Non-Maximum Suppression (NMS)

Reference :
https://www.mpi-inf.mpg.de/departments/computer-vision-and-machine-learning/research/object-recognition-and-scene-understanding/learning-nms

(x, y, w, h, confidence)

- YOLO 모델의 최종 Output : **S x S x (5 * B + C) (5 : x, y, w, h, confidence)**

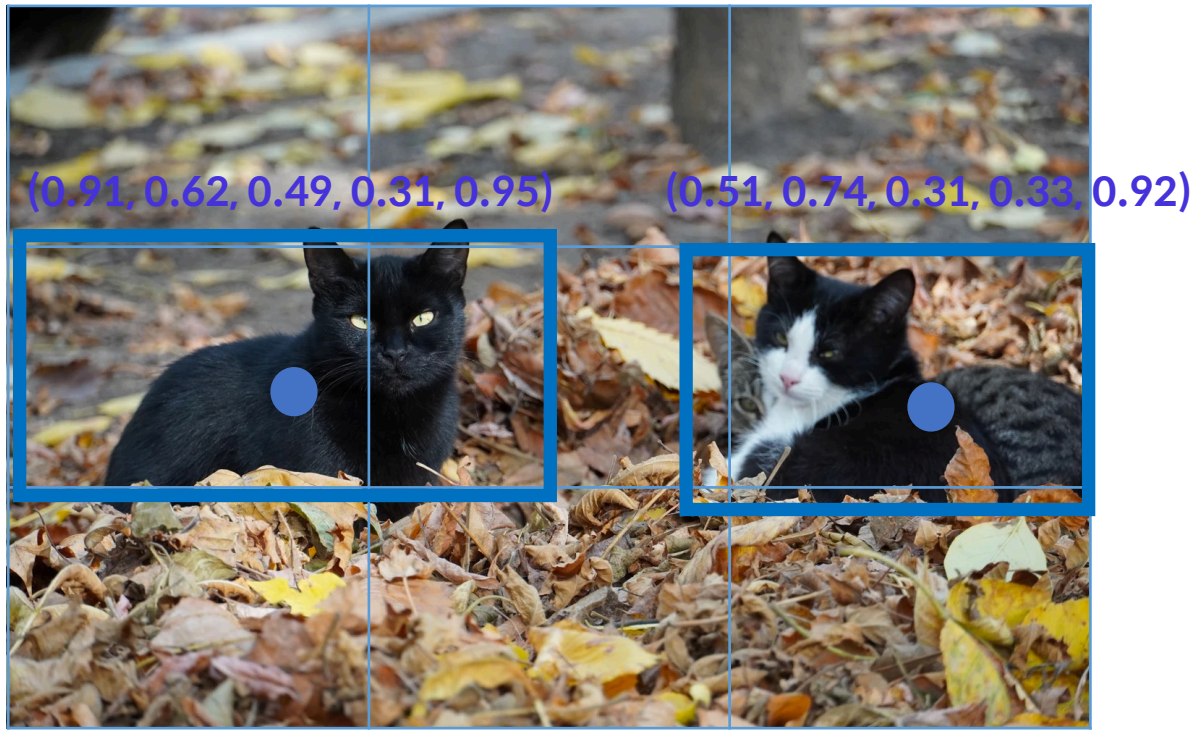
x : grid cell 내의 x의 위치 (0~1 사이의 값)

y : grid cell내의 y의 위치 (0~1 사이의 값)

w : 전체 이미지 대비의 width (0~1사이의 값)

h : 전체 이미지 대비의 height (0~1 사이의 값)

confidence : 이미지 내에 Object가 있을 것이라고 확신하는 정도 (0~1 사이의 값)



Reference :
https://unsplash.com/photos/OKcmHlcthJI

Non-Maximum Suppression 알고리즘 동작과정

① **confidence ≤ 0.6** 이하의 Bounding Box를 제거합니다.

② **class 별로** confidence가 가장 높은 Bounding Box가 앞으로 오도록 **전체 Bounding Box를 내림차순 정렬**합니다.

