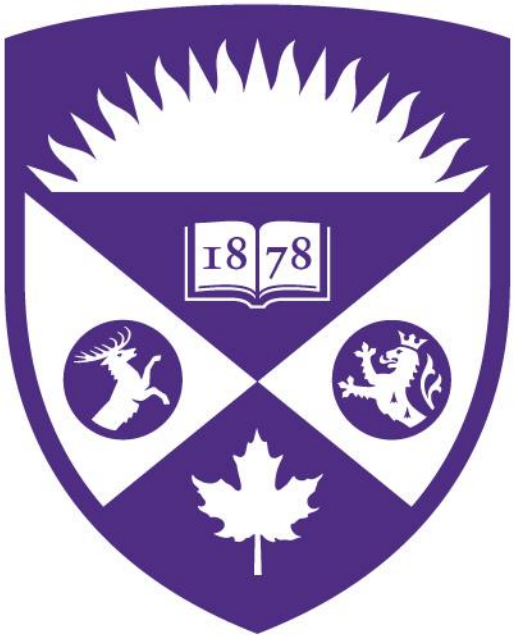
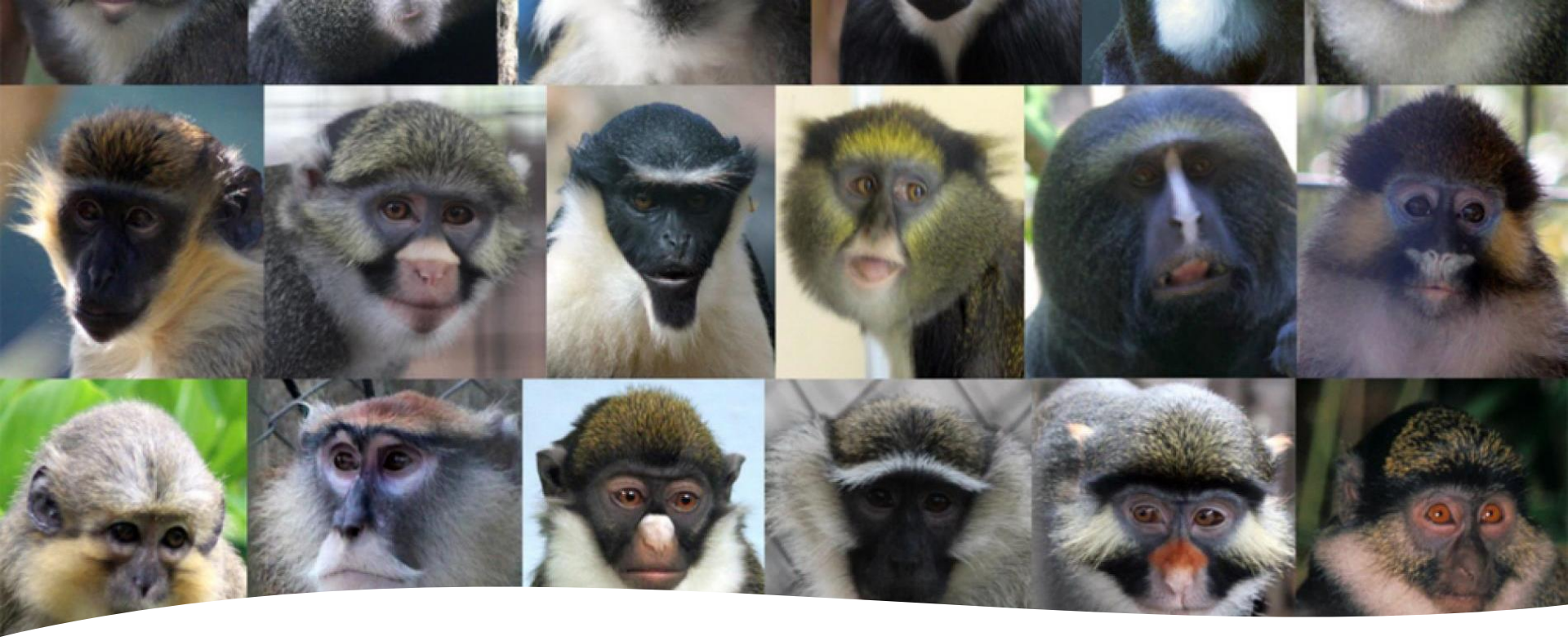


