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Sentinel-2 satellites produce multi-spectral optical images, including four bands with a high spatial resolution. Thanks to their open data access policy, these images have become an essential resource for an extensive variety of uses. Sentinel-2 is renowned for its cost-free access, extensive spatial coverage, and high temporal revisit frequency, generating multi-spectral images with 13 bands at resolutions of 10, 20, and 60 m/pixel. Nonetheless, the growing need for high-resolution images has highlighted the significance of super-resolution technology (SR), which improves spatial detail through enhanced sensor precision and density. While Google Earth offers high-resolution images from various sources, obtaining such high-resolution spatial imagery (VHSR), typically less than 1 m, directly from satellite providers can be prohibitively expensive for multi-temporal analysis in large and extensive areas.

To make the most of the free Sentinel-2 images, deep learning techniques are a good solution for improving single images. To harness the freely available Sentinel-2 imagery, deep learning techniques have emerged as a viable solution for super-resolution of a single image tasks, enhancing Low-resolution images (LR) are enhanced
by retrieving fine-grained high-frequency details resulting in high-resolution (HR) images enhanced through super-resolution techniques. In this research, we propose an enhancement of single-image resolution model derived from a Generative Adversarial Network, commonly abbreviated as GAN.

We implemented and trained a model, named GS-SRGAN (Google Sentinel - SRGAN), built on the foundation of the Super-Resolution GAN model (SRGAN), using pairs of Google Earth and Sentinel-2 images for generating super-resolved outputs of the RGB bands from the multispectral Sentinel-2 data using a 4x scaling factor. The results from our GS-SRGAN model surpass those of current best in class models when evaluated using standard metrics such as SSIM and PSNR, enabling the super-resolved Sentinel-2 imagery for use in studies that demand very high spatial resolution.

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