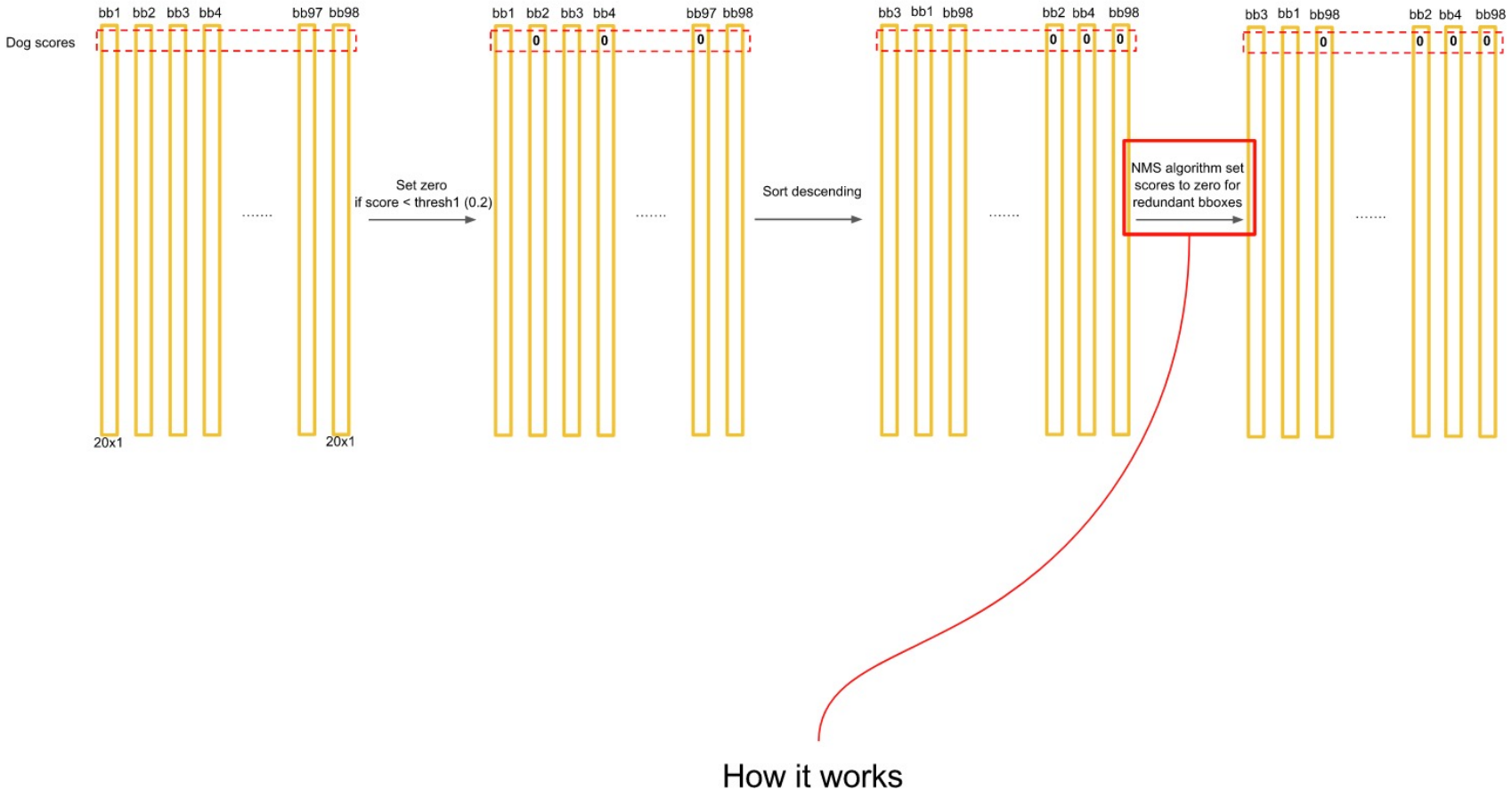
③ **가장 Confidence 가 높은 Bounding Box**와 나머지 Bounding Box를 비교해서 **2개의 Bounding Box의 IoU ≥ 0.5** 라면 **Confidence가 작은 Bounding Box를 제거**합니다.

④ **제거되지 않은 Bounding Box 중에서 Confidence가 가장 높은 Bounding Box**와 나머지 Bounding Box간에 ③번 과정을 반복합니다.

⑤ ③~④ 과정을 **전체 Bounding Box**에 대해서 진행합니다.

