Faculty of Computers and Artificial Intelligence

Computer Science Department

2021/2022

CS 395 Selected Topics in CS-1

Research Project

Report Submitted for Fulfillment of the Requirements and ILO's for Selected Topics in CS-2 course

Team No. 31

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PAPER AND ITS DATASET , ARCHITECTURE AND RESULTS

DeepWeeds: A Multiclass Weed Species Image Dataset for Deep Learning

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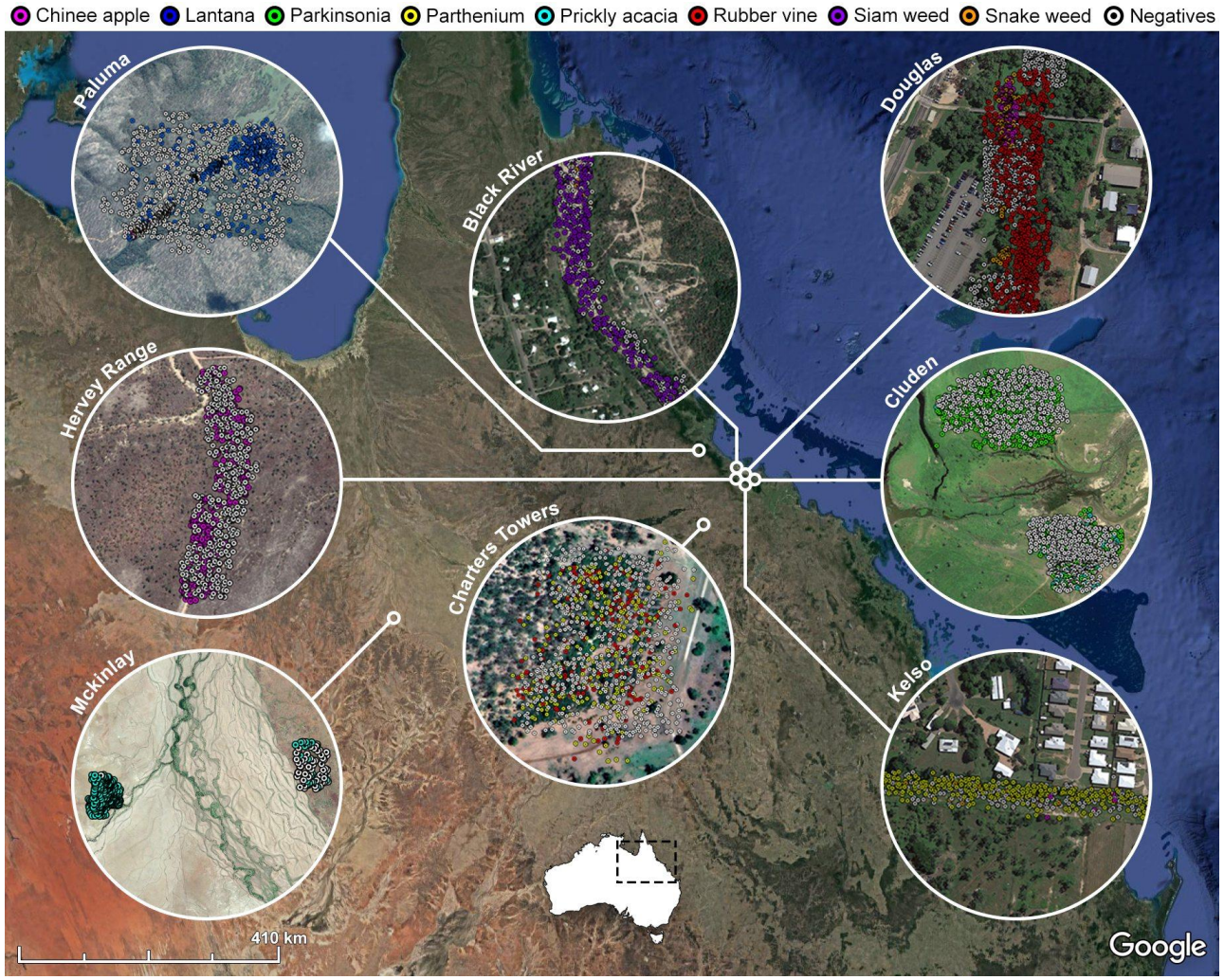


