Herbarium 2021
Half-Earth Challenge – FGVC8

FGVC competition hosted as part of the FGVC8 workshop at CVPR 2021

Presented by: Ricardo B. Sousa (up201503004)

FEUP, PDEEC, Computer Vision, 2020/2021

OUTLINE

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- Related Work
- Dataset
- ResNet
- Data Augmentation
- Experimental Results
- Conclusions & Future Work

Introduction: Context

- Approximately 3,000 herbaria in the world
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Introduction: Motivation

- Approximately 3,000 herbaria in the world
- Herbaria represent massive repositories of plant diversity data

- The Herbarium 2021: Half-Earth Challenge as a image classification competition
- Dataset with approximately 65,000
- DCNN have become the state-of-the-art for image classification

Introduction: Goals

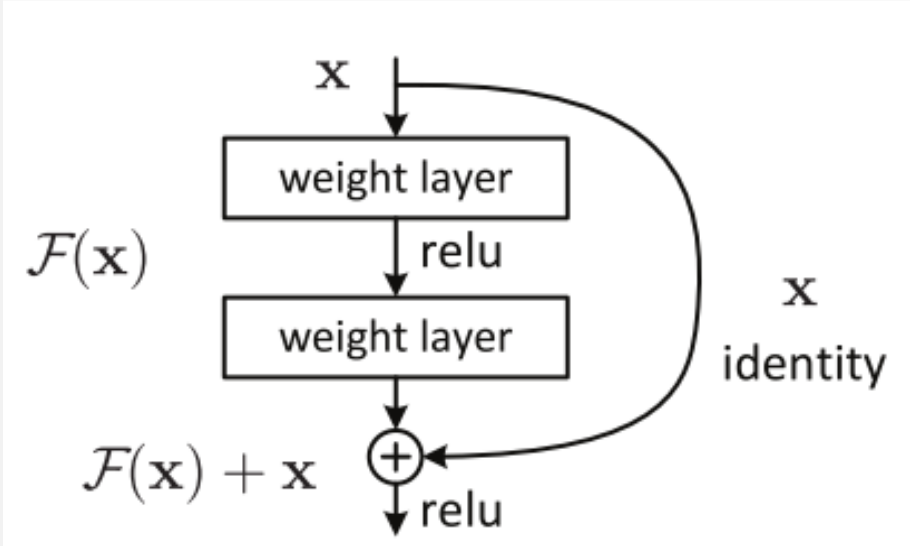
- Image classification of plant species of the Herbarium 2021 dataset
- Influence of data augmentation on the test results

Dataset: Herbarium 2021

- Data provided by several herbaria
- COCO format
- Includes region and supercategory information
- 2,500,779 images
  - ~80%/20% split for training/test
  - 64,500 species
  - Min. 3 images/species
  - Min. 1 image in training and test
  - Test set: max. 10 images/species

ResNet

- Identity shortcut connections
- Deeper networks while avoiding degradation problem
- Available in PyTorch:
  - ResNet-18, ResNet-34, ResNet-50, ResNet-101, ResNet-152



