



UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

School of Professional & Executive Development

POSTGRADUATE COURSE

ARTIFICIAL INTELLIGENCE WITH DEEP LEARNING

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#DLUPC

Computer Vision 6 Object Detection (Lab)



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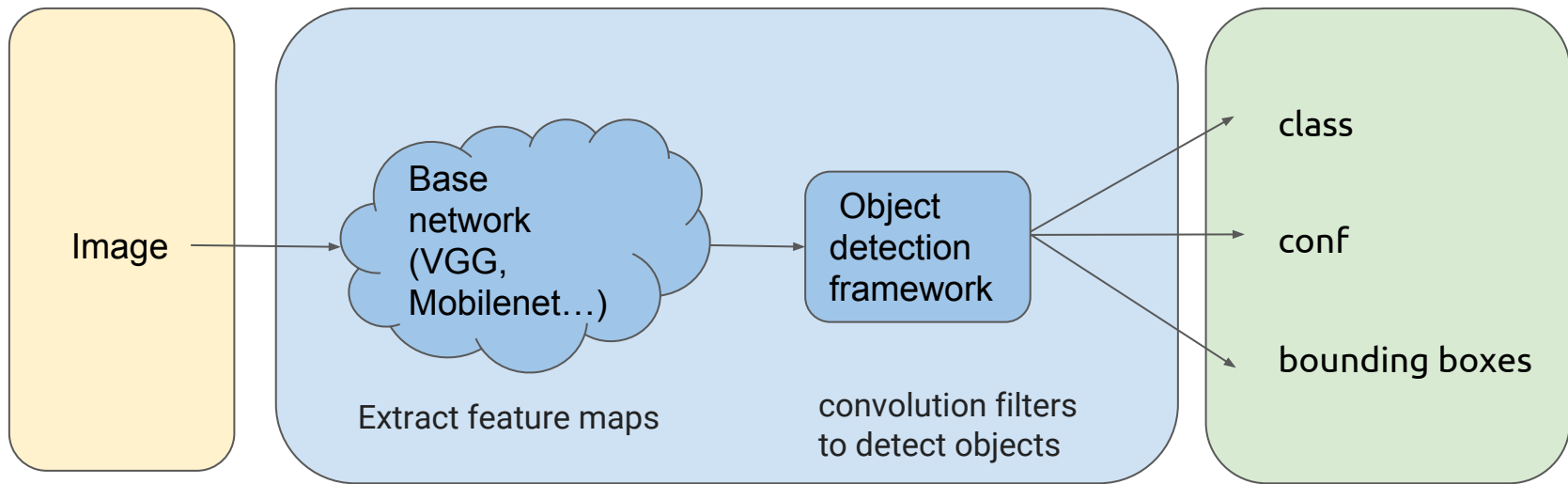
Disney Research



