



Bee Image Classification using Keras, CNN

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I in 3 bites

Bees are essential: food

Bees are in danger: BCC

1. Parasites
2. Pesticides/Infections
3. Climate Crisis

o1 Varroa Mite



o2 Hive Theft



o3 Missing Queen



GOAL



Build a classification model
that can detect the health
status of a hive with one image
of a bee.



DATA

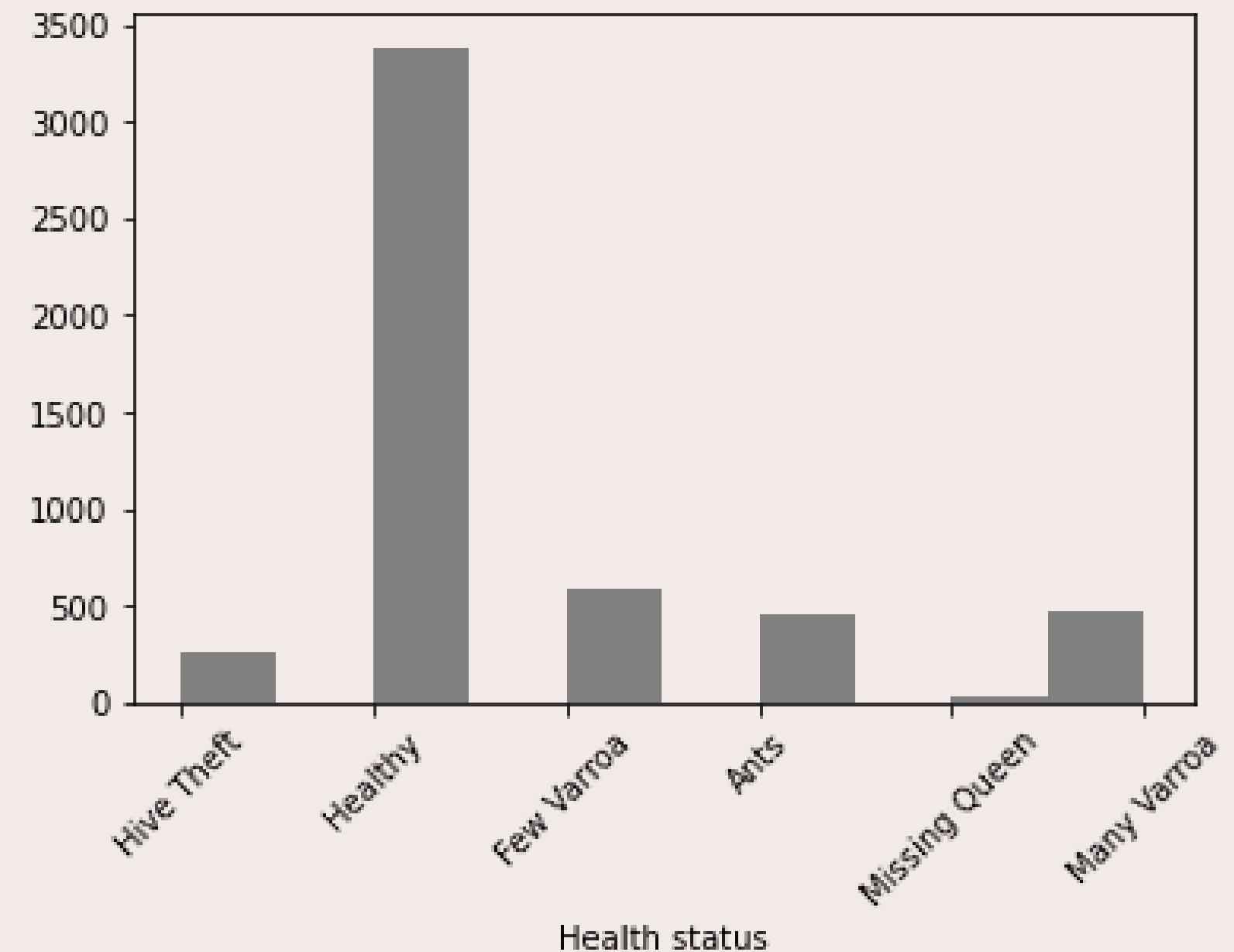


Class: Healthy



Class: Hive Theft

Health Condition Categories (n=6)



Annotated Bee Images
(n=4136)



