GluonCV: Object Detection

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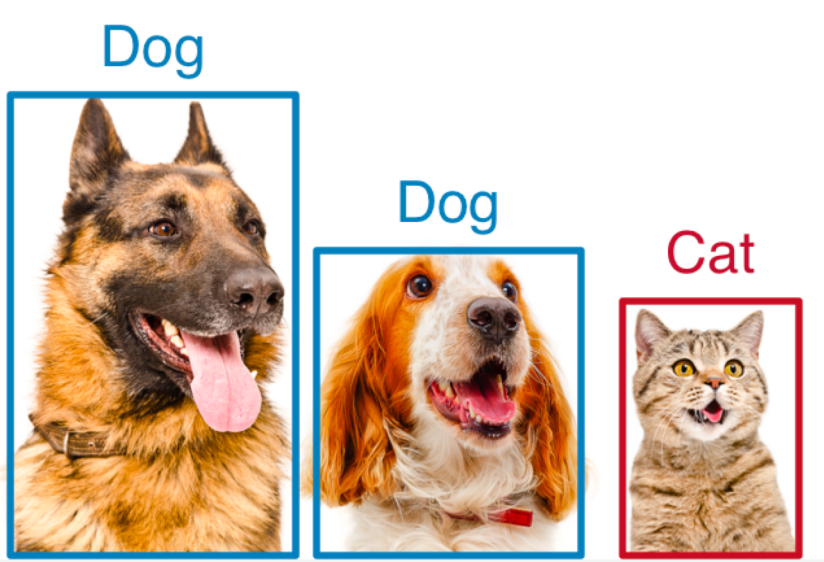
Introduction

What is detection?

Classify and Localize the object



Why Object Detection?

Multiple Objects

Object Detection with Deep Learning

Object Detection with Deep Learning

Compared with Image Classification

Classification:

Input: image
Output: class label
Evaluation: accuracy

Detection:

Input: image
Output: boxes with labels
Evaluation: IoU

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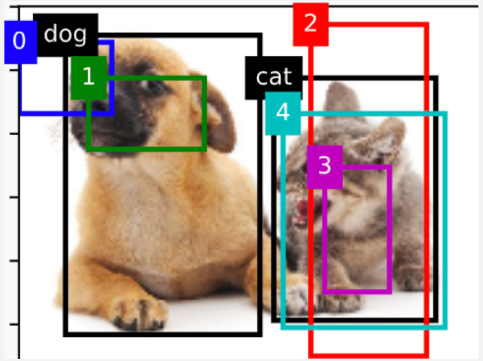
Object Detection with Deep Learning

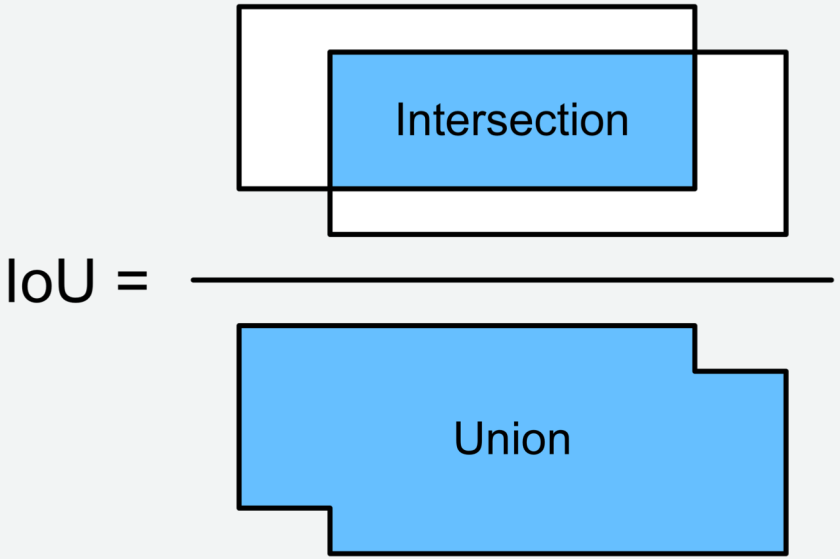
Bounding Box

- Generated by model
- Represented by (h, w, x, y)



