# IST652 - Scripting for Data Analysis

## Final Project Proposal

## Predicting CS:GO Match Outcomes Using Machine Learning

### Team Overview

Our team consists of data analysts, machine learning practitioners, and esports enthusiasts. Each member brings expertise in data collection, statistical analysis, and predictive modeling, which will be leveraged to analyze and forecast CS:GO match outcomes effectively.

### Project Objective

The goal of this project is to develop a predictive model for Counter-Strike: Global Offensive (CS:GO) esports matches using player statistics, map selection, and in-game performance data. By utilizing machine learning techniques, we aim to identify the key factors influencing match outcomes and generate accurate predictions.

### Data Sources

1. HLTV.org - Provides match results, player statistics, team rankings, and more.  
 - Access Methods: Unofficial APIs like HLTV.ORG-API, HLTV-API from GitHub.  
  
2. Steam API- Offers player statistics, match histories, and other relevant data.  
 - Access Methods: Requires a Steam Web API key for data retrieval.  
  
3. CS:GO Betting Odds - Betting platforms publish odds for upcoming matches, reflecting market predictions.  
 - Access Methods: Web scraping from betting websites or official API access.  
  
4. Kaggle Datasets- Hosts datasets related to CS:GO, including round-by-round data and match statistics.  
 - Example: 'CS:GO esport matches: round data' on Kaggle.

### Analysis Methods

#### 1. Exploratory Data Analysis (EDA)

- Descriptive Statistics: Calculate key metrics such as Kill/Death ratio, headshot percentage, and team win rates.  
- Correlation Analysis:Assess relationships between variables such as map selection and match wins.  
- Feature Engineering: Create new variables like map-based win probabilities and team synergy metrics.

#### 2. Predictive Modeling

- Logistic Regression: Model probability of a team winning based on various inputs.  
- Random Forest & XGBoost: Use ensemble learning methods for improved predictions.  
- Neural Networks:Apply deep learning techniques for advanced pattern recognition.

### Key Factors for Prediction

#### 1. Player Performance Metrics

- Kill/Death ratio, headshot percentage, average damage per round.  
- Entry frag success rate, clutch performance, consistency over time.

#### 2. Map Influence

- Historical win rate of teams on specific maps.  
- Tactical strategies and economy management on different maps.

#### 3. Team Dynamics & Synergy

- Impact of roster changes and player substitutions.  
- Effectiveness of different team compositions and playstyles.

#### 4. Economic Factors

- Economy rounds (save rounds, force buys) and their impact on match outcomes.  
- Weapon preference and spending efficiency.

### Project Scope

This project will focus on professional CS:GO matches from major tournaments. We will analyze data across multiple tournaments, comparing different teams, player performance, and strategies. The insights gained from this study will not only help in predicting match outcomes but also improve the understanding of esports analytics.

### Expected Outcomes

- Development of a machine learning model with high accuracy in predicting match results.  
- Identification of key performance metrics that influence CS:GO match outcomes.  
- Insights into how map selection, economy, and team dynamics impact professional esports.

### Submitted by:

[Your Name]

### Course:

IST652 - Scripting for Data Analysis