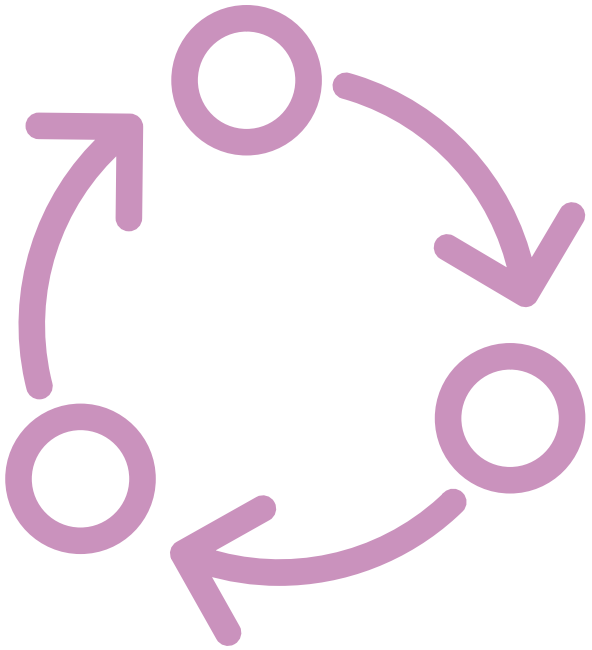
DATASET USED

- **The *DeepWeeds* Dataset**

From June 2017 to March 2018, images were collected from sites across northern Australia using the *WeedLogger* in-field instrument. The result is *DeepWeeds*, a large multiclass dataset comprising 17,509 images of eight different weed species and various off-target (or negative) plant life native to Australia.

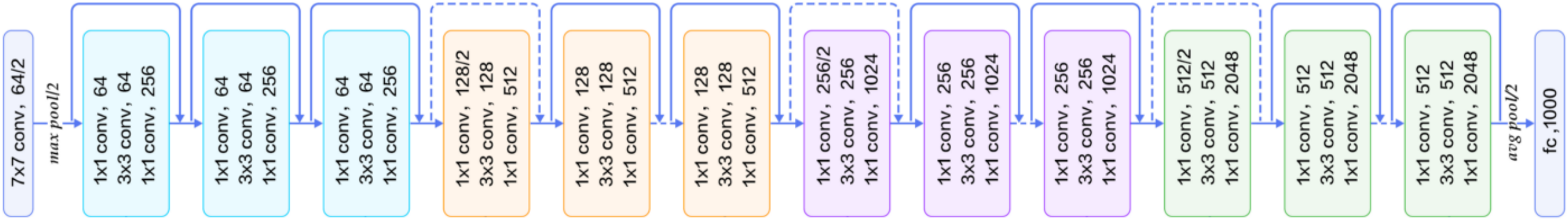
Implemented algorithms and its results

Species	Top-1 accuracy (%)		Precision (%)		False positive rate (%)	
	ResNet-50	Inception-v3	ResNet-50	Inception-v3	ResNet-50	Inception-v3
Chinee Apple	85.3	88.5	92.7	91.0	0.48	0.61
Lantana	94.4	95.0	90.9	91.7	0.62	0.55
Parkinsonia	96.8	97.2	95.6	97.9	0.29	0.13
Parthenium	94.9	95.8	95.8	96.7	0.26	0.21
Prickly Acacia	92.8	95.5	93.4	93.0	0.43	0.46
Rubber Vine	93.1	92.5	99.2	99.1	0.05	0.05
Siam Weed	97.6	96.5	94.4	97.2	0.38	0.18
Snake Weed	88.0	88.8	86.9	90.9	0.82	0.55
Negatives	97.2	97.6	96.5	96.7	3.77	3.59
Weighted average	**95.1**	**95.7**	**95.1**	**95.7**	**2.16**	**2.04**