TOOLS

*Data Acquisition
and Preprocessing*

OpenCV

numpy

pandas

Google Colab

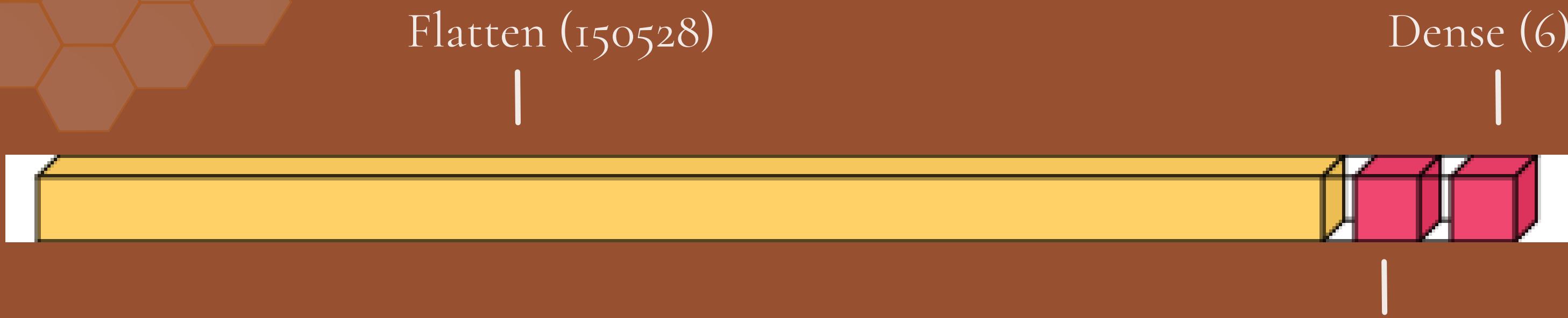
Keras

*Cloud Computing
