USING MOBILE NEURAL NETWORK FOR PETS CLASSIFICATION

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INTRODUCTION

Development of AI

- AlphaGo - AlphaGo Master - AlphaGo Zero
- Number of applicants – Number of university programs

Popularity of Computer Vision

- University (CMU, CUHK)
- Company (Amazon Rekognition)

Facial analysis

Get a complete analysis of facial attributes, including confidence scores. (Your images aren't stored.)

Done with the demo?
Download SDKs

▼ Faces | Confidence

looks like a face	99.8%
appears to be female	100%
smiling	99.4%
appears to be happy	93.2%
wearing eyeglasses	99.9%
wearing sunglasses	97.6%

Show more

Choose a sample Image

Use your own image

Upload or

Type or paste image URL Go

INTRODUCTION

Mobile Devices

Face detection when taking photo

Apple FaceID, Facebook, Alipay…

Compared to CV in the server end…

MOTIVATION

Why Mobile

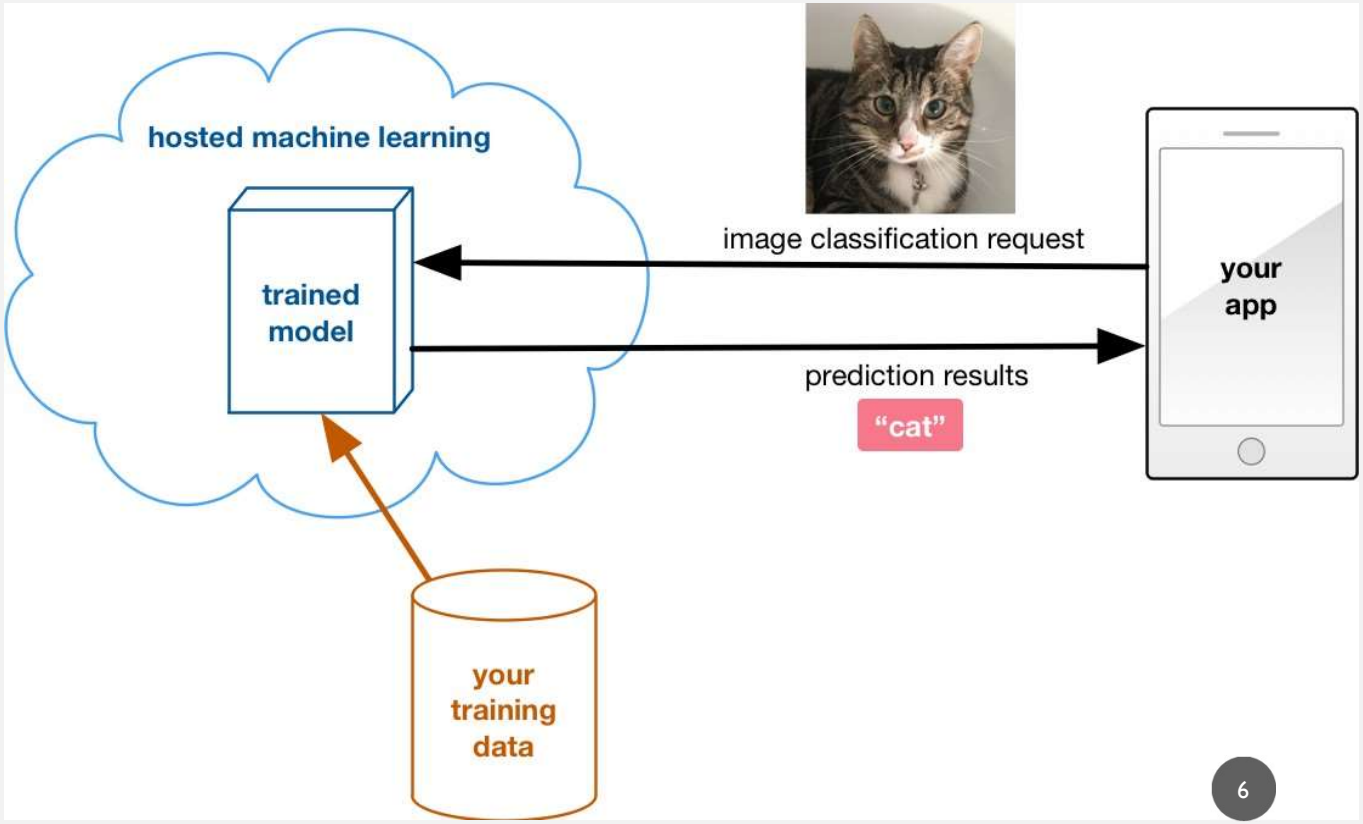
- General public
- Number of User
- Cost of time/money
- Wide usage scenario

