Benchmarking Multi-Image Super-Resolution of Satellite Images

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Enhancing spatial resolution of images is an important and challenging research topic in the field of computer vision. Algorithms used for this task, referred to as super-resolution (SR) reconstruction, have seen a great improvement in recent years, attributed to the use of convolutional neural networks that are extremely effective in learning the relation between low and high resolution. SR may be particularly beneficial in remote sensing, where the spatial resolution of acquired images can be easily insufficient to tackle specific Earth observation tasks. Depending on the available satellite imagery data, there are multiple possible approaches to SR, spanning across single image super-resolution (SISR), multi-image super-resolution (MISR), multispectral high resolution / hyperspectral low resolution images fusion and pansharpening. In our work, we focus mainly on the MISR approach, in which multiple satellite images acquired at different revisits are fused to produce a single image of higher resolution. However, one of the main obstacles when developing new SR models is the scarcity of training and benchmark datasets, and the difficulty of assessing the SR outcome. In this talk, we present different approaches to evaluating the SR algorithms, and we discuss two real-life benchmark datasets used for this purpose, namely PROBA-V dataset and our MuS2 dataset composed of Sentinel-2 images coupled with their high-resolution counterparts acquired by the WorldView-2 satellite. Furthermore, we outline the challenges concerned with unbiased and objective validation of SR algorithms relying on real-life image data.