# Object Detection

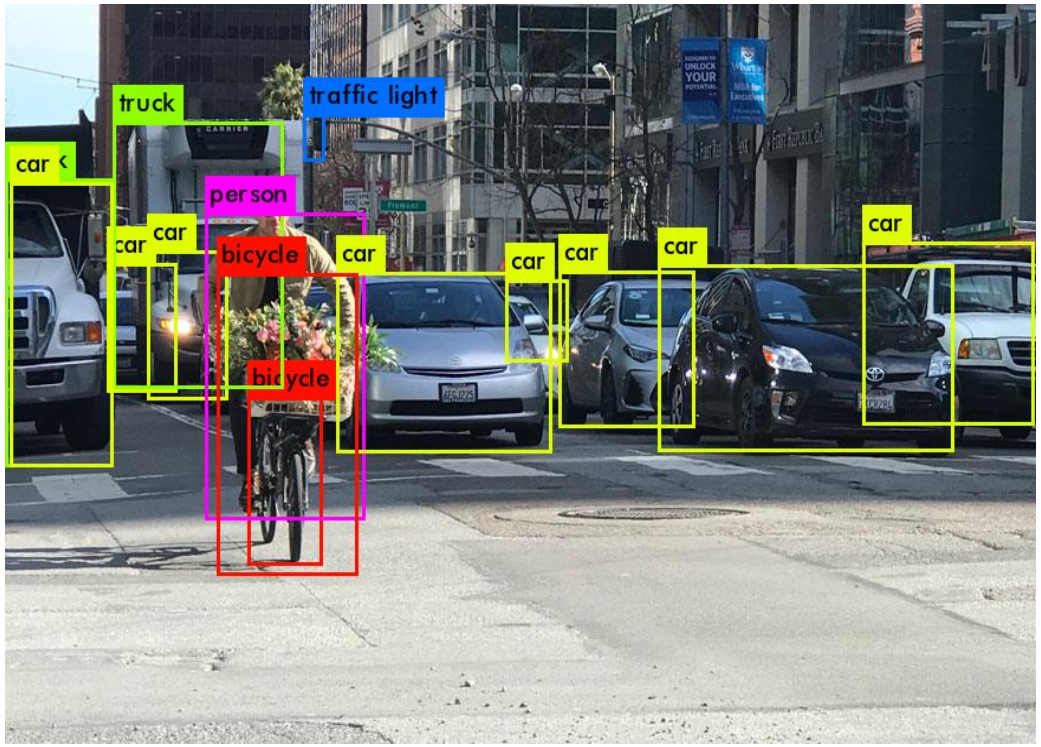
Thang Nguyen

# What is Object Detection

Cat

# What is Object Detection

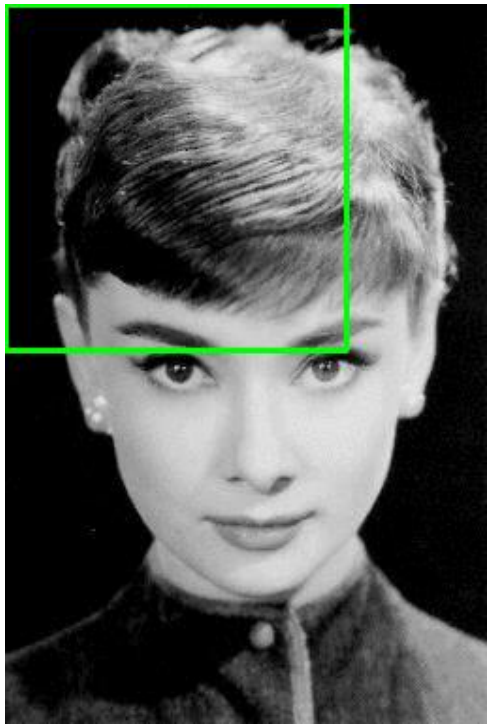
- Answer:

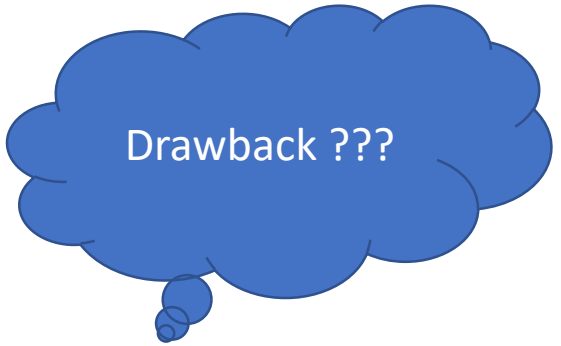



- ✓ **Step 1:** Find Regional Proposals
- ✓ **Step 2:** Regional Object Recognition
- ✓ **Step3:** Bounding Box Regression

# How to find Regional Proposals

- Sliding Windows

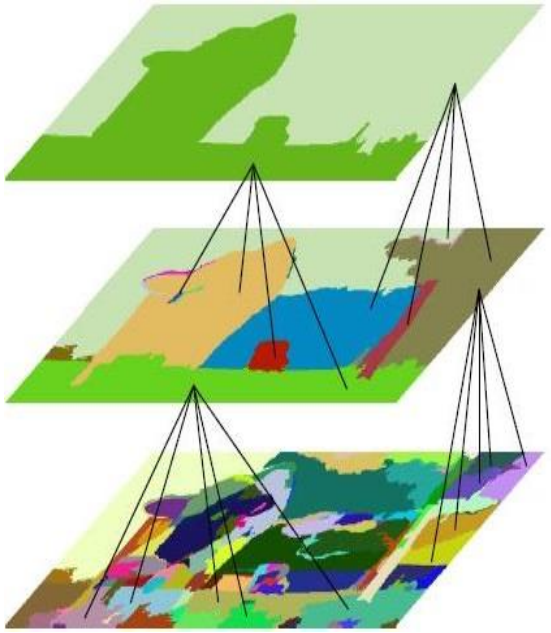


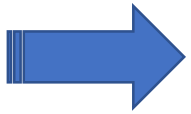


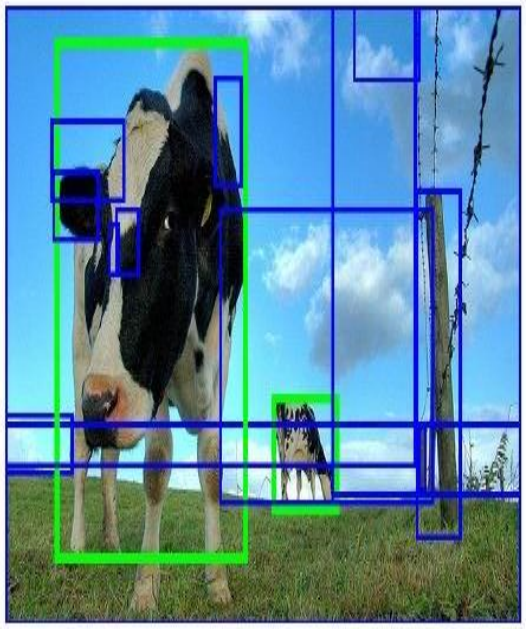

**~ 10,000 Region/Image**
**=> Too expensive in computation**

# How to find Regional Proposals

- Selective Search:





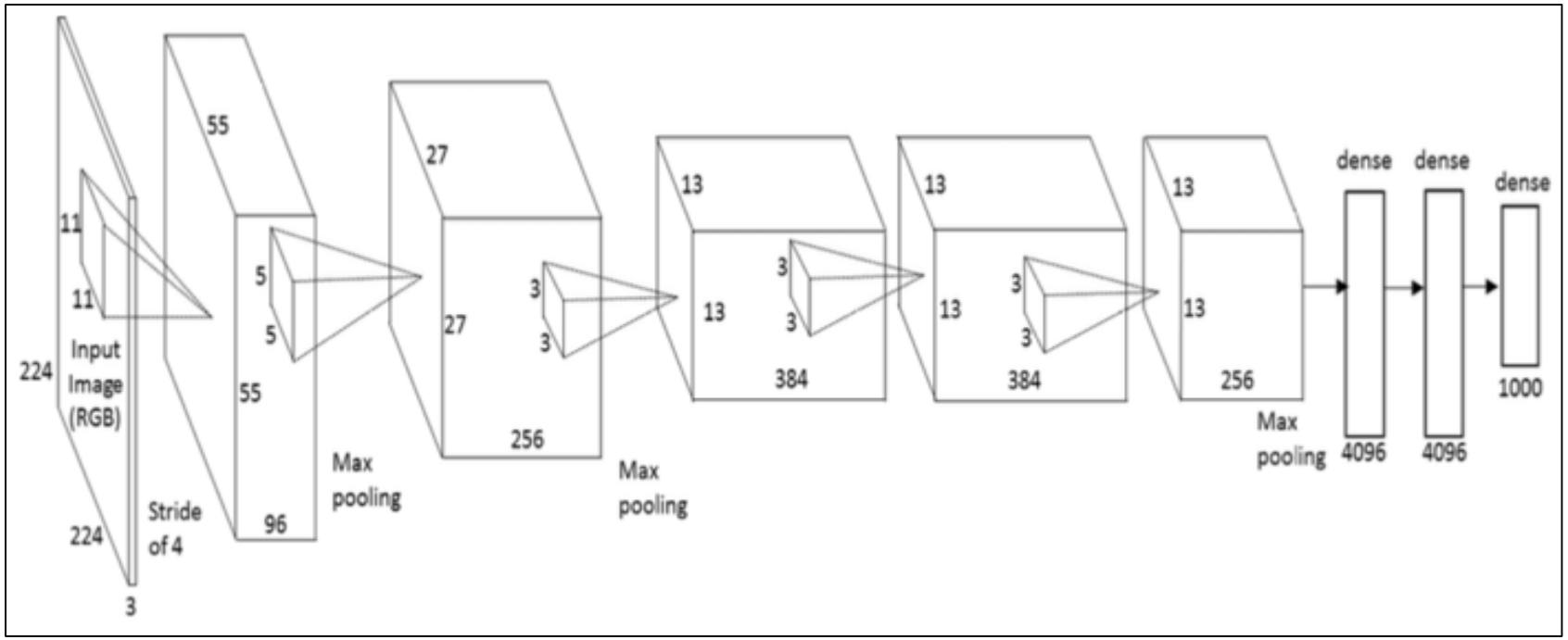


**Implemented In R-CNN**

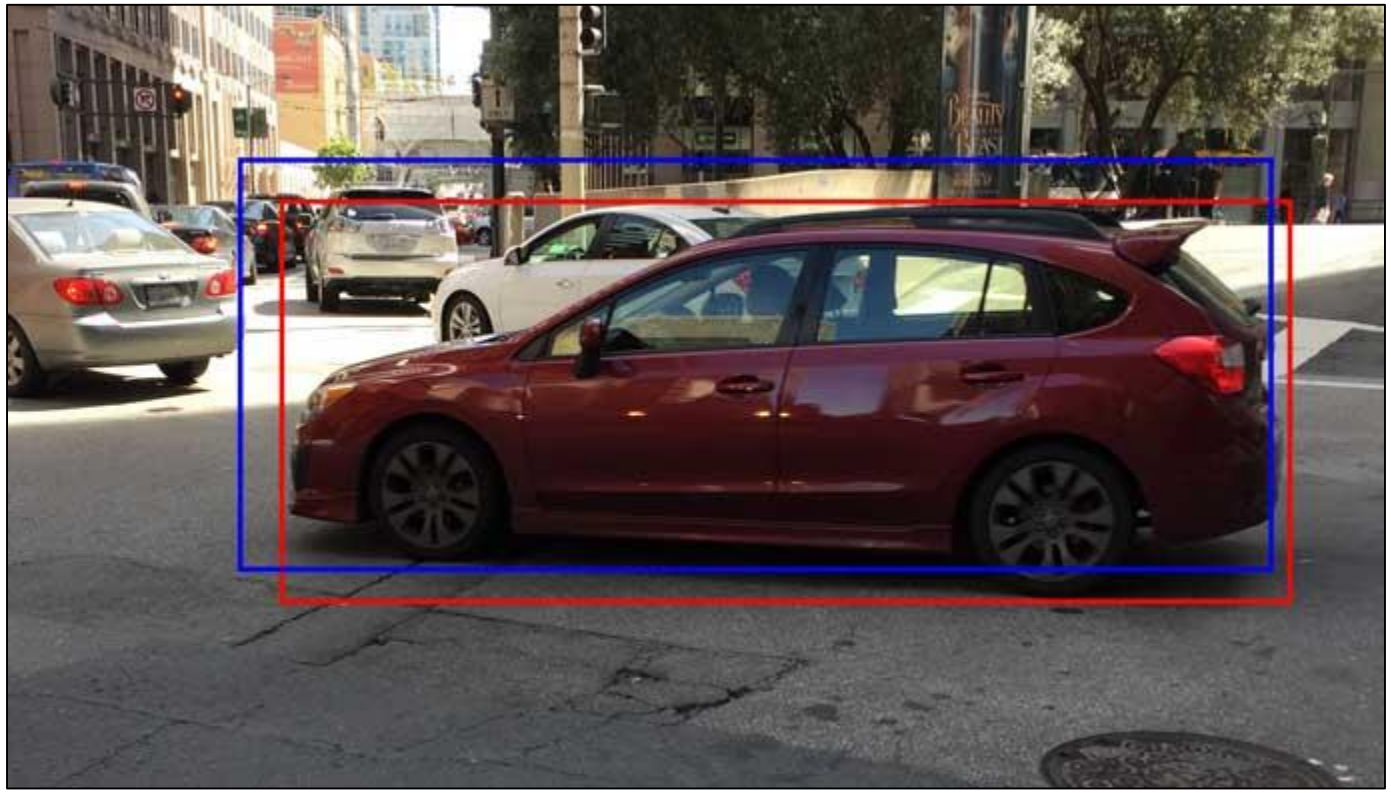
**~ 2000** Region/ Image

# Regional Object Recognition Model

**AlexNet Architecture**



# Bounding Box Regression



