FOOD IMAGE CLASSIFICATION USING CONVOLUTIONAL NEURAL NETWORK

05/08/2017 Barcamp Cyberjaya 2017

JACK GOH

ABOUT ME

/ Finished study at MMU Mid June 2017
/ Co-founder BOTAHEAD PLT
/ ML Developer at Coqnitiq Sdn Bhd

ABOUT THE PROJECT

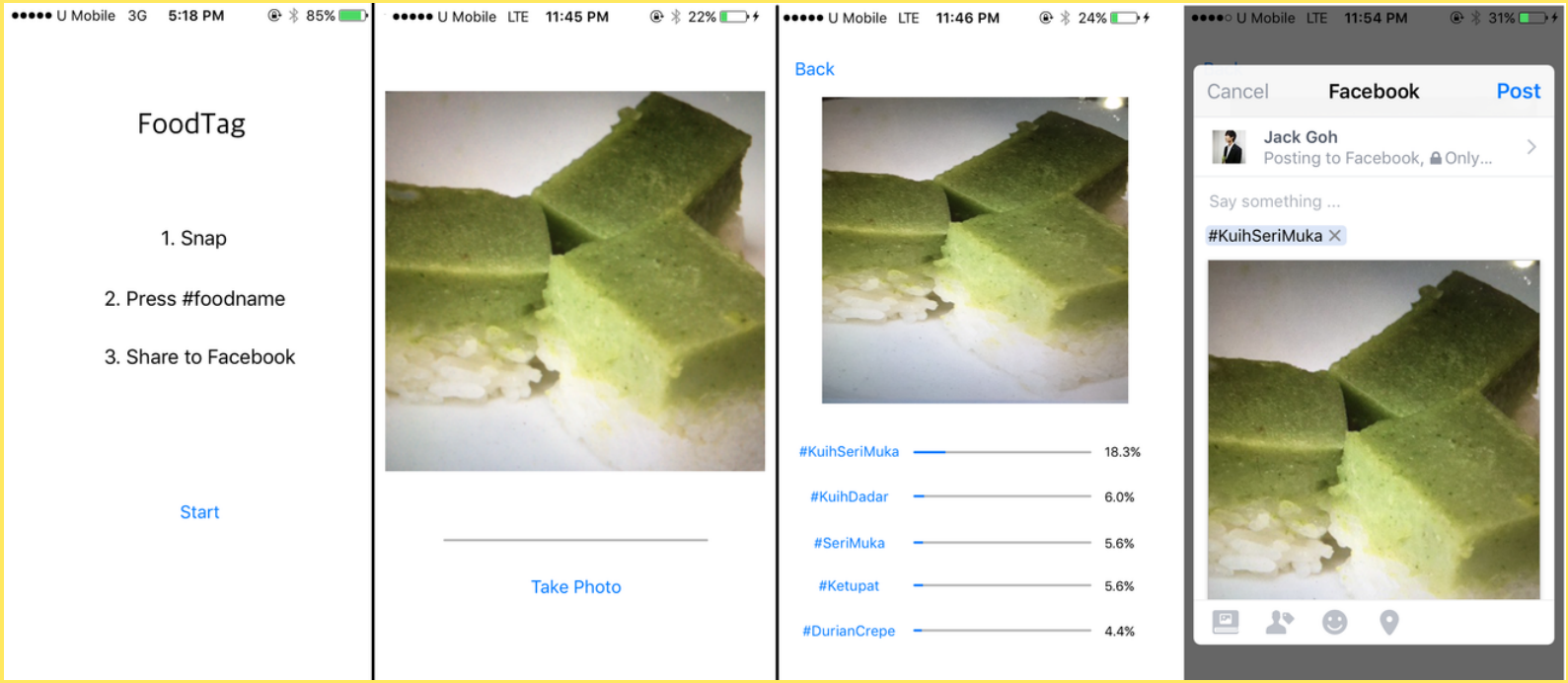
/ Final Year Project (July 2016 - Feb 2017)

