**Synopsis: Encryption and Decryption of texts and images using Genetic Algorithms**

**Objective:**

The main objective of this project is to develop a sense of security while sharing texts and images that might contain sensitive or personal information, thereby assuring privacy protection, integrity, trust building, and protection against other cyber threats.

**Data Preprocessing:**

1. Converting the image to gray scale reduces its complexity by transforming it from a three-channel (RGB) color image to a single-channel image, which simplifies the data and speeds up processing.
2. Flattening the image - transforming the 2D matrix of pixel values into a 1D array, which is necessary for many machine learning algorithms that require a single vector as input.

**Model Architecture:**

1. Individual Representation: Each individual in the population is represented as a list of integers, where each integer corresponds to a pixel value (0-255) in the flattened image.
2. Fitness Evaluation: Calculated using a custom fitness function that compares the individual's image representation to the target image. The algorithm aims to maximize this fitness value.
3. Selection: Tournament selection is used to choose individuals for reproduction.
4. Crossover: Two-point crossover is employed to combine genetic information from two parents.
5. Mutation: Bit-flip mutation is applied with a probability of 0.05 per gene (pixel).
6. Evolution Process: The algorithm uses a simple evolutionary process that iterates through generations, applying selection, crossover, and mutation to evolve the population.

**Encryption and Decryption functions:**

- Encrypted function encrypts the image and text using the best individual as key and returns the encrypted image.

- Decryption function takes the encrypted image, text and best individual as parameters and decrypts them.

**Technical Libraries and Tools:**

- NumPy: To handle multi-dimensional arrays.

- Matplotlib: For data visualization.

- Cv2: To solve computer vision problems.

- Deap: Framework for rapid prototyping and testing of ideas.

**Summary:**

This project enhances data security by optimizing encryption keys for text and images using a Genetic Algorithm. It can be widely used in secure communication, digital watermarking, cryptographic research, steganography, biometric data protection, secure image transmission, and random key generation, providing robust, efficient encryption for various security needs.