Using YOLO for Object Detection

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ISE-244 AI Tools and Practices for Systems Engineering

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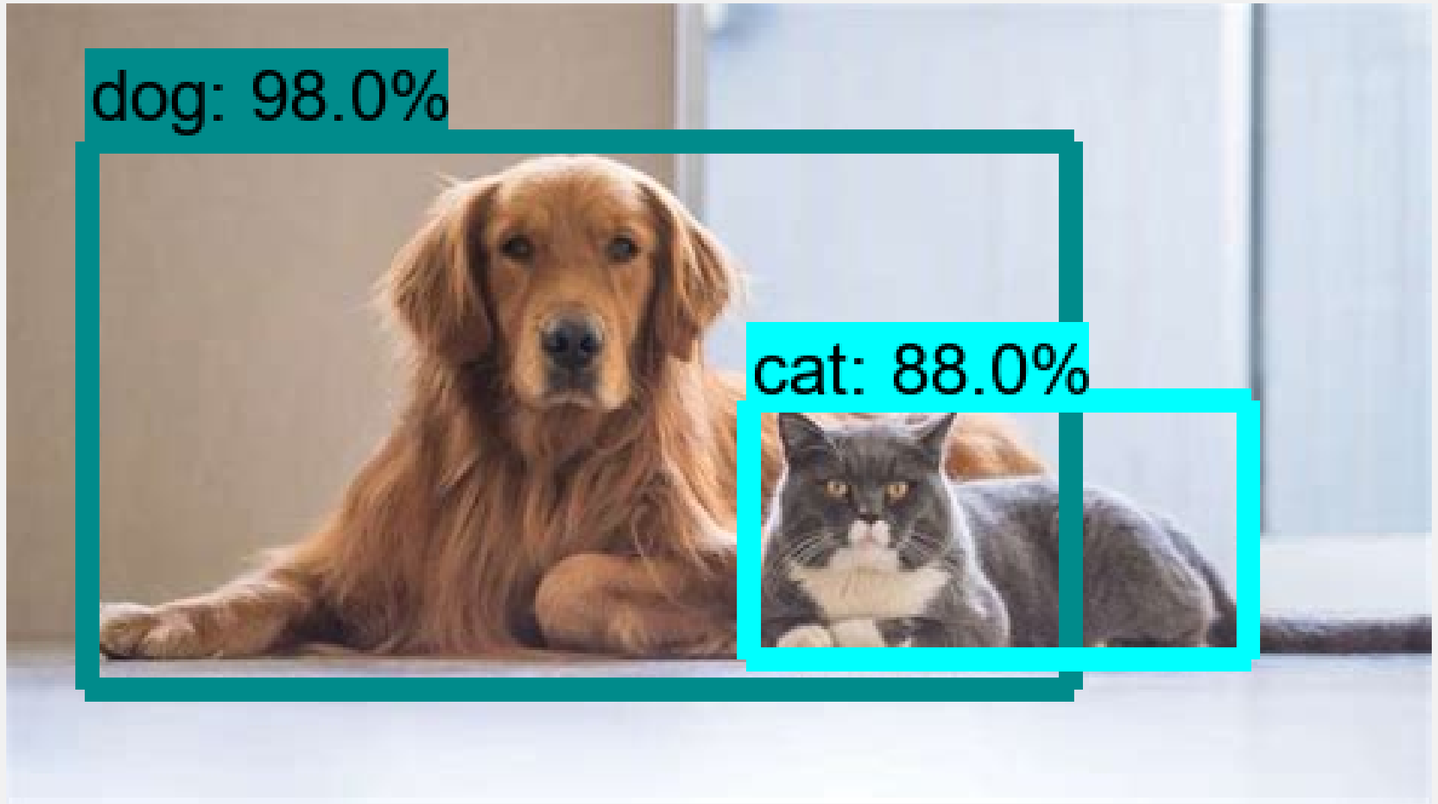

YOLO

YOU ONLY LOOK ONCE

You Only Look Once: Unified, Real-Time Object Detection

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University of Washington*, Allen Institute for AI†, Facebook AI Research¶
http://pjreddie.com/yolo/

Abstract

We present YOLO, a new approach to object detection. Prior work on object detection repurposes classifiers to perform detection. Instead, we frame object detection as a regression problem to spatially separated bounding boxes and associated class probabilities. A single neural network predicts bounding boxes and class probabilities directly from full images in one evaluation. Since the whole detection pipeline is a single network, it can be optimized end-to-end directly on detection performance.