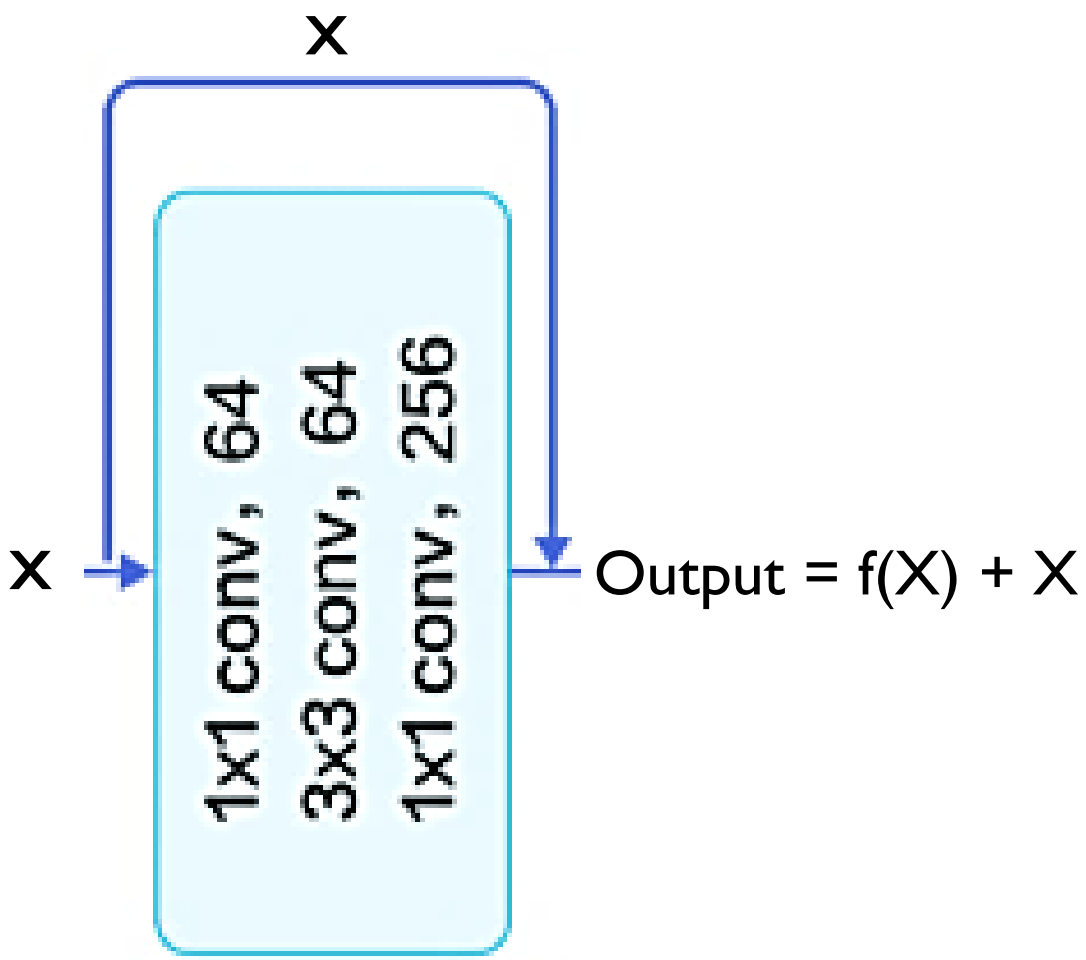


ARCHITECTURE USED IN THE PAPER

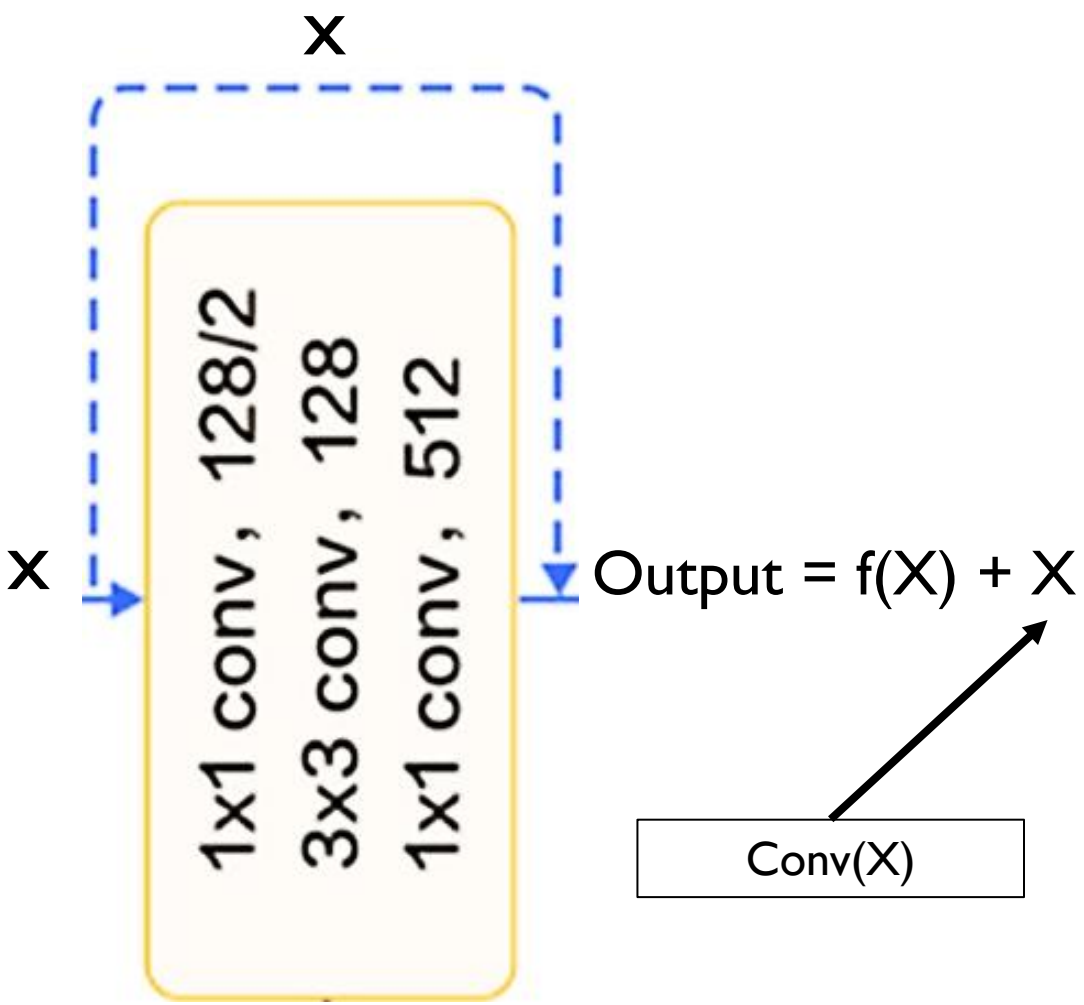
RESNET-50



Model trained on ImageNet Dataset