Data Augmentation

- Dataset provided by several herbaria and different people
- Different positions or orientations for the plant species
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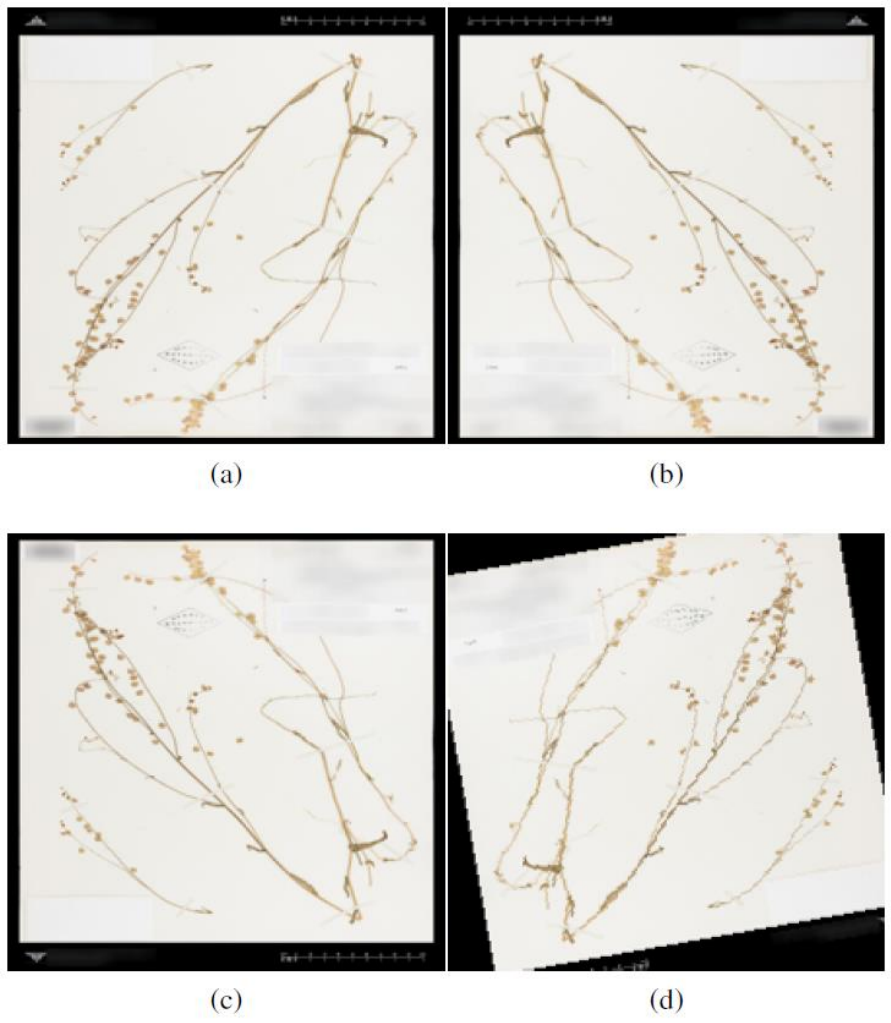
Data augmentation with geometric transformations

