

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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THE PAPER



DATASET DETAILS



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DETAILS



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PAPER DETAILS

DeepWeeds: A Multiclass Weed Species Image Dataset for Deep Learning

Authors :

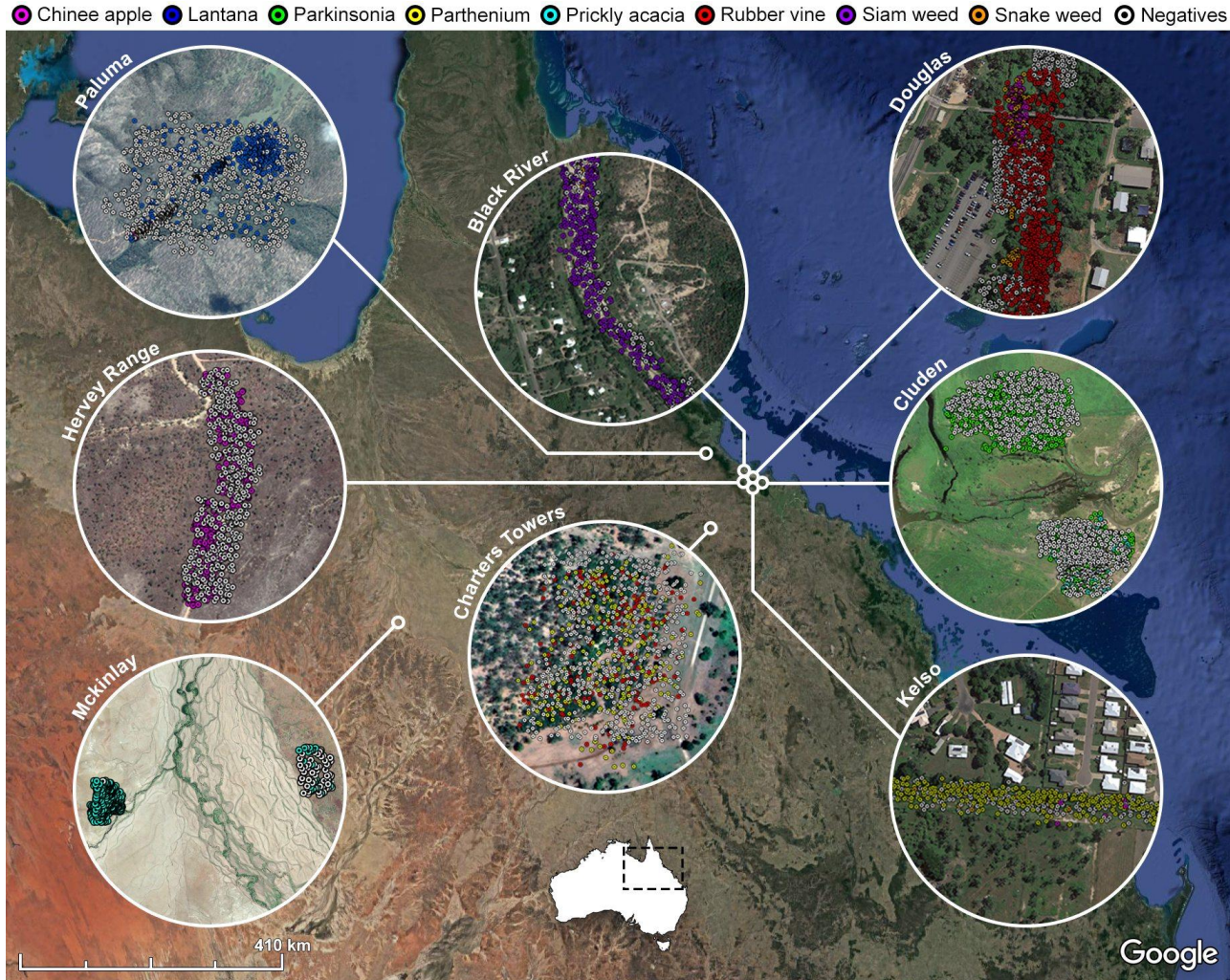
Alex Olsen^{1,*}, Dmitry A. Konovalov¹, Bronson Philippa¹, Peter Ridd¹, Jake C. Wood¹, Jamie Johns¹, Wesley Banks¹, Benjamin Girgenti¹, Owen Kenny¹, James Whinney¹, Brendan Calvert¹, Mostafa Rahimi Azghadi¹, and Ronald D. White¹

