Thesis title : A Comprehensive Biometric Approach for Taxonomic Identification of Plant Species of Western Ghats

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Abstract:

Diversity is a remarkable feature of organic species. In spite their differences the organisms are grouped into taxa. The assignment of an unknown living thing to a taxon is called identification. Knowledge of the species is crucial for conservation of the biodiversity of a region. The world has inherited a very large number of plant species. Current estimates of flowering plant species (angiosperms) range between 220,000. Plant identification is essential for ecological monitoring and thereby especially for biodiversity conservation. The conventional manual techniques used to identify plants is a cumbersome, complex and time-consuming process and it requires the skills of an experienced botanist to identify rare and endangered species of plants. It can be a huge hurdle for novices or beginners who would want to acquire species knowledge, which is hard to overcome. The declining and partly non-existent taxonomic knowledge within the general public has been termed “taxonomic crisis”.

The primary goal of this research is to automate plant identification and classification by utilising the leaf as a unit of organisation. Additionally, the research focused on developing a novel dataset, the western ghats leaf dataset. Plant leaves come in a variety of forms, both similar and dissimilar between and within species. As a result, developing a common strategy capable of classifying a wide variety of leaf forms without prior classification is rather a difficult undertaking, and the inadequacy of the methods provided in the literature is reflected in their low recall rates.

We collected the requisite photos of Western Ghats leaves for the construction of a standard dataset during our research from the Pilikula biodiversity reserve, the data has undergone rigorous pre-processing for deem it suitable for classification. Using various data augmentation techniques, increased the dataset from 950 to 121000 images. Extracted features from a particular leaf sample using a variety of feature extraction approaches, which contributed significantly in selecting the appropriate features for classification. After denoising the images, they were subjected to a variety of machine learning techniques to get varying degrees of accuracy. We have constructed and developed innovative deep learning models LeafNet-1, LeafNet-2 and LeafNet-3 for identification purposes. The models have achieved accuracies ranging from for these models. in the next stage we have also done a comparative study to assess the performance of our novel models to check their performance analysis.