YOLO
(Object Detection)

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Types Of Object Detection Algorithm

- Object detection consists of various approaches such as fast R-CNN, Retina-Net, and Single-Shot MultiBox Detector (SSD). Although these approaches have solved the challenges of data limitation and modeling in object detection, they are not able to detect objects in a single algorithm run.
- **YOLO algorithm** has gained popularity because of its superior performance over the previously mentioned object detection techniques.

What is YOLO

- YOLO is You Only Look Once which means that prediction in the entire image is done in a single algorithm run
- YOLO is an algorithm that uses neural networks to provide real-time object detection.
- Object detection in YOLO is done as a regression problem and provides the class probabilities of the detected images
- This algorithm is popular because of its speed and accuracy.
- It has been used in various applications to detect traffic signals, people, parking meters, and animals.

Why YOLO algorithm is important?

Speed: This algorithm improves the speed of detection because it can predict objects in real-time.

High accuracy: YOLO is a predictive technique that provides accurate results with minimal background errors.

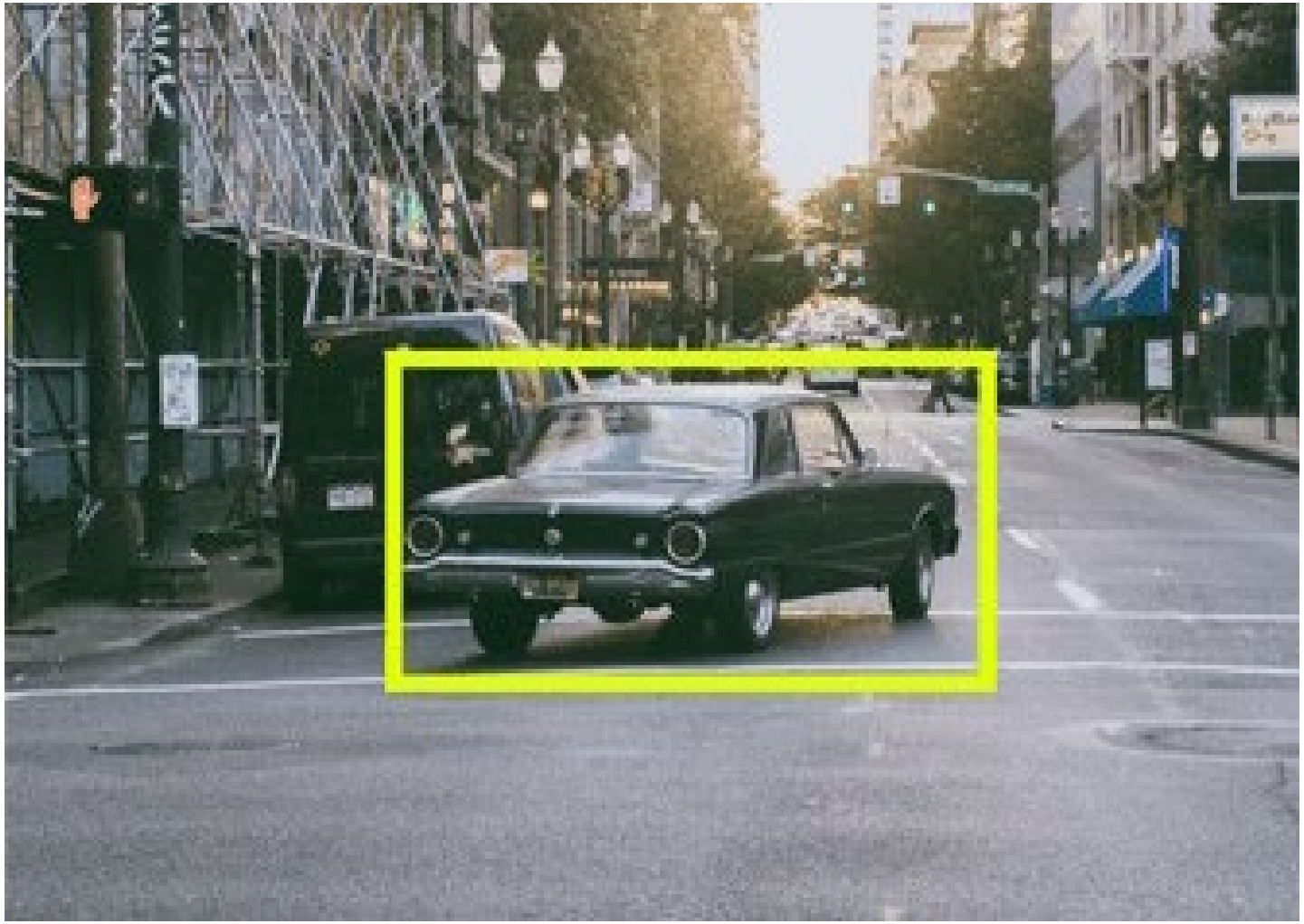
Learning capabilities: The algorithm has excellent learning capabilities that enable it to learn the representations of objects and apply them in object detection.