MOTIVATION

Mobile implementation

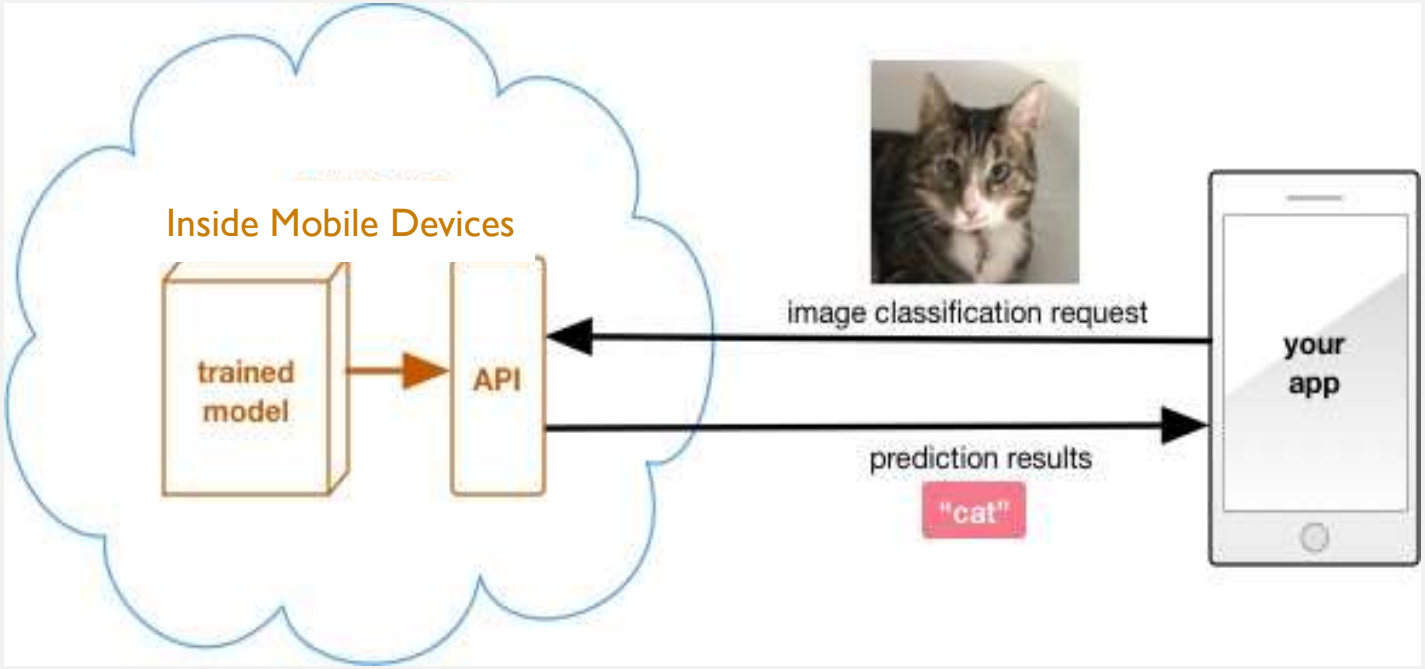
Need cloud server

Need Network



MOTIVATION

Mobile implementation

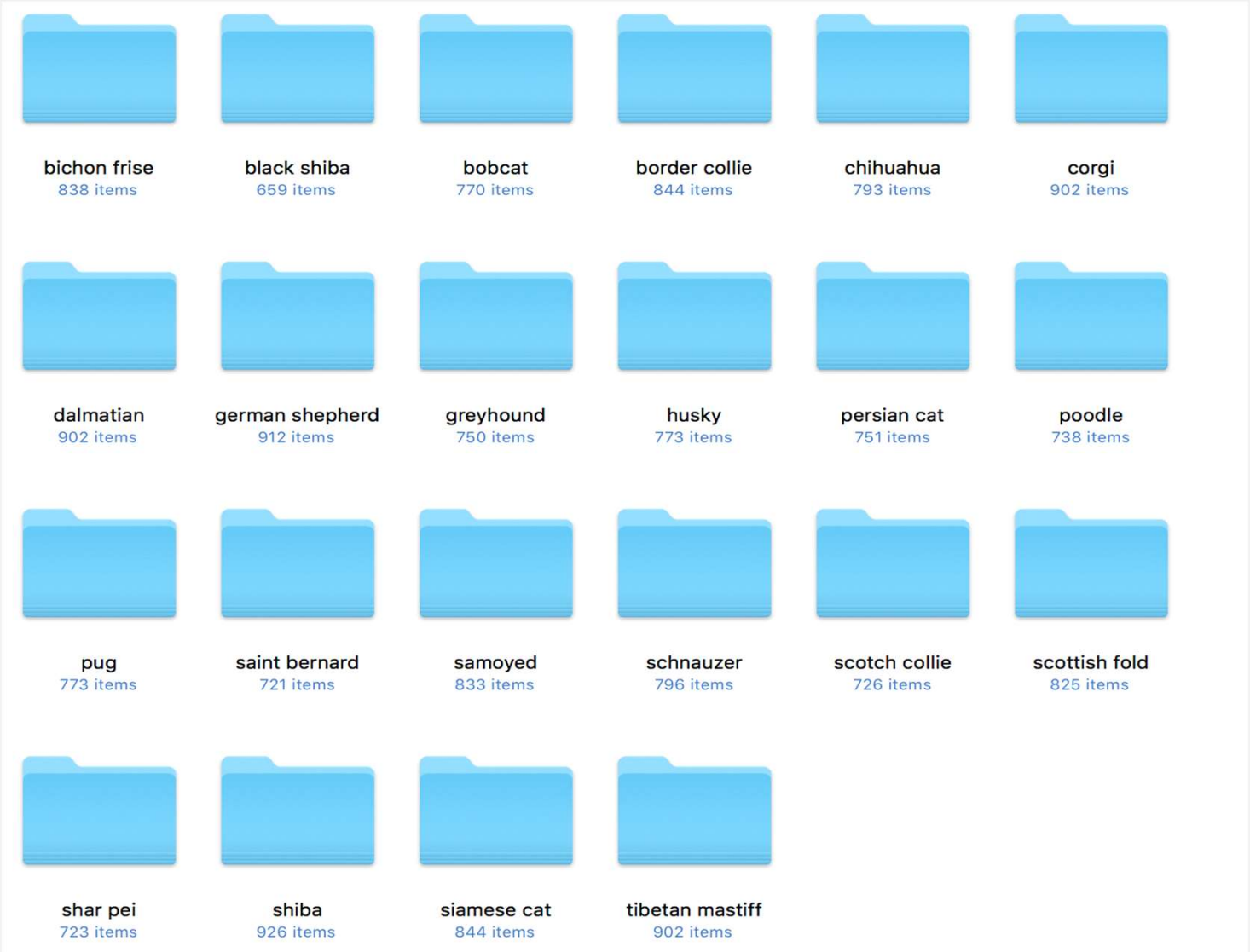


DATASET

What dataset to choose?