**Blue Box** - Initial Box(region)

**Red Box** – Ground Truth Box

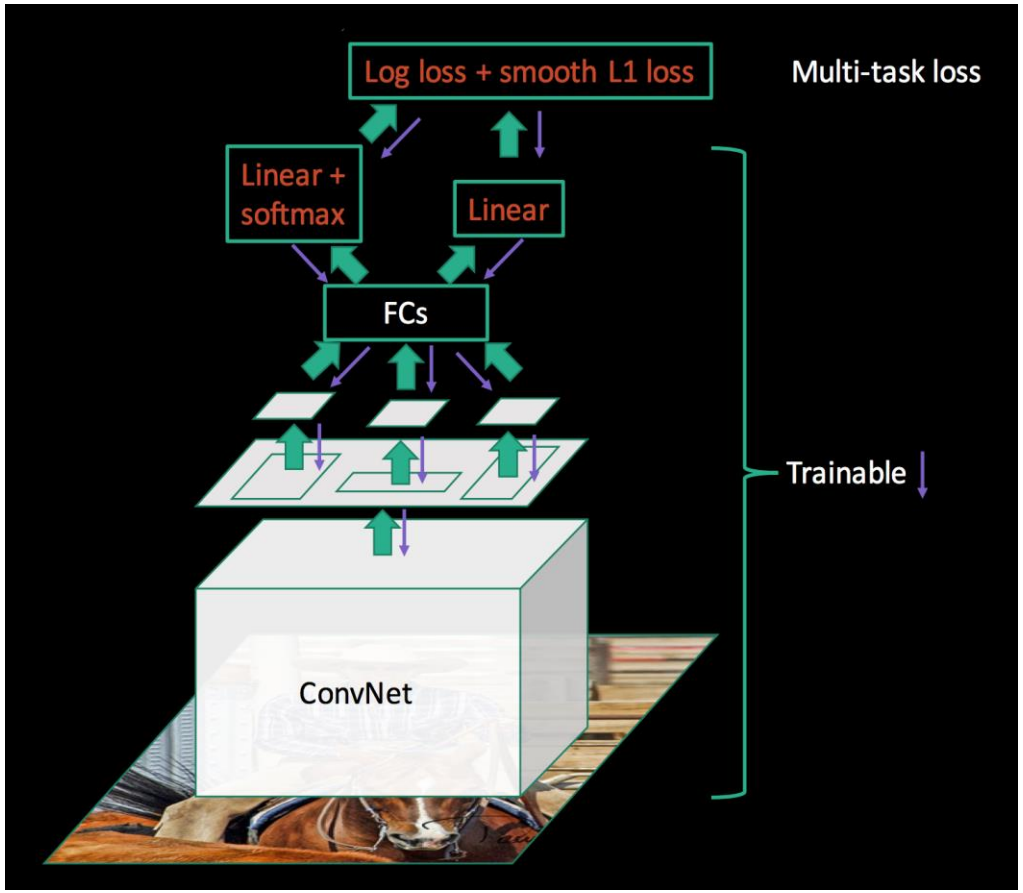
# Challenge Dataset

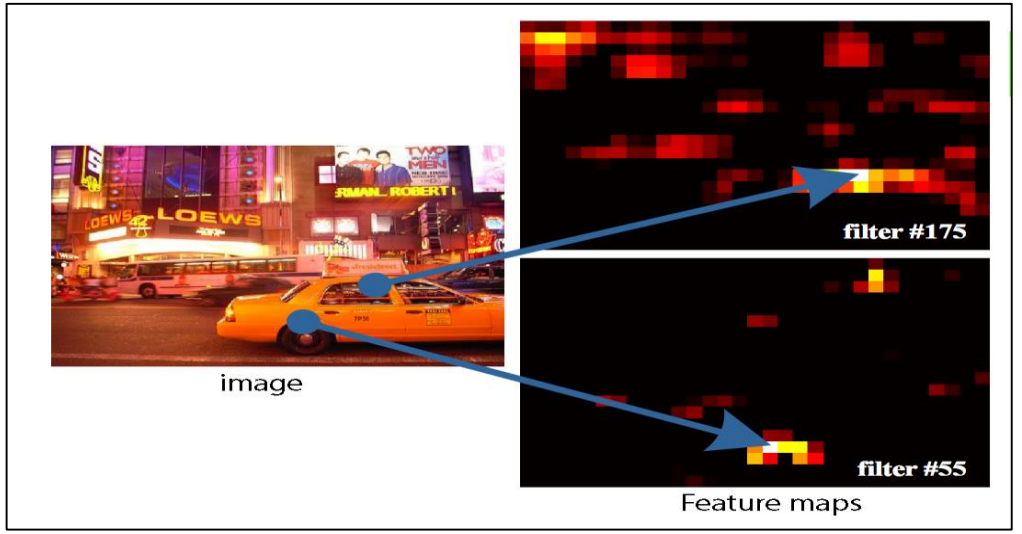
- ILSVRC (ImageNet Large Scale Visual Recognition Challenge) organized