Image Recognition

Xccelerate - Data Science Immersive

Agenda

Saving weights for a trained Neural network

Making Prediction with the trained Neural network

Using Pre-trained neural networks

Transfer Learning

Google - Cloud vision API

Saving and Retrieving model structure and weights

- Save structure of your model into a json file
- Save training weights into a H5 file

- Allows you to train your weights on different models.

- You can retrieve your models and weights to do prediction.

Pre-trained Neural Networks

- Researchers are competing and training NN for images
- Various trained models are available and can be used as a starting point
- Keras includes copies of many pre-trained neural networks that are ready to use
- All keras datasets have more than thousands of images with various categories of objects.

Image recognition Models

- VGG – CNN (19 layers) Very standard design : widely used(oxford)
- Resnet50 - 50 layer network more accurate less memory (Microsoft 2014)
- Inception V3 - 2015 - more complex design
- MobileNet (2017 google) low powered resource usage
- NASNet (2017) - designed by algorithms.

Keras Applications

- Keras Applications are deep learning models that are made available alongside pre-trained weights.
- These models can be used for prediction, feature extraction, and fine-tuning.
- Weights get downloaded when you instantiate a model

https://keras.io/applications/

Use cases

- Use a trained model to do recognition
- Transfer learning – adapt to an existing model to identify new types of objects instead of training from scratch.

How to use a pre-trained Model?

All models in applications library

Using a pre-trained VGG model.

For VGG - 224*224 image size

Transfer Learning

- In the real world – we almost never train a NN from scratch

- Transfer Learning – use a model trained on one set of data as a starting point for modeling new set of data.

How does transfer learning work

1. We simply slice off the last layer (dense or top layer)

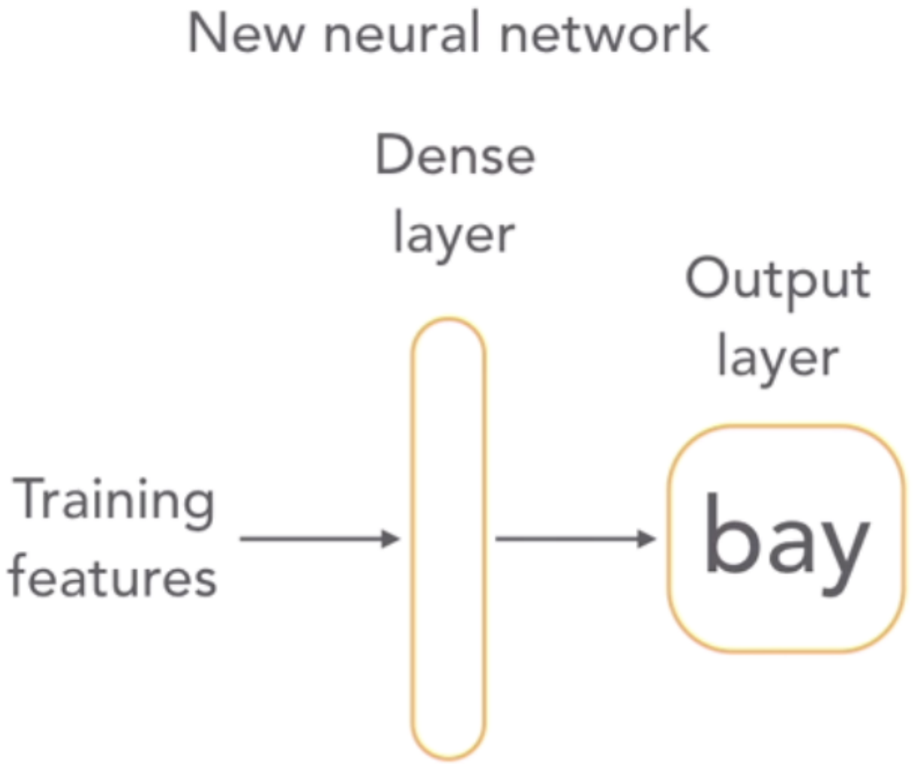
2. We keep all layers that detect features
3. We use pre-trained NN as a feature extractor.

4. We create a new NN to replace the last layer.
5. This is the layer which gets trained.

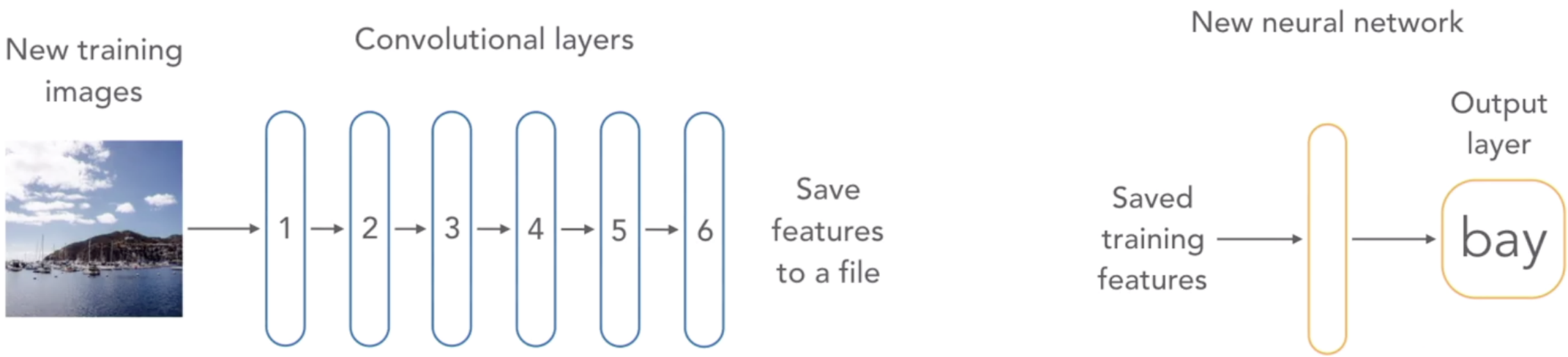
6. New training images – through the feature extractor and save features to a file
7. We use the extracted features to train the new NN (Step 4)

