ABOUT THE PROJECT

Key words: compressive sensing, motion compensation, deep neural network

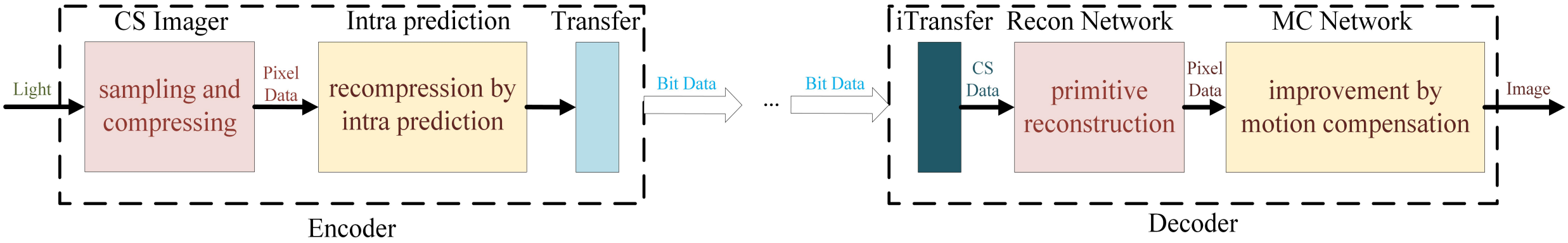
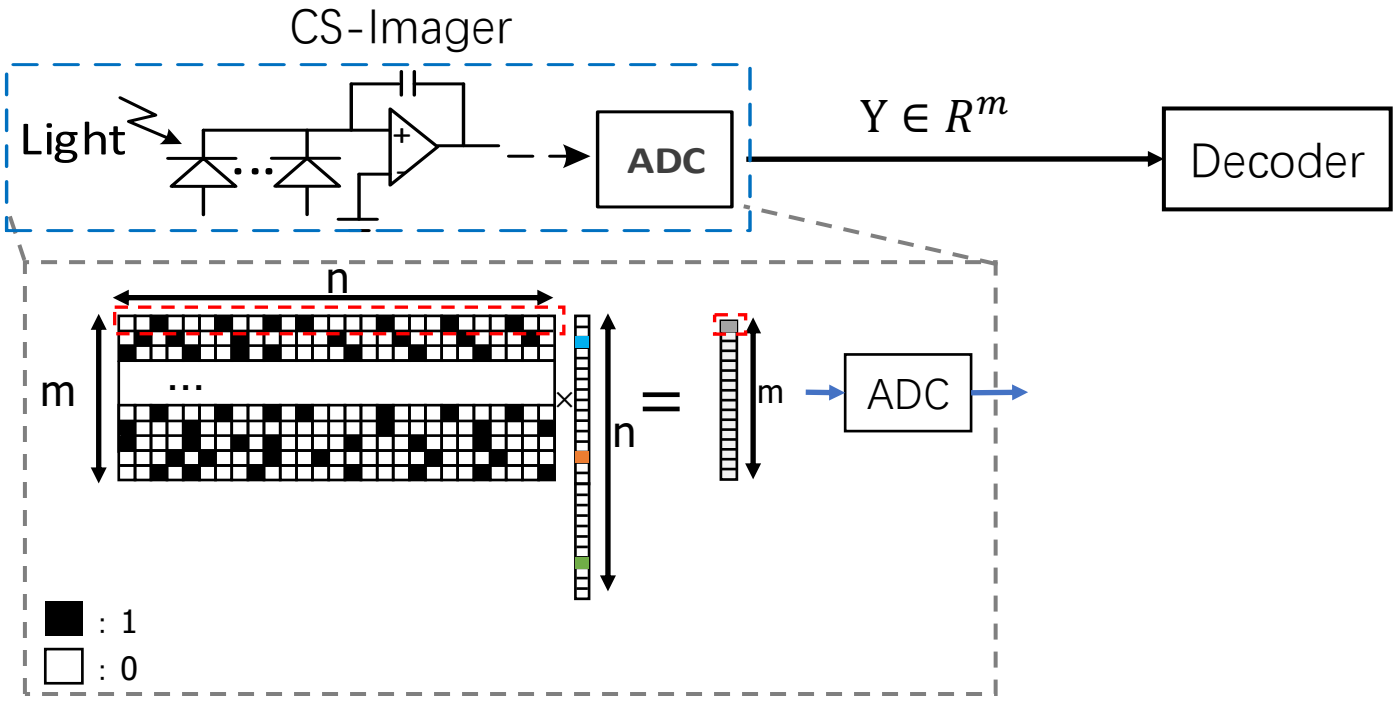


