

Flower Mapping in Grasslands with Drones and Deep Learning

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Abstract

Manual assessment of flower abundance of different flowering plant species in grasslands is a time consuming process. We present an automated approach to determine the flower abundance in grasslands from drone images using a deep learning (Faster R-CNN) object detection approach, which is trained and evaluated on data of five flights and two sites. Our deep learning network is able to identify and classify individual flowers. The novel method allows generating spatially explicit maps of flower abundance that meets or exceeds the accuracy of the manually counted extrapolation method and is less labor intensive. The results are very good for some types of flowers with precision and recall being close to or higher than 90%. Other flowers are detected poorly due to reasons such as lack of enough training data, appearance changes due to phenology or flowers being too small to be reliably distinguishable on the aerial images. The method is able to give precise estimates of the abundance of many flowering plant species. The collection of more training data will allow better predictions in the future for the flowers that are not well predicted yet. The developed pipeline can be applied to any sort of aerial object detection problems.

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