⑥ ②~⑤ 과정을 **전체 class**에 대해서 진행합니다.

YOLO



Slide credit: Deep Systems
(https://goo.gl/Am4vQB)

YOLO

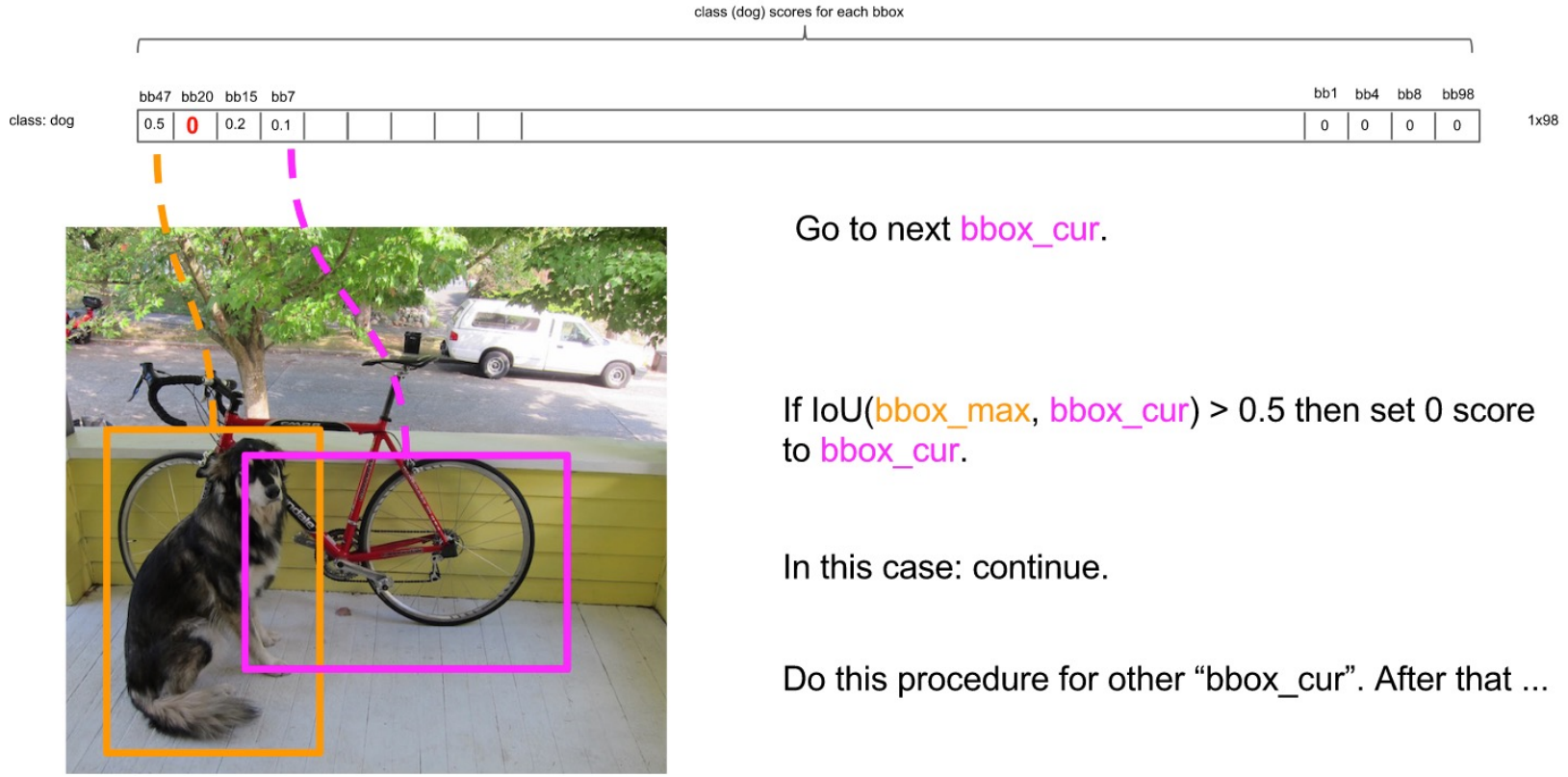
Non-Maximum Suppression: intuition

If IoU(bbox_max, bbox_cur) > 0.5 then set 0 score to bbox_cur.

