



SECURE for
Student Success

Undergraduate Research Program

Electrical and Computer Engineering Department

Research Duration: Summer 2024 (June – August 2024)

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Title of Project: Optimizing Inter-Satellite Optical Communication System Through the Integration of Turbo Codes

Goals and Objectives of the Project, Expectations and Outcomes

Summary: An Inter-Satellite Optical Communication (ISOC) system refers to the use of an optical communication link between satellites to facilitate data transfer. This system is crucial for satellite constellations, where multiple satellites work in tandem to provide comprehensive coverage and data networking. The ISOC system faces several challenges including potential disruption from interference and noise. Error correction coding is a method used in communication system to detect and correct errors in data transmission. The ISOC system currently utilizes Reed-Solomon error correction method. While Reed-Solomon is effective for burst errors, it is less optimal for other types of noises impact the optical link. Therefore, to enhance the performance of the considered ISOC system, in this project, Turbo codes is proposed. Turbo codes, a forward error correction method, aim to improve the reliability of signal transmission within the optical communication system. It represents a higher-performing error correction method, better suited to counteract the noise potentially interfering with optical communication. In this project, the performance of Reed-Solomon and Turbo codes will be compared under the influence of various types of noise commonly observed in inter-satellite communications using MATLAB. Subsequently, the implementation of this new error correction method will be developed for integration into the ISOC system.

After completing this project, the students will have a clear understanding of how different error correction coding techniques work and their impact on the performance of optical satellite communication systems.