Thesis Project Portfolio

The Robotic Foosball Table

(Technical Report)

Public Perceptions of Popular AI and Society

(STS Research Paper)

An Undergraduate Thesis

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Executive Summary

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Introduction

This portfolio contains two projects: the Computer Engineering Capstone Project and STS Research Paper. These two projects are connected through the common thread of computers accomplishing human tasks. While the research paper discusses artificial intelligence (AI) and how it affects society, the Capstone Project, a robotic foosball table, gives a unique perspective on how such technology influences how people approach games. Admittedly, the Capstone Project is largely focused on engineering a system designed for accomplishing a specific task, where the major challenges are all technical in nature. That said, it did give some insight into the other side of intelligent computing: what it is like to design the systems that may be affecting society.

Capstone Project

The robotic foosball table is an autonomous system that operates one side of a foosball table to play against a human opponent. The system consists of a mechanical interface to control the foosball players, a camera and Raspberry Pi to detect the ball and plan a response, and a microcontroller connected to custom-designed printed circuit boards (PCBs) to control the motors and collect sensor data. Each of these subsystems is physically connected to one another such that information regarding the state of the foosball game can be collected, processed, and converted into a desirable response like blocking an opponent shot or scoring a goal. This project is an example of robotic automation of a typically human task. While this application is for entertainment, demand for similar technologies is growing rapidly as costs fall.

STS Research Paper

Until recently, games have been a proving ground for uniquely human intelligence. When artificial intelligence (AI) began to defeat the champions of the most popular games like Checkers, Chess, and Go, it unsurprisingly drew global attention. This project aims to determine how the publicity of such popularized AI systems affects public opinion and policy, by asking the question: how does the publicity of AI systems affect peoples' perception of progress towards personal and societal applications of AI? The key frameworks utilized in this discussion are technological fix, for addressing the role of AI as a band-aid solution for complicated problems, and technological momentum, for understanding the interplay of society and AI over time. Surveys of public opinion, close reading of public policy, and case studies will drive the analysis of this question. This work may uncover a broader awareness of AI and its dangers among the American population, or it may reveal general ignorance of the subtle ways AI is involved in daily life. Potential results are similarly true for public policy, which will demonstrate how slowly or quickly the potential effects of AI have percolated through society. As artificial intelligence continues to encroach on every corner of society, understanding how the public perceives it is crucial for anticipating its impact.

Reflection

The whole point of the STS curriculum is to make engineers stop and think about what they are designing, especially in terms of how it might affect the people they are designing for. While designing the Robotic Foosball Table was a significant effort that took each group member hundreds of hours, working on the STS Research Paper simultaneously encouraged each group member to consider the consequences of what they were designing. At the end of the day the Table was intended for fun and probably had minimal consequences for society, it was still important to consider things like ethical sourcing of components, power consumption, and how

to sustainably dispose of the project once it was completed. Presenting the Robotic Foosball Table at the Capstone Fair also gave some insight into how people interact with such systems in person. Most users probably did not understand the algorithms powering the table's performance, but this did not stop them from enjoying competing with it. Even though the table was also better than most players (in some cases significantly so), people found it enjoyable to lose to such a machine. This could be the subject of its own STS Research Paper and may be worth exploring in the future.