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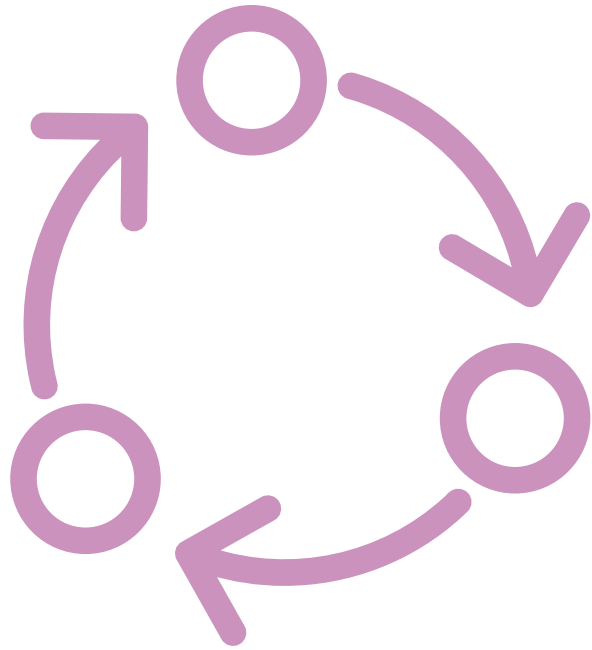
DATASET USED



- 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.