How YOLO Works!

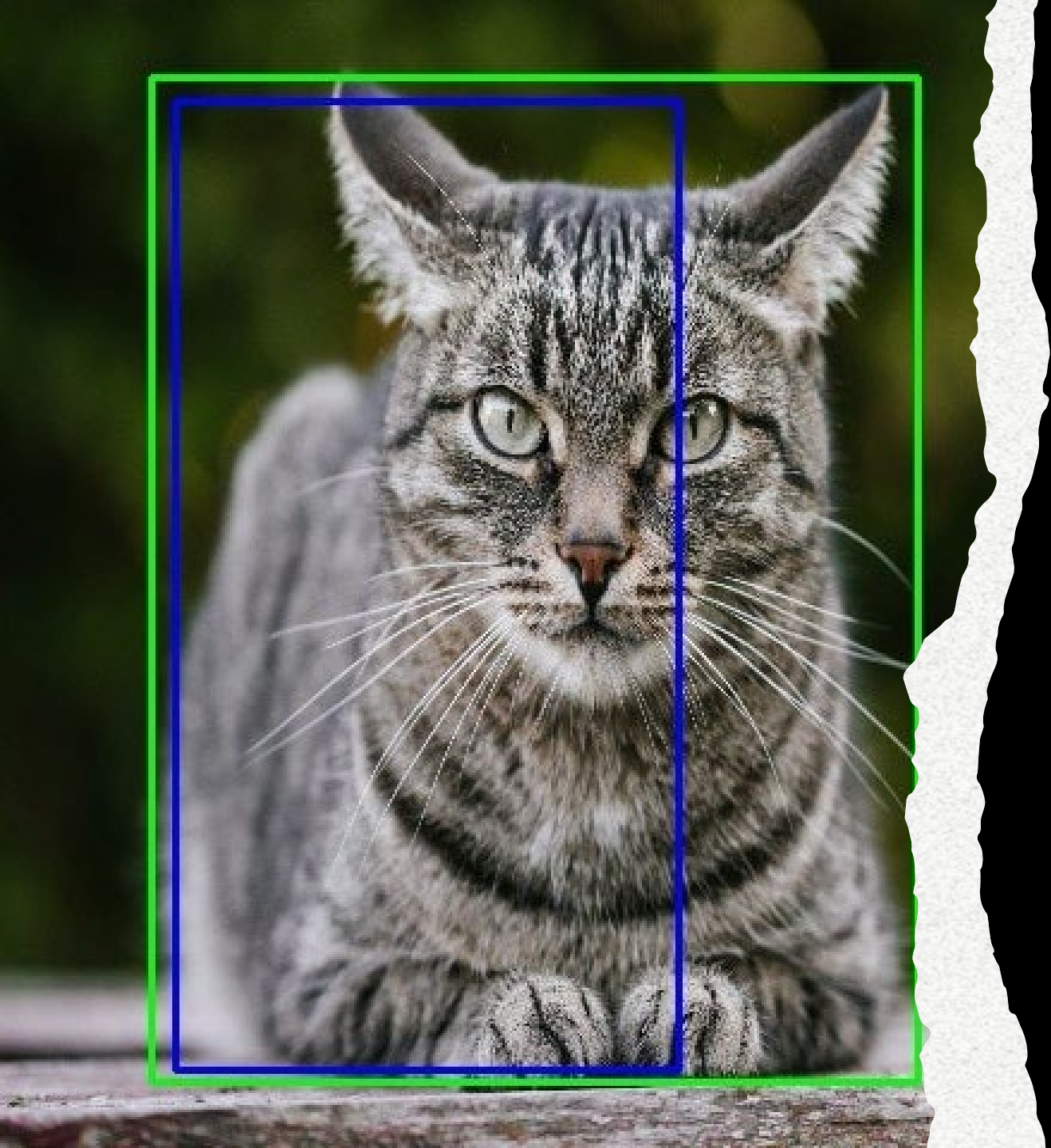
Residual Blocks

In the image above, there are many grid cells of equal dimension. Every grid cell will detect objects that appear within them. For example, if an object center appears within a certain grid cell, then this cell will be responsible for detecting it.