Our unified architecture is extremely fast. Our base YOLO model processes images in real-time at 45 frames per second. A smaller version of the network, Fast YOLO,

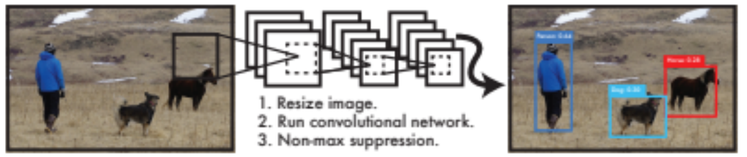
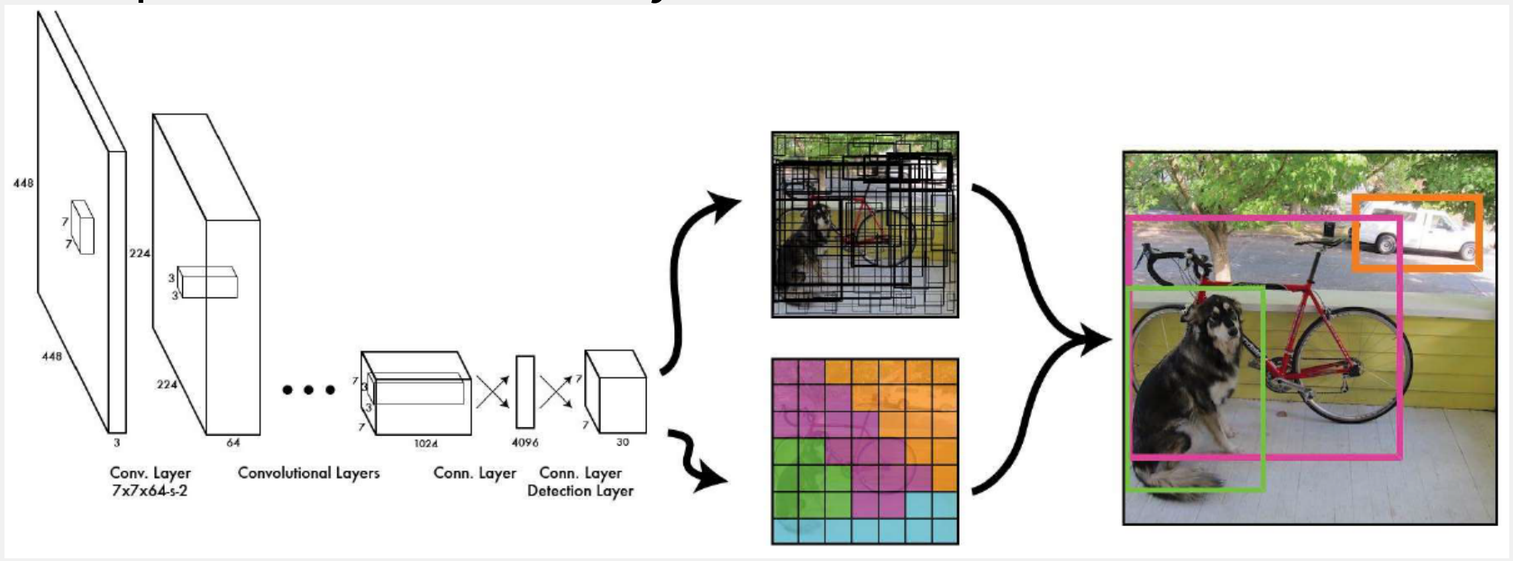
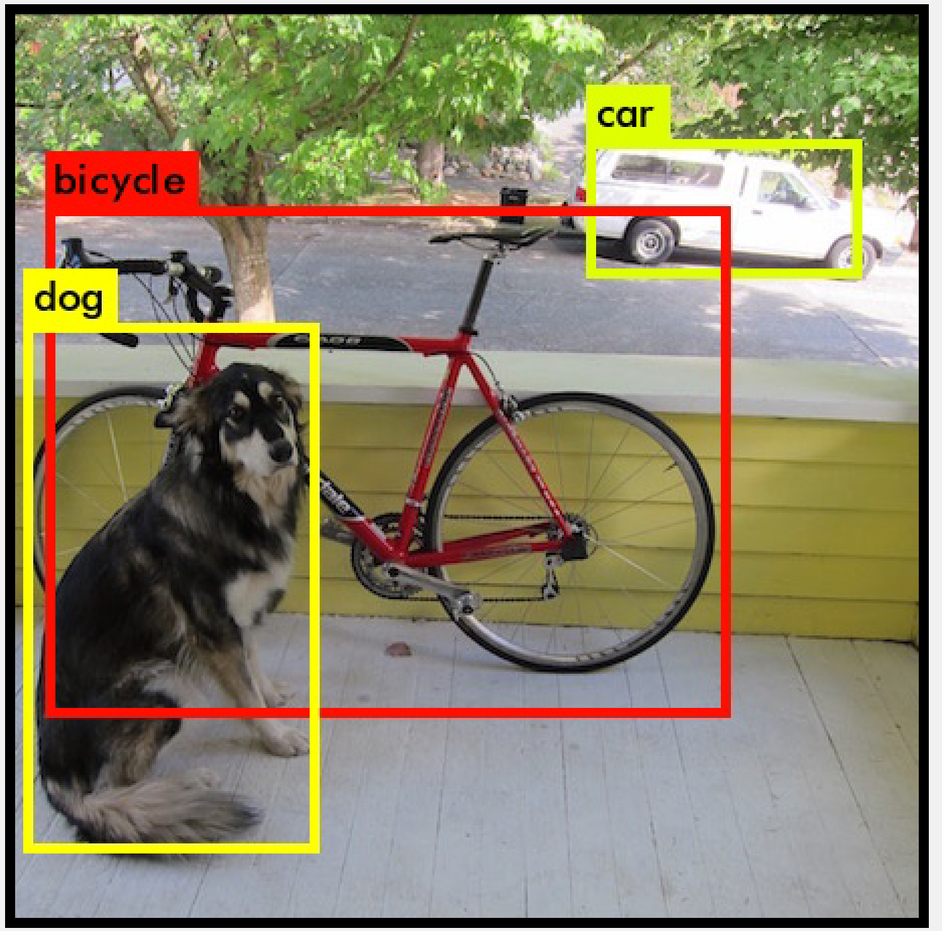