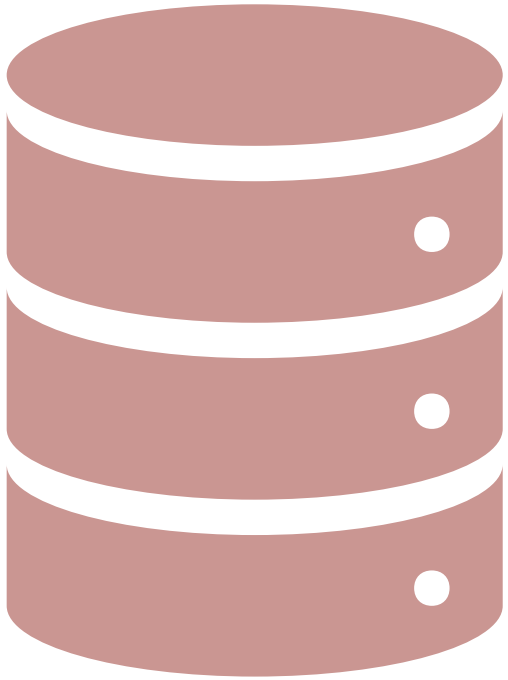


Avoid vanishing gradient problem



Avoid vanishing gradient problem

Because
Input shape != output shape



DATASET DETAILS