BotanWiki -> AnimalWiki
(Like ImageNet: dog, cat, cow, bird…)

AnimalWiki -> PetWiki
(Shiba, Husky, Scottish fold…)


bichon frise
838 items
black shiba
659 items
bobcat
770 items
border collie
844 items
chihuahua
793 items
corgi
902 items
dalmatian
902 items
german shepherd
912 items
greyhound
750 items
husky
773 items
persian cat
751 items
poodle
738 items
pug
773 items
saint bernard
721 items
samoyed
833 items
schnauzer
796 items
scotch collie
726 items
scottish fold
825 items
shar pei
723 items
shiba
926 items
siamese cat
844 items
tibetan mastiff
902 items

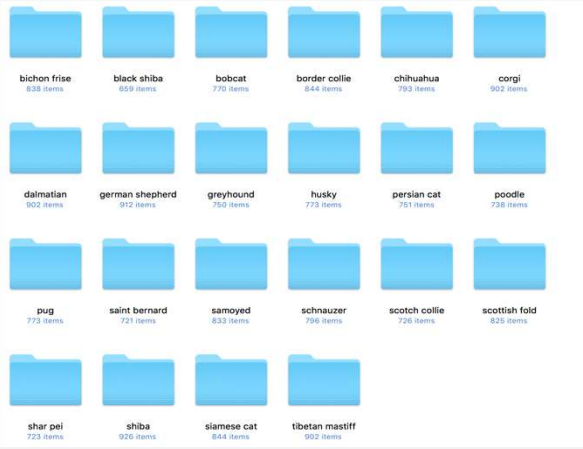
DATASET

About 20000 images for 21(+1) species: Google, Bing, Baidu

17(+1) dogs and 4 cats

Large dog (7): German Shepherd, Greyhound, Saint Bernard, Tibetan Mastiff, Samoyed, Scotch Collie, Husky.
Mid-size dog (5+1): Shiba, Black Shiba, Border Collie, Dalmatian, Shar Pei, Pug.
Small dog (5): Bichon frise, Chihuahua, Corgi, Poodle, Schnauzer.

Cat (4): Bobcat, Persian Cat, Scottish Fold, Siamese Cat.



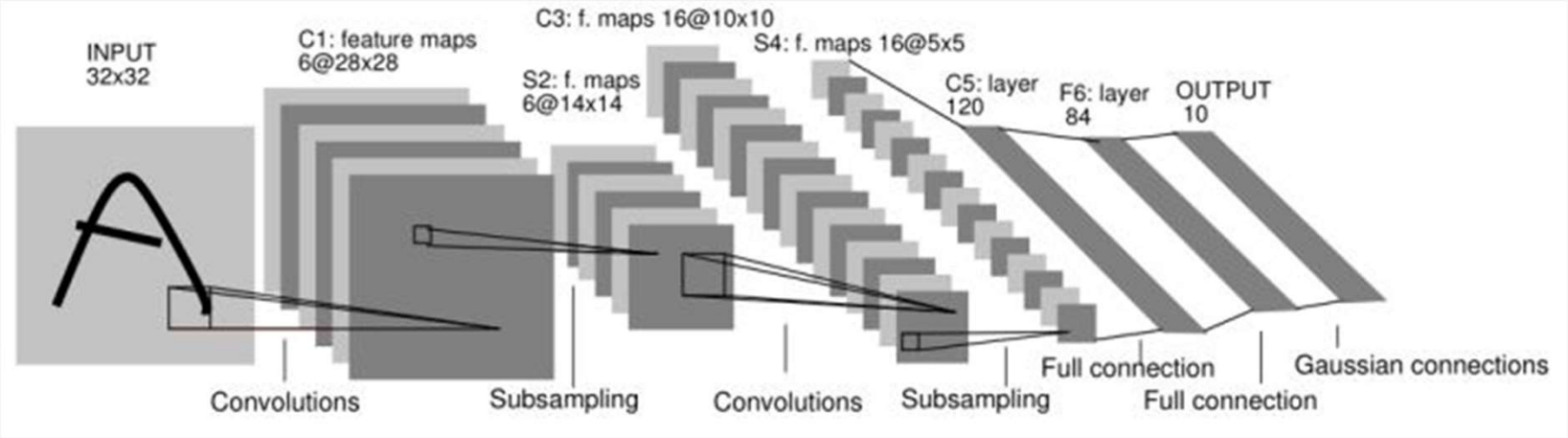
MODEL

What model to choose?