/ Food Tag : Automatic Classify Food Photos

/ (Hot dog or not Hot dog)

IOS APP

https://github.com/jackg0h/foodtagApp

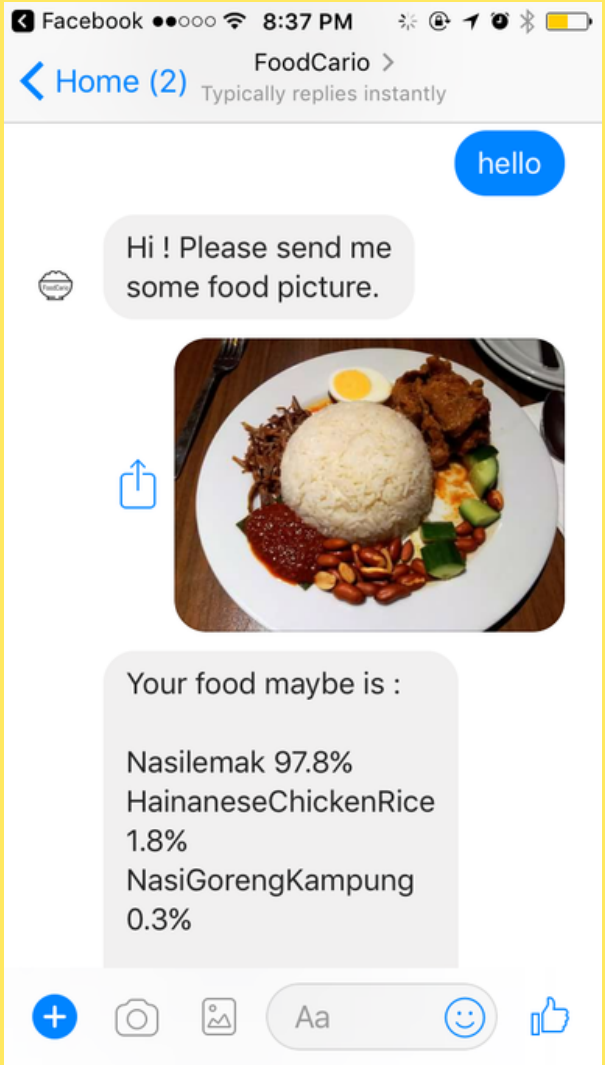


CHATBOT (MESSENGER)

