Thesis Project Portfolio

Personalization in Circadian Rhythm-Based Event Scheduling

(Technical Report)

Treating Depression Behaviorally Using Rhythm-Aware Recommendation Systems

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Many people live their daily lives contrary to the timing of their circadian rhythms, leading to reduced cognitive performance and sleep loss. This capstone project addresses this problem by investigating the feasibility of circadian-based activity scheduling technology for college students. The project includes the development of three circadian-based activity schedules with varying levels of personalization as well as a user study that examines users' responses to following each schedule. Human and social considerations are at the center of this technology, as our biological clocks affect our nerve conduction, body temperature, and muscular blood flow. This rhythm-aware schedule recommendation technology is focused on helping people optimally time their physical and cognitive activities to embrace their fluctuating energy levels, while achieving circadian alignment and its health benefits. In society, rhythm-aware recommendation systems have a wide range of applications, including mental health treatment, personal or commercial productivity enhancement, and mobile health applications for fitness or sleep health. As with any recommendation system, the influence of the system on both the user's wellbeing and behavior must be considered. My STS research focuses directly on these two considerations within the technology's application to mental health treatment, specifically treating depression. I employ two STS frameworks, "Three Rules for Technological Fixes" and technological determinism, to analyze this topic. The three-rule framework put forth by Daniel Sarewitz and Richard Nelson considers the technology's influence on the user's wellbeing by evaluating rhythm-aware recommendation systems' potential for success as a "technological fix" for depression. Then, I consider the technology's influence on the user's behavior through technological determinism and an analysis of system design features. With these two frameworks, I expect to find whether or not depression treatment through rhythm-

aware recommendation systems qualifies as a successful technological fix, while describing the technology's social effect through a deterministic lens.

When considered together, my capstone project and STS research both seek to employ the benefits of circadian alignment through rhythm-aware recommendation systems. My capstone project studies the effects of varying levels of personalization in rhythm-aware recommendation systems. The results can be used to fine-tune this type of system and provide insight regarding humans' tendencies to follow recommended, circadian-aware schedules. My STS research investigates the application of this technology in behavioral mental health treatment and provides a deeper understanding of the technology's potential effects on users and society.