Figure 1: The YOLO Detection System. Processing images with YOLO is simple and straightforward. Our system (1) resizes the input image to 448 × 448, (2) runs a single convolutional network on the image, and (3) thresholds the resulting detections by the model's confidence.

methods to first generate potential bounding boxes in an im-

Multiple Convolutional layers





Motivation behind the Project

Earth

the place we call home
is slowly dying...

Motivation behind the Project

Image-Adaptive YOLO for Object Detection in Adverse Weather Conditions

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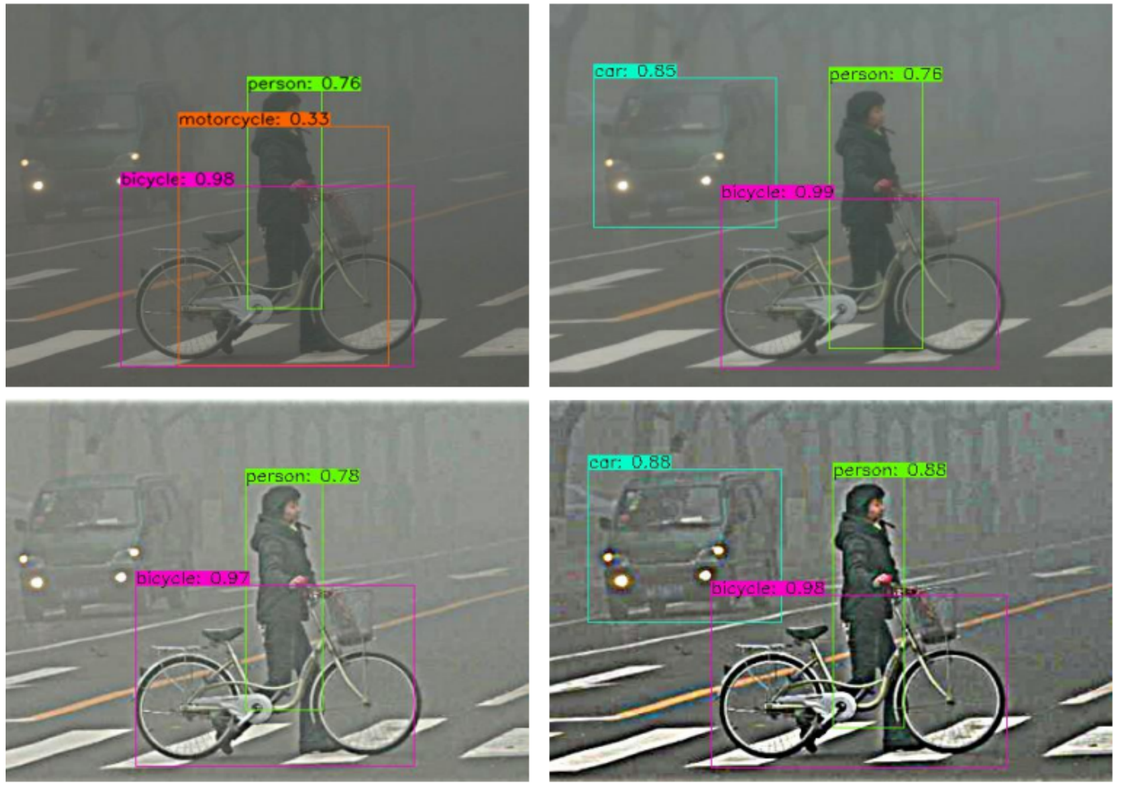
Abstract

Though deep learning-based object detection methods have achieved promising results on the conventional datasets, it is still challenging to locate objects from the low-quality images captured in adverse weather conditions. The existing methods either have difficulties in balancing the tasks of image enhancement and object detection, or often ignore the latent information beneficial for detection. To alleviate this problem, we propose a novel Image-Adaptive YOLO (IA-YOLO) framework, where each image can be adaptively enhanced for better detection performance. Specifically, a differentiable image processing (DIP) module is presented to take into account the adverse weather conditions for YOLO detector, whose parameters are predicted by a small convolutional neural network (CNN-PP). We learn CNN-PP and YOLOv3 jointly in an end-to-end fashion, which ensures that CNN-PP can learn an appropriate DIP to enhance the image for detection in a weakly supervised manner. Our proposed IA-YOLO approach can adaptively process images in both normal and adverse weather conditions. The experimental results are very encour-

(a) YOLO II (Baseline) (b) IA-YOLO (Ours)

Figure 1: In the real-world foggy condition, our method can adaptively output clearer images with sharper edges around objects' boundary, and consequently produce higher confidence detection results with fewer missing instances.

is mainly caused by the interaction between weather-specific information and objects, which leads to poor detection performance. Fig. 1 shows an example of object detection in foggy conditions. One can see that if the image can be prop-