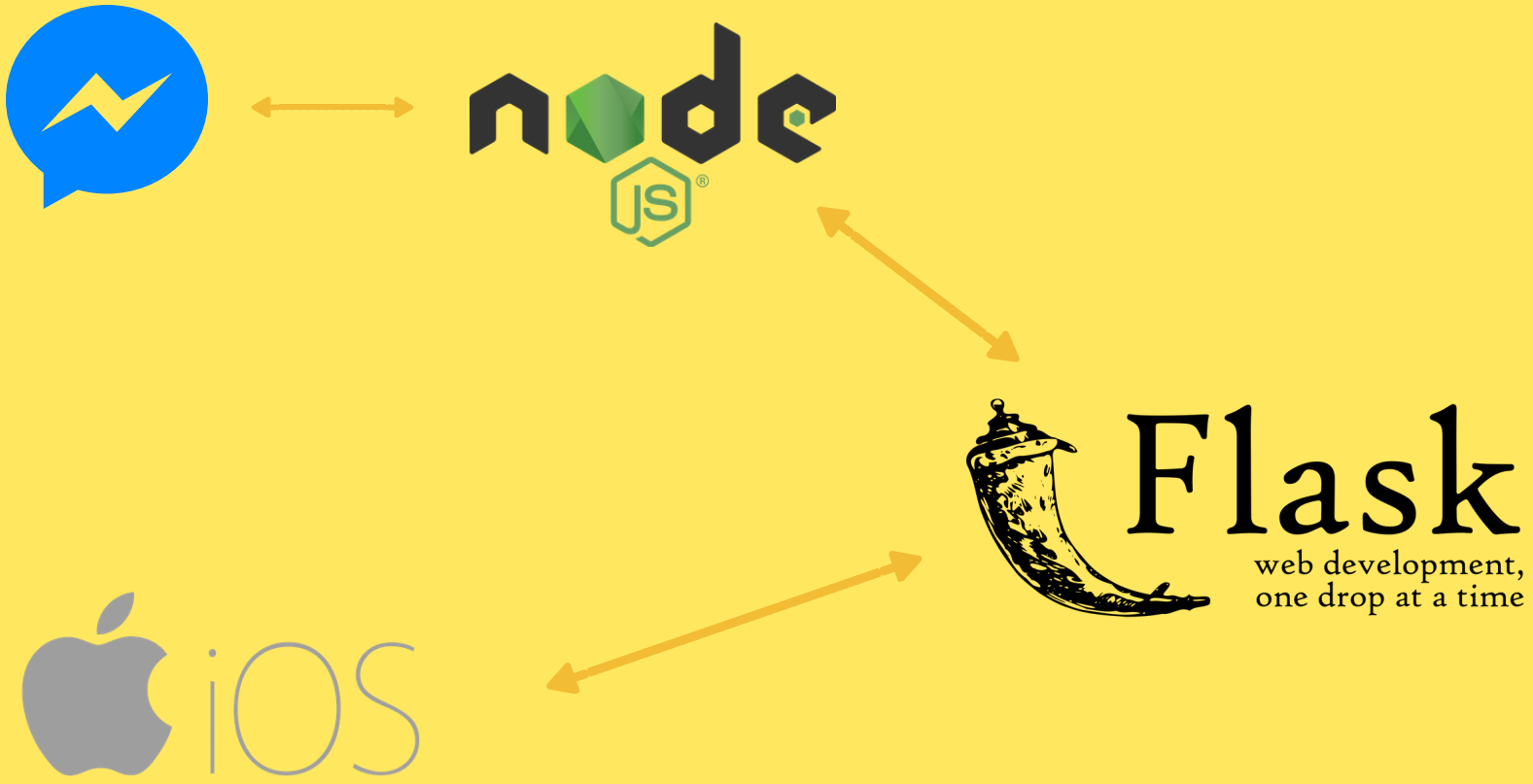
https://m.me/foodcario

or

http://foodcario.com



04.1 FOOD IMAGE CLASSIFICATION USING DEEP LEARNING



HANDCRAFTED

- Handcrafted feature extraction
- Specific
