

## **Thesis Project Portfolio**

### **Mountain Directed Energy Wayfinder (D.E.W.)**

(Technical Report)

### **Free Lunch? Spotify and the Cost of “Freemium” Music**

(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

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## Sociotechnical Synthesis

My technical project and STS project both examine the design of recommendation systems and their influence on how we perceive and interact with sensory phenomena. Passive recommendation systems, like astronomy aides, can enhance our perception of the world by highlighting and recontextualizing existing elements, such as stars in the night sky. Active recommendation systems, such as Spotify's algorithms, can directly change our sensory experience by producing new sensations, such as by playing music in a quiet room. In both cases, recommendation systems impact how we interpret the world, as they link stars, songs, or other experiences to abstract groupings like constellations and gender, often reinforcing or rejecting existing cultural perceptions of such groupings. It is therefore prudent to examine recommendation systems that influence *what* we perceive and *how* we interpret the world, and ask *why* they are constructed to do so and *whom* those means serve.

For my technical project, my team is creating a device that locates celestial objects in the night sky. The tripod-mounted device features a microcontroller that uses a servo motor to rotate a laser attached to a gimbal using time and location data from a GNSS module. At startup, a user powers the device using a battery and interacts with an LCD at the device's base to calibrate the laser at the North Star. The device then prompts the user for their selection, rotates the gimbal, and points the laser to guide the user to said celestial body. The device's target market is groups of amateur astronomers, such as boy scout troops or summer camp students. By integrating safety features for limiting user laser exposure, the device helps amateur astronomers to practice locating celestial objects in the night sky and inspires them to further examine the natural world.

For my STS research project, I examine how the music streaming service Spotify has changed our relationship with music. I review literature examining both the technical and social

aspects of Spotify's design from both the University of Virginia library and online sources and interpret my evidence through the ideas of Actor-Network Theory, Weapons of Math Destruction, and Acoustic Resonance. I argue that Spotify's pursuit of constant growth has harmed user experience due to lack of transparency in user data, lack of diversity in algorithmic recommendations, and reinforced presentations of gender and race in the app's user interface. Finally, I discuss how Spotify's design choices reinforce the service's control over listener experience to placate their allies in the music industries and attract further investment.