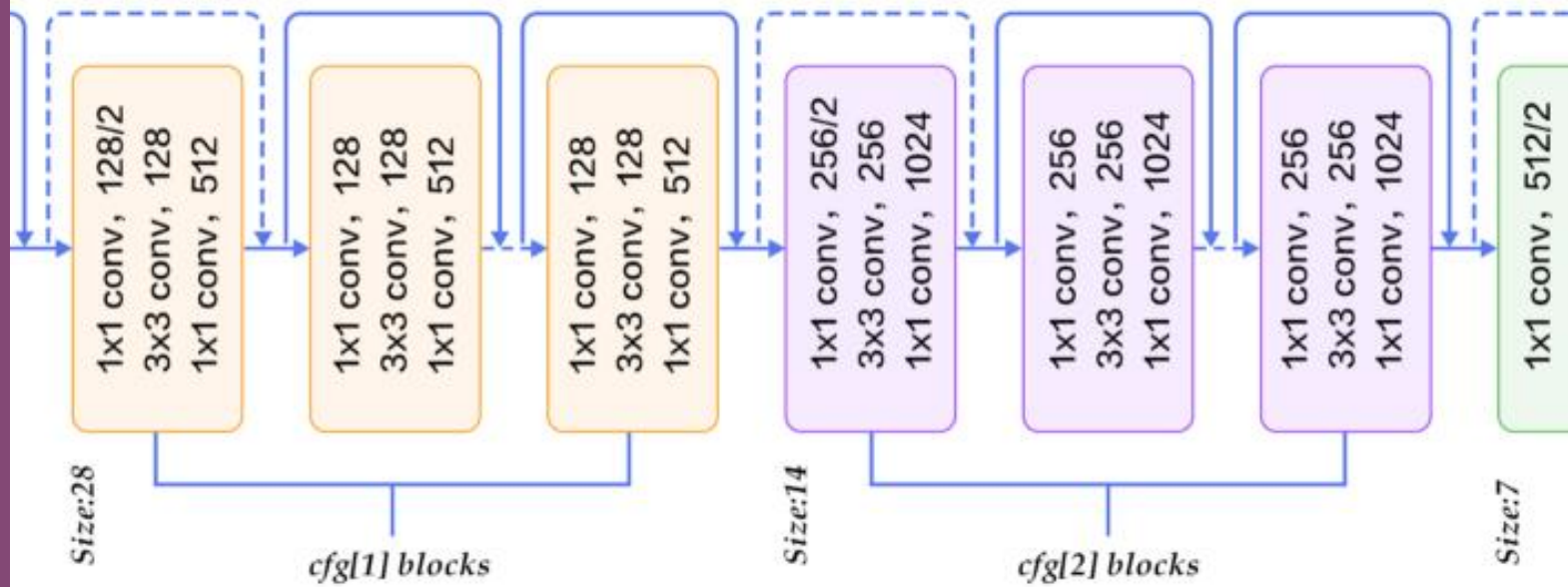
Implemented algorithms and its results

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

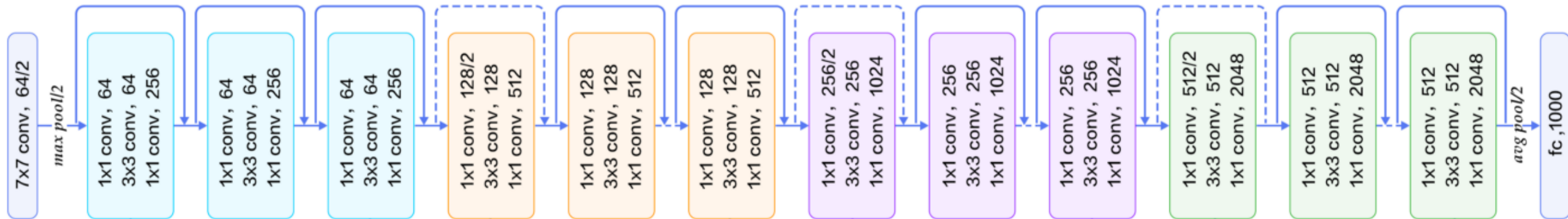


ARCHITECTURE USED IN THE PAPER