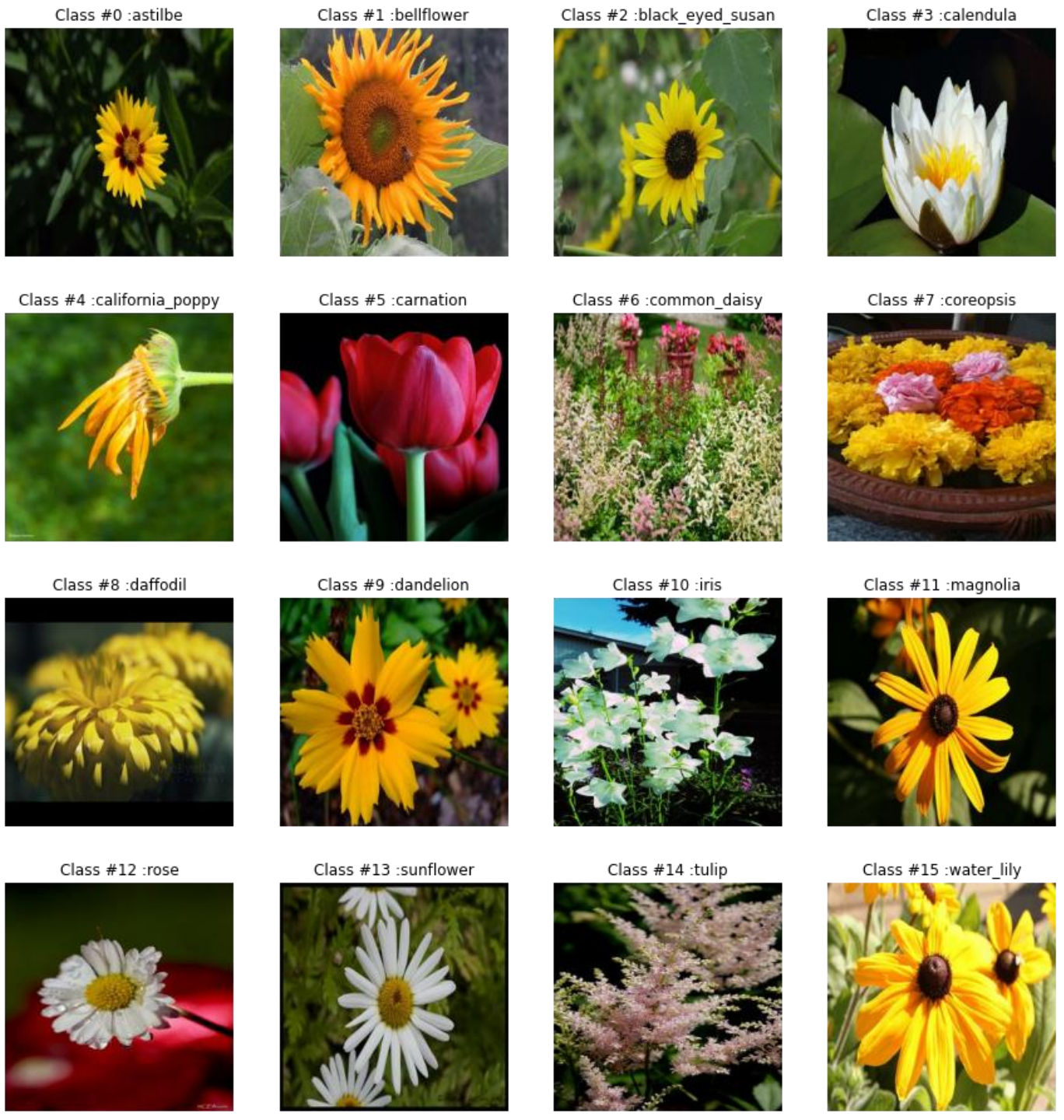
| FLOWERS

The dataset contains
images of 16 different
flowers species.

Total number of Images: 15740
(239 MB)