Object Detection with Deep Learning

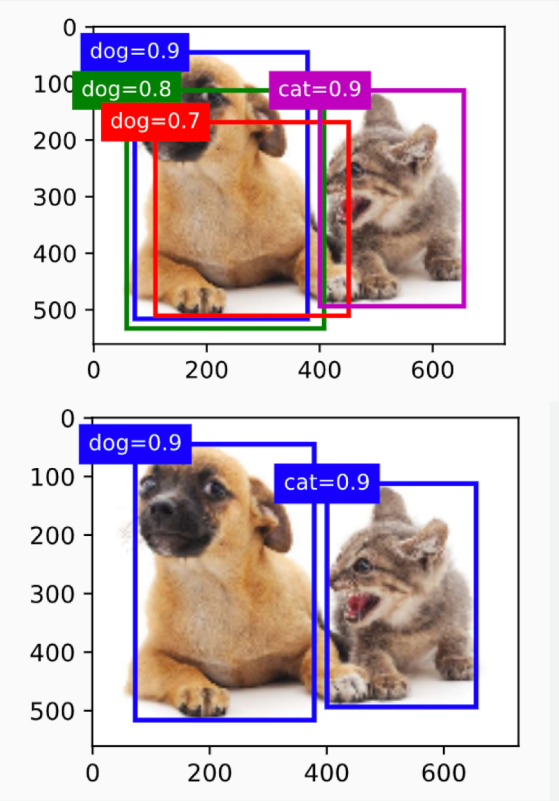
IoU: Intersection over Union



Object Detection with Deep Learning

NMS: Non-Maximum Suppression

- Choose the highest score
- Remove IoU > threshold
- Repeat



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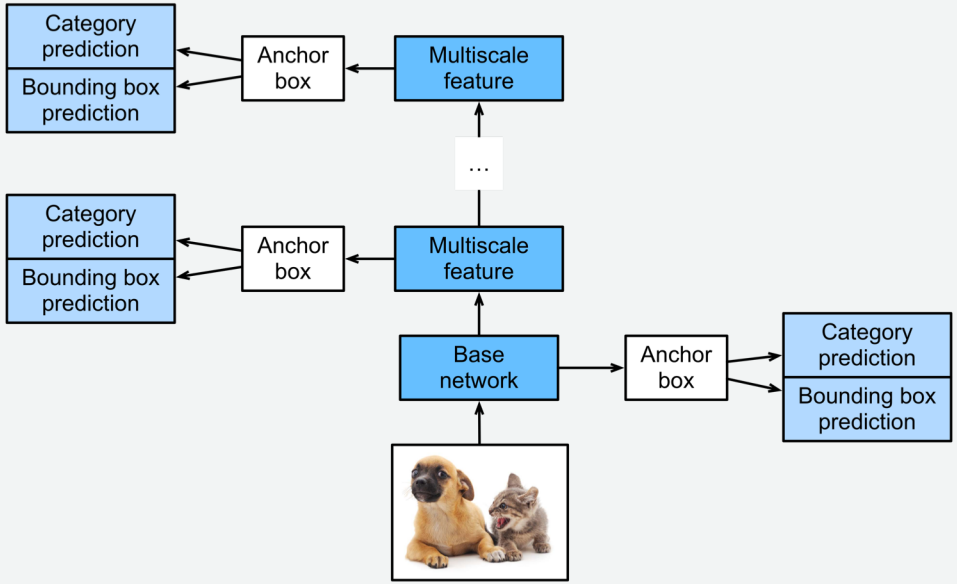
Object Detection with Deep Learning