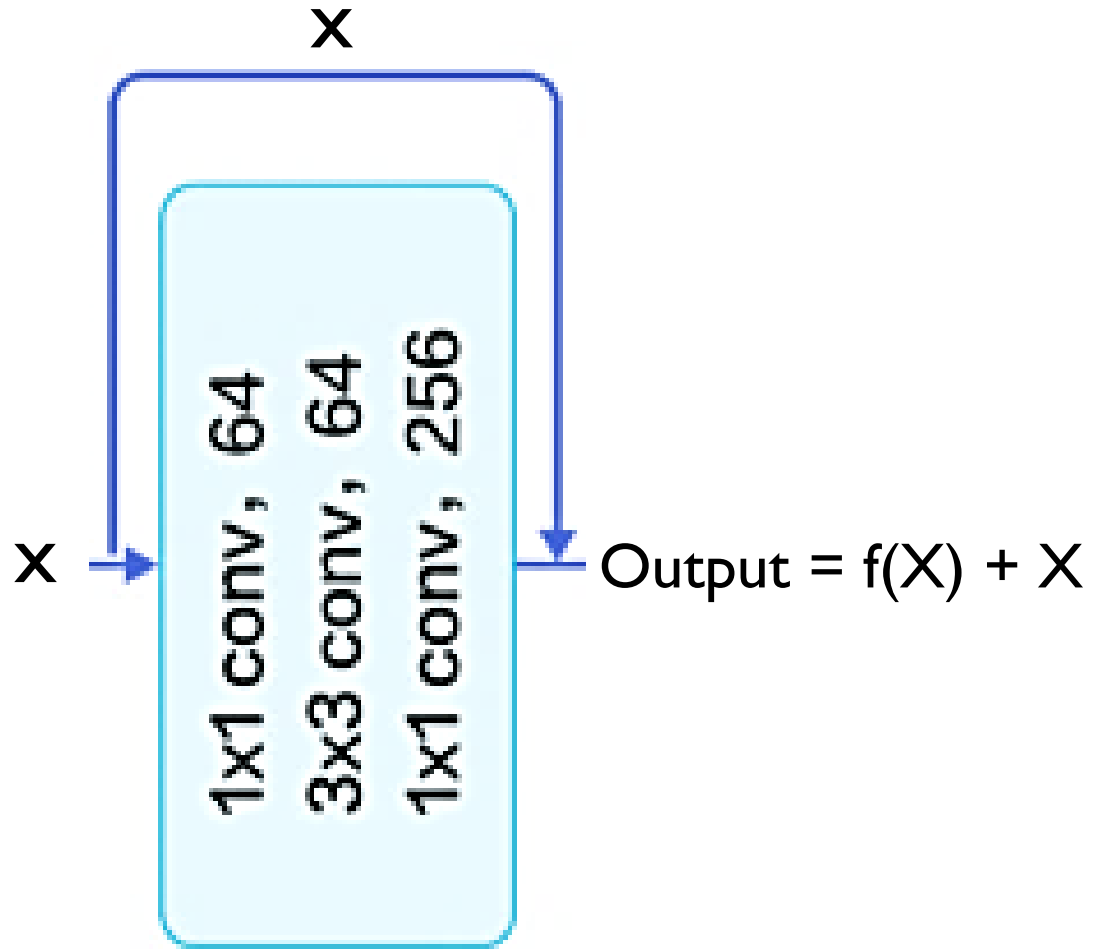
RESNET-50



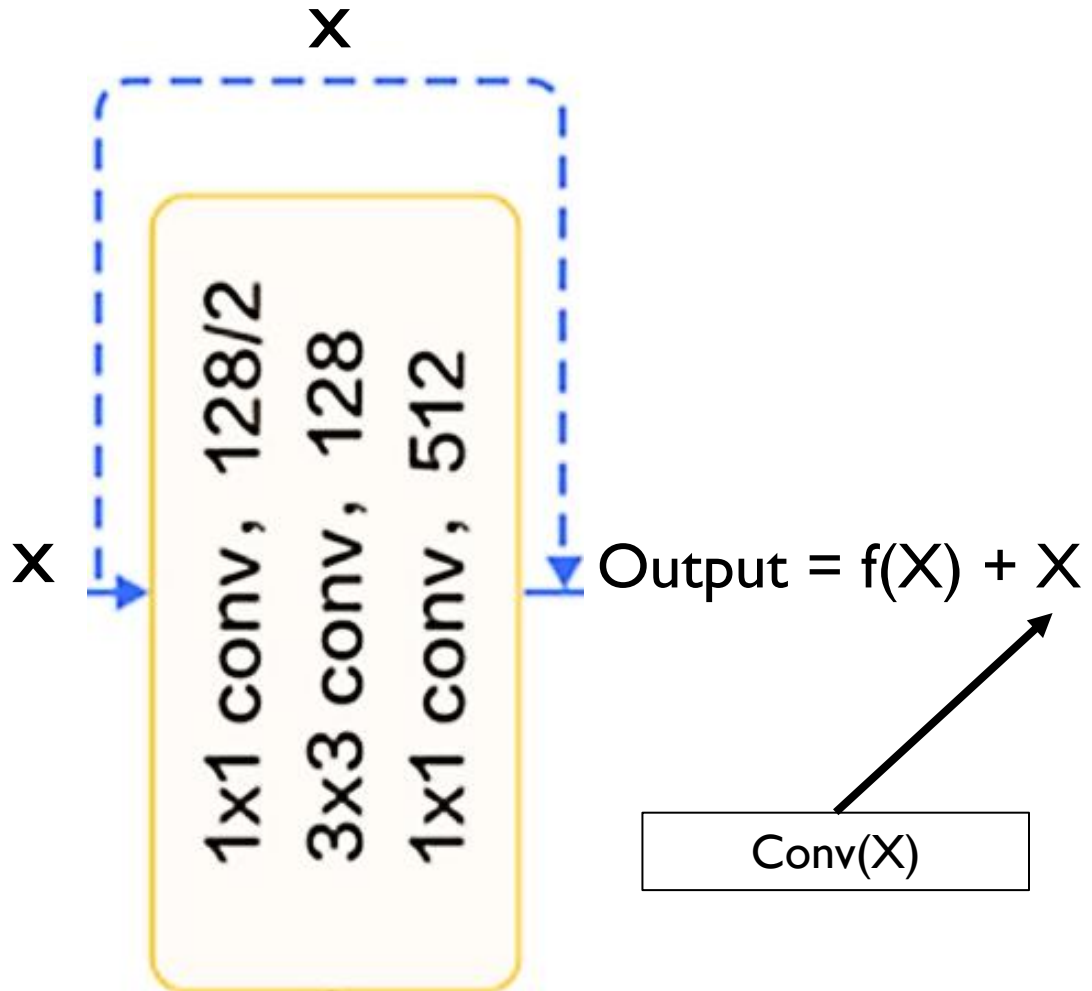
RESNET-50



Model trained on ImageNet Dataset

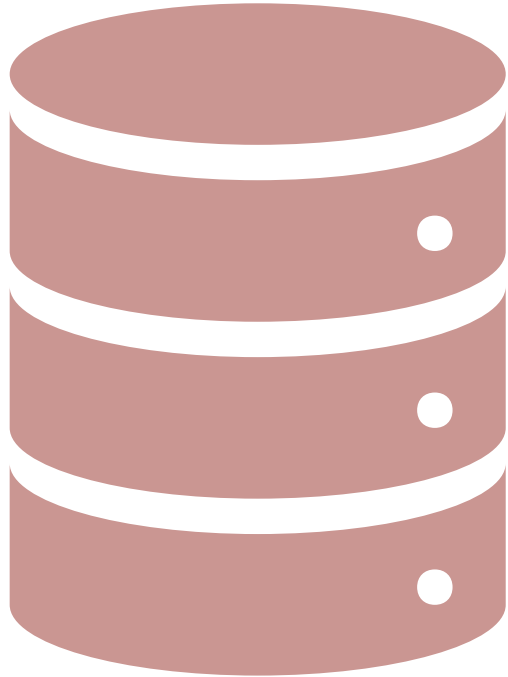


Avoid vanishing
gradient problem



Avoid vanishing gradient problem

Because
Input shape \neq output shape



DATASET DETAILS



The dataset contains
images of 16 different
flowers species.

Total number of Images: 15740
(239 MB)

Link: [kaggle](#)