1. Horizontal flip (p=0.25)
2. Vertical flip (p=0.25)
3. Rotation up to 10º (p=0.05)

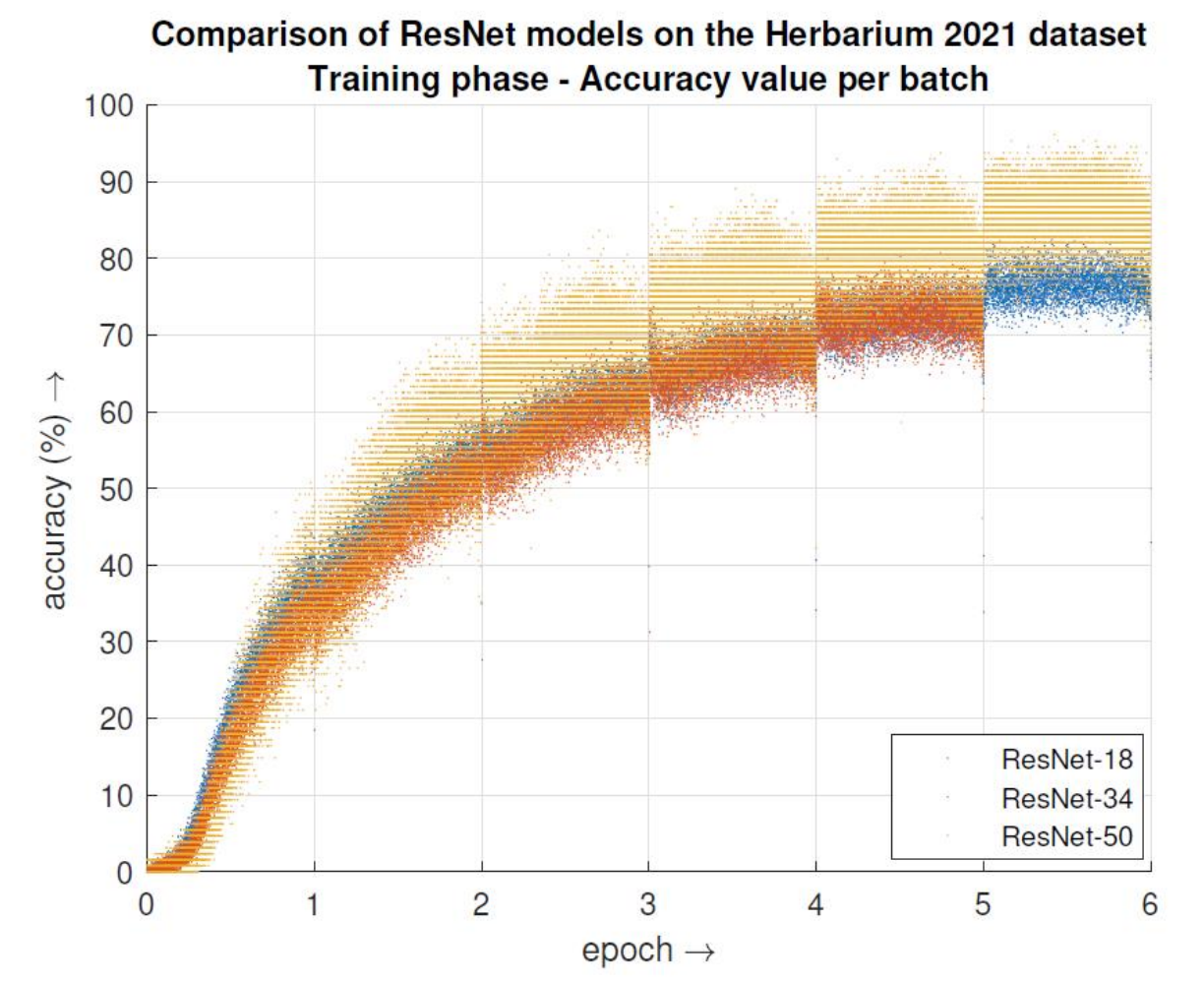
Data Augmentation

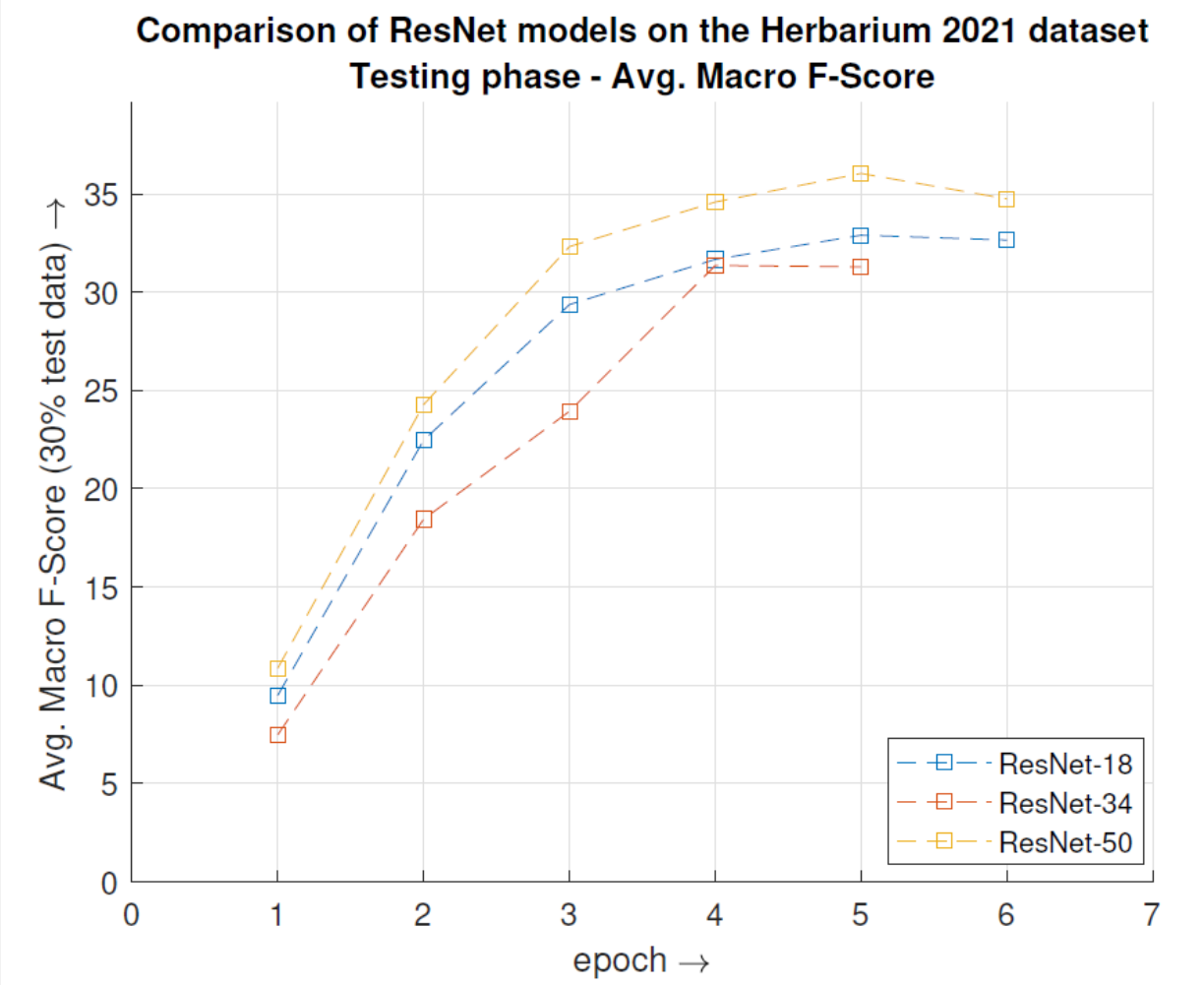


Experimental Results: Training Phase

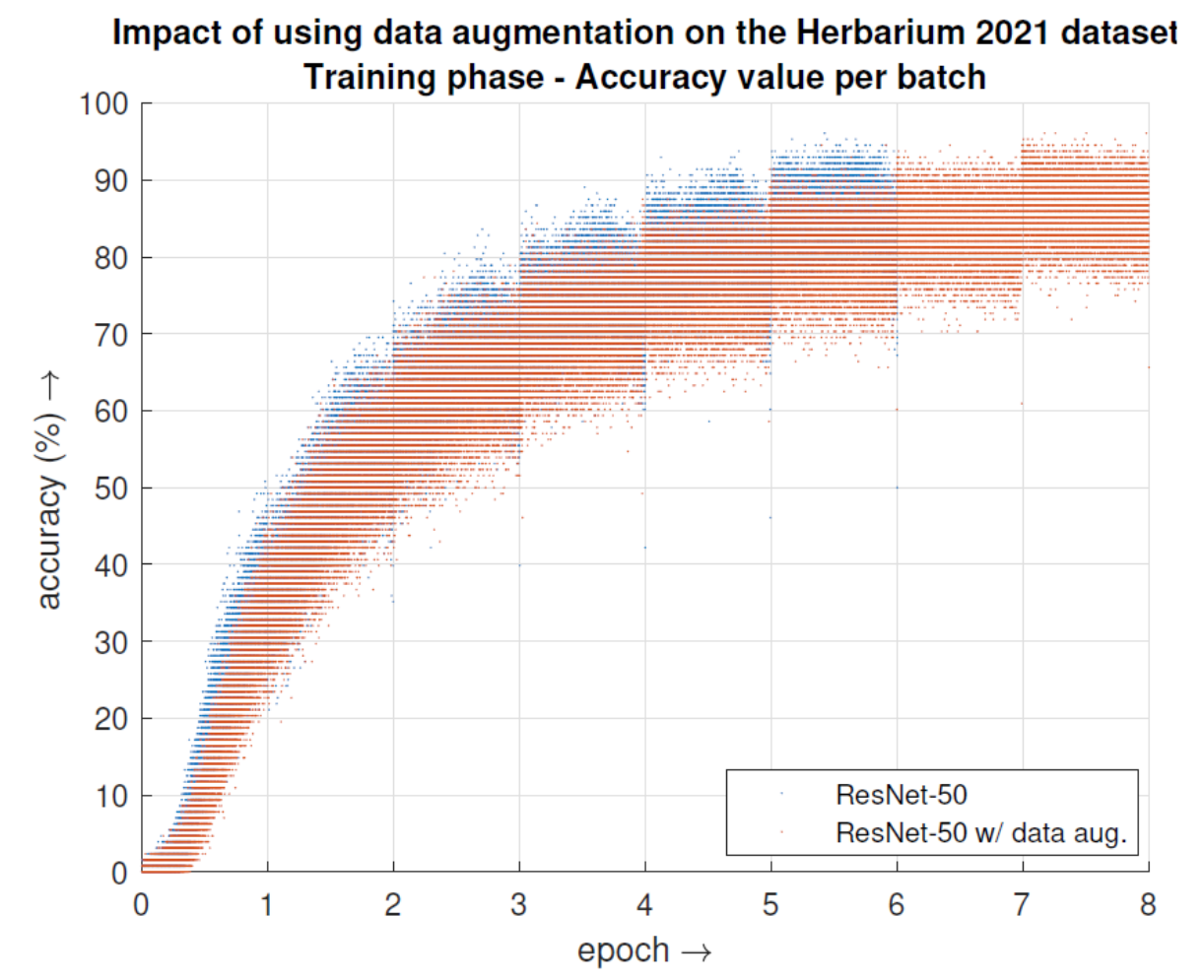
- Kaggle notebooks
- Virtual Machine with:
  - Intel Xeon CPU @ 2.00GHz
  - Nvidia Tesla P100 PCIE 16GB
- Adam optimizer w/ learning rate $4x10^{-4}$
- Batch size:
  - ResNet-18: 512 images
  - ResNet-34: 384 images
  - ResNet-50: 128 images