Western

UNIVERSITY · CANADA



FINE GRAIN IMAGE CLASSIFICATION

Presented by

EMMANUEL MADUWUBA(emaduwub)

KAMALJEET SINGH Mann (kmann52)

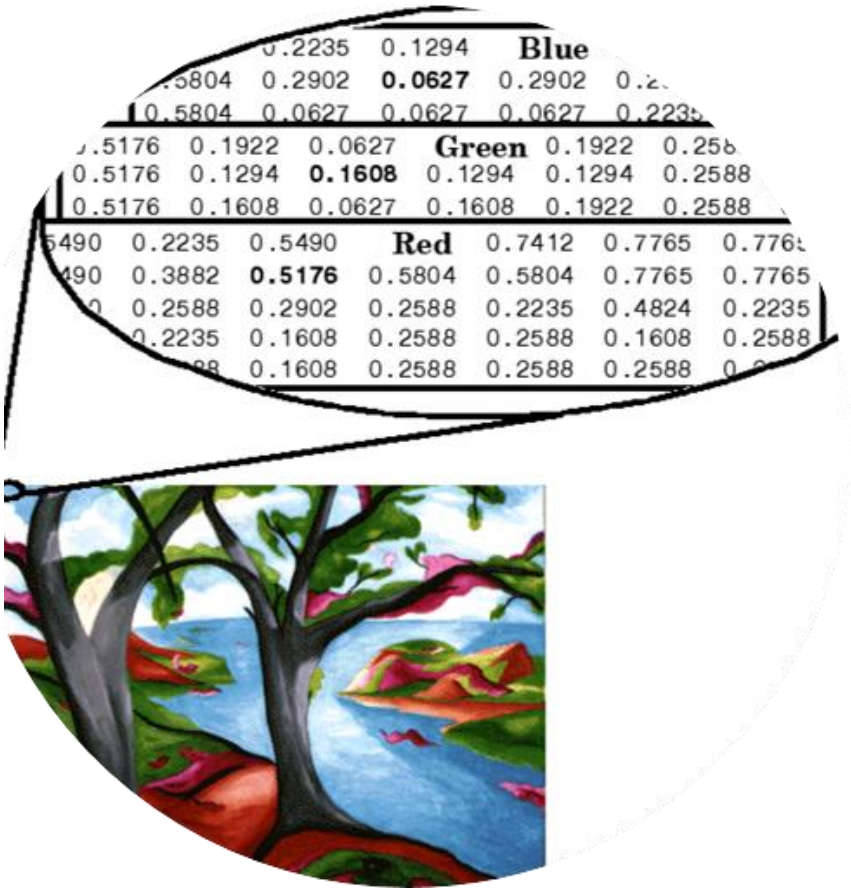
DHARANIKOTA RAJENDRA KAMAL(rdharan)

Introduction:-

- Machine learning helps us to build analytical models, which in turn help computer in learning from the data.
- One such model is used for image classification. It has various applications ranging from identifying the human beings struck In natural calamities to maintaining wild life.
- It can be put use to preserving animal species that are nearing extinction.
- We have taken a data set that contains the images of monkeys that are segregated into 10 different species.
- We are using this data set to apply some fine grain image classification .

Machine point view of an Image:-

- An Image contains pixels and these are stored in the matrix format.
- A machine loads matrix of pixel intensities to store the images.
- There are monochrome images where the pixels are represented by two intensities only(general term for grayscale Image).
- An RGB image has three channels and the pixel of an RGB image is represented as a tuple of numbers([r,g,b]).

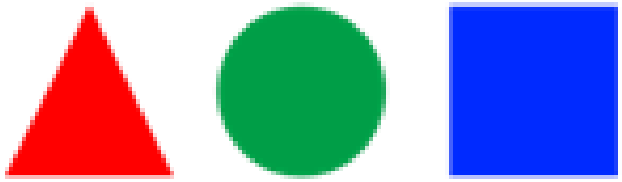


Introduction:-

- Just like humans learn, artificial neural networks also works in the similar fashion.
- Human beings learn by frequently being exposed to the things, feeling them and memorizing their dimensions and can eventually classify them.
- In the similar fashion an algorithm can be designed to feed the data for the learning process and then test it weather it classifies correctly or not.
- In order to make this learning process more effective and faster we can use feature extraction.