IMAGES SAMPLES

Class #0 :astilbe



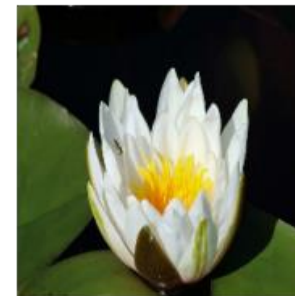
Class #1 :bellflower



Class #2 :black_eyed_susan



Class #3 :calendula



Class #4 :california_poppy



Class #5 :carnation



Class #6 :common_daisy



Class #7 :coreopsis



Class #8 :daffodil



Class #9 :dandelion



Class #10 :iris



Class #11 :magnolia



Class #12 :rose



Class #13 :sunflower



Class #14 :tulip







Class #15 :water_lily

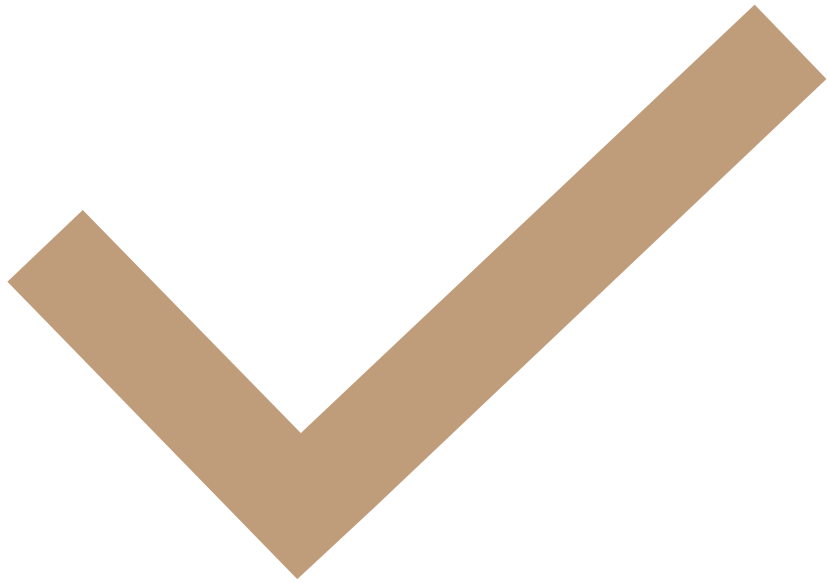


Data balancing

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

- ▼  flowers
 - ▶  astilbe
 - ▶  bellflower
 - ▶  black_eyed_susan
 - ▶  calendula
 - ▶  california_poppy
 - ▶  carnation
 - ▶  common_daisy
 - ▶  coreopsis
 - ▶  daffodil
 - ▶  dandelion
 - ▶  iris
 - ▶  magnolia
 - ▶  rose
 - ▶  sunflower
 - ▶  tulip
 - ▶  water_lily



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)

