Supplementary Material: Jointly Learning Band Selection and Filter Array Design for Hyperspectral Imaging

Ke Li[1] Dengxin Dai[2] Luc Van Gool[1,3]
[1]CVL, ETH Zurich, [2] MPI for Informatics, [3]PSI, KU Leuven
{ke.li,vangool}@vision.ee.ethz.ch, ddai@mpi-inf.mpg.de

1. Network Architectures

As discussed in our main paper, our sparse demosaicing network consists of a sequence of four Sparse Residual Blocks. The architecture of the Sparse Residual Block is shown in Fig. 1, which consists of three branches with different depth. The residual design helps pass through information from the input to the output.

The network architecture of our spectral recovery network is shown in Fig. 2. The design is inspired by the recent work SSPN [3] which was developed to learn interactions between spectral bands of hyperspectral images.

2. MS Filters

We provide the detailed data of the 12 filters that are used to generate the input image, *i.e*. the measurement image X, for our method. Please see the data in Fig. 3.

3. Visual Results

We show more visual results of our method and comparison methods in Fig. 4. The visual results again show that our method outperforms other methods and generate better results in terms of both spatial resolution and spectral (color) accuracy. As discussed in the main paper, this is mainly due to the flexibility of our joint optimization method that can strike a good balance between spatial and spectral resolution for the input spectral bands.

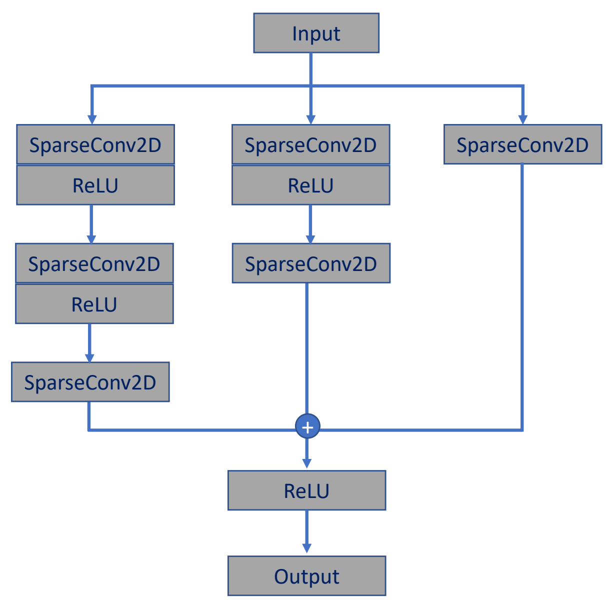


Figure 1: The architecture of our Sparse Residual Block, where each SparseConv2D is a Minkowski 2D Convolution [1]

References

[1] Christopher Choy, JunYoung Gwak, and Silvio Savarese. 4d spatio-temporal convnets: Minkowski convolutional neural networks. In *IEEE Conference on Computer Vision and Pattern Recognition*, pages 3075–3084, 2019.

[2] Bernardo Henz, Eduardo S. L. Gastal, and Manuel M. Oliveira. Deep joint design of color filter arrays and demosaicing. *Computer Graphics Forum*, 37(2):389–399, 2018.

[3] J. Jiang, H. Sun, X. Liu, and J. Ma. Learning spatial-spectral prior for super-resolution of hyperspectral imagery. *IEEE Transactions on Computational Imaging*, 6:1082–1096, 2020.