Three popular models

- SSD
- Faster R-CNN
- YOLO

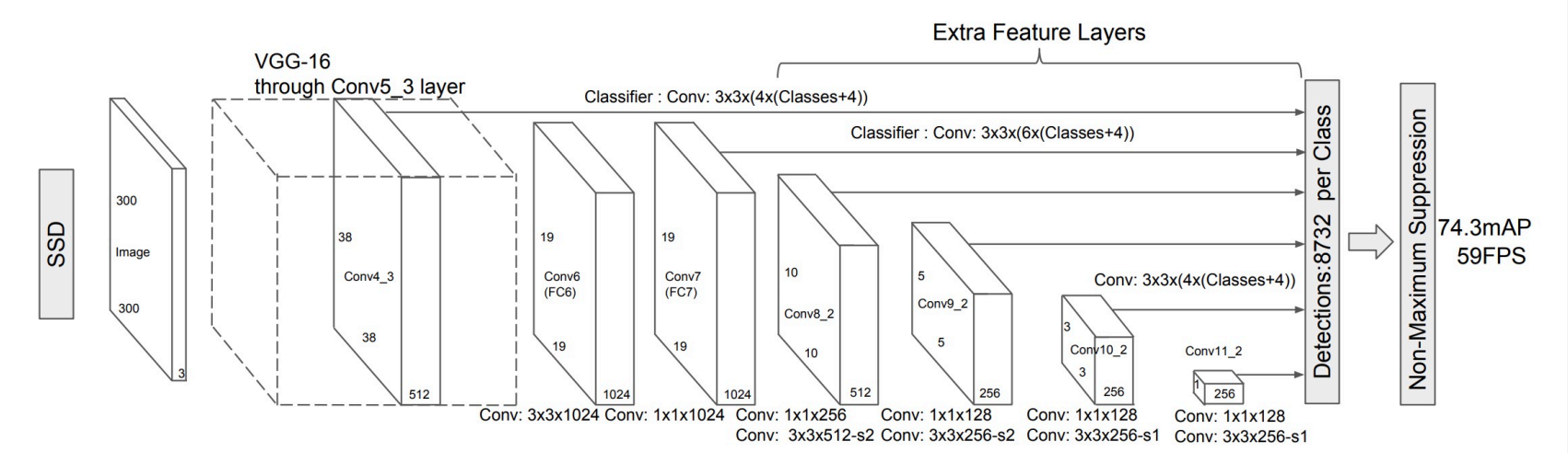
Object Detection with Deep Learning

SSD: Single Shot multibox Detection



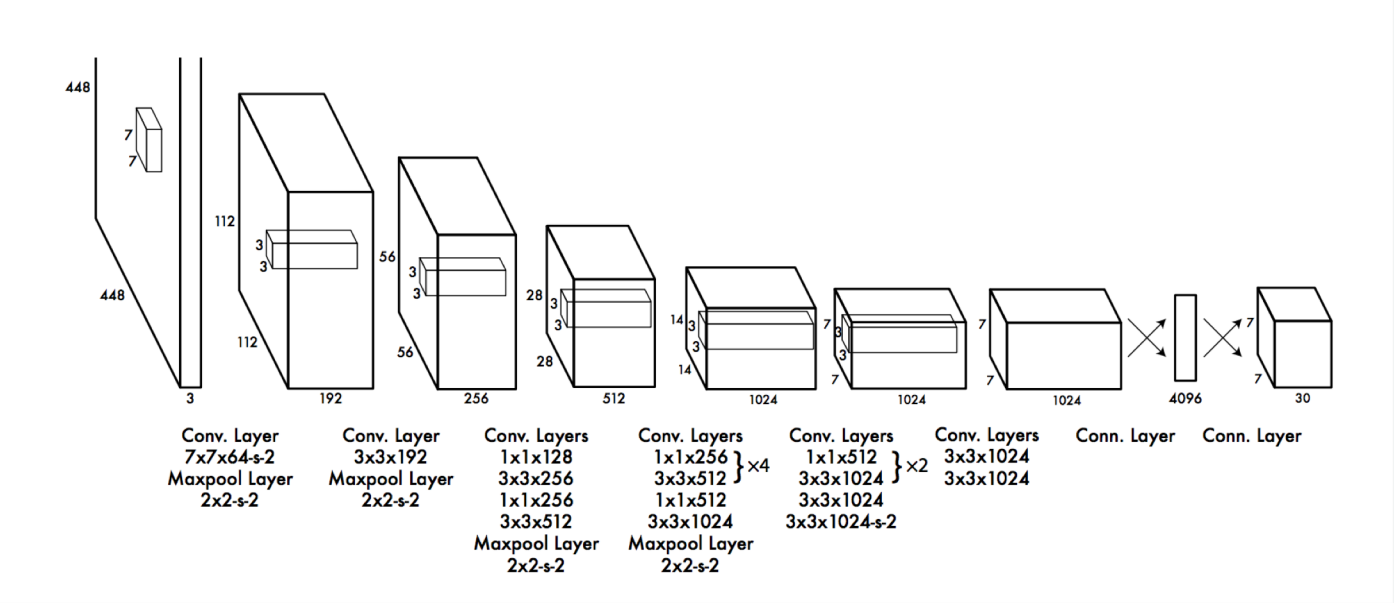
