(70), D (60), F (0).

project_report_example.pdf