Slide credit: Deep Systems (https://goo.gl/Am4vQB)

YOLO

Non-Maximum Suppression: intuition



Go to next bbox_cur.

If IoU(bbox_max, bbox_cur) > 0.5 then set 0 score to bbox_cur.

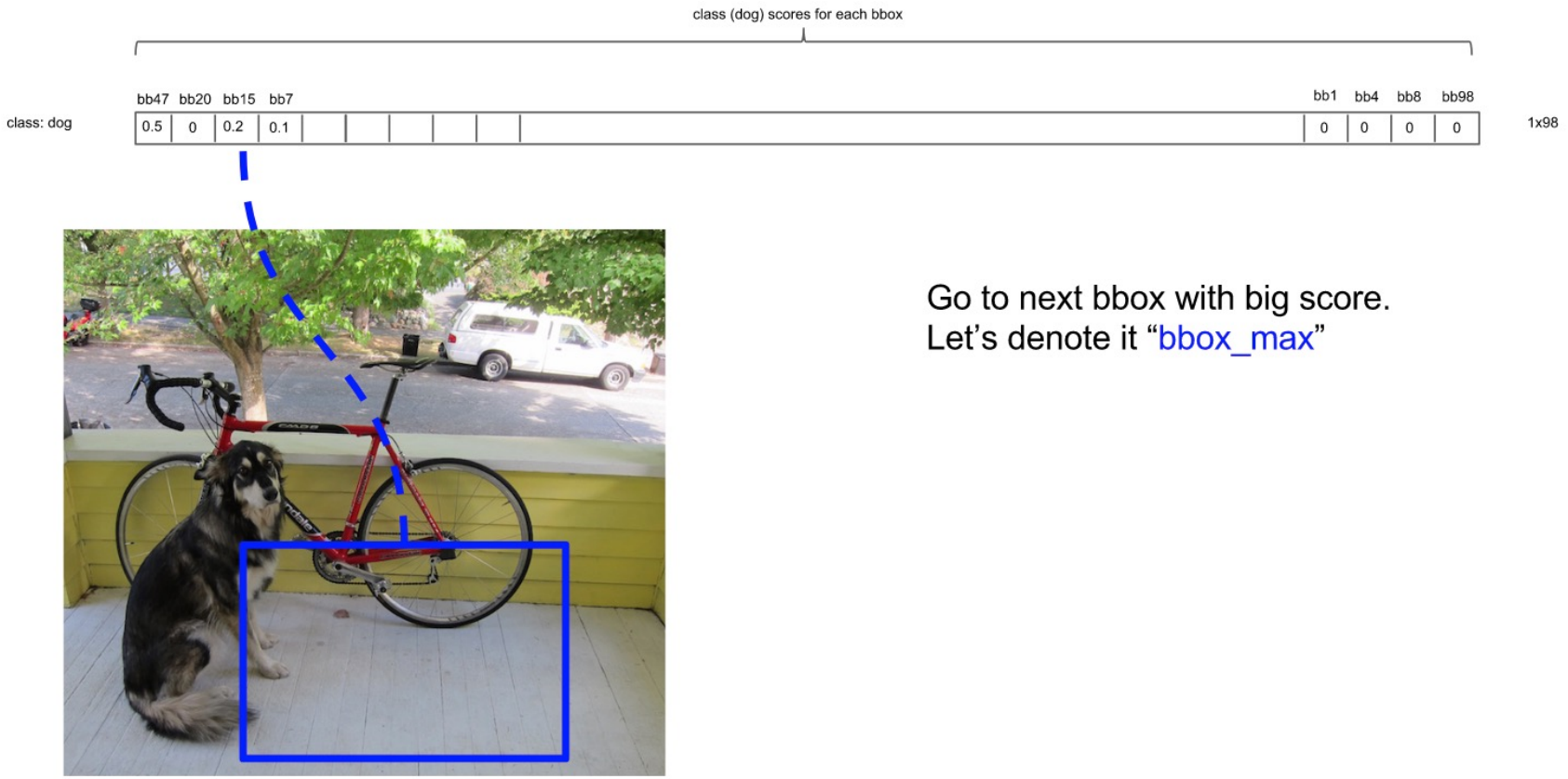
In this case: continue.

Do this procedure for other “bbox_cur”. After that ...