Object Detection with Deep Learning

SSD: Single Shot multibox Detection



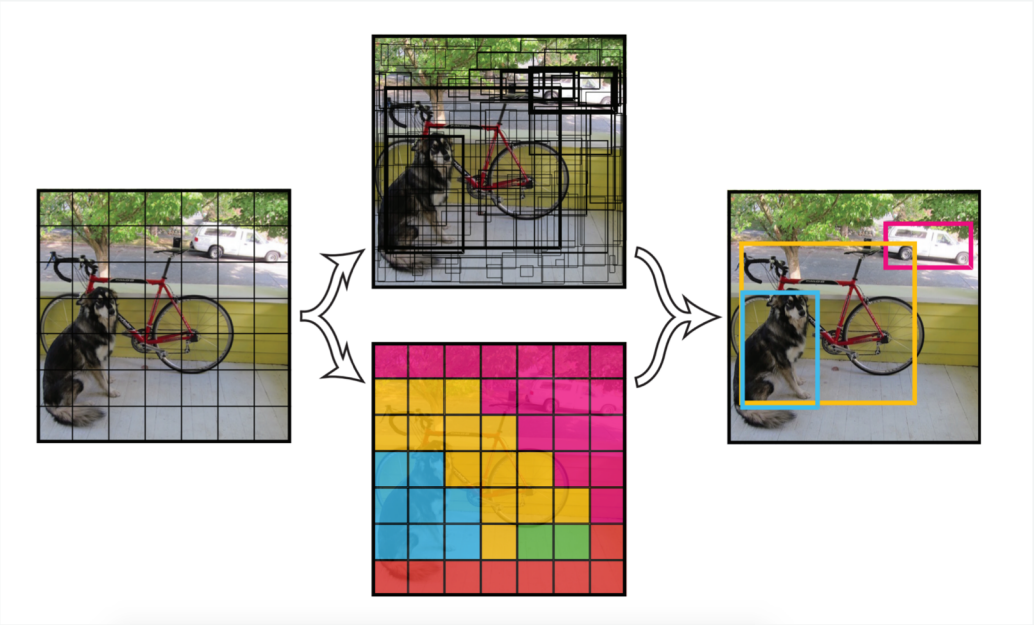
Object Detection with Deep Learning

YOLO: You Only Look Once



Object Detection with Deep Learning

