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Privacy Enhanced and Verifiable for Medical Image Processing on the Cloud

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Abstract: The well-known compressed sensing reconstruction (CSR) uses the sparse characteristics of the signal to obtain discrete samples with the compression (i.e. measurement) algorithm, and then perfectly reconstructs the signal through the reconstruction algorithm. Benefiting from the storage savings, the CSR has been widely used in the field of large-scale image processing. However, the reconstruction process is computationally overloaded for resource-constrained clients. Therefore, designing a cloud-aided CSR algorithm becomes a hot topic. In this paper, we investigate the existing secure CSR algorithms within a cloud environment and propose a new privacy-enhanced and verifiable CSR outsourcing algorithm for online medical image processing services. Compared with previous work, our new design can efficiently achieve more extensive security. Precisely, (1) our algorithm realizes the privacy preservation of the original image, as well as the input/output information of the reconstruction process under the chosenplaintext attack, (2) our design is based on a malicious cloud server model and can verify the correctness of the cloud returned result with a probability of approximating 1, and (3) our algorithm is highly efficient and can make the local client achieve decent computational savings. The main technique of our design is a combination of linear transformation, permutation and restricted random padding which is concise and high efficiency. We analyze the above claims with rigorous theoretical arguments and comprehensive experimental analysis.

Keywords: compressed sensing reconstruction

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