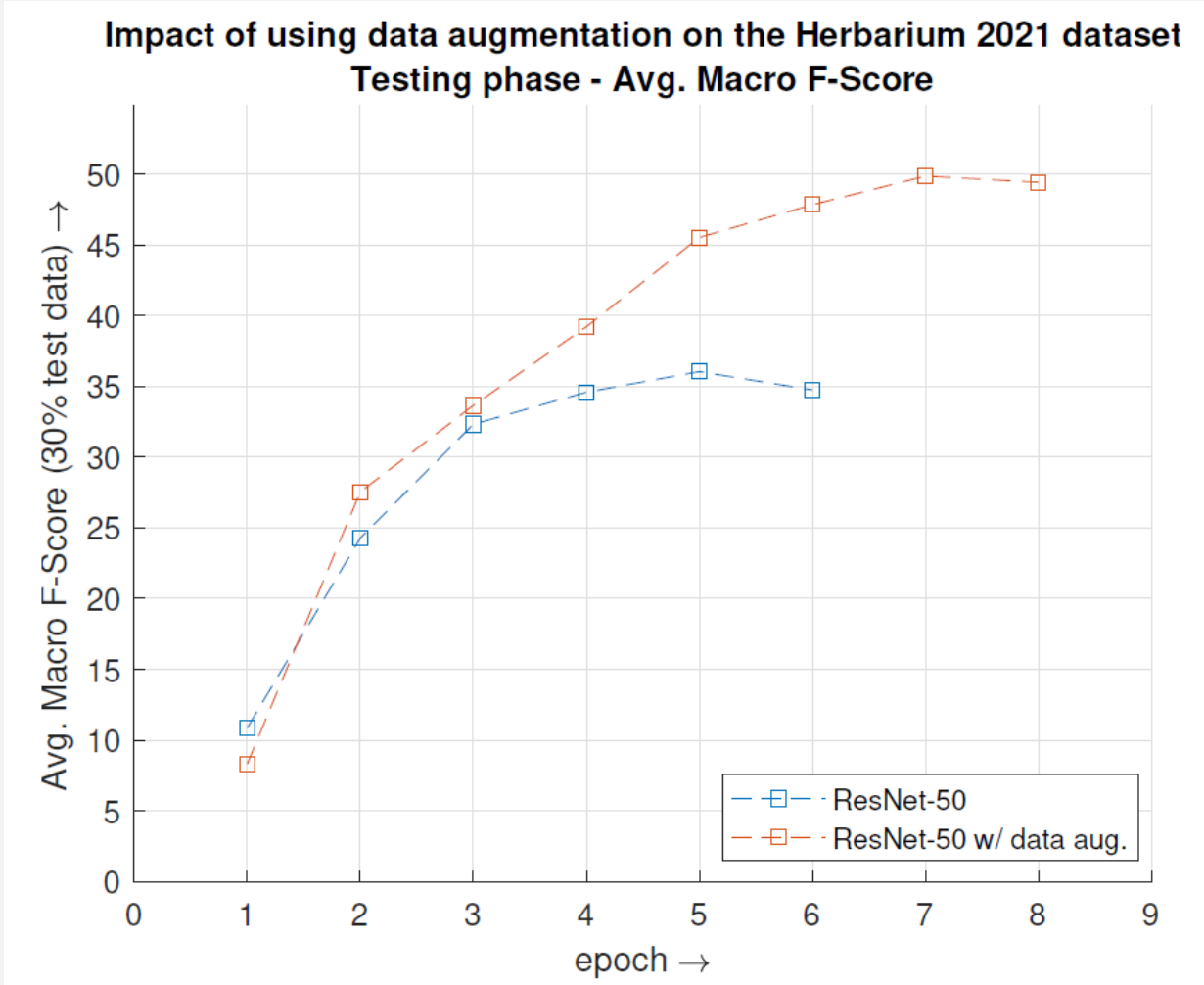
Experimental Results: Comparison ResNet Models





Experimental Results: Impact of Data Augmentation





Conclusions & Future Work

- Deeper networks seemed to increase the classification results
- Data augmentation crucial to improve the test Macro F-Score (49.85% vs 36.04%)
- 13th place on the Kaggle competition:
  - 49.851% w/ 30% test data
  - 44.841% w/ 70% test data

- Higher number of ResNet layers or EfficientNet-based network
- Supercategory information to implement a hierarchical model
- Optimize parameters used in the data augmentation techniques and optimization algorithm
- Evaluate other scores in the training phase:
  - Average Macro F-Score, precision, recall

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