Diagram of the CS encoder-decoder system

Publication

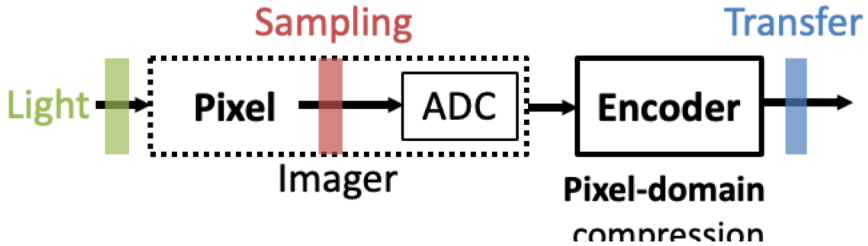
- **Bowen Huang**, Jinjia Zhou, Xiao Yan, Ming’ e Jing, Rentao Wan and Yibo Fan. CS-MCNet: A Video Compressive Sensing Reconstruction Network with Interpretable Motion Compensation. Asian Conference on Computer Vision(ACCV), November 2020.

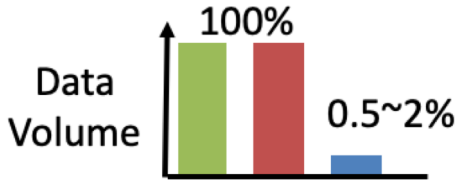
WHAT IS COMPRESSIVE SENSING



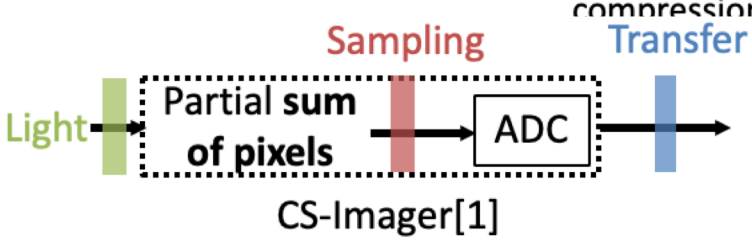
$$Y = AX$$

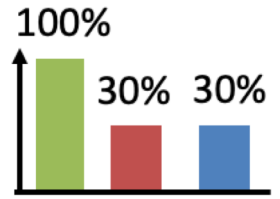
- Traditional image acquisition:Sampling→ Compression (JPEG, HEVC) → Transfer