Link: kaggle

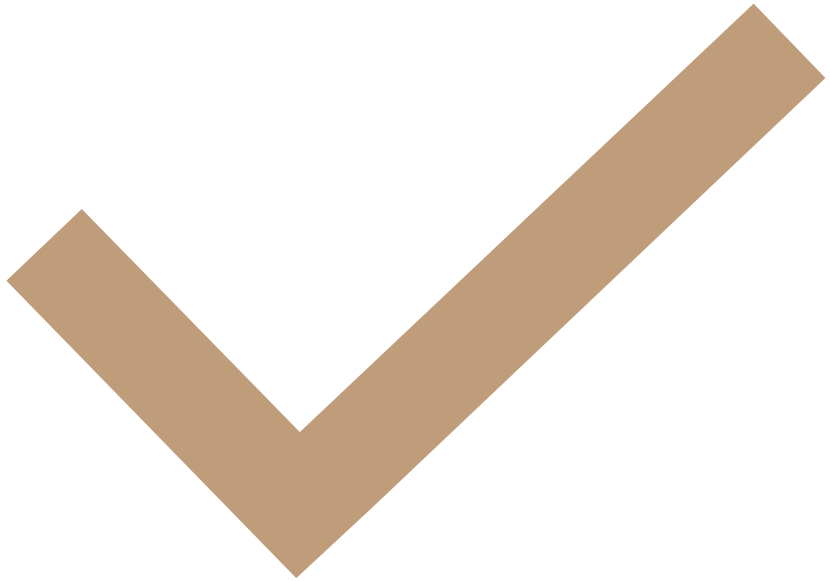
IMAGES SAMPLES



Data balancing

Class #0 (Number Of Images: 737)	Name : astilbe
Class #1 (Number Of Images: 873)	Name : bellflower
Class #2 (Number Of Images: 1000)	Name : black_eyed_susan
Class #3 (Number Of Images: 978)	Name : calendula
Class #4 (Number Of Images: 1022)	Name : california_poppy
Class #5 (Number Of Images: 923)	Name : carnation
Class #6 (Number Of Images: 980)	Name : common_daisy
Class #7 (Number Of Images: 1047)	Name : coreopsis
Class #8 (Number Of Images: 970)	Name : daffodil
Class #9 (Number Of Images: 1052)	Name : dandelion
Class #10 (Number Of Images: 1054)	Name : iris
Class #11 (Number Of Images: 1048)	Name : magnolia
Class #12 (Number Of Images: 999)	Name : rose
Class #13 (Number Of Images: 1027)	Name : sunflower
Class #14 (Number Of Images: 1048)	Name : tulip
Class #15 (Number Of Images: 982)	Name : water_lily

FOLDER STRUCTURE



IMPLEMENTATION DETAILS

DATA PREPROCCESING

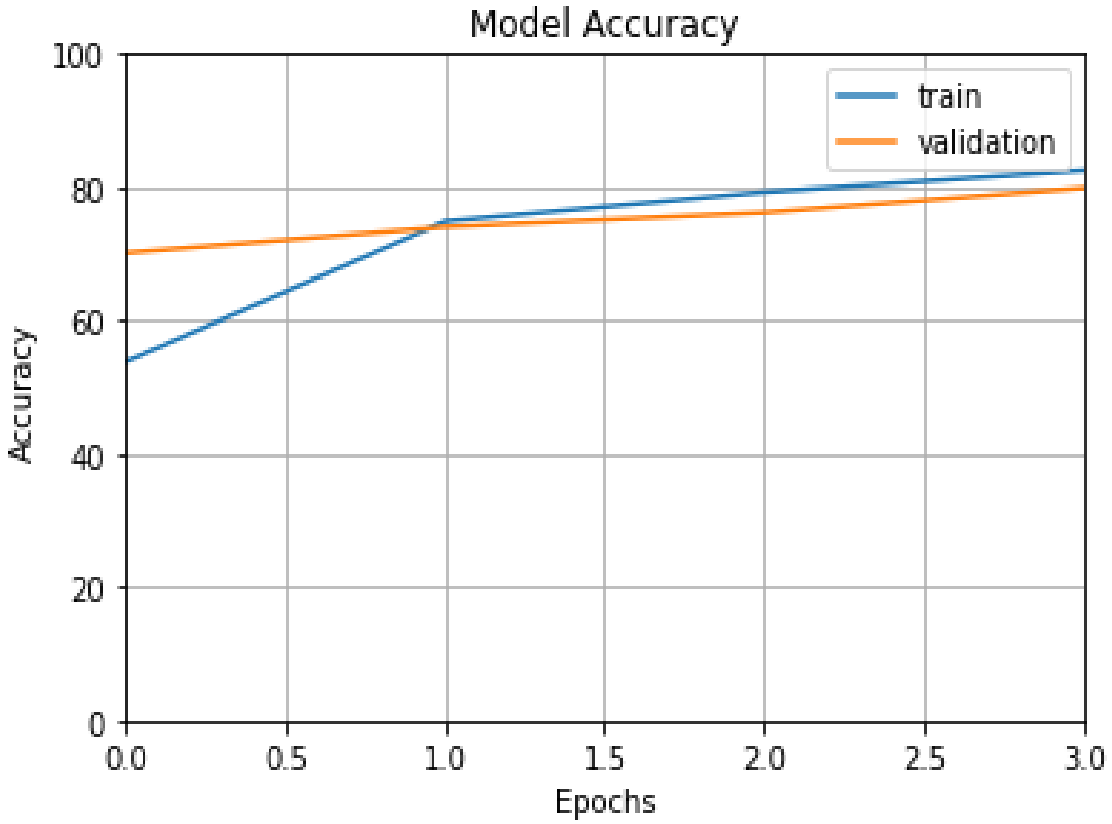
- Resize Images to (128px,128px)
- Training Data: 72% (11328 Image)
- Validation Data: 18% (2832 Image)
- Testing Data: 10% (1580 Image)
- Loading the Images with colors (RGB)