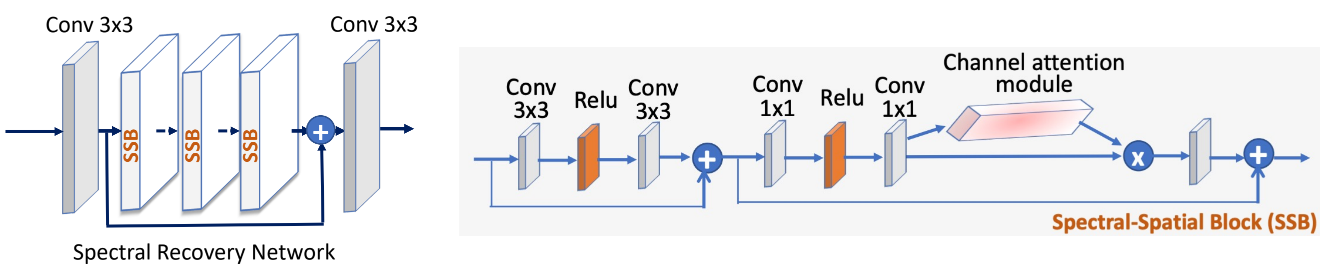
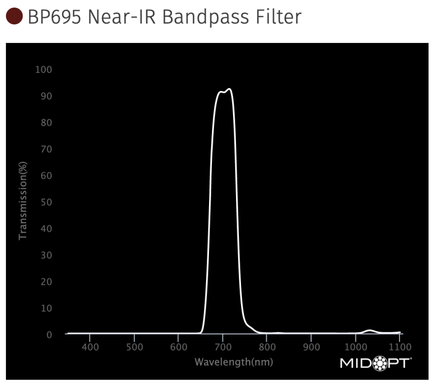
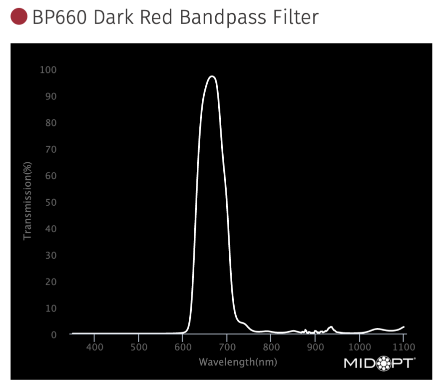


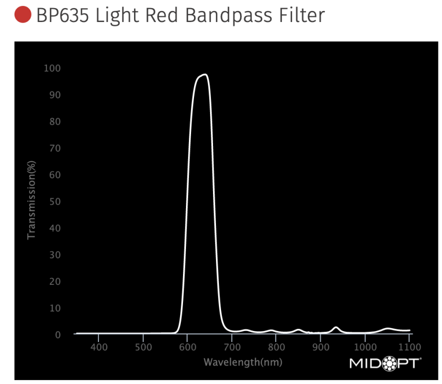
Figure 2: The architecture of our spectral recovery network.



