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Signal reconstruction with joint training of sampling operator and decoder

PROBLEM TO SOLVE

The quantity of information originating from sensors to end users and stored on storage media has increased dramatically over the past decades. Various types of sensors are concerned by this problem including acquisition of one– or multi– dimensional signals in the variety of frequency bands. Applications generating particularly high volumes of signal data include hyperspectral imaging, medical (e.g., nuclear magnetic resonance) imaging or astronomic (e.g., square kilometer arrays) imaging. While different solutions exist to reduce the quantity of data streaming for such signals, none of them is fully satisfactory.

SOLUTION

The proposed technology represents a machine learning based imaging method with joint optimization of sampling and reconstruction operators that reduces the amount of acquired data by several orders of magnitude in a controlled manner, yet preserving the quality of reconstruction.

TECHNICAL FEATURES

The proposed technology offers superior quality with a reduced number of samples. It consists in reconstructing one– or multi– dimensional signals from a finite number of sparse samples with a prior learned from an external database or learned on-fly from the signal to be reconstructed. In a similar way, the proposed technology offers the joint optimization of the sampling operators and the classifier. Compared to the state-of-the-art a key advantage consists in the joint training of the sampling operator and of the decoder, providing a universal solution for imaging problems, with significantly reduced data straming and enhanced quality of reconstruction.

REFERENCES

Ref. invention: 1093-A1039 (M. Ferrari, O. Taran, T. Holotyak, K. Egiazarian, and S. Voloshynovskiy)

Ref. patent application: EP 18191494.6 (filed on 29 August 2018)

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Keywords: Compressive sensing, learnable compressive sampling, support learning, reconstruction, deep priors.

Ref. publications: M. Ferrari, O. Taran, T. Holotyak, K. Egiazarian, and S. Voloshynovskiy, "Injecting Image Priors into Learnable Compressive Subsampling," in Proc. 26th European Signal Processing Conference (EUSIPCO), Rome, Italy, 2018.