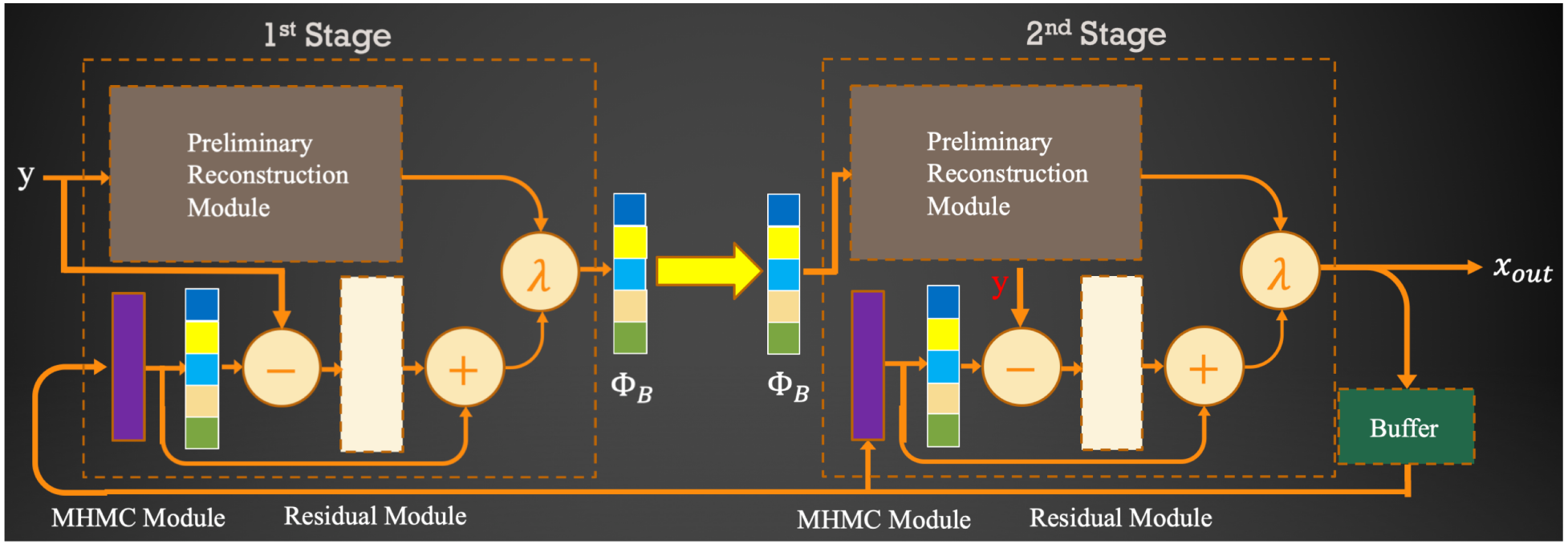


- Compressive Sensing:Sampling/Compression → Transfer



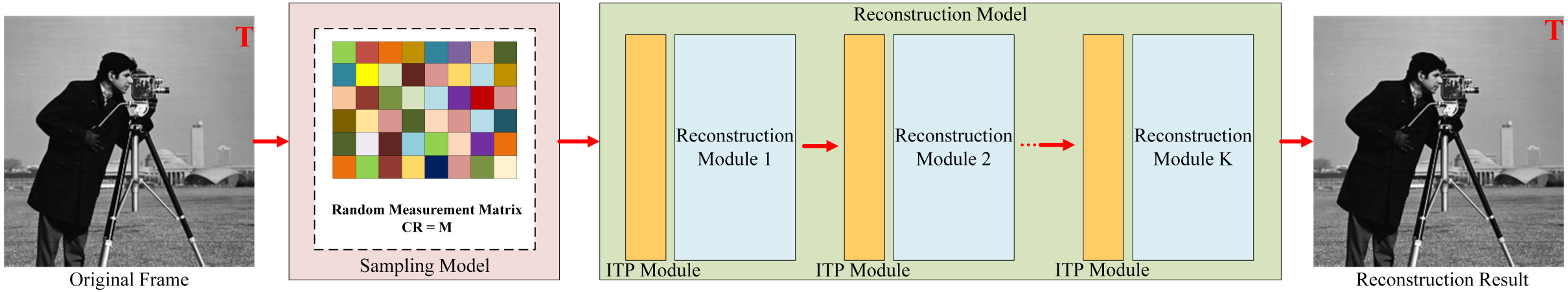


DETAIL-DECODER



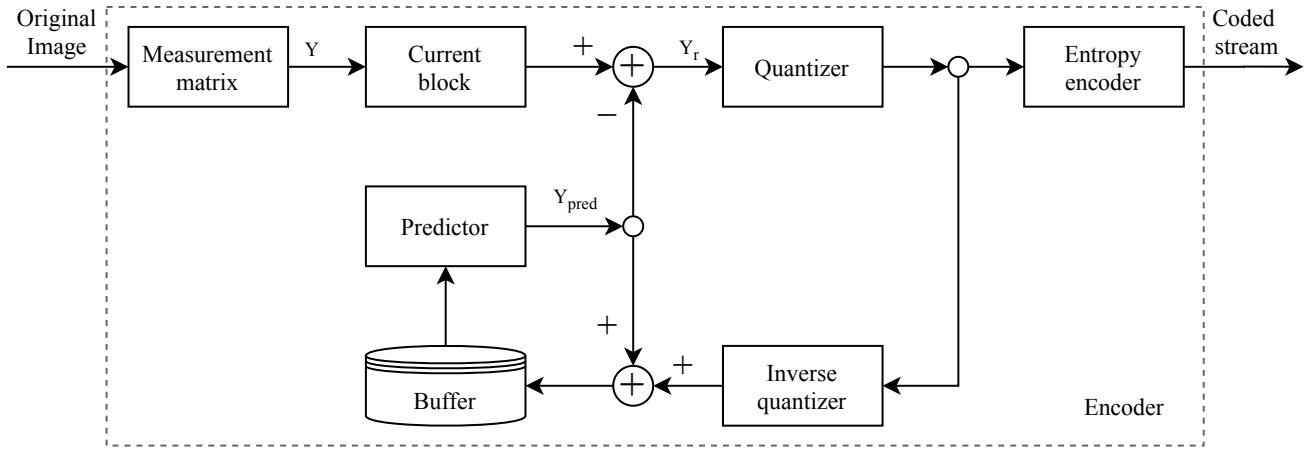
- Using neural network structures and video codec inter-frame prediction techniques to improve the speed and quality of video compressive sensing(CS) signal reconstruction.
- Using Algorithm Unrolling to design a neural network structure with interpretable features. The reconstruction quality is enhanced by a multi-hypothesis motion compensation(MHMC) algorithm.
- A test model CS-MCNet is built based on Pytorch, and the MHMC module is implemented through a fully connected layer. Compared with traditional methods, this method has 2-3 orders of magnitude improvement in reconstruction speed and 20% improvement in reconstruction quality(PSNR).