- Pre-defined

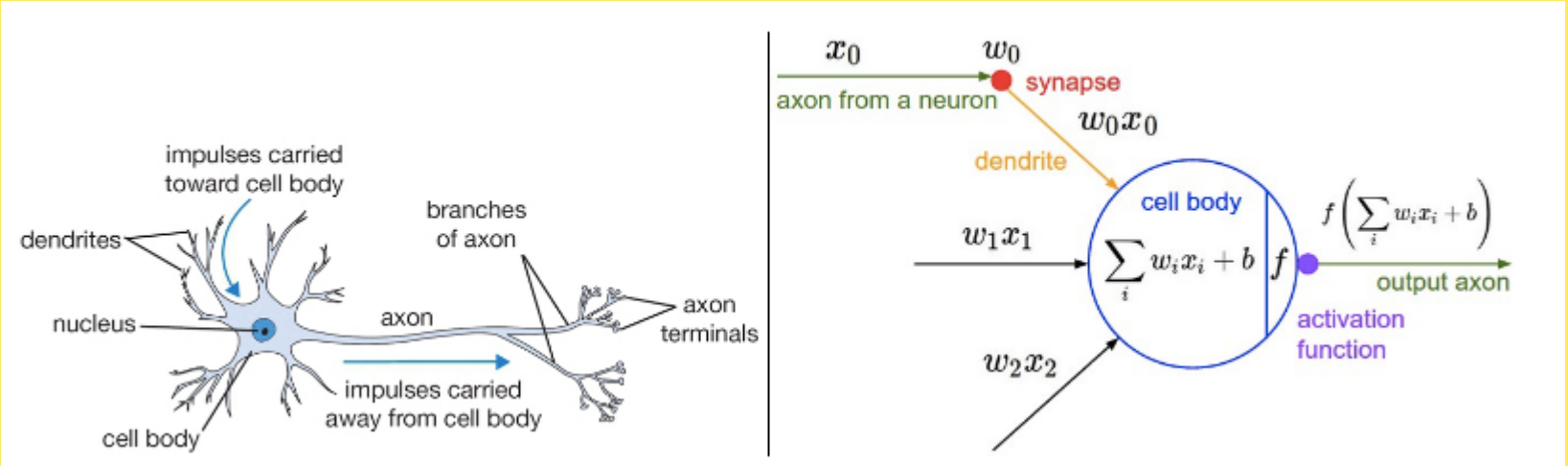
DEEP LEARNING

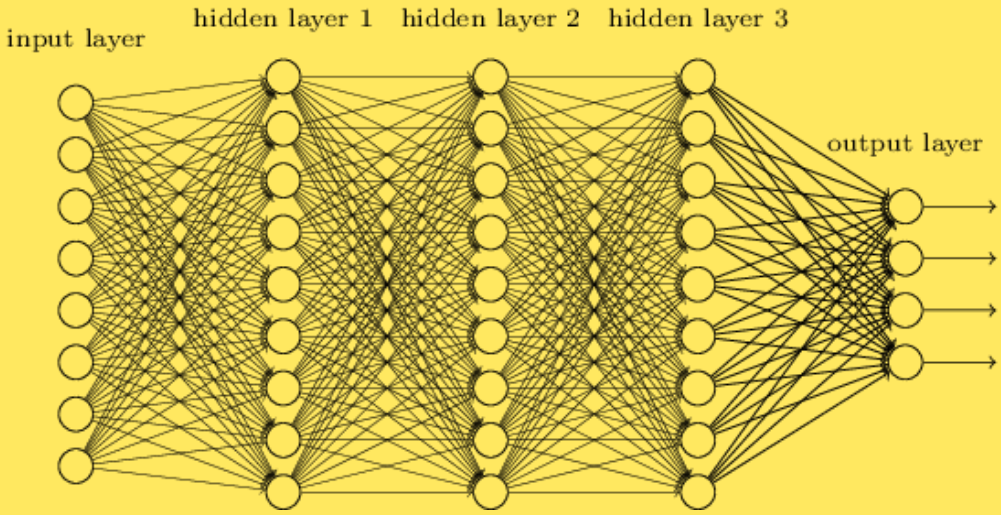
- Automatically learn features
- Robust
- Generalizable
- Performance improves with more data