Feature Extraction:-

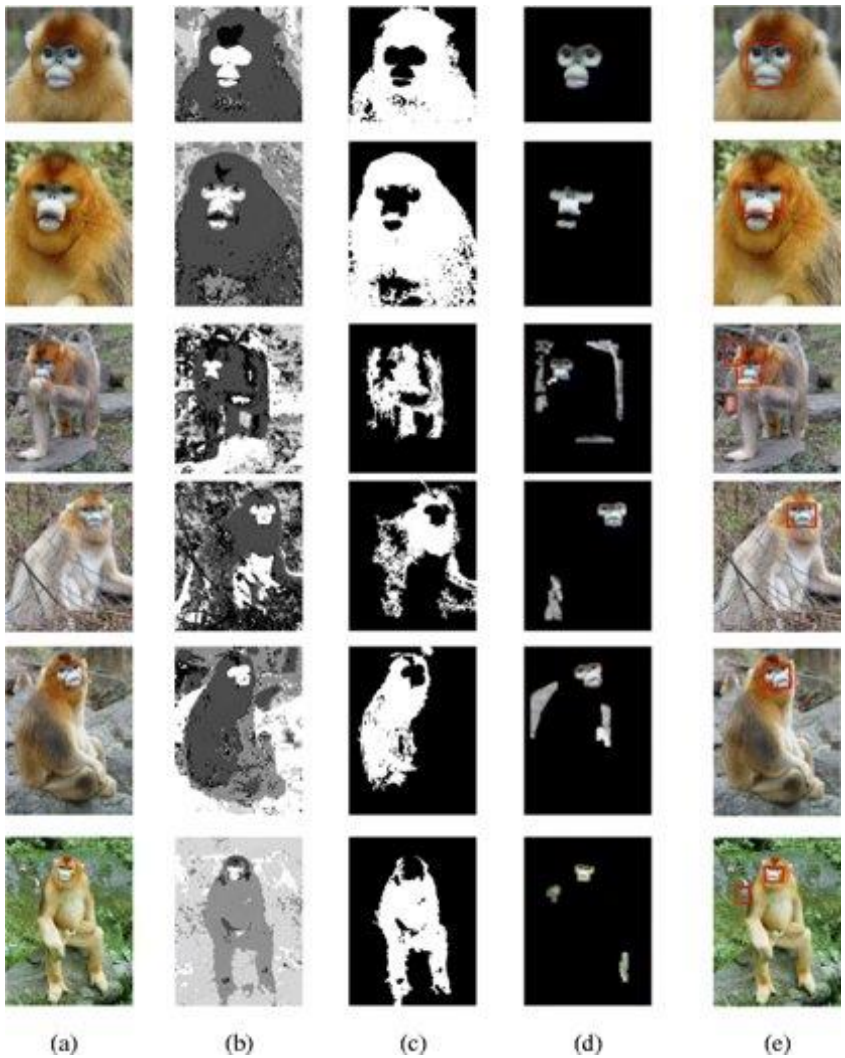
- The perfect way is to understand how each image works and what makes an image or its content different from the other.
- For example :- what makes shapes different ?
- The way they look , number of side, points , edges etc...



Feature Extraction:-

- In the similar way we just have to realize and understand what makes one monkey different from an another.
- It can be the color of the monkey or the eyes, the pattern of its skin and facial hair growth or some times even the positioning of the ears.
- These features can be extracted by using and determining:-
- 1. Key points.
- 2. Gray scaling the image.
- 3. Using heat map.
- 4. Edge detection.
- 5. Setting Boundaries. Etc....

Example:-



DATASET DESCRIPTION

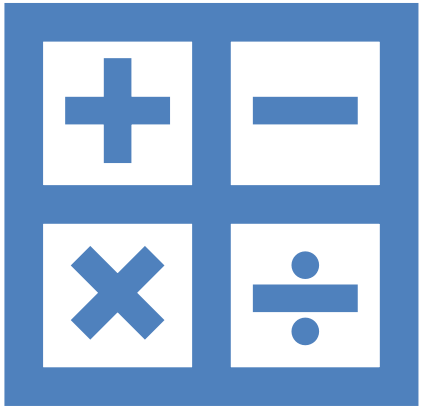
- 1400 Images
- Grouped into subfolders
- Over 100+ images

Link : https://www.kaggle.com/slothkong/10-monkey-species

WHY CNN?