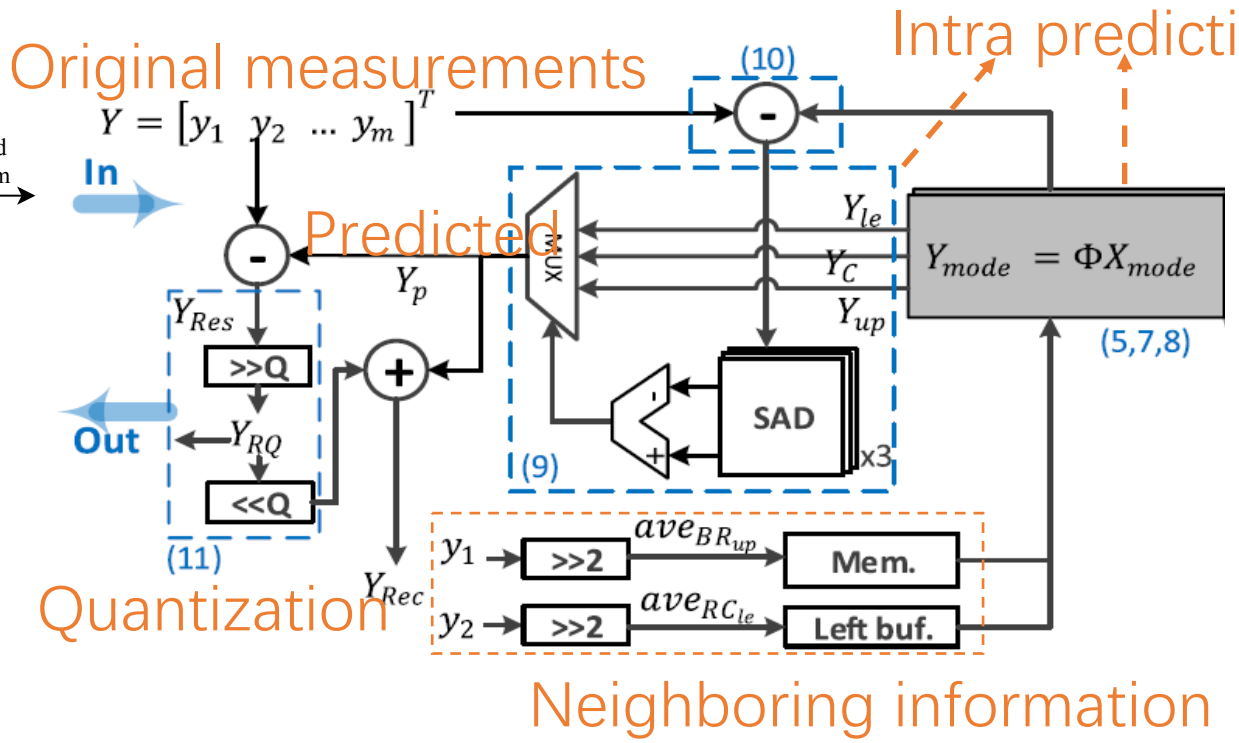
DETAIL-DECODER



- A novel sampling and interpolation strategy is proposed to solve the task of multi-compression ratio CS.
- The signal interception and interpolation strategies are designed so that the CS sampling and reconstruction of video signals under different compression ratios can be accomplished by one neural network with fixed structure parameters.
- A test model CS-MCNet-ITP is build based on Pytorch, which is inherited from CS-MCNet. High quality signal interpolation is achieved by deconvolution. Experimentally, it is proved that the method can save 5 times the training and storage overhead with about 10% reconstruction quality loss.

DETAIL-ENCODER





- Assist team members in exploring the algorithm which includes Intra-prediction for secondary compression. The algorithm can also help control the bit rate.
- Based on the CS sampling rules, the sensing matrix and strategy are designed based on the similarity of adjacent pixels to improve the rate distortion optimization performance.
- Collaborate with team members on hardware architecture design of the encoder.