- Inception (V3)
- MobileNet

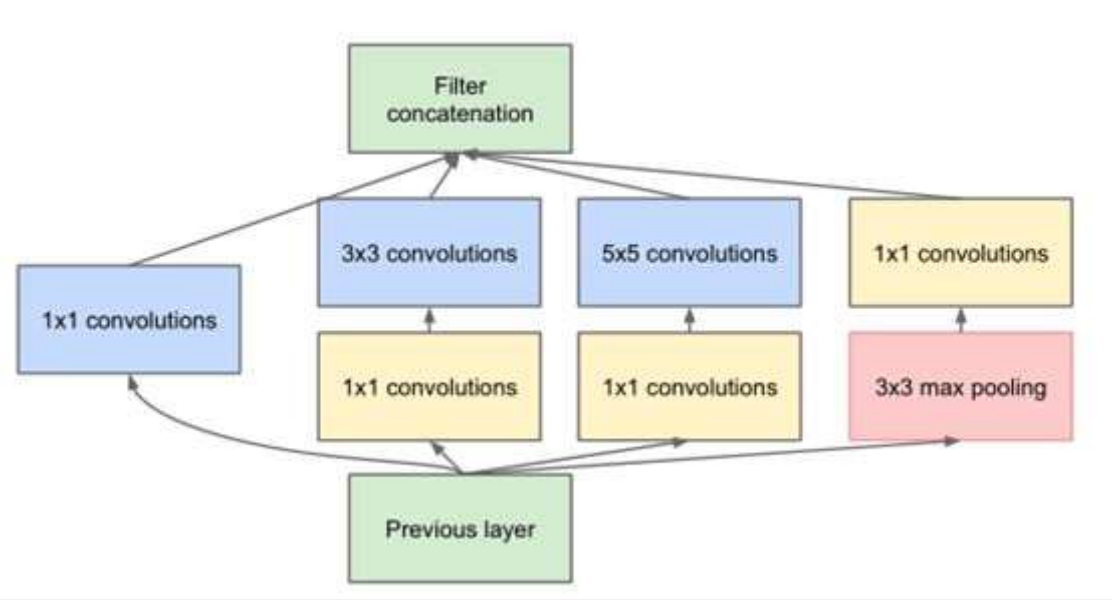
MODEL

Before Inception: Con Layer + Pooling Layer



MODEL

Inception: Bottleneck Layer

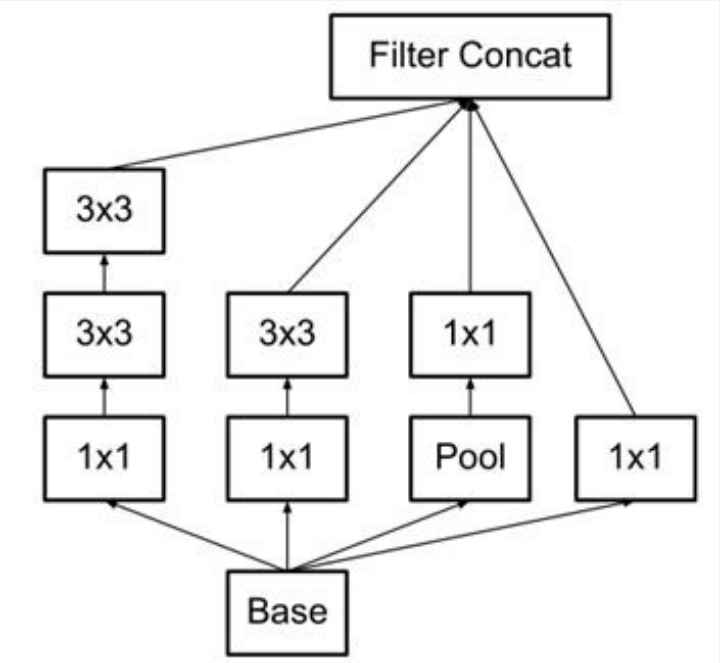


MODEL

Inception V2

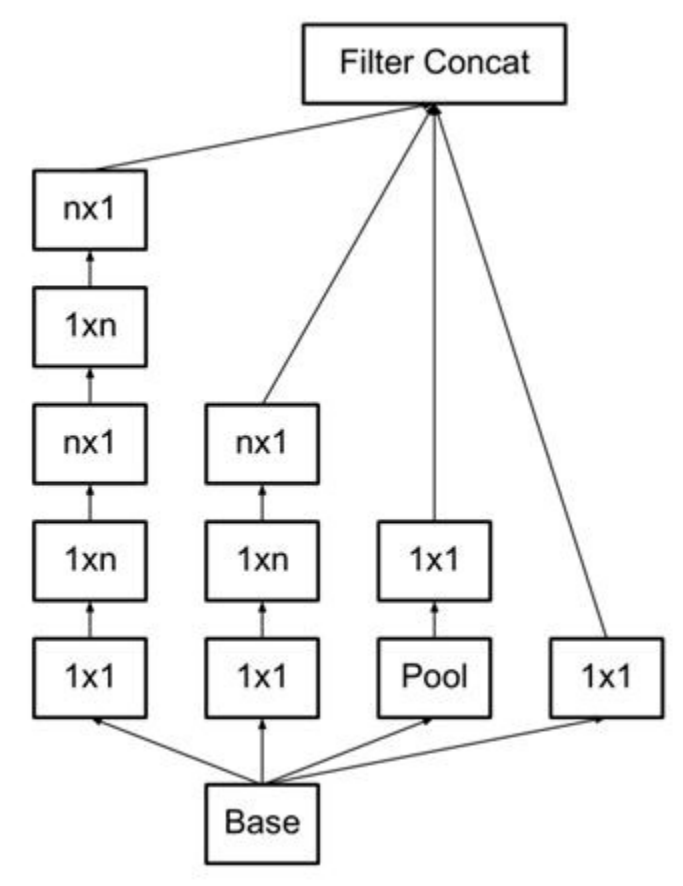
BN Layer

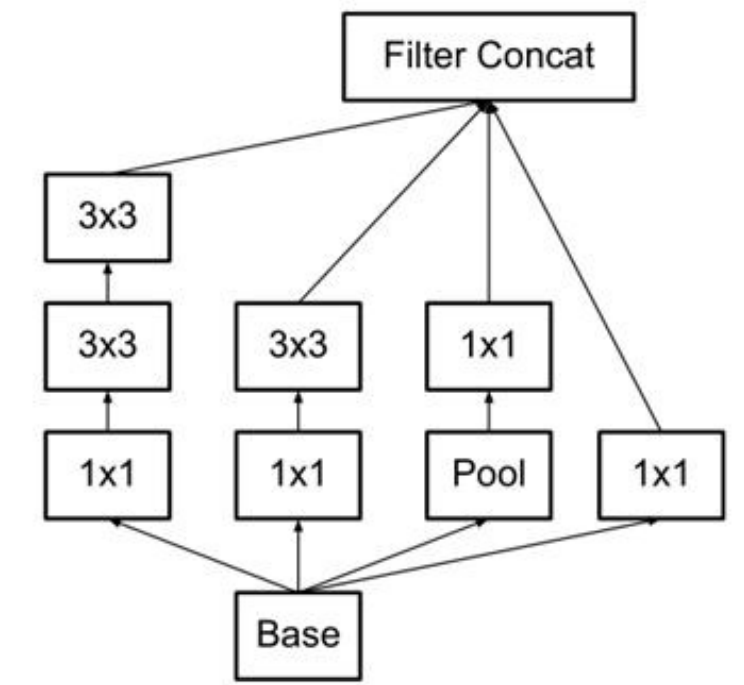
5*5 Con Layer –> 2 3*3 Layer



MODEL

Inception V2





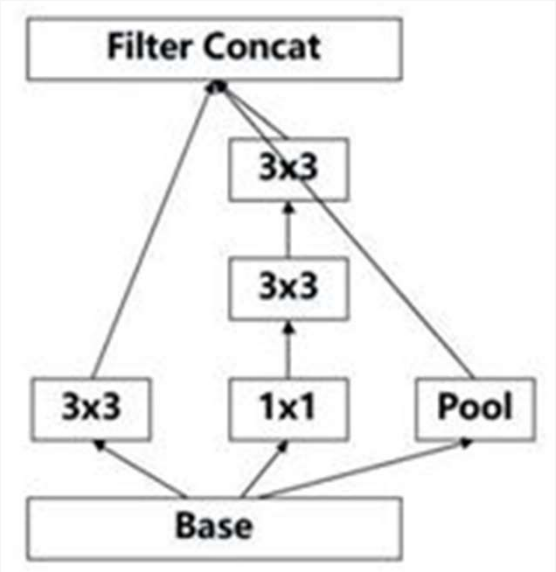
