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A statistical approach to simulate hyperspectral information based on multispectral sensors

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Nowadays, hyperspectral remote sensing is used for a wide range of applications, from mining and geology to ecology and more generally environmental science. Even if the use of hyperspectral imaging is clearly identified, the availability of the hyperspectral image at high resolution is limited.
Here we use multiple-point statistics to overcome this limitation and convert multispectral images to hyperspectral images based on spatial patterns learned on a training dataset. The approach uses for training a pair of collocated hyper/multi-spectral training images, and produces hyperspectral bands corresponding to the target multispectral image by pattern matching between the target and the training image. The main advantages of this approach are the generation of a posteriori hyperspectral information, for example on archive imagery, and the possibility to bypass expensive hyperspectral sensors. The underlying geostatistical approach provides an uncertainty quantification that can be propagated to further uses of the generated hyperspectral data.