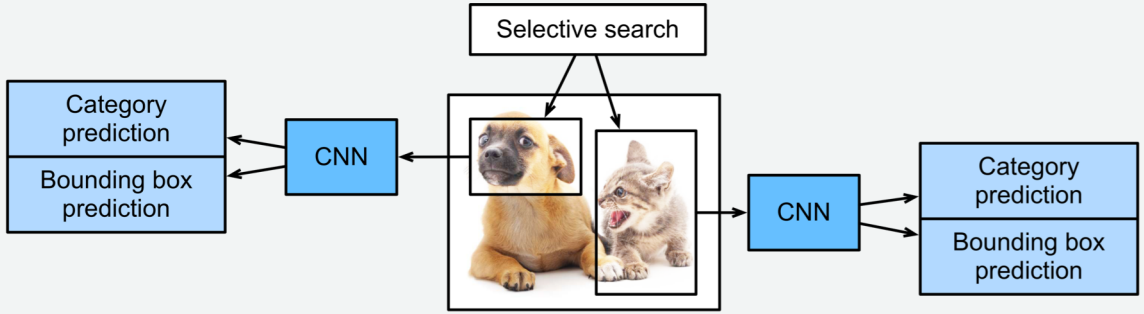
YOLO: You Only Look Once



Object Detection with Deep Learning

R-CNN

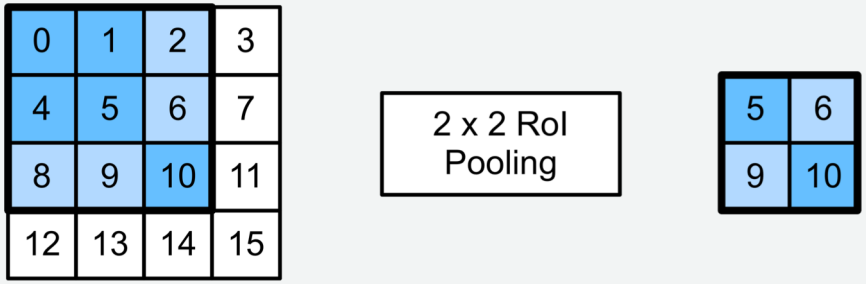
- Selective search is slow
- Class prediction by SVM