- One of the best methods for solving prediction problems involving image data as input.
- Feature Engineering.
- Faster Learning Process

PROJECT PHASES



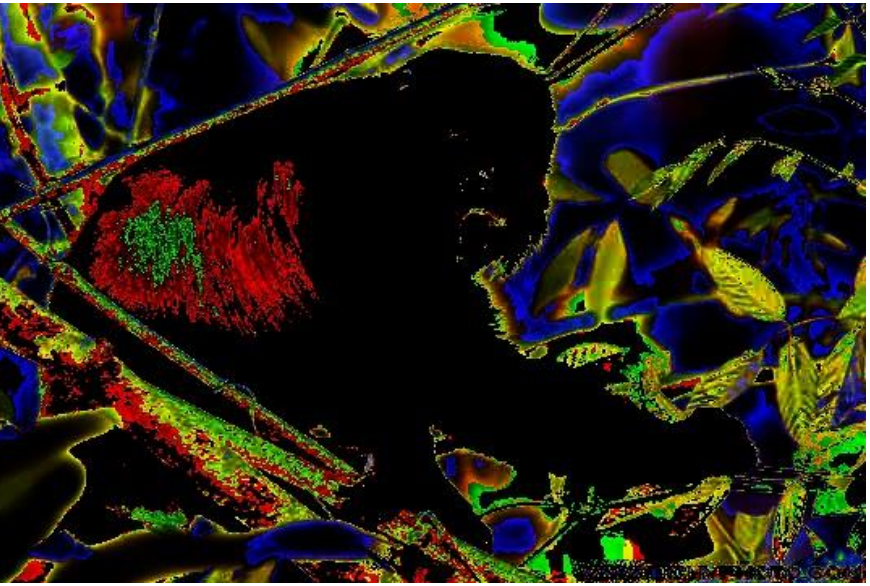
- Problem Analysis
- Model Selection
- Data Preprocessing
- Model Optimization