MODEL

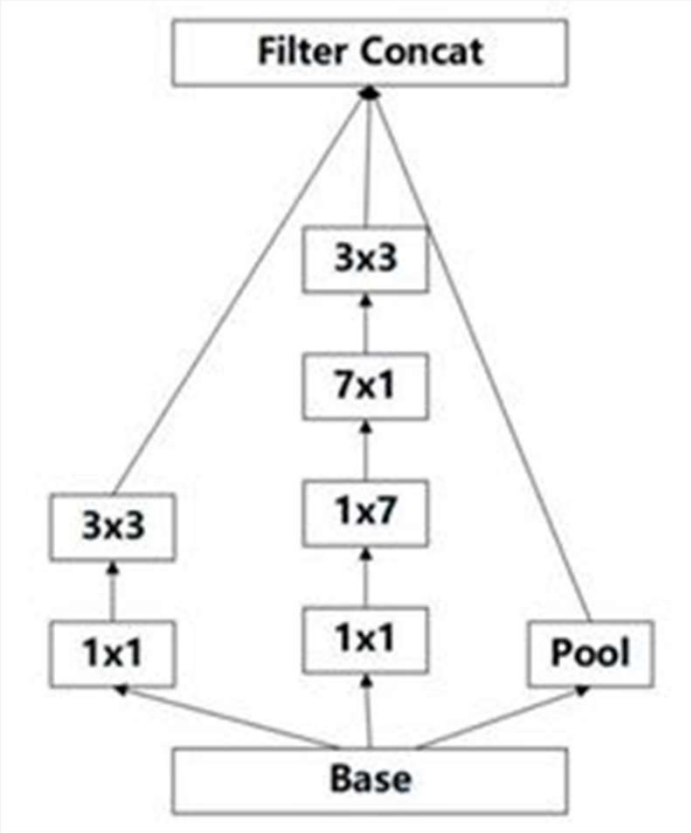
Inception vs Inception V2

Network	Top-1 Error	Top-5 Error	Cost Bn Ops
GoogLeNet [20]	29%	9.2%	1.5
BN-GoogLeNet	26.8%	-	**1.5**
BN-Inception [7]	25.2%	7.8	2.0
Inception-v2	23.4%	-	3.8
Inception-v2 RMSProp	23.1%	6.3	3.8
Inception-v2 Label Smoothing	22.8%	6.1	3.8
Inception-v2 Factorized 7×7	21.6%	5.8	4.8
Inception-v2 BN-auxiliary	**21.2%**	**5.6%**	4.8