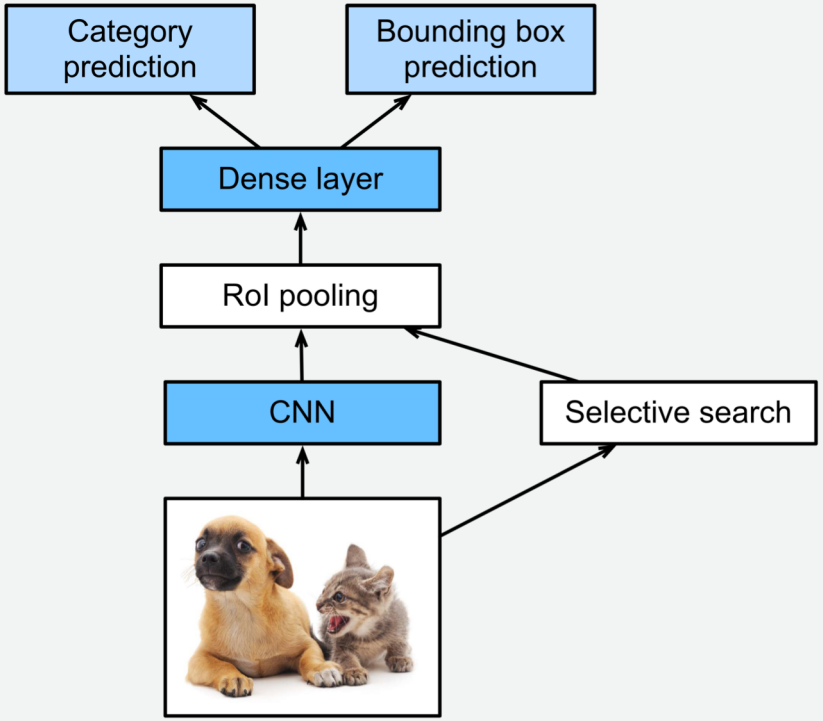


Object Detection with Deep Learning

Fast R-CNN

- RoI Pooling
- Prediction in dense layer





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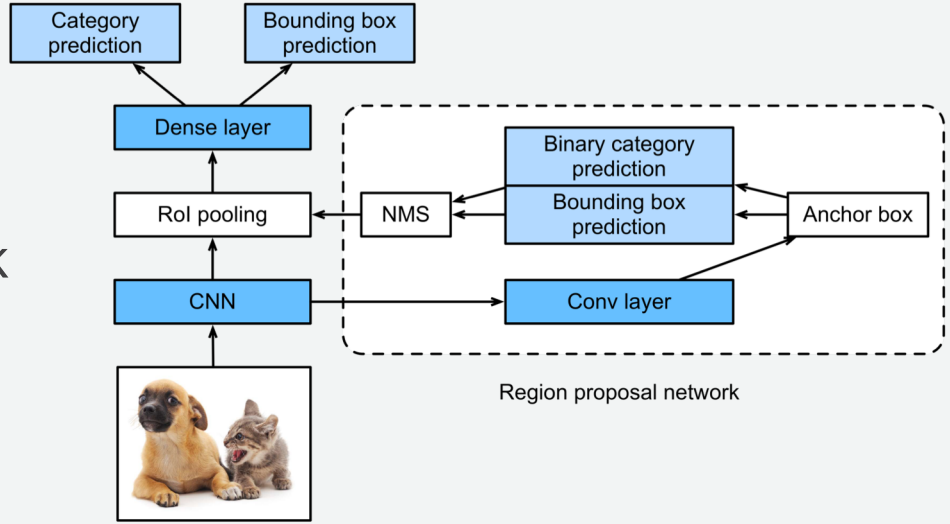
Object Detection with Deep Learning

Faster R-CNN

- Replace selective search by region proposal network



Object Detection with Deep Learning

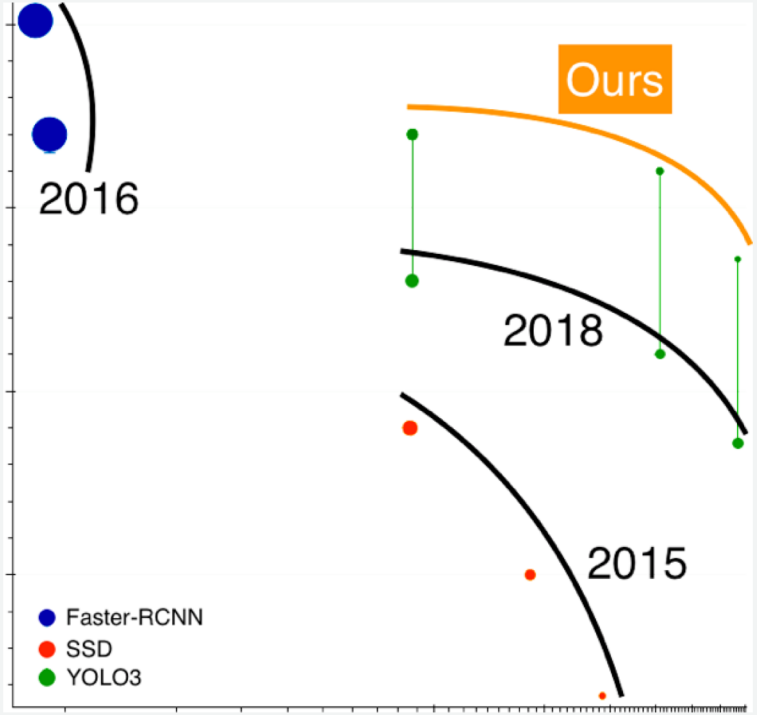
Summary

- SSD
  - Fast, easy to implement, less accurate
- Faster R-CNN
  - Slow, very accurate
- YOLO
  - Fast, accurate

