Trees outside forests in global drylands

TOFDRY
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Project description

Uncovering the economic and ecological importance of non-forest trees

Non-forest trees have been largely overlooked by researchers. In fact, little is known about their density and size, even though they play a crucial role in biodiversity and provide a large variety of ecosystem services. The EU-funded TOFDRY project will focus on trees in global drylands, aiming to shed light on how human interventions and climate change impact dryland trees as well as how these trees can help to mitigate degradation, climate change and poverty. To find the answers, the project will study the trees on an individual basis, recording their coverage but also their density, crown size, key ecological services and socio-environmental determinants. Satellite imagery and extensive field data will be used together with deep learning techniques to identify objects within imagery.

Objective

Drylands cover approximately 65 million km² of the Earth’s land surface but their tree and shrub cover is a major unknown in terrestrial research. This is because a large proportion of dryland trees grow isolated without canopy closure and most scientific and non-scientific interest is devoted to forests, while the density and size of trees outside of forests is not well documented. However, these non-forest trees play a crucial role for biodiversity and provide ecosystem services such as carbon storage, food resources, livelihoods and shelter for humans and animals. The limited attention devoted to the quantification of dryland trees leads to an underrepresentation of non-forest trees in development strategies and climate\vegetation models, and the economic and ecological importance of non-forest trees is largely unknown at large scale.

Through this project I will work towards a wall-to-wall identification of trees in global drylands, and study their ecological services and socio-environmental determinants. The breakthrough is that trees are not assessed as canopy fraction of an area, but as individuals, allowing to identify not only their coverage but also their density, crown size, and key ecological services. I will apply a new generation of satellite imagery at sub-meter resolution and extensive field data in conjunction with fully convolutional neural networks, a deep learning technique being able to identify objects within imagery at an unprecedented accuracy. In doing so, I will lay the groundwork for new insights into the contribution of human agency and climate change to the distribution of dryland trees and their role in mitigating degradation, climate change and poverty.