MODEL

Inception V3

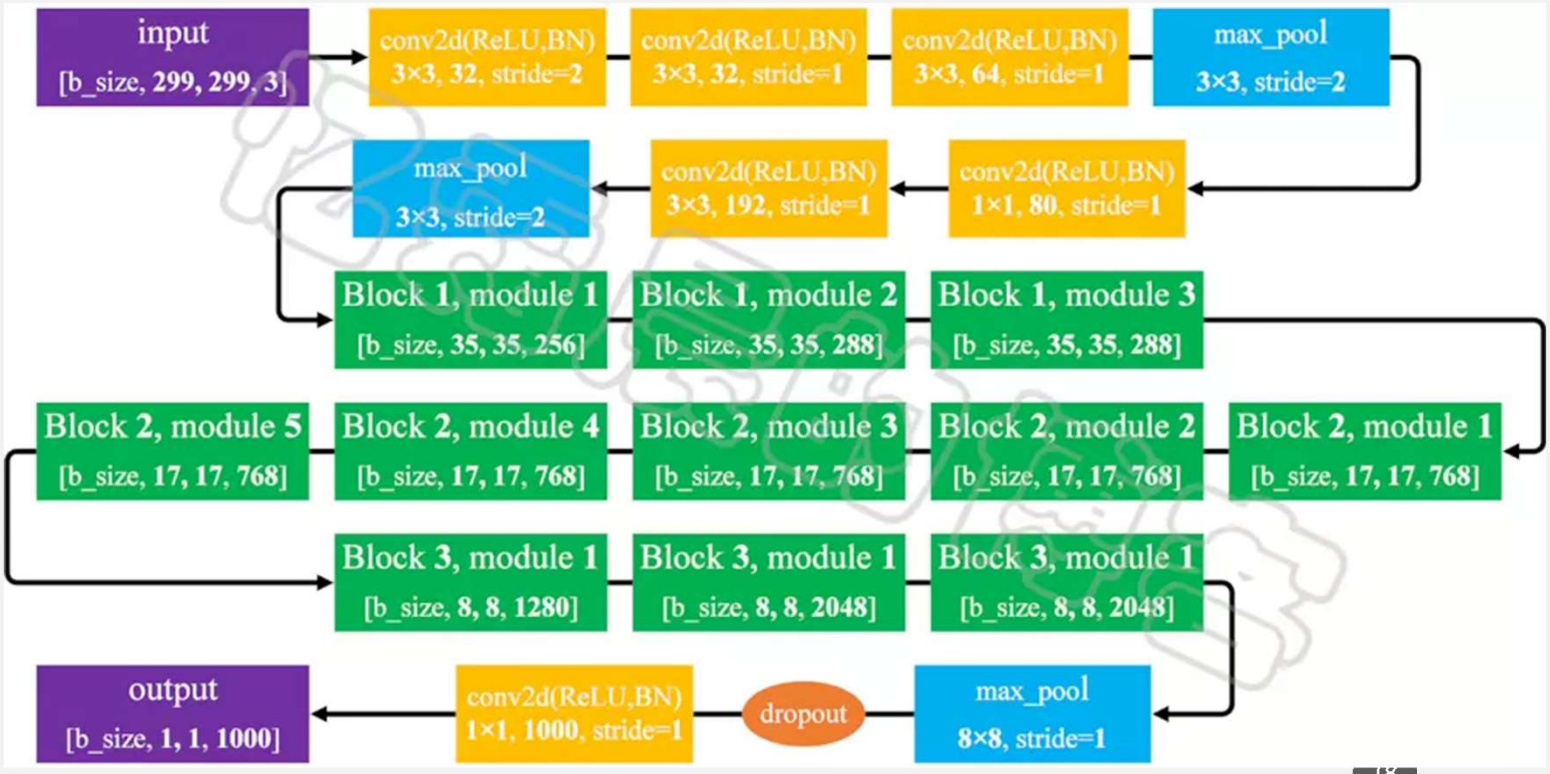




MODEL

Inception (V3)

> 45 layers



MODEL

Inception vs Inception V3

Network	Crops Evaluated	Top-5 Error	Top-1 Error
GoogLeNet [20]	10	-	9.15%
GoogLeNet [20]	144	-	7.89%
VGG [18]	-	24.4%	6.8%
BN-Inception [7]	144	22%	5.82%
PReLU [6]	10	24.27%	7.38%
PReLU [6]	-	21.59%	5.71%
Inception-v3	12	19.47%	4.48%
Inception-v3	144	**18.77%**	**4.2%**

RESULT

Training Accuracy &
Model Size

80% Training
10% Validation
10% Testing

Inception v3	**Accuracy: 0.98 Size: 88M**
MobileNet 100, 224	**Accuracy: 0.94 Size: 10M**
MobileNet 050, 224	**Accuracy: 0.92 Size: 3M**
MobileNet 050, 128	**Accuracy: 0.91 Size: 3M**
MobileNet 035, 224	**Accuracy: 0.94 Size: 2M**

DEMO

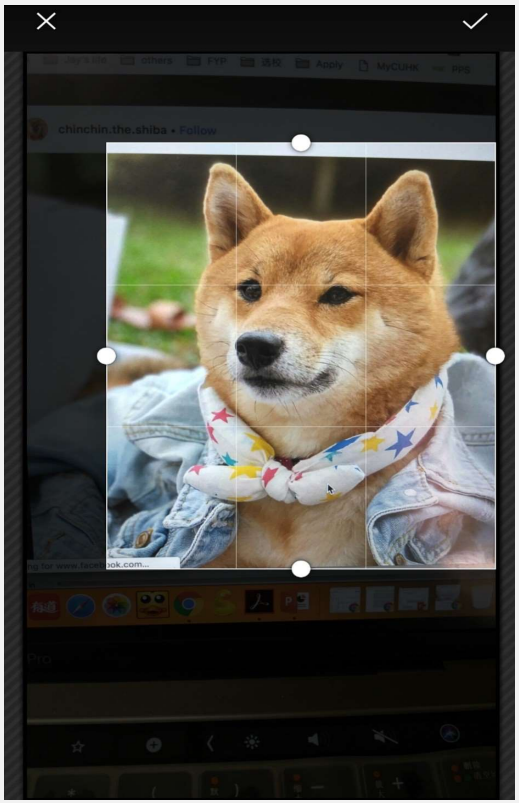
Application

1. Take/Choose photo with Inception model
2. Real-time Classify with Inception model
3. Real-time Classify with MobileNet model

