Satellite Image Super-Resolution Using Generative Adversarial Network

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With the recent flourishing development of satellite imaging technology, the spatial resolution of images is getting higher and higher. However, the Ground Sample Distance (GSD) may be decreased due to some limitations, such as large off-nadir angle and high percentage of cloud coverage. For the image acquisition, the very high-resolution satellites have a revisit period of up to a few days. On the other hand, certain microsatellite constellations can capture the same locations multiple times within a single day, albeit with relatively low spatial resolution of the images. In some applications, certain users require the ability to identify objects in greater detail by focusing on specific features and continuously monitoring the targets. In other words, they need to acquire numerous high-resolution images within short timeframes. Due to the aforementioned limitations and budget constraints, meeting the requirement is extremely challenging. To address this issue, this study aims to utilize Super-Resolution Generative Adversarial Network (SRGAN) machine learning algorithm to enhance the spatial resolution of both very-high resolution and medium-resolution images. Consequently, users may have a higher chance to the acquire sharper images, enabling them to fulfill their missions more effectively. The experimental results indicate that visual improvement in the spatial resolution of the images can be achieved effectively. However, there is an issue of color shift observed in the Super-Resolution images processed by SRGAN, indicating the need for future efforts to resolve this challenge.

Keywords: Super resolution; Image Enhancement; SRGAN; Deep Learning; Convolution neural network