by Researchers from University of Stanford,  Princeton, North Carolina

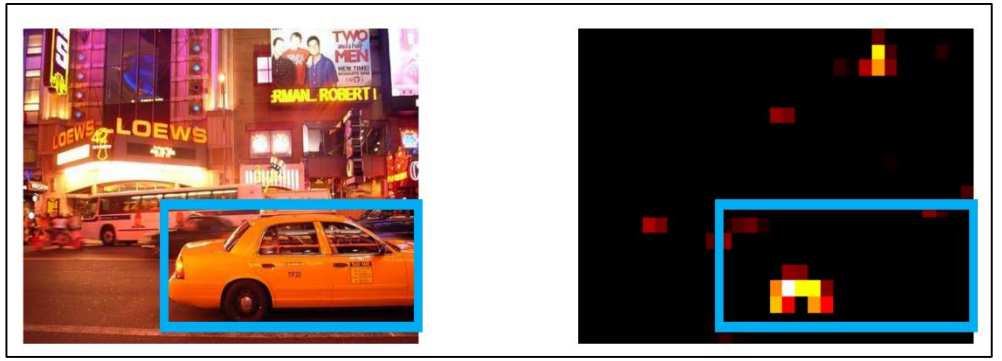
- Pascal VOC (Visual Object Classes) organized by Researchers from University Of Oxford, Cambridge, Zurich