Source: Convolutional Neural Networks in Practice // Cassidy Williams, Clarifai

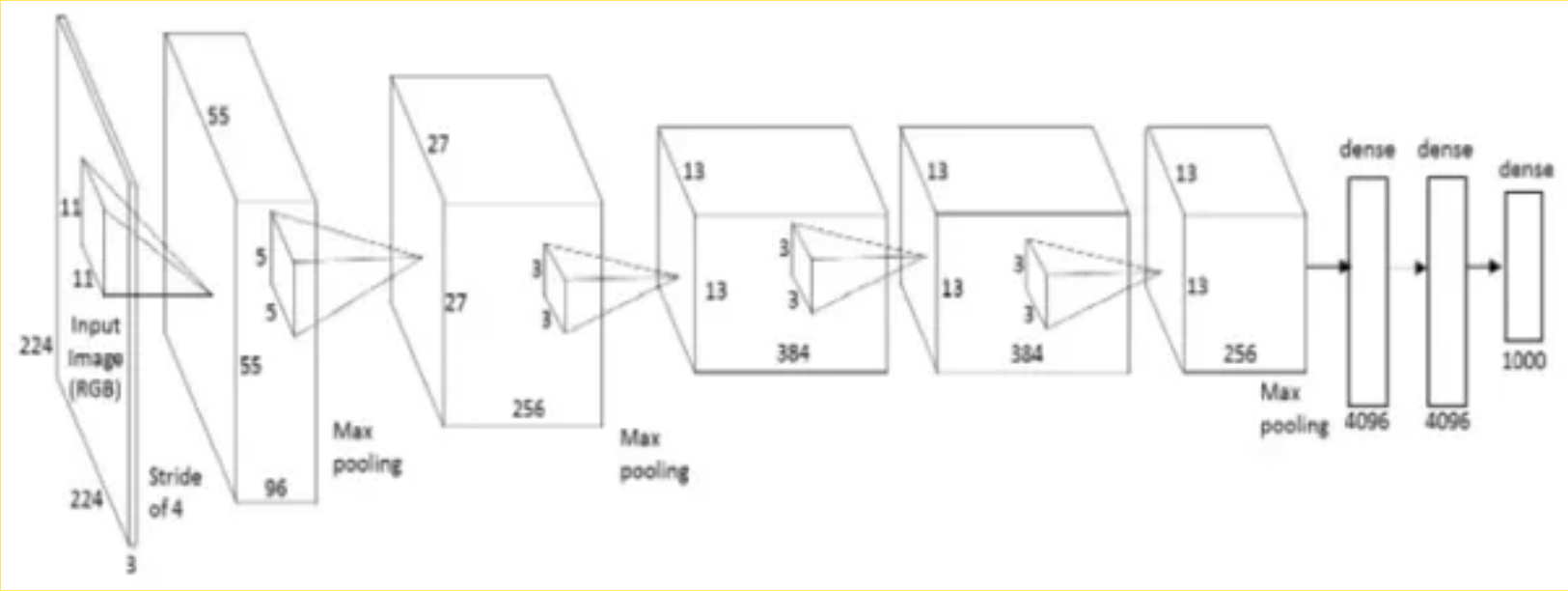
Neural Network

Source: cs231n Standford University

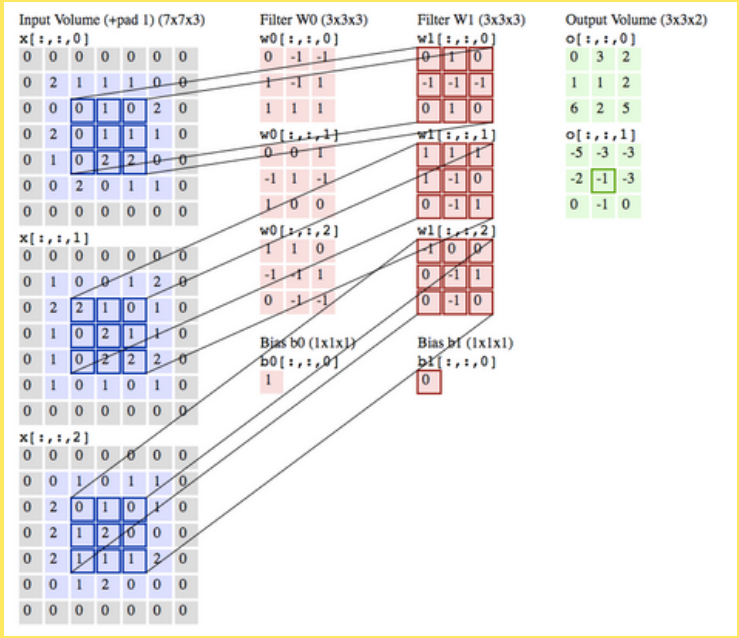


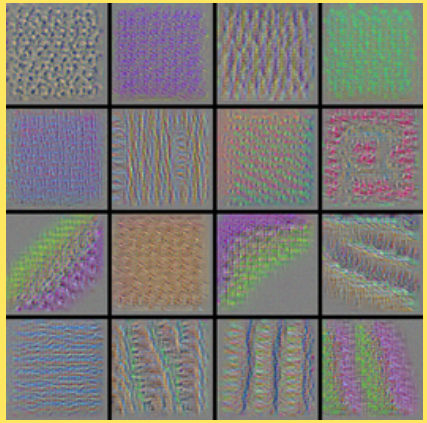


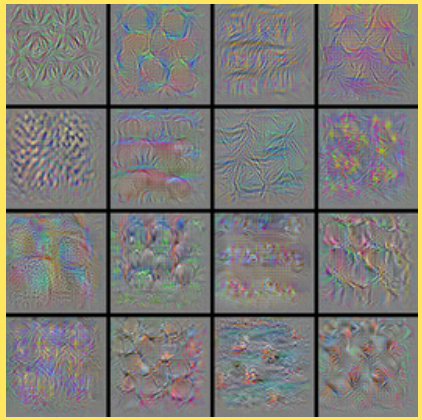
Convolution Neural Network

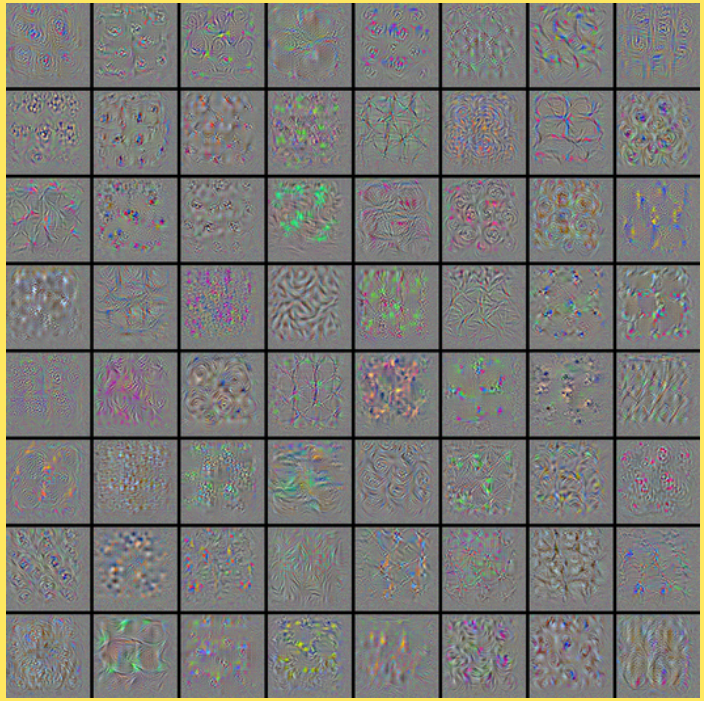


09 FOOD IMAGE CLASSIFICATION USING DEEP LEARNING



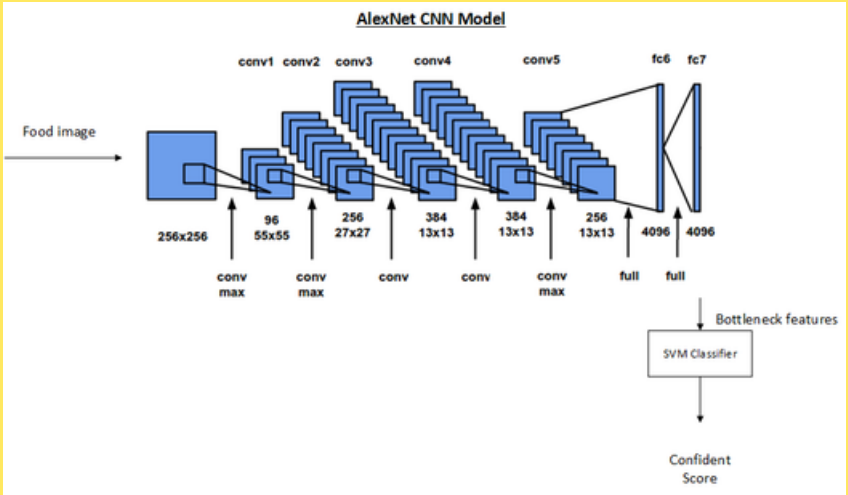




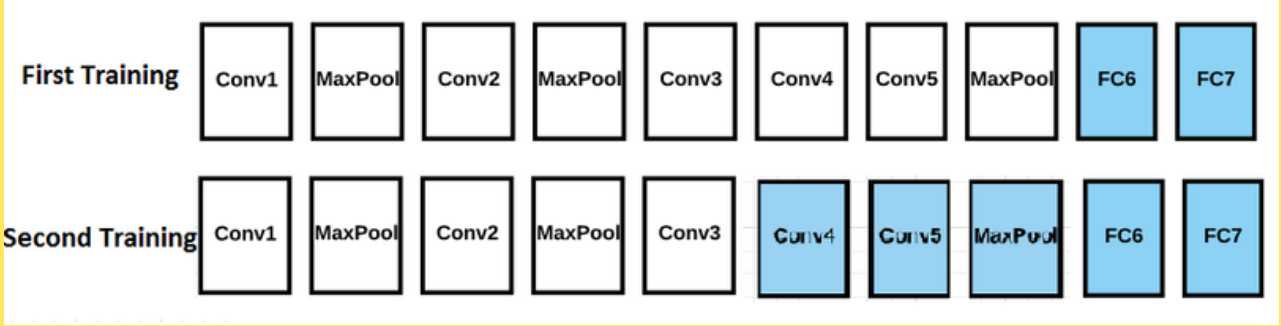


My Purposed Pipeline (Transfer Learning)

Feature Extraction



Finetuning



Data Augmentation

Results (Accuracy)

Without Data Augmentation

