Project Report: Steganography Tool for Image/File Hiding

# 1. Introduction

This project presents a Steganography Tool developed in Python that allows users to hide text or files within image files using the Least Significant Bit (LSB) technique. Steganography is a technique for concealing messages or information within other non-secret text or data. This tool provides a user-friendly GUI for encoding and decoding messages into/from image files in formats such as PNG and BMP.

# 2. Objective

The primary objective of this project is to design and implement a software tool that can embed secret messages into images and extract them when needed, ensuring that the data remains invisible to unintended viewers. This technique is especially useful for secure communication and data privacy.

# 3. Tools and Technologies Used

The following tools and technologies were used in this project:  
- Python Programming Language  
- Pillow (PIL) Library for image manipulation  
- Tkinter for developing the graphical user interface  
- Basic binary conversion and bitwise operations

# 4. Working Principle

The tool works by modifying the least significant bit (LSB) of each pixel component (Red, Green, Blue) in the image. Each character in the message is converted to binary (8 bits), and these bits are inserted into the LSBs of the image pixels. A special binary pattern (e.g., 11111110) is added at the end of the message to indicate the termination point during decoding.

# 5. Features

- Convert any text message to binary and hide it inside an image  
- Drag-and-drop or file selection GUI for image and message input  
- Decode messages from previously modified images  
- GUI-based interface for ease of use  
- Support for common image formats such as PNG and BMP

# 6. Application Workflow

1. The user selects an image file through the GUI.  
2. The user enters a secret message in the text box.  
3. Upon clicking 'Encode', the message is converted to binary and embedded into the image.  
4. The new image is saved with the hidden message.  
5. The user can later open this image and click 'Decode' to retrieve the hidden message.

# 7. Use Cases

This tool can be used in various domains where secure communication is essential:  
- Secure messaging and information hiding  
- Watermarking and copyright protection  
- Digital signature and authentication  
- Covert communication in cybersecurity practices

# 8. Conclusion

This Steganography Tool demonstrates a basic but powerful concept of hiding information within digital images. With a simple and intuitive GUI, users can safely encode and decode messages. This project also lays a foundation for more advanced steganographic applications, including file hiding and cryptography-based improvements for enhanced security.