DEMO

Take/Choose photo with Inception model

1. Take a photo in APP

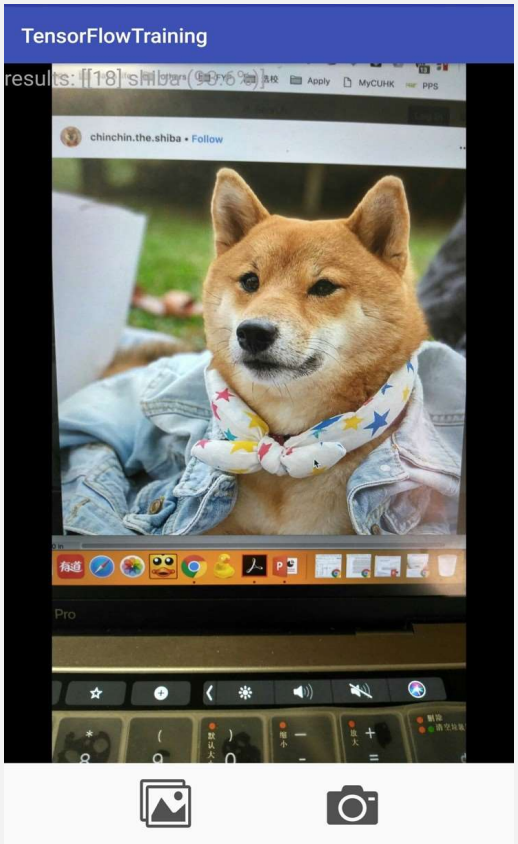


DEMO

Take/Choose photo with Inception model

1. Take a photo in APP

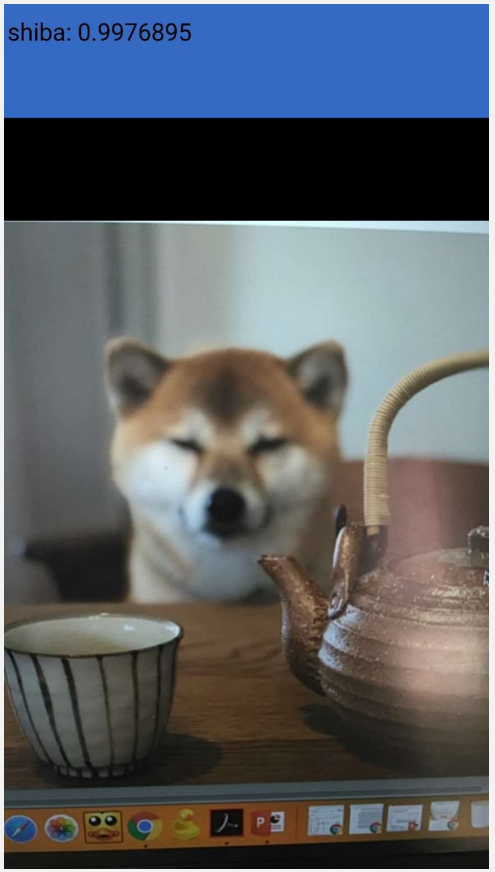
2. Choose a photo from album: Crop & Not Crop



