

# Mushroom classification with MobileNetV2 and Xception

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# Introduction

- ▶ Purpose of the project: study and build a classifier that is able to recognize images of mushrooms and categorize them.
- ▶ MobileNetV2
  - ▶ 71% in top-1 accuracy and 90% in top-5 accuracy on ImageNet.
- ▶ Xception
  - ▶ 79% in top-1 accuracy and 95% in top-5 accuracy on ImageNet.
- ▶ MobileNetV2 is six times smaller than Xception in memory storage.

# Methods (2)

## Software

- ▶ Google Colab platform with Google GPUs; Tensorflow, Keras.

## Dataset

- ▶ Each image has a label defined by the pair (*super-category*, *category*).
- ▶ This dataset contains about 90,000 images belonging to about 1,500 classes.
- ▶ For our work we used 6,739 images belonging to 20 classes.
- ▶ To balance the dataset we picked:
  - ▶ 414 images if we use the first 3 classes,
  - ▶ 340 images if we use the first 10 classes;
  - ▶ 255 if we use all the 20 classes.

## Methods (3)

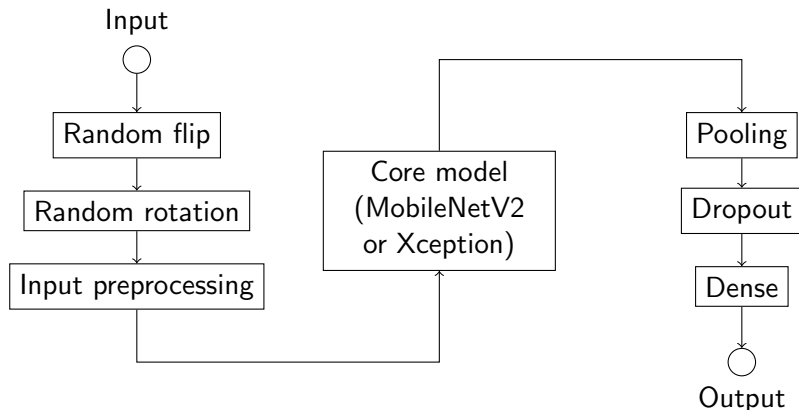


Figure: Architecture of the model.

# Methods (4)

## Fine tuning

1. First training phase: convolutional layer weights update was disabled, only the final dense layer was updated.
2. Second training phase: also some convolutional layers were updated.

## Hyperparameters

- ▶ Split training - test = 80%-20%
- ▶ Split training - validation = 80%-20%
- ▶ Batch size = 32
- ▶ Learning rate =  $10^{-4}$  for phase 1,  $10^{-5}$  for phase 2
- ▶ Epochs = 100 for phase 1, 20 for phase 2

# Results

Classes	Samples per class	MobileNetV2		Xception	
		Top-1	Top-5	Top-1	Top-5
3	414	92%	-	90%	-
10	340	77%	98%	81%	98%
20	255	65%	95%	70%	95%

**Table:** Result values for top-1 accuracy and top-5 accuracy.

## Results (2)

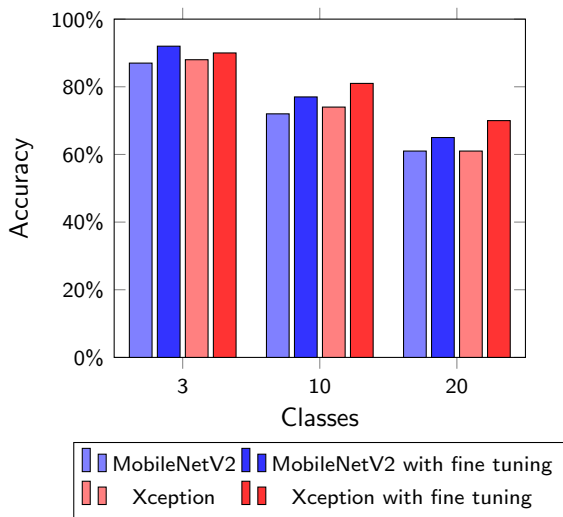


Figure: Comparison of performances between MobileNetV2 and Xception.

# Discussion

- ▶ We notice that with increasing the number of classes, the accuracy tends to decrease rapidly.
- ▶ Comparing the the 1000 classes of ImageNet, 20 classes are very few.
- ▶ Results probably will be better if:
  - ▶ we have more samples for each class;
  - ▶ we extend the training phase with more epochs.

## Further directions

- ▶ Try different setting for hyperparameters.



# Conclusions

- ▶ A method to use pre-trained neural networks to classify mushrooms was presented.
- ▶ Dataset was explored and prepared.
- ▶ The model was implemented following the official guidelines.
- ▶ A fine tuning phase was performed to achieve better performances.
- ▶ Results shows that models can correctly predict with noticeable accuracy.