# THESIS PROJECT PORTFOLIO

**Golf and GameForge: Innovative Analytics for Recommender Systems**

(Technical Report)

**The Woods Effect: The Use of Data Analytics in Golf Training**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

**Samuel Roberts**

Spring, 2022

Department of Engineering Systems and Environment

**TABLE OF CONTENTS**

SOCIOTECHNICAL SYNTHESIS

GOLF AND GAMEFORGE: INNOVATIVE ANALYTICS FOR RECOMMENDER SYSTEMS
with Rose Dennis, Zachary Kay, Rachel Kreitzer, Jerry Lu, Thomas Twomey, and Steven Wasserman
Technical advisor: William Scherer, Department of Engineering Systems and Environment

THE WOODS EFFECT: THE USE OF DATA ANALYTICS IN GOLF TRAINING
STS advisor: Kent Wayland, Department of Engineering and Society

PROSPECTUS
Technical Advisor: William Scherer, Department of Engineering Systems and Environment;
STS advisor: Hannah Rogers, Department of Engineering and Society

The STS thesis and technical project can be centered around a fairly specialized topic: data analytics in golf. Over the last twenty years, there has been a growing interest within the sports world in developing advanced metrics for use in better identifying the best players and where specific individuals/teams could improve. Sports such as the MLB and NBA have openly embraced the sabermetric revolution, unlike golf, which is particularly resistant to change. Historically, the only number that has been important to golfers is the final score; lots of analysts and coaches rely on qualitative factors such as "the eye test" over raw data. However, golfers who embrace advanced analytics could use it as an extra way to get an edge on competitors who may not be as open to this idea.

The STS thesis looks at how PGA Tour professionals may or may not use existing advanced analytics in order to better their games. Since Tiger Woods' entrance into the golf world and subsequent dominance, the ultimate goal for most players has been to replicate his mastery of the sport. In order to do this, most golfers have become focused on getting into great shape in order to hit the ball as far as they can. The thesis uses the technological momentum theory to illustrate that players have become too enthralled with maximizing their driving distance, even as modern statistics like strokes gained have shown that putting is actually the most important aspect for success in the PGA Tour today. A player who spent their time practicing their skill on the green instead of single-mindedly concentrating on weightlifting could get a competitive advantage on the rest of the field on the PGA Tour.

The technical project attempts to come up with new ways to measure and rank the performance of high school and college players of both sexes. The UVA Capstone team partnered with GameForge, a golf analytics firm, in order to get a better understanding of which junior golf players were truly better than the field. During the duration of the project, three

separate features were created: a player recommender system, a high school ranking, and a strengths/weaknesses identifier. The player recommender system uses factors such as academic ranking, geographic region, college size, and team ranking in a model to outline what types of schools a specific high school player should be looking at. The ranking system aggregates results from all high school tournaments and uses head-to-head results to rank players in a system that outperforms the current leading high school golf rankings. The strengths/weaknesses guide uses player tournament scores, as well as user-inputted metrics, to determine what types of holes (par 3, long/short par 4, long/short par 5) as well as what aspect of the game (driving, irons, short game, putting) a player excels at and where they need improvement. Finally, all these systems are rolled up into a dashboard that makes it easy for (often data-illiterate) coaches to quickly analyze and interpret the results for each player.

Both the technical and STS theses detail how analytics could be better integrated into golf as a sport. Between the two papers, we can see how metrics may be used at all competitive levels of golf, from juniors to pros. In this analysis, there is certainly room for improvement. For example, the strokes gained metric referenced in the STS paper cannot be used for high school and college golfers, as it depends upon GPS shot-tracking data collected by the PGA. If a similar, reliable system was introduced to all golfers, we could use that in place of the player skills/gaps method. All in all, though, the author is very pleased with the results found in both papers, and is excited to see how they are used in the future.