Generative Neural Networks for Ecosystem Simulation

Abstract

Climate change is one of the most important problems humankind has ever faced. Remote sensing data collected can be used to monitor changes in the climate and the effect it has on the ecosystem. Insufficient tools exist to process and analyze this vast amount of data. The aim of this project is to develop a system that can simulate changes in the ecosystem using the remote sensing data. Generative adversarial networks (GAN) have seen a rapid development in image generation and image translation over the past few years. This type of model has been used before to simulate ecosystem changes, for post-flood scenarios and by using environmental variables to generate realistic images, but these models either are only able to simulate one ecosystem change (flooding) or they do not use contextual information that lie in satellite images. We have created a deep learning model which uses state of the art loss functions, network architecture, and by training the model on the sentinel-2 dataset we demonstrate that it learns to generate realistic changes in a satellite image, using multiple types of changes. Furthermore it uses contextual information and is able to convincingly preserve objects through these changes and realistically simulate changes in the ecosystem.