Method Used	Top-1 (%)			Top-5 (%)		
	Fold1	Fold2	Avg Acc	Fold1	Fold2	Avg Acc
TrainedFromScratch	30.70	29.59	30.19	59.77	58.06	58.92
DeepCNNfeatures($fc7$)	33.97	33.55	33.76	62.10	62.58	62.34
Finetuning($fc6, fc7$)	36.67	36.66	36.67	66.05	66.16	66.11
Finetuning($conv5, fc6, fc7$)	36.66	36.87	36.77	65.97	66.16	66.07
Dual fine-tuning (fc6, fc7), then (conv4, conv5, fc6, fc7)	40.10	39.78	39.94	70.12	70.12	70.12

With Data Augmentation

Method Used	Top-1	Top-5
Trained From Scratch	57.53%	87.38%
Finetuning (fc6, fc7)	49.26%	79.59%
Finetuning (conv5, fc6, fc7)	**68.25%**	**92.73%**
Dual fine-tuning (fc6, fc7), then (conv4, conv5, fc6, fc7)	58.25%	85.58%

Results (Speed)

With XEON 2670v1 With GTX1060 6GB

Method Used	CPU	GPU
Trained From Scratch	993 seconds	50 seconds
Finetuning (fc6, fc7)	597 seconds	32 seconds
Finetuning (conv5, fc6, fc7)	596 seconds	30 seconds
Dual fine-tuning (fc6, fc7), then (conv4, conv5, fc6, fc7)	624 seconds	33 seconds

Table 6.4: Deep Learning Method Computation Time (second/epoch) Without Data Augmentation)

Method Used	CPU	GPU
Trained From Scratch	1070 seconds	106 seconds
Finetuning (fc6, fc7)	690 seconds	112 seconds
Finetuning (conv5, fc6, fc7)	716 seconds	109 seconds
Dual fine-tuning (fc6, fc7), then (conv4, conv5, fc6, fc7)	722 seconds	107 seconds

