

# AST101 Final Project Proposal

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1. Title:

Stellar Encryption: A Secure Communication Method Using Astronomical Data and Hadamard Matrices

2. Project Level and Criteria:

I am planning to submit a Level 3 project. It requires creativity in combining astronomical data and Hadamard matrices for secure communication. It also demonstrates the substantial implementation of concepts beyond the scope of the course, such as cryptography and data security. The project will require approximately 10-15 hours to complete, including implementation, testing, and documentation.

3. Introduction:

This project aims to develop a secure communication method that combines astronomical data and Hadamard matrices for encryption and decryption. The proposed process, called “Stellar Encryption,” takes a secret message and a dictionary containing planet data, converts them into numerical vectors, and combines them into a single vector. This combined vector is then encrypted using a Hadamard matrix and a key. The encrypted vector can be decrypted using the inverse Hadamard matrix and the same key, ultimately recovering the secret message and planet data.

4. Objective:

- a. Implement the Stellar Encryption method using Python.
- b. Demonstrate the encryption and decryption with a sample secret message and planet data.
- c. Evaluate the effectiveness and security of the proposed method.

5. Methodology:

- a. Implement a Python class called “StellarEncryption” containing the following methods:
  - hadamard\_encrypt: Encrypt a data vector using a Hadamard matrix and an encryption key.
  - hadamard\_decrypt: Decrypt an encrypted data vector using a Hadamard matrix and a decryption key.
- b. Implement additional helper functions:
  - text\_to\_vector: Convert a text string into a vector of Unicode code points.
  - vector\_to\_text: Convert a vector of Unicode code points back to a text string.
- c. Use the implemented methods and functions to demonstrate the encryption and decryption with a sample secret message and planet data.

6. Expected Outcomes:

- a. A functional implementation of the Stellar Encryption method in Python.
- b. A demonstration of the encryption and decryption process using a sample secret message and planet data.
- c. An assessment of the effectiveness and security of the proposed method.

7. Submission Format:

The project will be submitted electronically, including Python scripts and a README file. It will be provided to guide the user on how to run the script and understand the code.

8. Highlight:

This project will highlight the use of astronomical data, such as planet mass, radius, etc., in a novel encryption method. The project will engage topics related to astronomy, such as data representation and the properties of celestial objects.

Also, the project will engage my interests in computer science and mathematics, particularly cryptography. It will showcase the application of mathematical concepts and computer programming in developing secure communication methods.