Object Detection with GluonCV

Object Detection with GluonCV

Model Zoo



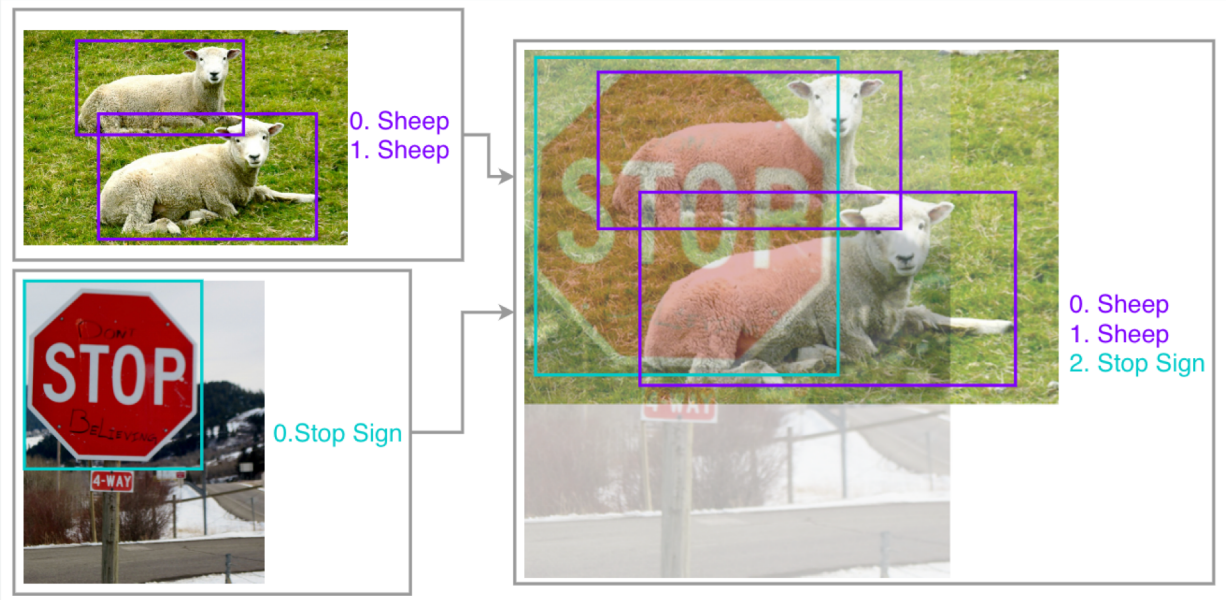
Object Detection with GluonCV

Advanced Training

- Learning rate schedule
- Mix-up
- Label smoothing

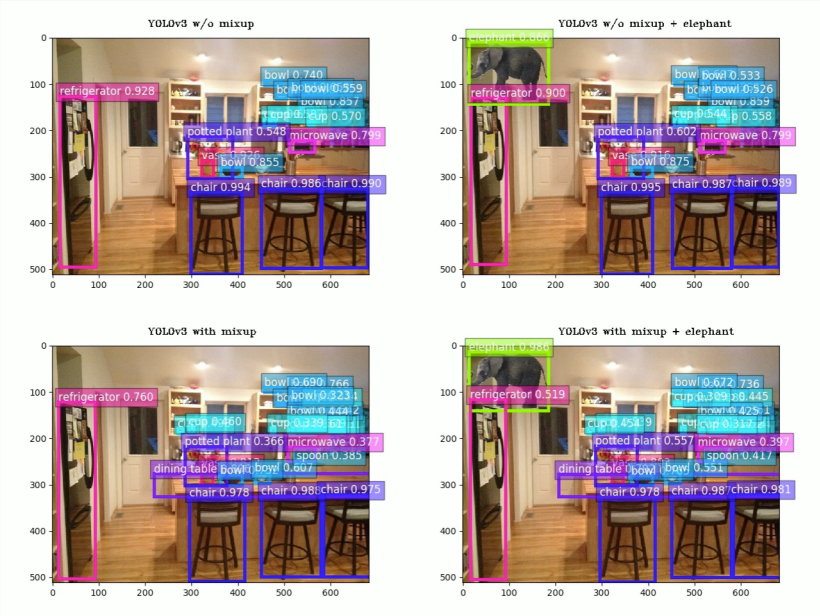
Object Detection with GluonCV

Mix-Up



Object Detection with GluonCV

Elephant-in-the-Room



Object Detection with GluonCV

Resources:

- Model Zoo: https://gluon-cv.mxnet.io/model_zoo/detection.html
- Tutorials: https://gluon-cv.mxnet.io/build/examples_detection/index.html
- Deep Learning Book: http://en.diveintodeeplearning.org/

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Object Detection with GluonCV

Hands On!