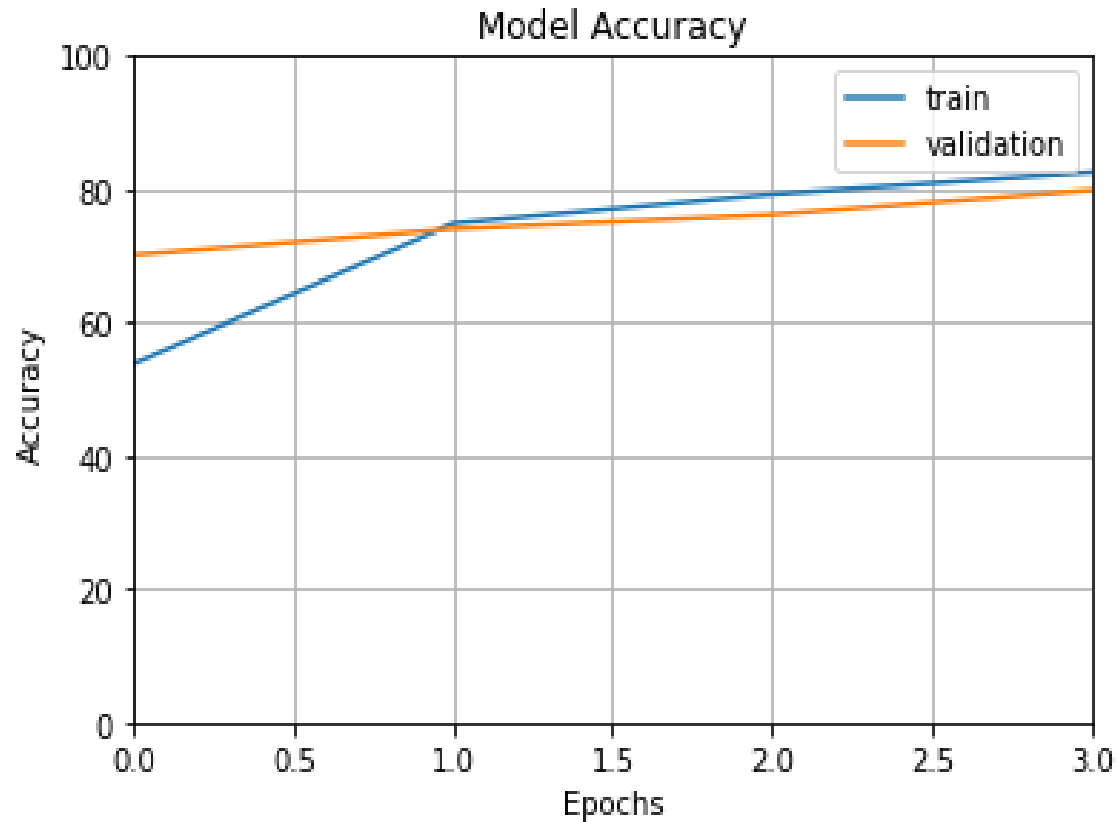
Hyper parameters

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(160, activation='relu')
	Dense(16, activation='softmax')	Dense(16, activation='softmax')
epochs	4	7



RESULTS AND VISUALIZATIONS

Before Optimization

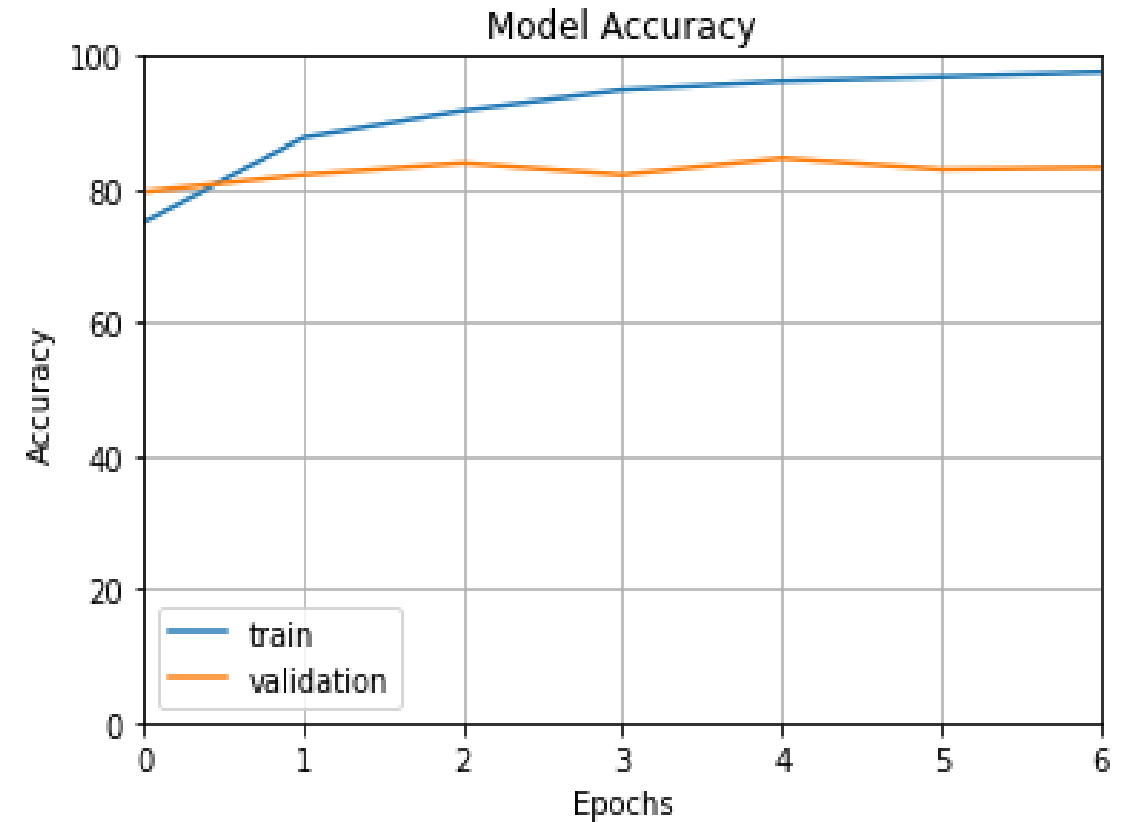


Training Accuracy: 82.4%

Validation Accuracy: 79%

Testing Accuracy: 80%

After Optimization



Training Accuracy: 97.5%

Validation Accuracy: 83%

Testing Accuracy: 85%