Bounding Box Regression



- YOLO uses a single bounding box regression to predict the height, width, center, and class of objects. In the image above, represents the probability of an object appearing in the bounding box.

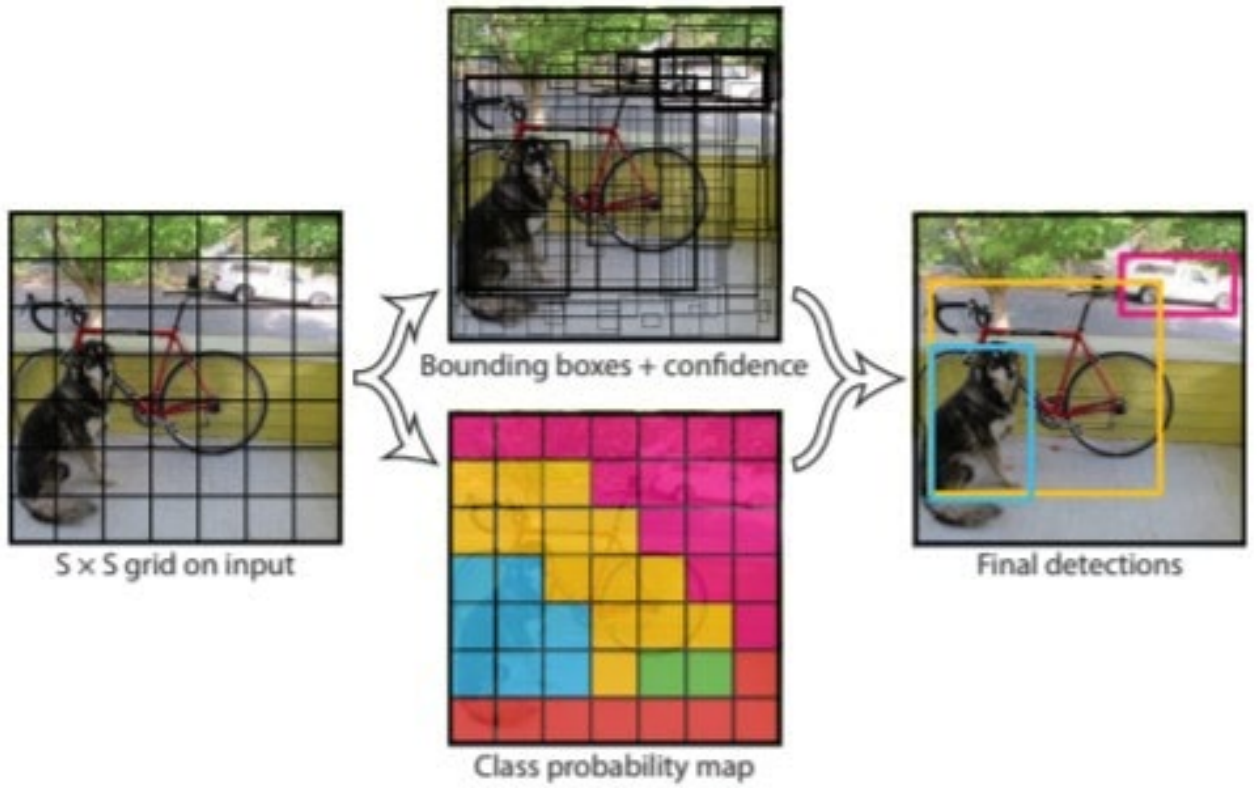


Intersection Over Union(IOU)

In the image above, there are two bounding boxes, one in green and the other one in blue. The blue box is the predicted box while the green box is the real box. YOLO ensures that the two bounding boxes are equal.

Combination of three techniques

- The following image shows how the three techniques are applied to produce the final detection results.



Applications of YOLO

- **Autonomous driving:** YOLO algorithm can be used in autonomous cars to detect objects around cars such as vehicles, people, and parking signals. Object detection in autonomous cars is done to avoid collision since no human driver is controlling the car.
- **Wildlife:** This algorithm is used to detect various types of animals in forests. This type of detection is used by wildlife rangers and journalists to identify animals in videos (both recorded and real-time) and images. Some of the animals that can be detected include giraffes, elephants, and bears.
- **Security:** YOLO can also be used in security systems to enforce security in an area. Let's assume that people have been restricted from passing through a certain area for security reasons. If someone passes through the restricted area, the YOLO algorithm will detect him/her, which will require the security personnel to take further action.

Conclusion

- This technique provides improved detection results compared to other object detection techniques such as Fast R-CNN and Retina-Net.