# Ficha Prática 3

Object Detection

1. **Understanding Bounding Boxes and IoU.** In this exercise, we should learn how to represent objects using bounding boxes and calculate Intersection over Union (IoU).

   a. Load an image with multiple objects.

   b. Manually define bounding boxes for objects in the image (e.g., using OpenCV cv2.rectangle).

   c. Implement a function to compute IoU between two bounding boxes.

   d. Test the IoU function with different pairs of boxes.

2. **Running a Pre-trained SSD Model on an Image.** Now, the goal is to learn how to use a pre-trained SSD model in PyTorch.

   a. Load a pre-trained SSD model from torchvision.models (e.g., MobileNetV3-SSD).

   b. Preprocess an input image (resize, normalize, convert to tensor).

   c. Run inference and extract bounding boxes, labels, and confidence scores.

   d. Display the results on the image using matplotlib or OpenCV.

3. **Face Detection.** Use one of the available face/head detectors on the web (for example: https://github.com/topics/head-detection) to define the respective regions of interest. For each region of interest, create an annotation file in CSV format

   "Example_001.csv"
   25, 25, 45, 60   %x1, y1, x2, y2
   …
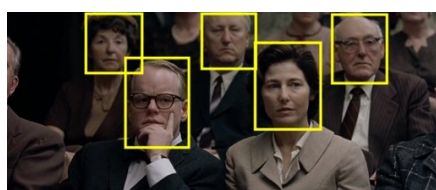
Create a Python script that runs the detector over a set of images, and obtain the following metrics: F1, precision and recall values.

4. **Human Detection.** Repeat the previous exercise using a human silhouette detector (available at: https://github.com/topics/human-detection) to define the full body as the region of interest. Use a similar annotation format to the previous exercise.