DEMO

Real-time Classify
with Inception model

3. Difficult/Incomplete/Blur pictures/memes

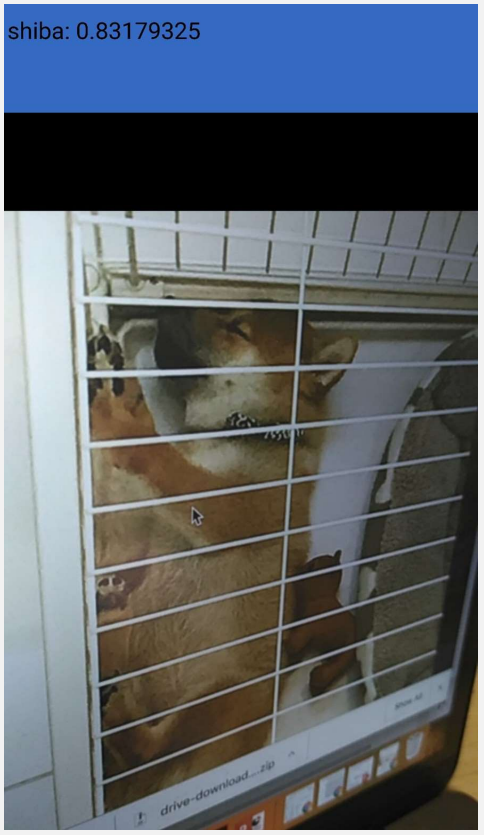


DEMO

Real-time Classify
with Inception model

3. Difficult/Incomplete/Blur pictures/memes

4. Different Angles



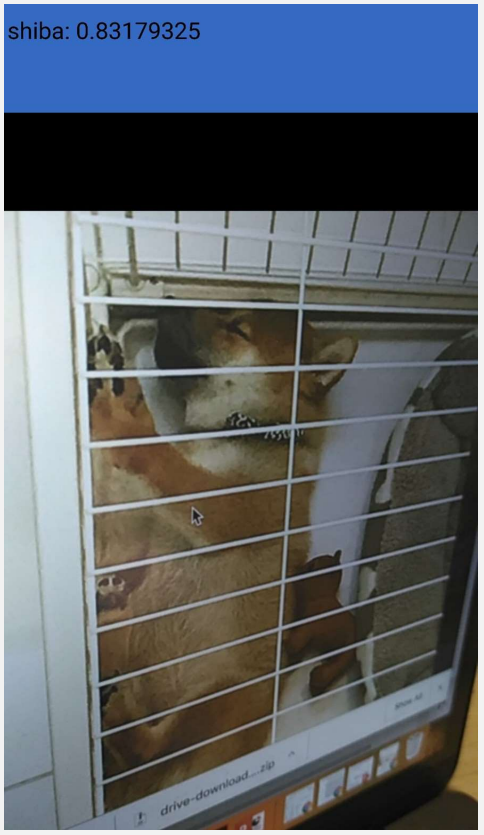
DEMO

Real-time Classify
with Inception model

3. Difficult/Incomplete/Blur pictures/memes

4. Different Angles

5. Other Species



DEMO

Real-time Classify
with Inception model

3. Difficult/Incomplete/Blur pictures/memes

4. Different Angles

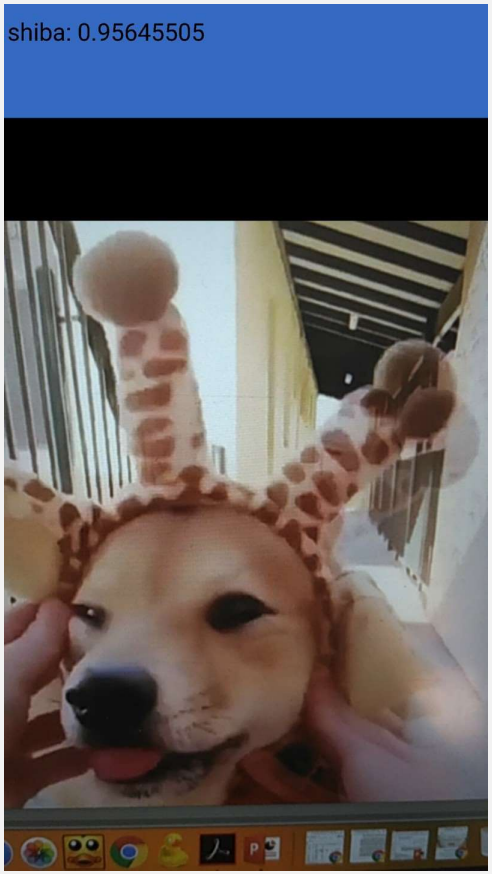
5. Other Species

6. Similar Species
(Shiba – Black Shiba – Husky)

	SIBERIAN HUSKY	ALASKAN MALAMUTE
Picture		
Origin	Siberia	Alaska
Size	51 -60 cm	58 - 71 cm
Weight	16 -34 kg	39 - 57 kg
Function	To carry a light load at moderate speed over great distances	To carry a heavy load
Eyes	Blue or Brown	Only Brown
Ears	Set high on the head	Set wide apart on the head
Tail	Fox brush carried in a sickle	A waving plume
Personality Traits	Highly Active & Vocal	Laid Back
	Friendly towards other dogs	Gender aggresive towards dogs of the same sex
	No loyality to one person - they love everyone & everything	Family orientated - Babysat the Mahlemut children in the tribe

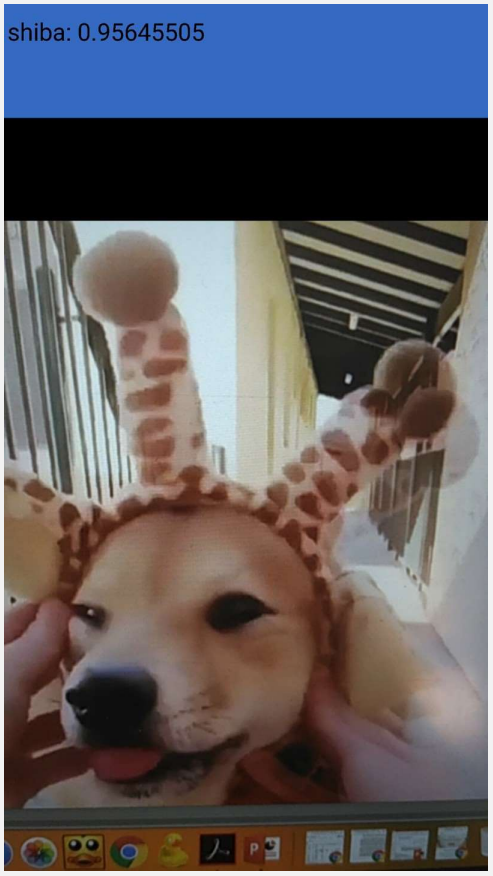
DEMO

Real-time Classify with
Inception model



DEMO

Real-time Classify with
MobileNet model



DEMO

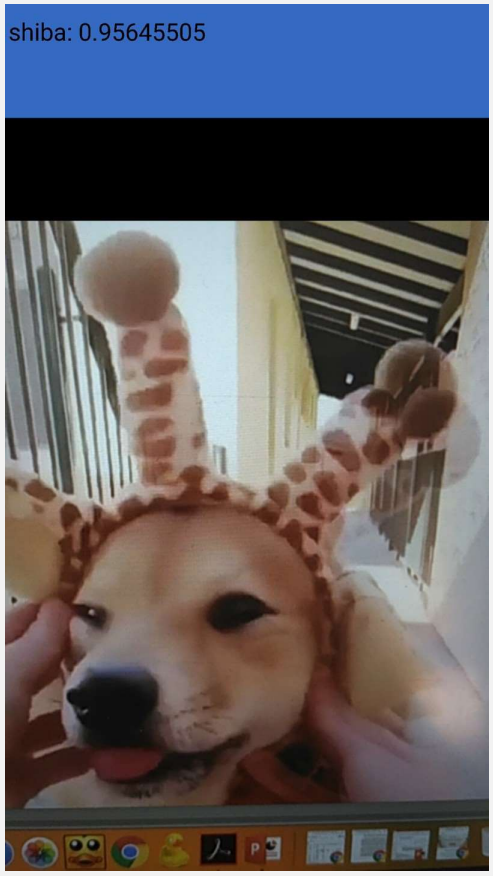
MobileNet vs Inception

Speed

Stability

“Unknown” (Human face)

-> Sure about usage: MobileNet, Inception



CONCLUSION

Shortcomings & Future Work

1. Classify "unknown" images: threshold, build an unknown class
   -> detect adversarial samples ?
2. Result of MobileNet varies rapidly in some cases.
3. Accuracy from different dataset
4. Evaluate our model
5. UI
6. More similar species (Husky vs Alaskan)

CONCLUSION

Term Review