Background

eSports is at the forefront as one of the fastest growing industries, with a growing user base of people either playing online games or watching other gamers stream. There is also greater incentives for players to get better, as eSports becomes more recognised as a sport and a career for people to pursue. This can be observed in the increased investments in this sector, through increased number of tournaments per year, higher prize pools for teams to win and more people pursuing professional careers in their game of choice.

Currently gamers who want to get better at their game of choice have the options to either:

- seek out coaching from more skilled players,
- watch better players game, through their streaming\(^1\) channels,
- or by reviewing demo files (video replays) uploaded to various platforms (e.g YouTube) by professional gamers.

The options above are however limited in their offerings, since coaching has to be done one-on-one. Therefore, this makes it difficult to scale to more users, in addition to the costs associated with paying an individual for personal coaching. Although watching other gamers stream, or reviewing their demo files is free, this option only gives you insight on how a professional gamer plays, but doesn’t really help you improve your gaming.

It is clear from the above observations that some automated recommendation system would solve the above dilemma. This automated solution would solve scalability concerns, diminish costs associated with coaching and allow users to not just know what they are doing wrong, but also provide them with feedback on how to improve.

We will initially develop a product for Counter-Strike: Global Offensive\(^2\). Specifically, it includes a web-based platform where users can upload their game replays, meaning video recordings of the games they play. These are automatically stored for CS:GO in the form of .dem files. These replays can then be analyzed using Machine Learning, to perform classifications on different player roles. We are currently working with the top eSports Gymnasiums in Sweden and Denmark. Therefore, our startup aims to provide talent scouting to professional eSports teams, as well as feedback on how gamers can improve their gaming.

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\(^1\) playing games online, where other participants can view the game in real time, usually through Twitch TV or YouTube  
\(^2\) Online First Person Shooter (FPS) game with a current player base of 14 million
Project Description

The proposed project is to use machine learning to analyse CS:GO data in order to give feedback to users about which areas should be improved and how it should be performed appropriately. With the given data, students could perform classification on what player role a gamer is and who potential complementary team members could be. In other words, matchmaking could be performed on different player combinations that complement each other. This information is particularly valuable for pro eSports teams looking to recruit talented individuals to join their existing teams or for building new teams. The project is an extension of the blockbuster movie Moneyball (2011) applied to eSports.

The project would entail extracting feature data from .dem files using a C# library in addition to a statistics generator developed by Stats Helix on github.

We currently have a lot of video replay files (.dem files) of professional gamers playing. We would then need the student(s) to determine:

1. What are the different player roles?
2. How does a professional gamer play?

From this data the students can determine the different player groupings and determine what characteristics makes a good gamer.

Our hope is that if one of our users would then submit their video replays (.dem file) on our web platform, we could tell them what type of playing role they are and how to improve in order to play like a pro. Essentially we could determine how their playing style differs from other professionals with the corresponding player role.

We believe the problem could be achieved using Naive-Bayes or other classification algorithms. From this classified data we can that additionally perform matchmaking on which players complement each other when forming a team.

Data

The data we can currently extract from .dem files using stats helix statistics generator is given below. We can probably obtain more features from the .dem files, however this is still yet to be determined by the students at IT. If students would like to expand their knowledge further than required a reinforcement loop may be added in order for the algorithm to perform better, however this is not expected in the project. For further details about obtaining features from .dem files, see stats helix github link under “more information”. The data is in the public domain, and for CS:GO in particular there are existing services, like matchmaking platforms, that publicly provide access to these demo (.dem) files. In addition to manually gathering the data from these platforms, we will also encourage players to upload their local demo files onto our database through our web application.
From the .dem files we can obtain the following information about each player at any point in time:

- Name
- SteamID
- Team
- Clantag
- Position
- View-Direction
- HP
- Whether he is alive
- The player’s team (CT / T / Spectator)
- The player's weapons
- Kills
- Deaths
- Assists
- MVPs
- Score
- Money
- Current money
- Current equipment value
- Scores
- Team-names
- The following game-events:
  - Player was attacked (for GOTV\(^3\) demos newer than July 1st, 2015)
  - Exploding / starting / stopping of the following nades:
    - Grenade (position, throwing player)
    - Smoke (position, throwing player, when did it start, when did it stop)
    - Fire (position, throwing player, when did it start, when did it stop)
    - Flash (position, throwing player, flashed players)
  - Weapon fired (who fired, what weapon, position)
  - Player died (weapon, killer, victim, weapon, position)
  - Round started
  - Match start
  - End of Freezetime
  - Bomb-Events

**Recommended Prerequisites**

Scientific areas relevant to the project are thus primarily AI and Machine Learning. It is advisable that students have taken the courses listed below, however equivalent knowledge from self taught material through online courses is just as relevant. These courses are however not exhaustive, but would minimise the students’ initial learning curve.

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\(^3\) a service that offers the ability to have an unlimited number of spectators watching online games based on the Source Engine. GOTV spectators are invisible to players and cannot interact with the running game in any way.
Master's Thesis: Classification and Matchmaking of CS:GO gamers using Supervised Learning

- TDA 231 Algorithms for Machine Learning & Inference
- FFR135 Artificial Neural Networks
- TIN174/DIT410 Artificial Intelligence
- Watch Moneyball on Netflix

More information

Regarding extracting data from .dem files, there are already existing applications. One example that might be helpful is DemolInfo https://github.com/StatsHelix/demoinfo

Who are we?

We are a team of Master’s students in Entrepreneurship and Business Design and have backgrounds in Chemical (Process Control), Mechanical (Product Development) and Industrial (Software) Engineering. We also have a partnership with a top CS:GO player, who will act as our domain expert. We have taken introductory courses in machine learning (TDA 231) and Artificial Intelligence (TIN 174). We are currently working on the startup full time in the Chalmers Ventures Incubator located at Vera Sandbergs Allé 8.

Contact Information:

Karabo Ikaneng (karabo@student.chalmers.se, +46 72 021 4167)
Sten Li (stenl@student.chalmers.se, +46 73 560 5055)

We are always available, please don’t hesitate to get back to us if you require more clarity.