

## **Design of an Expert System Coach for Complex Team Sports**

**Brice Colcombe, Lindsay Horton, Muhammad Ommer, and Julia Teng**

George Mason University  
Fairfax, Virginia

Corresponding author's Email: [bcolcomb@masonlive.gmu.edu](mailto:bcolcomb@masonlive.gmu.edu)

**Author Note:** Brice, Lindsay, Muhammad, and Julia are Senior Systems Engineering students at George Mason University in Fairfax Virginia. Special thanks to Dr. Lance Sherry, Tom Morrell, and Jones et al. for their contributions to this project.

**Abstract:** Soccer is a complex sport involving two teams of eleven autonomous agents working to advance the ball into the opponents' goal. These agents working together create complex patterns of ball movements in time and space that cannot be easily recognized by humans. Coaches can gain competitive advantages in recognizing and exploiting these patterns. This paper describes the Design of an Expert System Coach Decision Support Tool to assist coaches in making in game decisions which positively affect the outcome of the game. Through previous game data, probability maps are generated and input into a Monte Carlo simulation which outputs statistics to make tactical adjustments. While data is sparse, simulations show coaches can increase their probability of winning through ideal passing percentages and game flow pattern information which leads to more NCAA Tournament bids, and an increase in coaching salary by \$67k due to these bids.

*Keywords:* Probability maps- ball movement and success probabilities broken down into 14 zones per field