8. To predict – we extract features and feed into our new NN

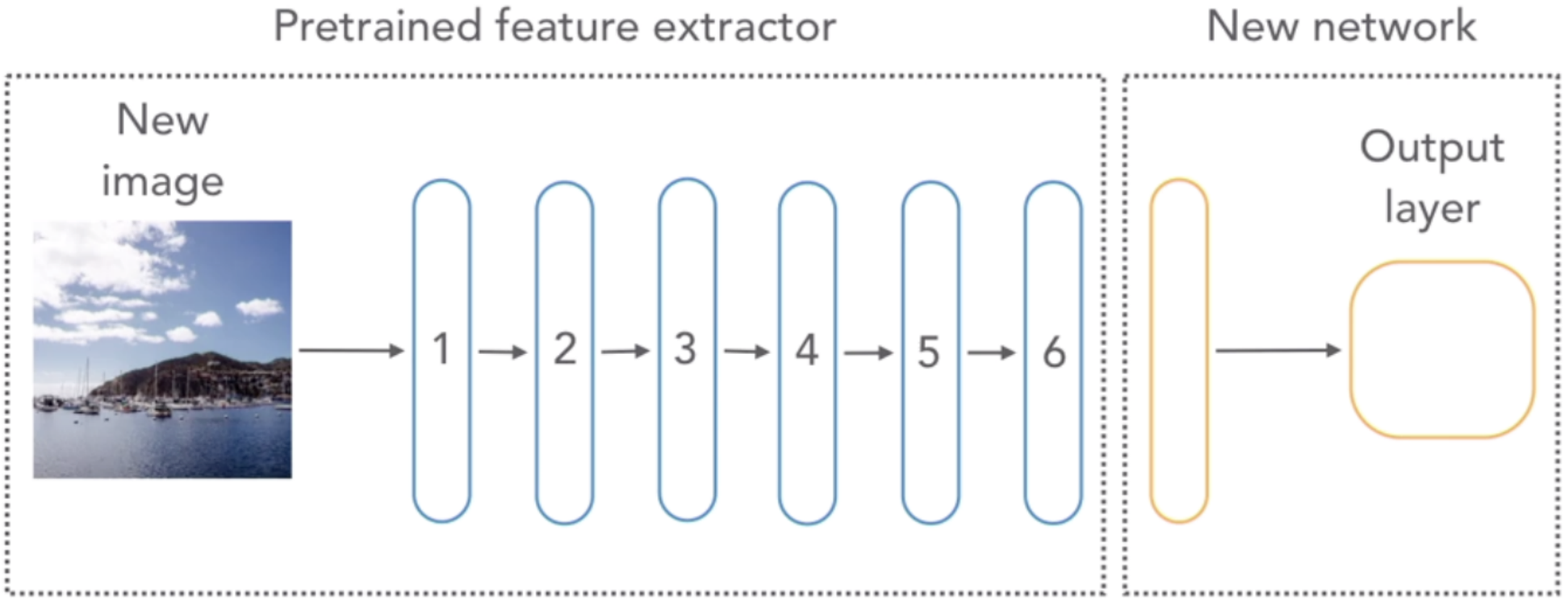
Training with Transfer learning



Training with Transfer learning



Prediction with Transfer learning



When to use transfer learning

- Try first – because it takes less time
- Head start for your projects.
- You don’t have a lot of training data but already have a model that solved a similar problem.

Image API’s in the cloud

- Off the shelf image APIs are available
- All major Cloud vendors provide API;s (+ startups)
- Upload an image and be able to Recognise objects which appear in a image
- Downside: built-in list of objects

Cloud Vendors

- Google Cloud vision API
- Amazon Rekognition
- Microsoft Azure Computer vision
- Smaller startups with unique offerings.

When to use cloud based image API

- Don’t have training data
- Detect many different kinds of objects
- Detecting common objects
- Low budget or time

Building your own model

- Specialised training images
- Detect uncommon objects
- Training data is sensitive or proprietary

Google Cloud vision API

- No training required
- Pay per 1000 API requests
- All processing happens on cloud

Features

- Labels
- Web detection
- OCR
- Handwriting
- Landmark detection
- Face detection
- Content moderation

Demo - Google Cloud vision API

- Find Labels in images
- Extract text in images