



A secure cloud system for maintaining COVID-19 patient's data using image steganography

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ABSTRACT

Background: The COVID-19 pandemic has been life-threatening for many people and as such, a contactless medical system is necessary to prevent the spread of the virus. Smart healthcare systems collect data from patients at one end and process the acquired data at the other end. The cloud is the central point and the communication happens through insecure channels¹. The main concern, in this case, is the violation of privacy and security as the channel is untrusted. Traditional methods do not provide enough hiding capacity, security, and robustness^{2,3}. This work proposes an image steganography method using the deep learning method to hide the patient's medical images inside an innocent cover image in such a way that they are not visible to human eyes which reduces the suspicions of the presence of sensitive data.

Methods: An auto encoder-decoder-based model is proposed with three components: the pre-processing module, the embedding network, and the extraction network. Features from the cover image and the secret images are extracted and fused to reconstruct the stego image. The stego image is then used to extract the ingrained secret image. Figure 1 shows the overall system workflow.

Results: Peak Signal-to-Noise Ratio (PSNR) is the evaluation metrics used. The ImageNet dataset was used for training and testing the proposed model. Figure 2 shows the image results of the proposed method.

Conclusion: During a COVID-19 screening test, private patient data such as mobile number and Qatari identity card are collected, transferred, and stored through untrusted channels. It is of paramount importance to preserve the privacy, security, and confidentiality of the collected patient records. A secure deep learning-based image steganography method is proposed to secure the sensitive data transferred through untrusted channels in a cloud-based system.

Keywords: image steganography, deep learning methods, cloud system, auto encoder-decoder, information hiding

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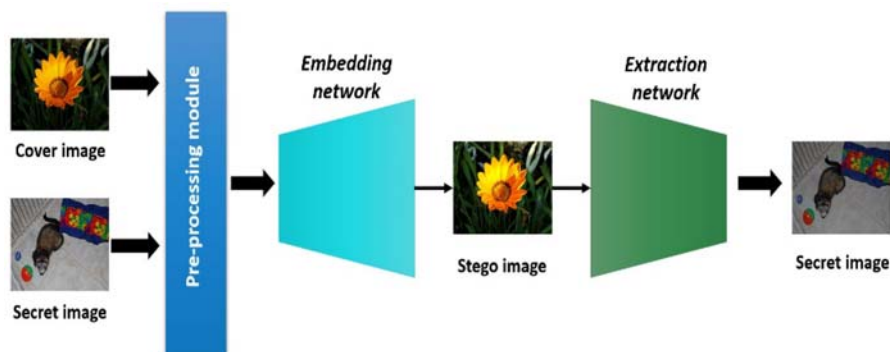


Figure 1. Overall steganography system overview

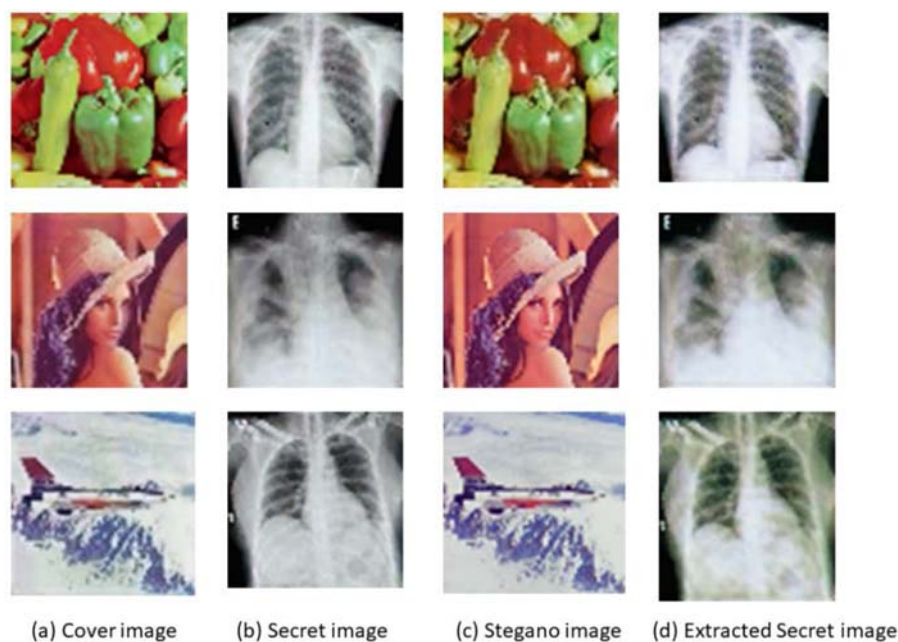


Figure 2. Image results of the proposed method

Ethical approval/IRB statement: The images used for training and testing the model are taken from a public repository. It can be downloaded from <https://tiny-imagenet.herokuapp.com/> and <https://github.com/ieee8023/covid-chestxray-dataset>

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