Инна Тужикова, 17.04.2019

Transfer learning

Transfer learning: idea

Transfer learning is a machine learning method where a model developed for a task A is reused as the starting point for a model on a task B.

ImageNet Large Scale Visual Recognition Competition (ILSVRC)



Object classes: 1000. Images: 1.2 M train, 100k test



cherry

gill fungus ffordshire bullterrier

dalmatian

elderberry

grape

currant

mushroom

fire engine dead-man's-fingers

agaric

mushroom

jelly fungus

grille

convertible

beach wagon

grille

pickup

Madagascar cat

squirrel monkey

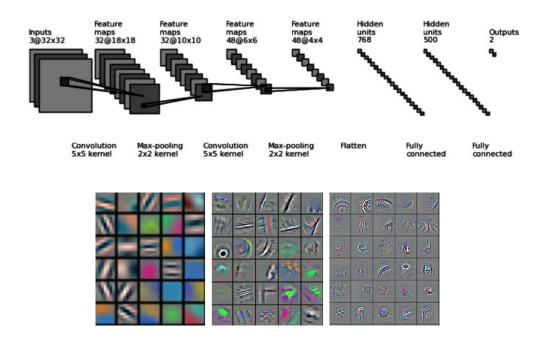
spider monkey

howler monkey

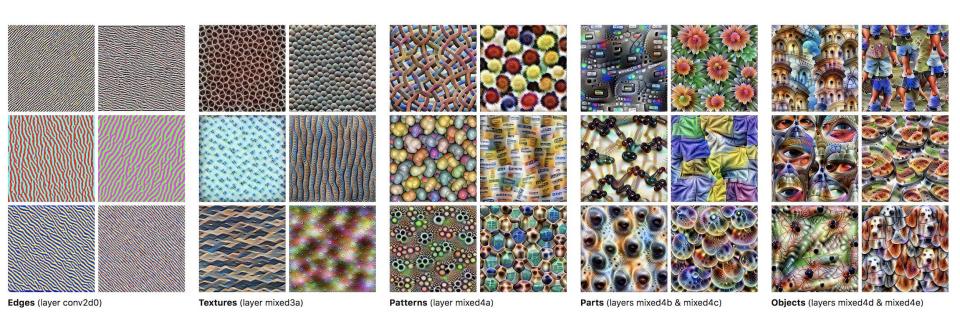
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indri

General vs specific



General vs specific

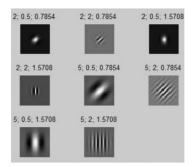


Gabor filters

111	112	113	114	115	121	122	123	124	125	131	132	133	134	135	141	142	143	144	145
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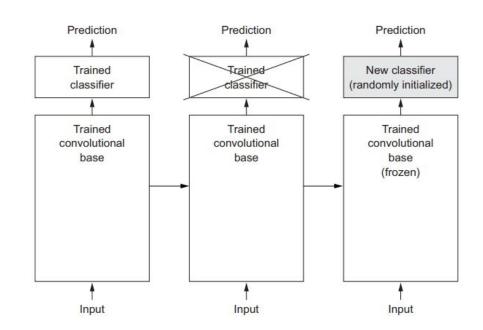
Gabor filters

$$g(x,y;\lambda, heta,\psi,\sigma,\gamma)=\exp(-rac{x^{\prime 2}\,+\gamma^2\,y^{\prime 2}}{2\sigma^2})\cos(2\pirac{x^\prime}{\lambda}+\psi)$$



Feature extraction

Feature extraction consists of using the representations learned by a previous network to extract interesting features from new samples. These features are then run through a new classifier, which is trained from scratch.



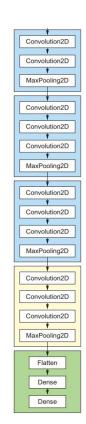
Fine-tuning

UNFREEZED BACKBONE + CUSTOM HEAD + BACKPROPAGATION

Replace and retrain the classifier on top of the pretrained neural network on the new dataset, but to also fine-tune the weights of the backbone by continuing the backpropagation.

FINE-TUNE:

- ALL LAYERS
- FIX LOW-LEVEL
- ONLY HIGH-LEVEL



Fine-tuning

- 1. Add your custom HEAD on a top of pretrained BACKBONE.
- 2. Freeze the BACKBONE.
- 3. Train the HEAD.
- 4. Unfreeze some layers in the BACKBONE.
- 5. Jointly train (low lr) unfreezed layers + HEAD.