

# Enhanced Image-Based Security: Integrating Cryptography, Steganography and Watermarking

Dr. D. Vijaya Lakshmi<sup>1</sup>, Baireddy Sai Chandhan<sup>2</sup>, Kalvakunta Shriya<sup>3</sup>

<sup>1</sup>Professor & HOD, Mahatma Gandhi Institute of Technology, Hyderabad, India

<sup>2,3</sup>UG Student, Mahatma Gandhi Institute of Technology, Hyderabad, India

**Abstract:** *The rise of digital communication has brought about major security issues when it comes to keeping sensitive data safe and unchanged during transmission. Regular encryption methods do a good job of hiding messages but don't do much to check if the data has been messed with while it's being sent. In the same way, steganography tricks can hide data in pictures, but they often can't stop someone from changing the data without permission. The big problem is coming up with a safe way to communicate that not protects what's in the messages but also lets us know if someone has tampered with them while they're being sent. To tackle these problems, we want to create a strong safe communication system that brings together AES encryption, LSB steganography using images, and fragile watermarking. This system will make sure the encrypted message is hidden in a picture keeping it secret and making it hard for unauthorized people to find. At the same time, the fragile watermark will act as a way to spot tampering allowing us to check if the image has been changed. This multi-layer approach will deal with both keeping things secret and making sure they stay unchanged offering a complete answer for sending data. The communication system we're suggesting will provide an advanced way to make sure sensitive information is exchanged protecting both unauthorized access and tampering.*

**Keywords:** Cryptography, Steganography, Watermarking, AES Encryption, Cipher Block Chaining, Least Significant Bit (LSB) Steganography, Fragile Watermarking, Tamper Detection, Confidentiality, Integrity Verification, Secure Communication, Image-Based Security, Stego Image

