Title

VeilTech – A Steganographic technology implemented using Machine Learning

Objective

The primary objective of VeilTech is to develop a secure communication system that utilises machine learning-based steganography to conceal secret information within digital media, such as images or audio files. The system aims to ensure that the hidden data remains completely invisible to human observers and undetectable by modern steganalysis tools. By combining artificial intelligence with traditional data-hiding techniques, VeilTech seeks to achieve a balance between security, imperceptibility, and data capacity. The project also focuses on maintaining user privacy through local processing and providing a simple, user-friendly interface for practical use.

Plan of Action

Phase 1: Requirement Analysis

- Study different steganography methods (spatial and frequency domain techniques).
- Research ML-based embedding and detection techniques (CNNs, GANs, Autoencoders).
- Identify datasets of images/audio for training and testing.
- Define performance metrics such as PSNR, SSIM, and detection accuracy.

Phase 2: System Design

- Design the architecture, including the input module, encoder-decoder ML model, embedding and extraction modules, and evaluation system.
- Prepare flow diagrams for embedding and extraction processes.
- Plan the user interface (UI) layout for file upload, embedding, and extraction.

Phase 3: Implementation

- Implement preprocessing for both secret and cover data.
- Develop the ML-based encoder-decoder model (e.g., CNN).
- Write embedding and extraction algorithms.
- Integrate local storage for input and output files.
- Develop the UI using Python (Streamlit).

Phase 4: Testing

- Test the system on different types of images and file sizes.
- Evaluate imperceptibility (using PSNR, SSIM) and robustness (against compression and noise).
- Compare performance with traditional LSB and other techniques.
- Conduct security testing against detection tools.

Phase 5: Deployment

- Package the application for local use on desktop or laptop.
- Prepare user documentation and demonstration video.
- Deploy the prototype for presentation and testing purposes.

Phase 6: Conclusion and Future Enhancements

- Summarise performance and security improvements achieved.

- Suggest future extensions such as:
    - Support for video and audio steganography.
    - Integration of encryption before embedding.
    - Lightweight mobile version.

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