**Comparison Between HOSVD and 3D-DCT for Large-Scale Image Compression and Processing**Andrei Daniel CODREANU

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**Abstract**

In today's digital age, safeguarding valuable information has become a critical challenge. With data security becoming paramount, encryption stands as the pillar for protecting sensitive information. A fundamental requirement for robust encryption is the generation of high-quality random numbers. While pseudo-random number generators (PRNGs) have long been a standard solution, this project focuses on true random number generators (TRNGs) that derive randomness from natural and unpredictable phenomena, offering a higher degree of entropy.

In this project, we aim to explore innovative methodologies for TRNG development using natural phenomena. Building on our initial strategies—leveraging ambient radio signals and NASA's solar imagery—we will next evaluate their scalability and real-world applicability for enhancing encryption systems. To ensure high-quality randomness, we will conduct rigorous analyses, calculating Shannon entropy for each data source to evaluate their effectiveness. The combined data streams will next undergo additional transformations, including multi-layered XOR operations and bit manipulations, before being securely hashed using the SHA3-512 algorithm. These processes amplify entropy and yield cryptographic-quality random outputs.

By introducing resourceful solutions to randomness inspired by natural phenomena, this project aims to contribute to the ongoing exploration of new methodologies for enhancing data security. Our findings emphasize the potential for leveraging innovative sources of entropy to strengthen encryption techniques and protect sensitive information in an increasingly digital world.

**Keywords**: Entropy, TRNG, Data Security, Encryption, NASA Solar Imagery, PyRadio.