and Deep
Learning Model*

Visualization

visulkeras

BASELINE MODEL

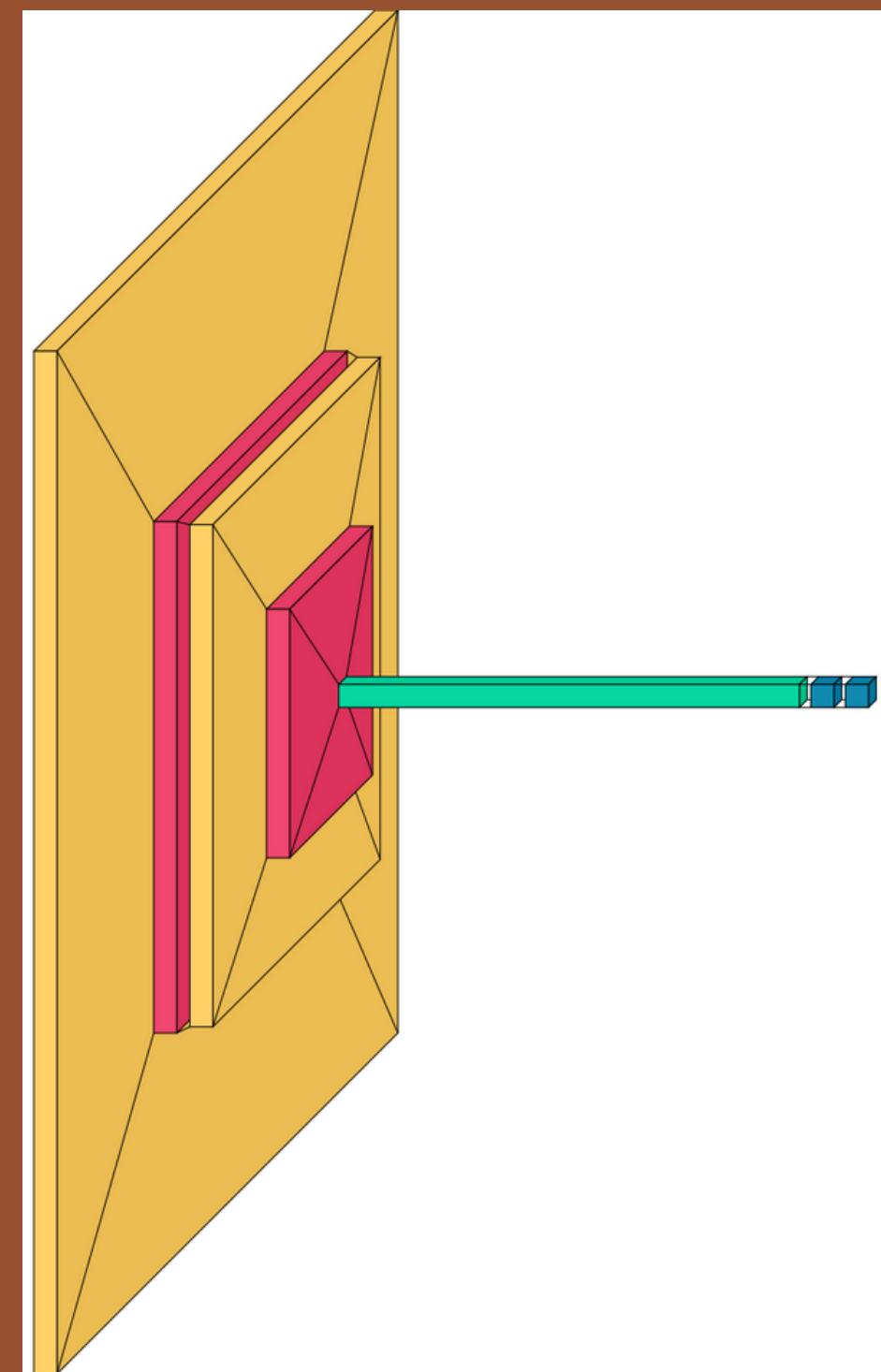
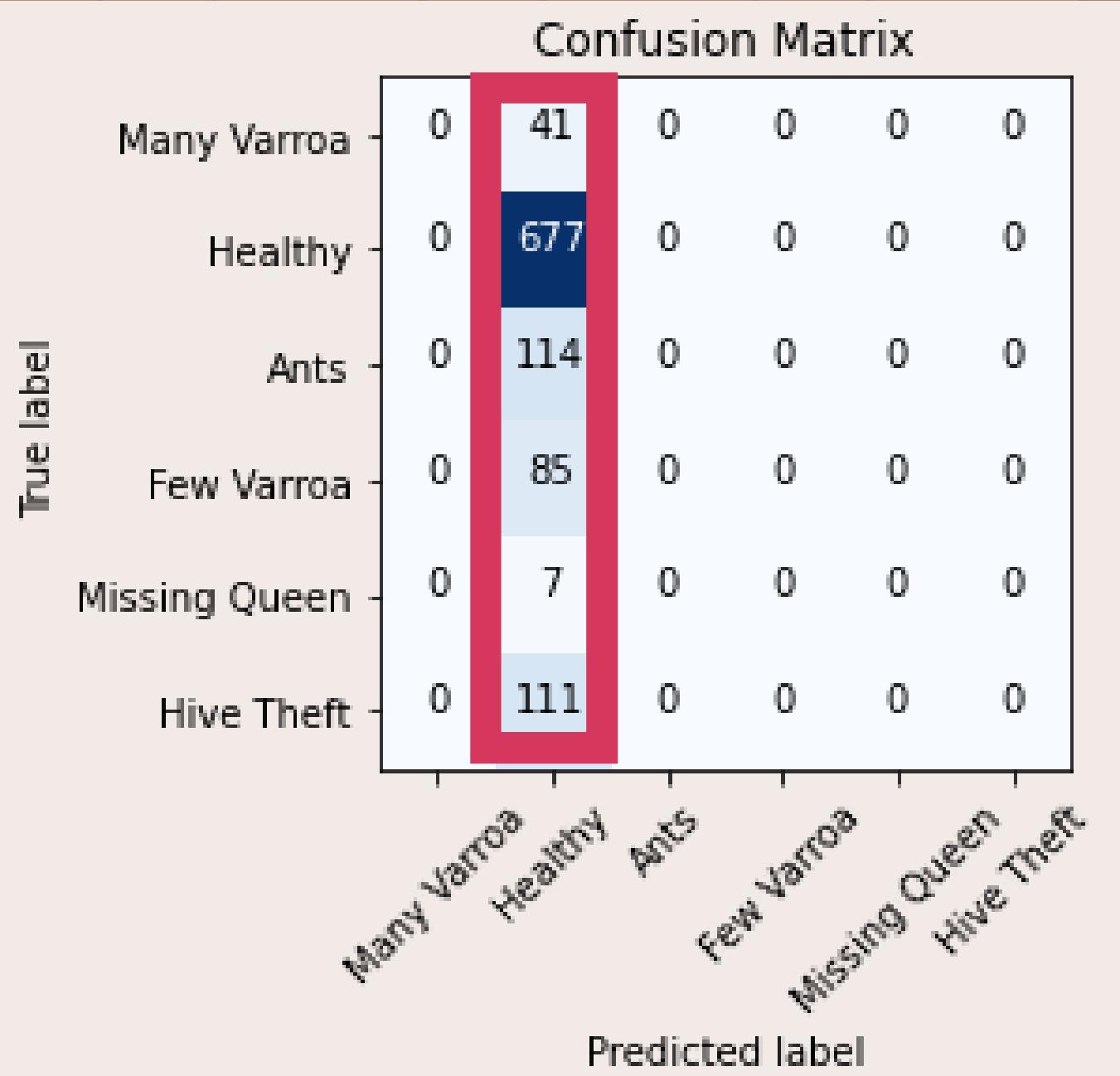