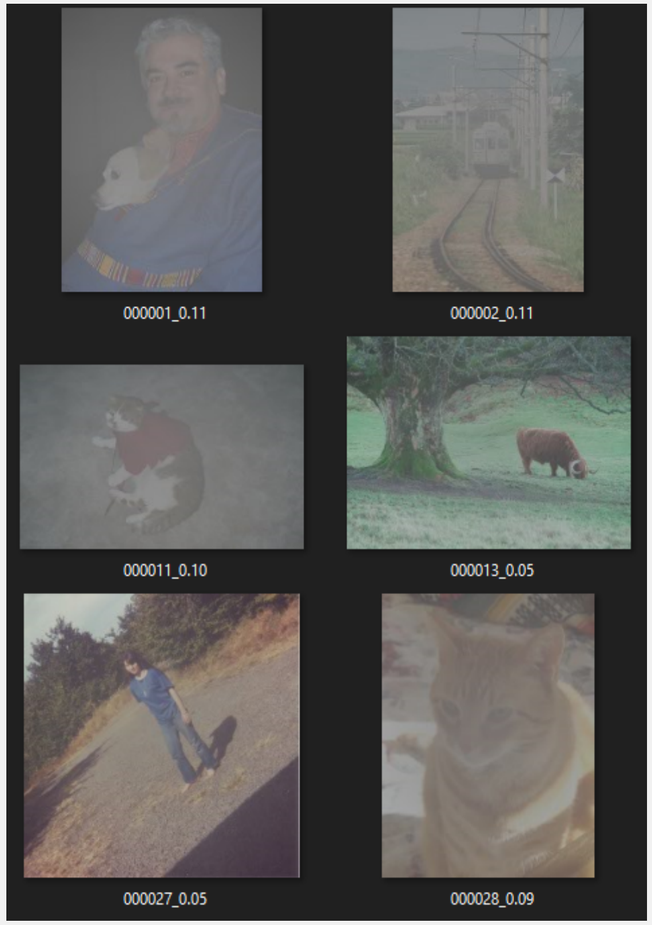


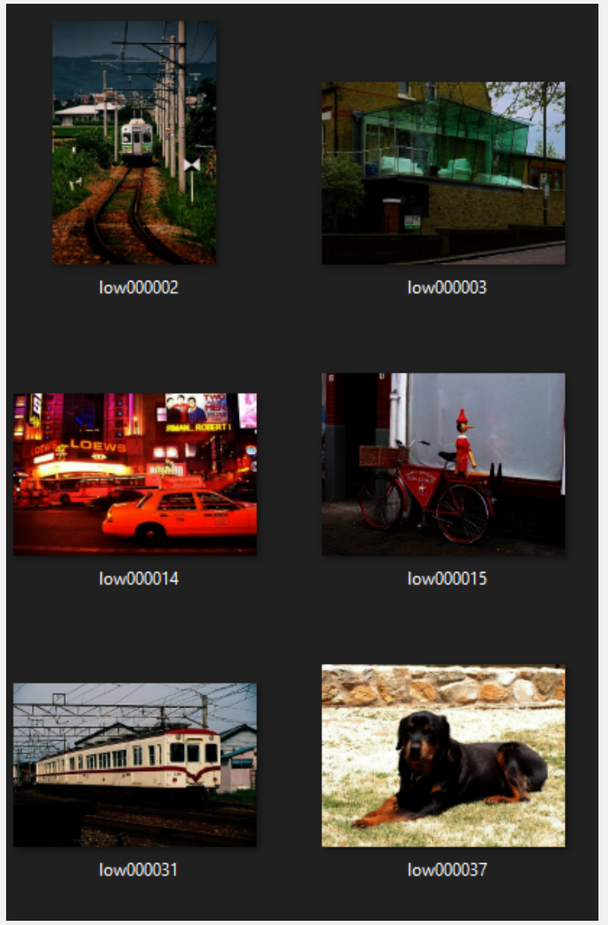
Top-Left : YOLO II model
Bottom-Right : Image-Adaptive Yolo Model

Exhaustive Process of Image Adaptive Yolo

Creating Offline Data

With foggy filters and low light filters





Foggy filters, low-light filters

Sequentially Cleaning Filters

- Pixel-wise Filters
- Sharpen Filter
- Defog Filter
- Convolutional Neural Network modules
- Detection Network Module

Challenging and was unattained for now

- Advanced Computer Vision
- Days of Training time
- Conflicting libraries

Subset Chosen for the Semester Project

- Object Detection using YOLO

DEMO

Future Work

Image Adaptive YOLO for foggy and low-light images

Paper on Yolo

https://arxiv.org/pdf/1506.02640.pdf

Paper on Image Adaptive - YOLO

https://arxiv.org/abs/2112.08088

YOLO Code

https://github.com/AlexeyAB/darknet

Image Adaptive YOLO Code

https://github.com/wenyyu/Image-Adaptive-YOLO