Hyper parameters

Hyper parameters	Model before optimization	Model after optimization
Pretrained model	ResNet50	ResNet50
weights	ImageNet	ImageNet
Pooling	max	average
Top layers	Dense(32, activation='tanh') Dense(16, activation='softmax')	Dense(160, activation='relu') Dense(16, activation='softmax')
Optimizer	Not used	Adam(learning rate=0.001)
epochs	4	7

RESULTS AND VISUALIZATIONS

Before Optimization

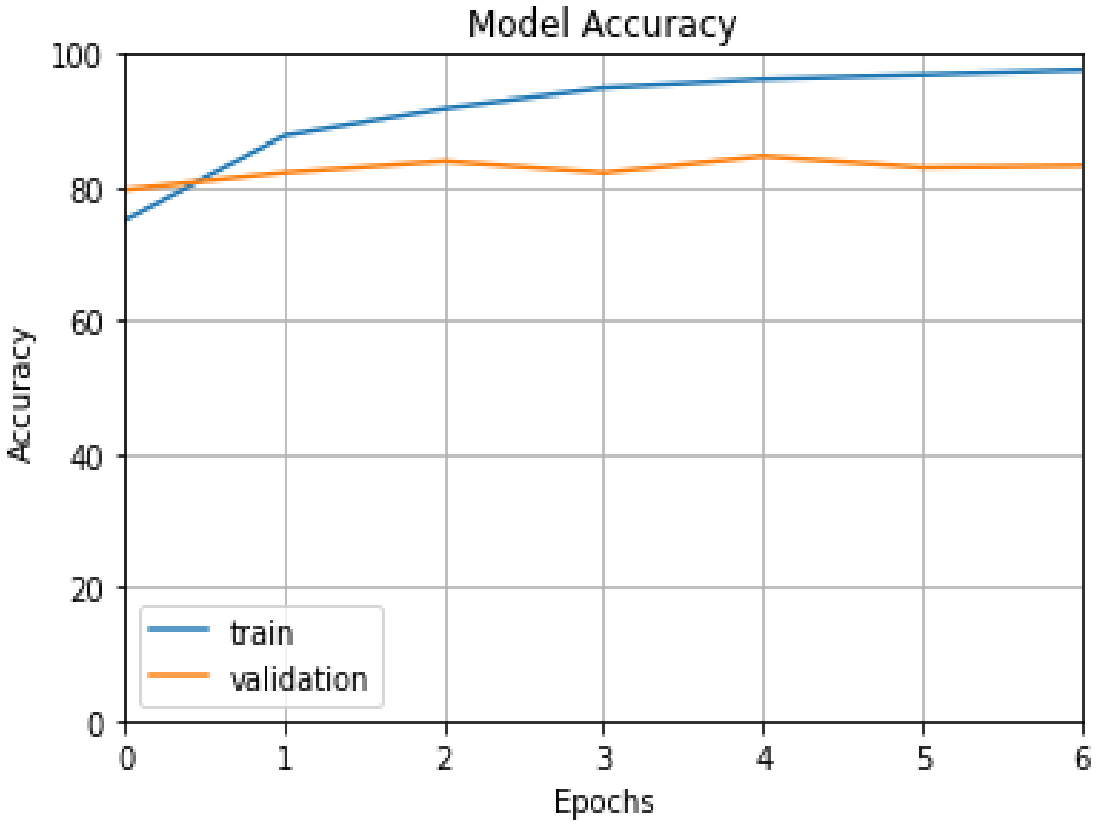


Training Accuracy: 82.4%

Validation Accuracy: 79%

Testing Accuracy: 80%

After Optimization



Training Accuracy: 97.5%

Validation Accuracy: 83%

Testing Accuracy: 85%