## Theory

## The theoretical part of this work investigates methods and tools to improve \textit{Engagement}, \textit{Education} and \textit{Performance} in race games. Existing racing games focus on maximizing either \textit{Engagement} or the \textit{Educational} effect. A combined approach has not been attempted. In literature, there are various design guidelines for game developers to improve \textit{Engagement}. Two key principles are applicable for racing games: build around one core game mechanic and well-adjusted challenge for the players. Most of the existing research focuses on creating new innovative strategies to improve the game development process. There is a desperate need to measure and compare different approaches. Only little insight is given on how commercial games solve these problems. Most advanced algorithms are kept secret or are patented. Development

## The \textit{Virtual Rival Framework} should be used as \textit{Educational} environment, so it is really important to provide a realistic racing simulation as a foundation. Considering the graphical requirements, multiple players and large data sizes, it becomes clear the framework has to be based on a powerful platform. The game engine Unity has stood the test for all defined requirements. The built-in components have made it easy to model a racing game. The integrated asset store was a valuable source for 3D models and predefined scripts. Unity’s scene system has been proven to be a powerful tool for structuring and integrating user-studies without compromising the game flow. However, it turned out to be difficult to develop and test the application for multiple platforms, especially different browser types.

## Evaluation

The evaluation was based on standardized questionnaires from psychology. The integration and evaluation of the questionnaires worked exceptionally well. The use of python for statistical evaluations turned out to be very beneficial in terms of usability, scalability and customizability. For instance, the questionnaires could be read, statistically processed and visualised with a few simple lines of code. Visualising the data was especially helpful to get a feeling for the data structure and the possible implications on the next processing steps and the final result. The standard psychological questionnaires delivered clear and definite results. An interesting outcome was that winning a close race against Virtual Rivals was more satisfying as traditional ghost cars. The results confirm that automatically difficult adjustment and personalisation are the keys towards more Engagement in racing games.