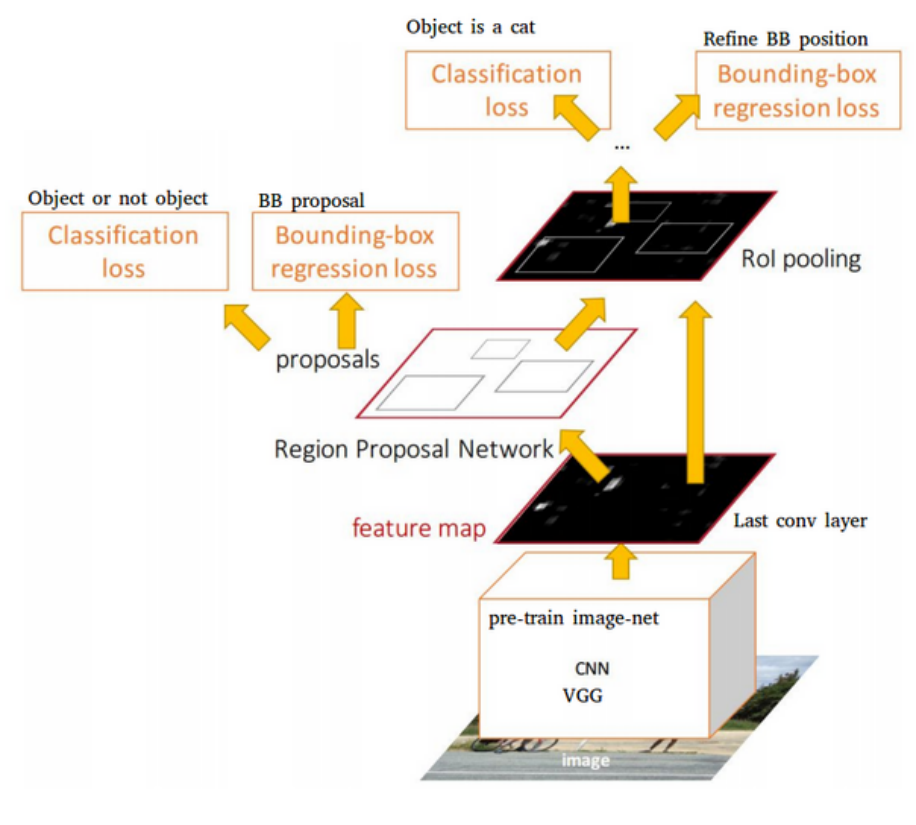
Table 6.5: Deep Learning Method Computation Time (second/epoch) With Data Augmentation

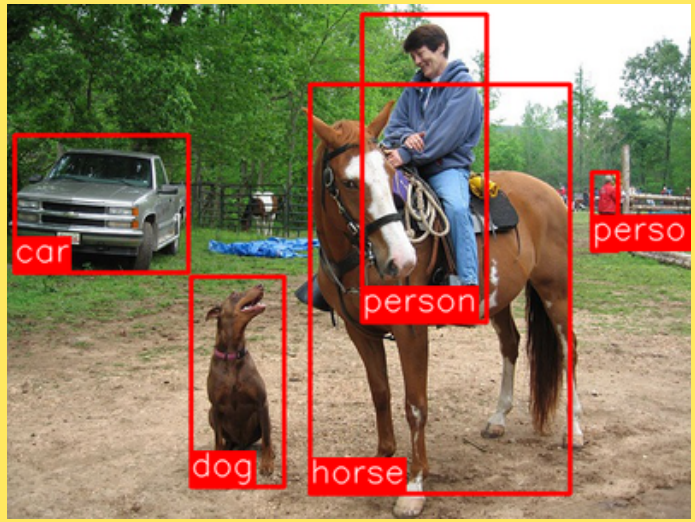
Code Demo?

https://github.com/jackg0h/barcampcyber2017

What next ?

Region Based CNN (RCNN)





Resources

http://keras.io

http://cs231n.stanford.edu/

https://blog.keras.io/building-powerful-image-classification-models-using-very-little-data.html

Thank You!

https://m.me/foodcario