DATA PREPROCESSING

- Flip
- Scaling
- Resizing

A) Normal image

B) Flipped Image



C) Dark Colour

D) Lightning

CNN Architecture

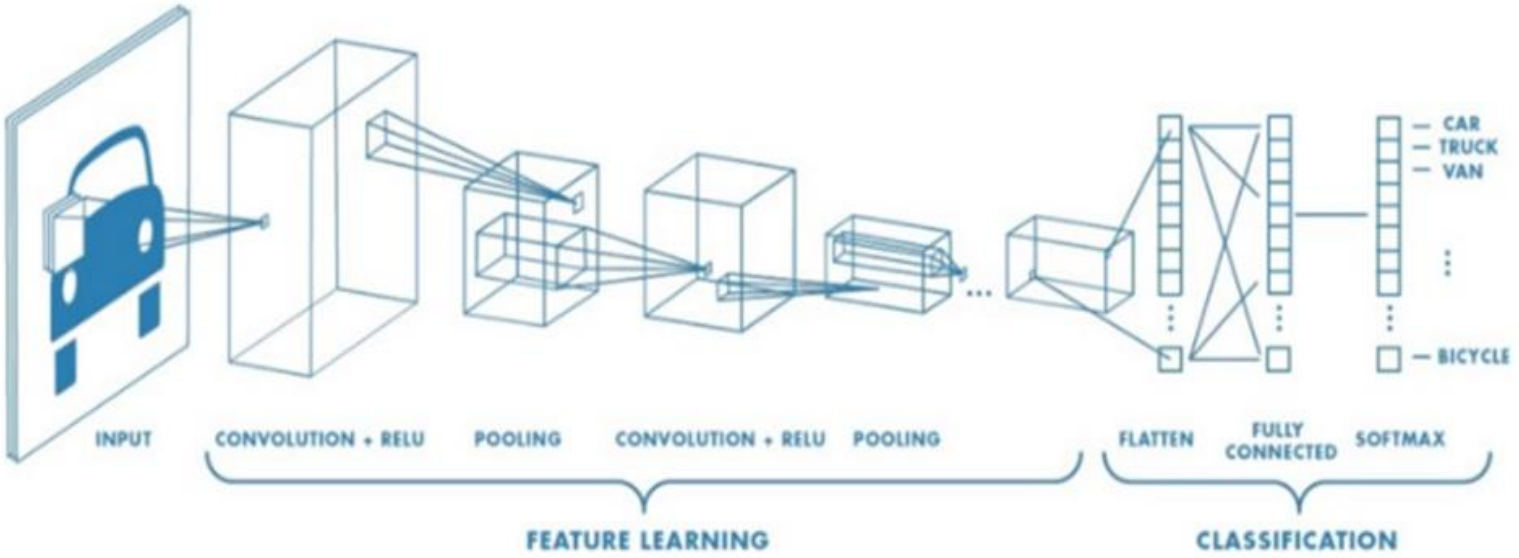


Figure 2 : Neural network with many convolutional layers