# State Of Art Models

Fast RCNN

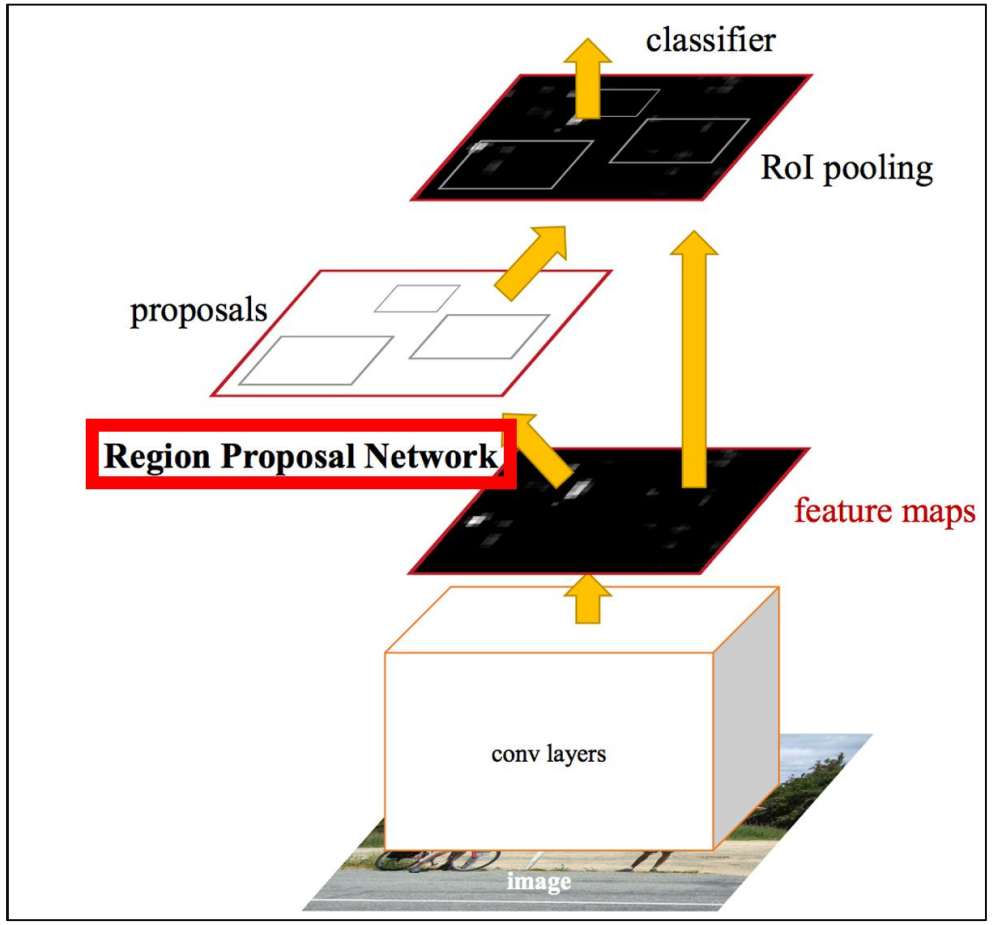


# State Of Art Models

Faster R-CNN




- **Do Not** need a Special Regional Proposal Method
- Train a separate neural network that predicts the region proposal

# State Of Art Models

| Detection Frameworks | Train | mAP | FPS |
|---|---|---|---|
| Fast R-CNN [5] | 2007+2012 | 70.0 | 0.5 |
| Faster R-CNN VGG-16[15] | 2007+2012 | 73.2 | 7 |
| Faster R-CNN ResNet[6] | 2007+2012 | 76.4 | 5 |
| YOLO [14] | 2007+2012 | 63.4 | 45 |
| SSD300 [11] | 2007+2012 | 74.3 | 46 |
| SSD500 [11] | 2007+2012 | 76.8 | 19 |
| YOLOv2 288 × 288 | 2007+2012 | 69.0 | 91 |
| YOLOv2 352 × 352 | 2007+2012 | 73.7 | 81 |
| YOLOv2 416 × 416 | 2007+2012 | 76.8 | 67 |
| YOLOv2 480 × 480 | 2007+2012 | 77.8 | 59 |
| YOLOv2 544 × 544 | 2007+2012 | **78.6** | 40 |