Snapshot Compressive Sensing Imaging in Video

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Introduction

Capturing high-dimensional data has long been viewed as a challenge in signal processing. In 2021, Xin Yuan et al.(2021) introduced Snapshot compressive imaging (SCI) uses a 2D detector to capture HD (≥3D) data in a snapshot measurement. We want to apply SCI to video compressive sensing: various coding patterns modulate multiple high-speed frames. The integration of these modulated frames will be captured by the low-speed detector. Therefore these captured measurement frames incorporate the information of all the coded frames.

Objective

In this project, we will implement reconstruction algorithms to recover the high-speed video.

Plan

Two reconstruction algorithms are proposed. (a) Iteration-based reconstruction algorithm DeSCI (b)CNN-based algorithm. Specifically, we want to discover how the varying image sizes and compression ratios affect both algorithms and tune the hyper-parameters for the CNN-based algorithm in terms of runtime, PSNR and SSIM.

Dataset

https://github.com/mq0829/DL-CACTI/tree/master/dataset

Source Code

https://github.com/mq0829/DL-CACTI

Reference

1. X. Yuan, D. J. Brady and A. K. Katsaggelos, "Snapshot Compressive Imaging: Theory, Algorithms, and Applications," in IEEE Signal Processing Magazine, vol. 38, no. 2, pp. 65-88, March 2021, doi: 10.1109/MSP.2020.3023869.
2. M. Qiao, Z. Meng, J. Ma, and X. Yuan, “Deep learning for video compressive sensing” in APL Photon. 5, 030801, 2020, doi: 10.1063/1.5140721