Disney Research

SSD: Single Shot Multibox Detector

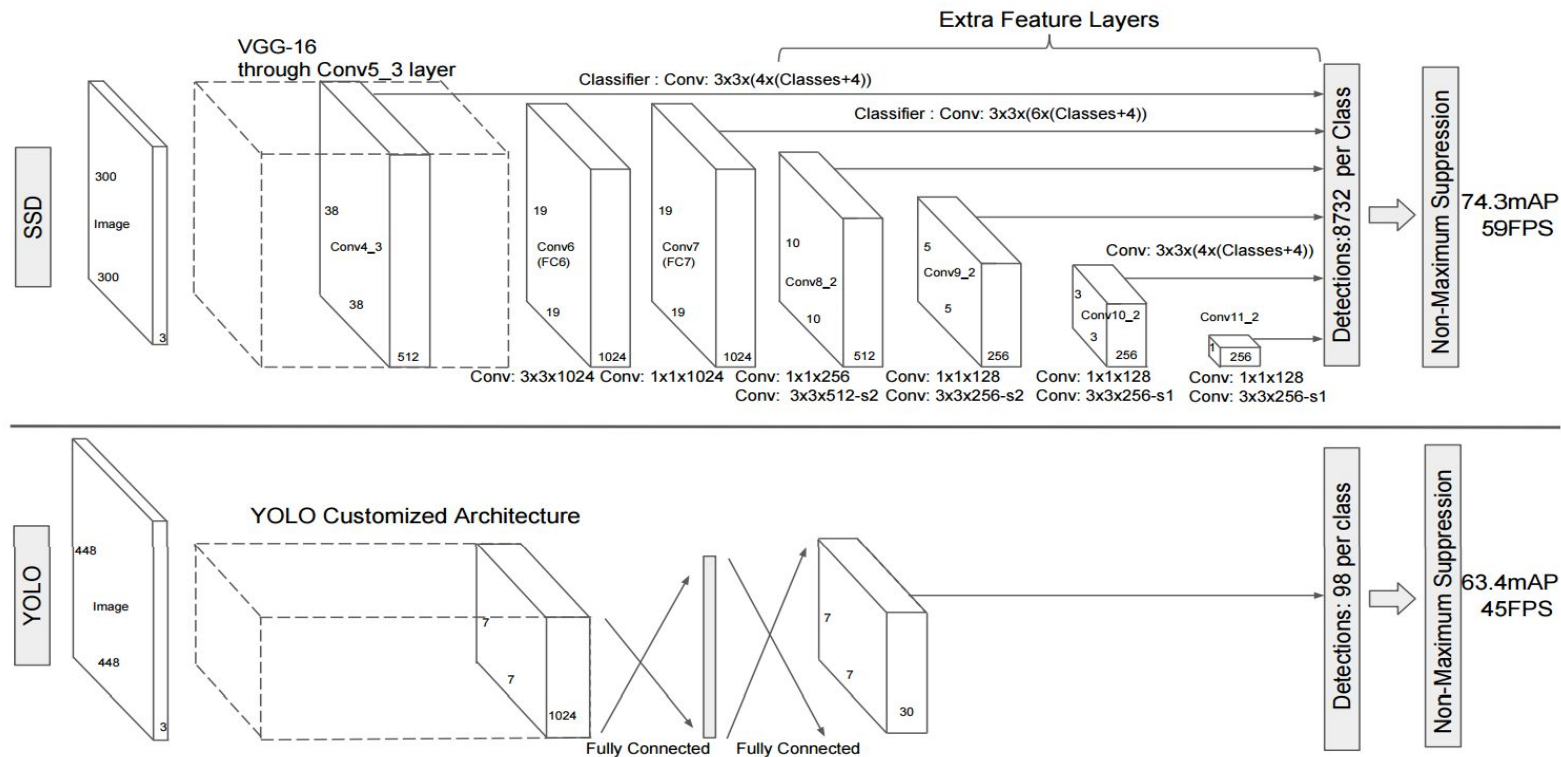
SSD is designed to be **independent of the base network**, and so it can run on top of pretty much any feature extractor.



What is new?

Other detectors make predictions for only a single feature map while SSD **combines predictions** across multiple feature maps at different sizes.

What is new?



Losses

- Cross entropy (softmax) for **classification**
- Smooth L1 for **localization**

Dataset

- Pascal VOC 2007 (20 classes)
- Annotations:

[xmin, ymin, xmax, ymax, one hot encoded classes]

Prior boxes

We need a set of prior boxes.

The annotations are “encoded” using this prior boxes.

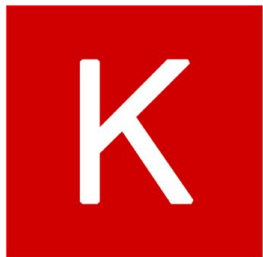
This “encoded” annotations and the images will be the input to our network.

(The prior boxes that do not match with any ground truth bounding box are labeled as background)

The Lab

Today's objectives

- Learn how to use SSD to detect objects.
- See the different steps that SSD requires for training and inference.
- Test SSD network loading weights



Keras

Google Colab

The screenshot displays the Google Colaboratory web interface. At the top, there's a header with the 'co' logo, the text 'Hello, Colaboratory', and a menu bar with options like 'Archivo', 'Editar', 'Vista', 'Insertar', 'Entorno de ejecución', 'Herramientas', and 'Ayuda'. On the right of the header, there are links for 'COMPARTIR', 'CONECTAR', and 'EDICIÓN'. Below the header, a toolbar contains icons for 'CÓDIGO', 'TEXTO', 'CELDA', and 'COPIAR EN DRIVE'. The main content area is divided into two panels. The left panel, titled 'Índice', lists various topics: 'Welcome to Colaboratory!', 'Local runtime support', 'Python 3', 'TensorFlow execution', 'Visualization', 'Forms', 'Examples', and 'For more information:'. The right panel, titled 'Fragmentos de código', shows a 'Welcome to Colaboratory!' message, followed by a 'Local runtime support' section, and a 'Python 3' section. The 'Python 3' section includes a code snippet that prints the Python version and a welcome message.

co Hello, Colaboratory

Archivo Editar Vista Insertar Entorno de ejecución Herramientas Ayuda

CÓDIGO TEXTO CELDA CELDA COPIAR EN DRIVE

COMPARTIR CONECTAR EDICIÓN

Índice Fragmentos de código

Welcome to Colaboratory!