CNN Layer

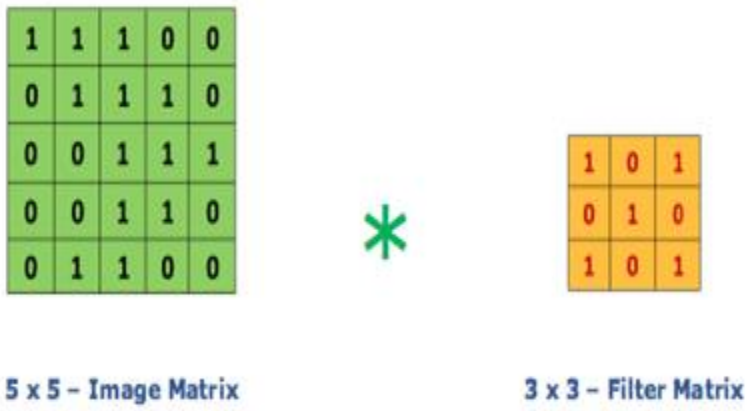


Figure 4: Image matrix multiplies kernel or filter matrix

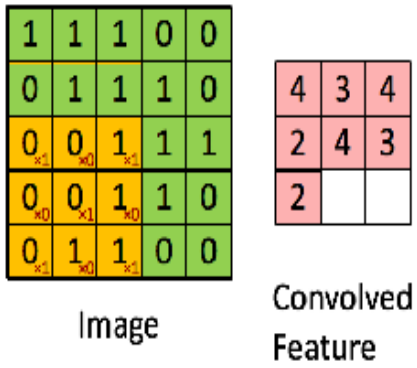
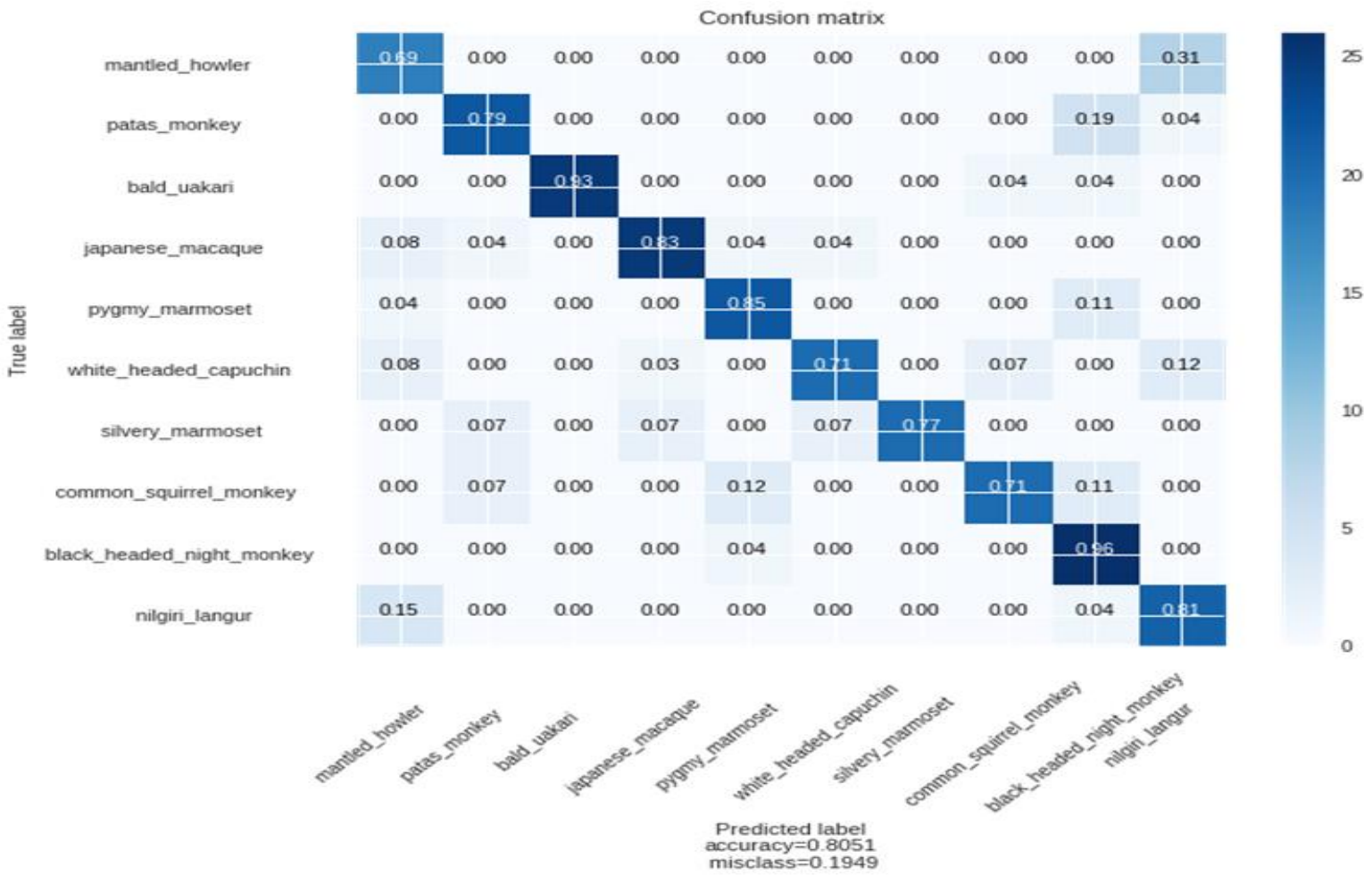