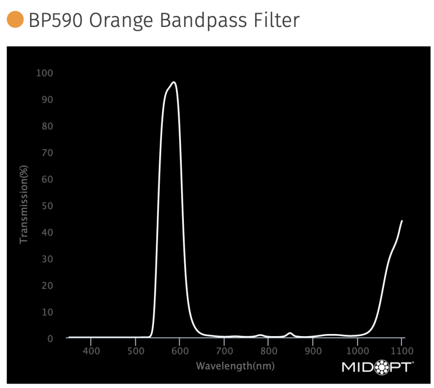
(a) Near-IR Bandpass Filter



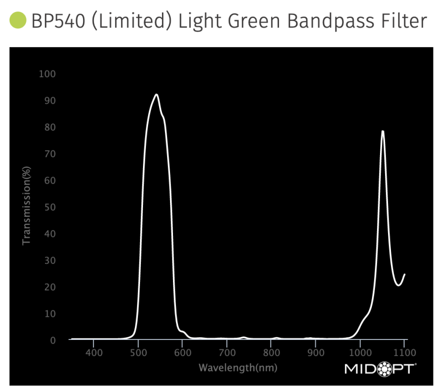
(b) Dark Red Bandpass Filter



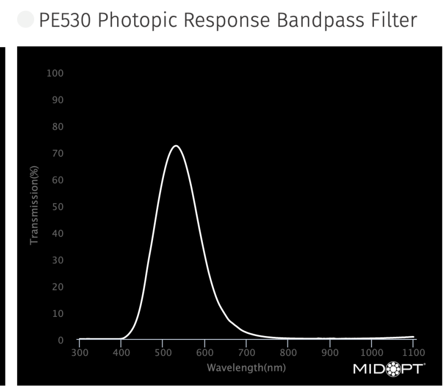
(c) Light Red Bandpass Filter



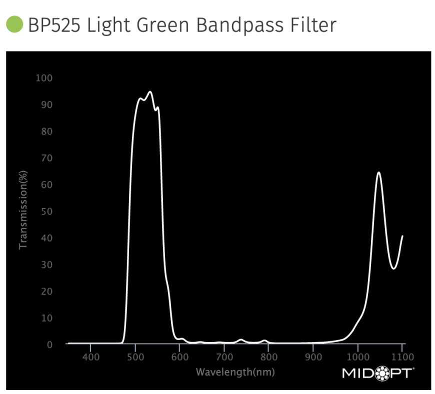
(d) Orange Bandpass Filter



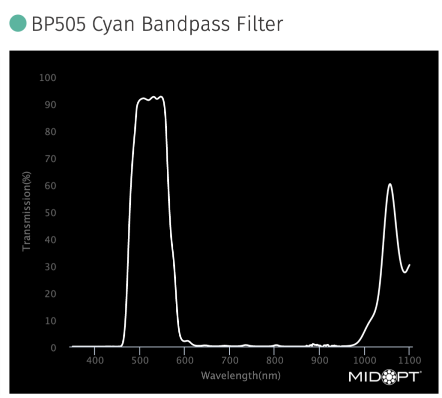
(e) Green Bandpass Filter



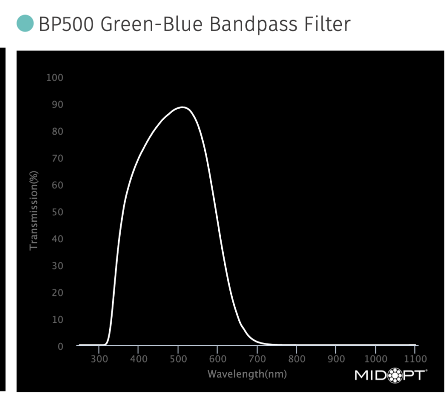
(f) Photopic Response Bandpass Filter



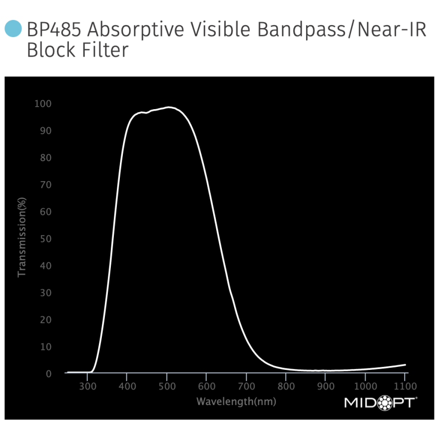
(g) Light Green Bandpass Filter



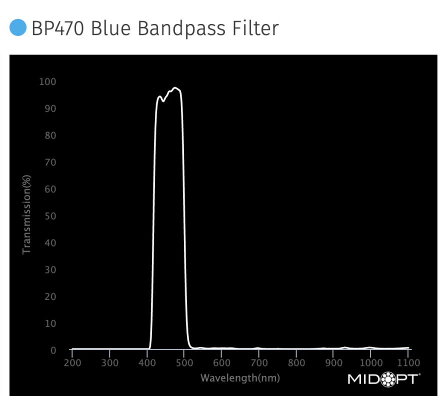
(h) Cyan Bandpass Filter



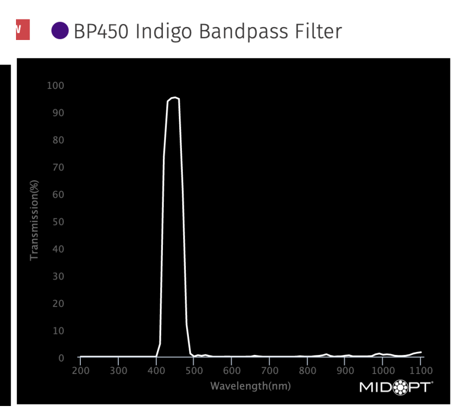
(i) Green-Blue Bandpass Filter



(j) Absorptive Visible Bandpass Filter



(k) Blue Bandpass Filter



(l) Indigo Bandpass Filter

Figure 3: The responses functions of the 12 MS filters that are used by our method.