Local runtime support

Python 3

TensorFlow execution

Visualization

Forms

Examples

For more information:

SECCIÓN

Welcome to Colaboratory!

Colaboratory is a Google research project created to help disseminate machine learning education and research. It's a Jupyter notebook environment that requires no setup to use and runs entirely in the cloud.

Colaboratory notebooks are stored in [Google Drive](#) and can be shared just as you would with Google Docs or Sheets. Colaboratory is free to use.

For more information, see our [FAQ](#).

Local runtime support

Colab also supports connecting to a Jupyter runtime on your local machine. For more information, see our [documentation](#).

Python 3

Colaboratory supports both Python2 and Python3 for code execution.

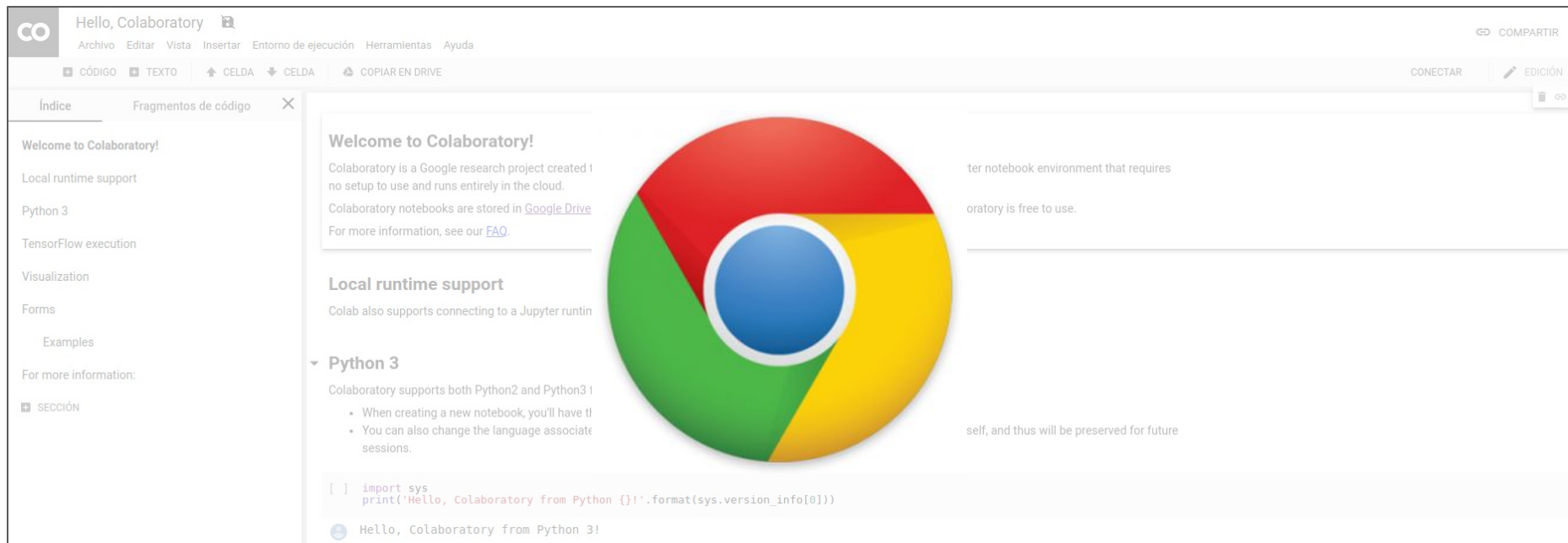
- When creating a new notebook, you'll have the choice between Python 2 and Python 3.
- You can also change the language associated with a notebook; this information will be written into the `.ipynb` file itself, and thus will be preserved for future sessions.

```
[ ] import sys
    print('Hello, Colaboratory from Python {}'.format(sys.version_info[0]))
```

Hello, Colaboratory from Python 3!