Figure 5: 3 x 3 Output matrix

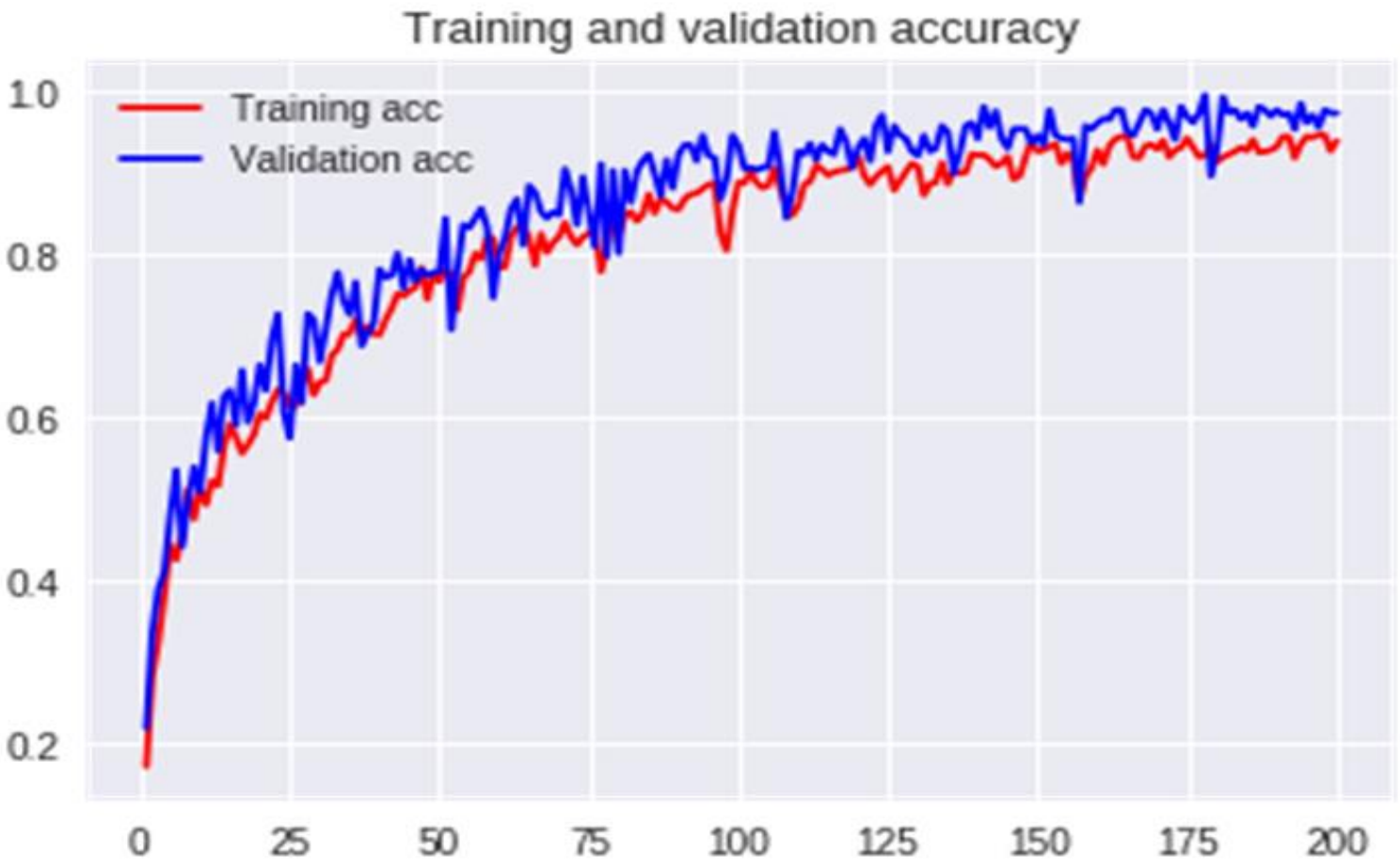
Model Summary

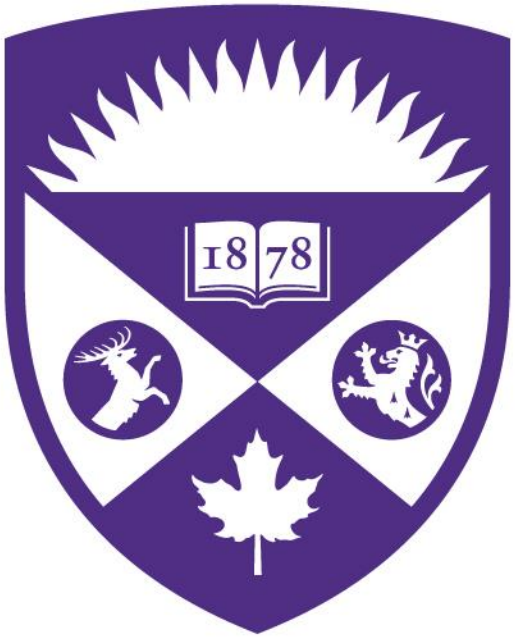
Layer (type)	Output Shape	Param #
conv2d_1 (Conv2D)	(None, 148, 148, 32)	896
activation_1 (Activation)	(None, 148, 148, 32)	0
max_pooling2d_1 (MaxPooling2	(None, 74, 74, 32)	0
conv2d_2 (Conv2D)	(None, 72, 72, 32)	9248
activation_2 (Activation)	(None, 72, 72, 32)	0
max_pooling2d_2 (MaxPooling2	(None, 36, 36, 32)	0
conv2d_3 (Conv2D)	(None, 34, 34, 64)	18496
activation_3 (Activation)	(None, 34, 34, 64)	0
max_pooling2d_3 (MaxPooling2	(None, 17, 17, 64)	0
dropout_1 (Dropout)	(None, 17, 17, 64)	0
flatten_1 (Flatten)	(None, 18496)	0
dense_1 (Dense)	(None, 512)	9470464
activation_4 (Activation)	(None, 512)	0
dropout_2 (Dropout)	(None, 512)	0
dense_2 (Dense)	(None, 10)	5130
activation_5 (Activation)	(None, 10)	0

Confusion Matrix



Accuracy


Training and validation accuracy
Training acc
Validation acc
1.0
0.8
0.6
0.4
0.2
0
25
50
75
100
125
150
175
200



Western

UNIVERSITY · CANADA