Accuracy: 0.65
F1: 0.52

SIMPLE CNN MODEL

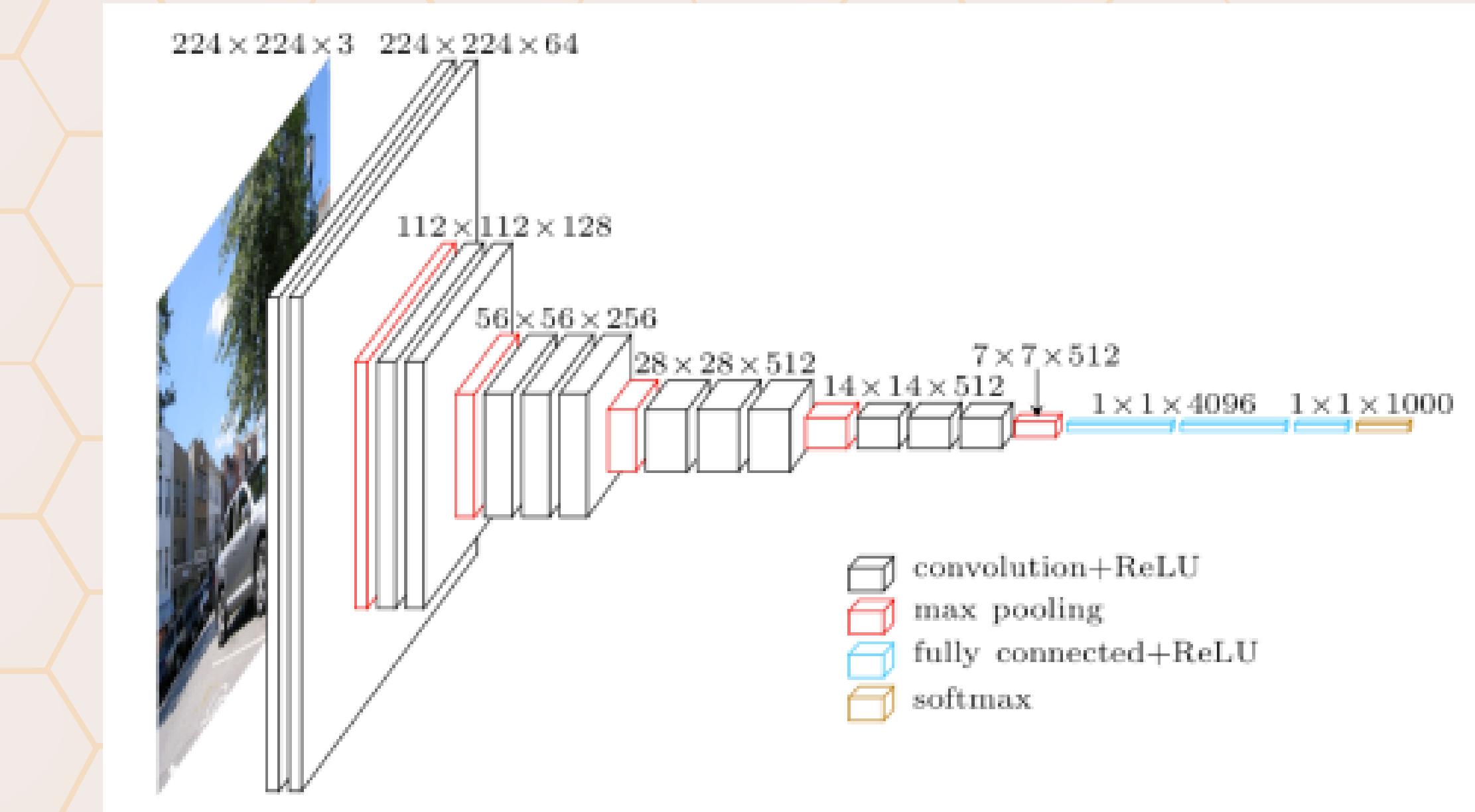
Accuracy: 0.73

F1: 0.71



VGGI6 Weighted with Imagenet

Accuracy: 0.924
F_I: 0.92II



VGG16 Model Confusion Matrix

Confusion Matrix

		Many Varroa	Healthy	Ants	Few Varroa	Missing Queen	Hive Theft	
True label	Many Varroa	30	10	1	0	0	0	600
	Healthy	5	666	2	2	0	2	500
Predicted label	Many Varroa	30	10	1	0	0	0	600
	Healthy	5	666	2	2	0	2	500
		Ants	Few Varroa	Missing Queen	Hive Theft			
		1	8	101	0	0	4	400
		1	6	1	76	0	1	300
		4	2	0	0	1	0	200
		0	2	27	0	0	82	100
								0

Many Varroa Healthy Ants Few Varroa Missing Queen Hive Theft



Future Work

- Continue tuning hyperparameters
- Gather more bee images
- Run with more epochs
- Develop a video classification model (RNN, LSTM) to handle videos of bees



THANK YOU

Appendix

Accuracy for Simple CNN