<https://colab.research.google.com/>

Google Colab



The screenshot displays the Google Colaboratory web interface. At the top, the header includes the 'co' logo, the title 'Hello, Colaboratory', and a menu with options like 'Archivo', 'Editar', 'Vista', 'Insertar', 'Entorno de ejecución', 'Herramientas', and 'Ayuda'. Below the header, there are tabs for 'CÓDIGO', 'TEXTO', 'CELDA', and 'COPIAR EN DRIVE'. The main content area is divided into a left sidebar with a table of contents (Índice) and a main workspace. The workspace shows a 'Welcome to Colaboratory!' message, a 'Local runtime support' section, and a 'Python 3' section. A large, colorful circular logo is centered in the workspace. Below the logo, there is a code cell with the following code:

```
[ ] import sys
print('Hello, Colaboratory from Python {}'.format(sys.version_info[0]))
```

The output of the code cell is 'Hello, Colaboratory from Python 3!'. The interface also includes a 'CONECTAR' button and an 'EDICIÓN' button in the top right corner.

<https://colab.research.google.com/>

Lab



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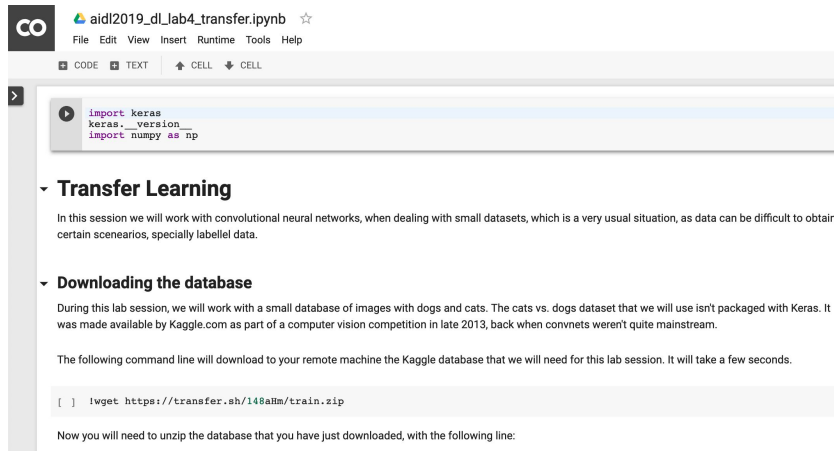


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Google Colab

1. Login in [Colab](#) with a Google account: yours or aidlupc2019@gmail.com (talentcenter)
2. Open [the notebook](#) of this lab session
3. Copy this notebook to your Drive to be able to run it (or open in draft mode if using aidlupc2019@gmail.com)
4. Change runtime type to work with GPU! Your trainings will be much faster :)



aidl2019_dl_lab4_transfer.ipynb

File Edit View Insert Runtime Tools Help

CODE TEXT + CELL

```
import keras
keras.__version__
import numpy as np
```

Transfer Learning

In this session we will work with convolutional neural networks, when dealing with small datasets, which is a very usual situation, as data can be difficult to obtain certain scenarios, specially labelled data.

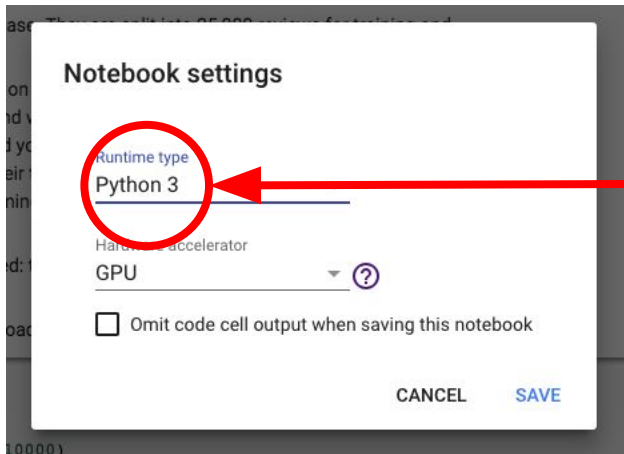
Downloading the database

During this lab session, we will work with a small database of images with dogs and cats. The cats vs. dogs dataset that we will use isn't packaged with Keras. It was made available by Kaggle.com as part of a computer vision competition in late 2013, back when convnets weren't quite mainstream.

The following command line will download to your remote machine the Kaggle database that we will need for this lab session. It will take a few seconds.

```
[ ] !wget https://transfer.sh/148aIm/train.zip
```

Now you will need to unzip the database that you have just downloaded, with the following line:



Notebook settings

Runtime type
Python 3

Hardware accelerator
GPU

☐ Omit code cell output when saving this notebook

CANCEL SAVE

Today we
are using
Python 2!