Slide credit: Deep Systems (https://goo.gl/Am4vQB)

YOLO

Non-Maximum Suppression: intuition



Go to next bbox with big score.
Let's denote it "bbox_max"

Slide credit: Deep Systems (https://goo.gl/Am4vQB)

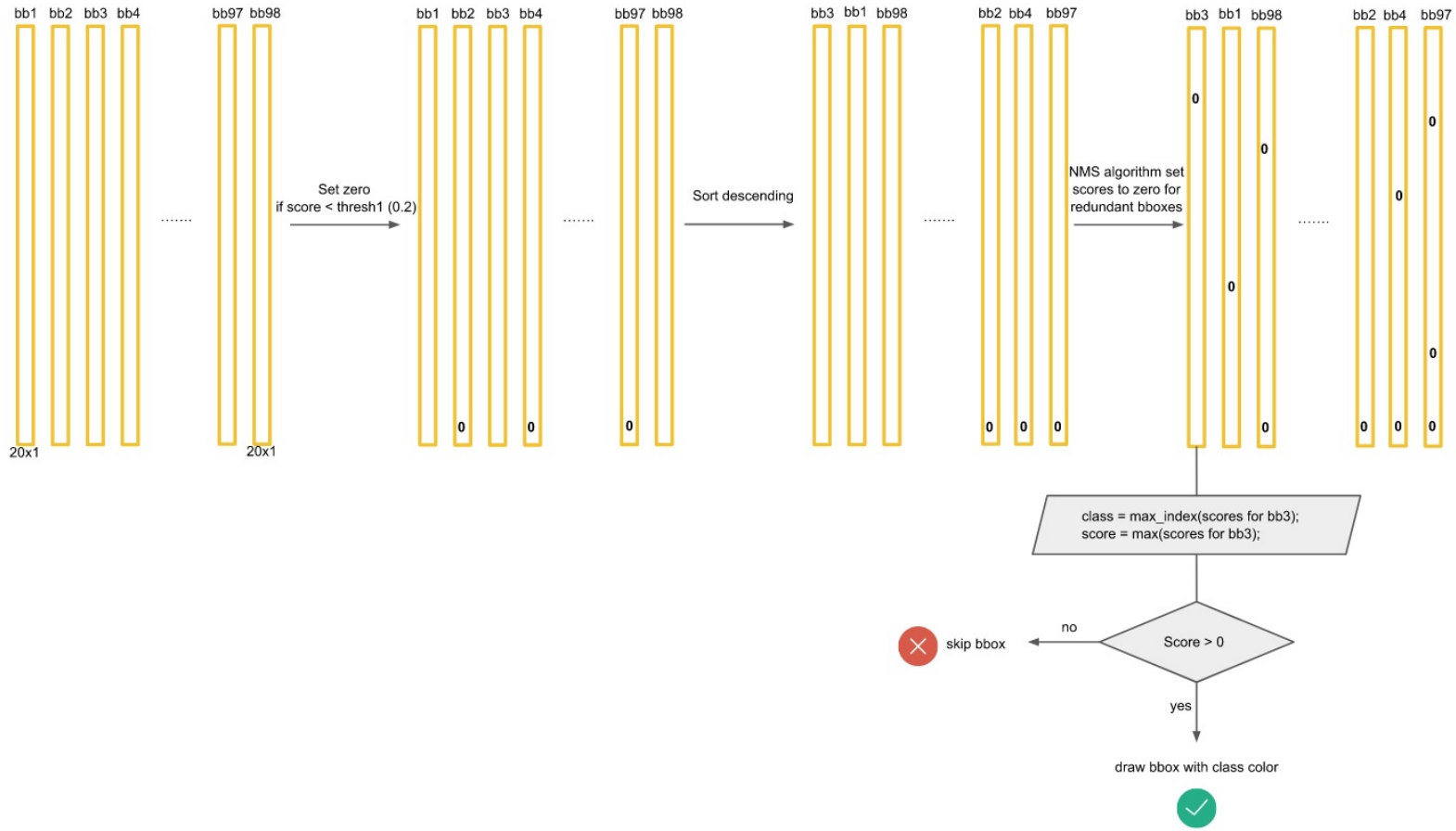
YOLO

Non-Maximum Suppression: intuition

After comparison almost all pairs of bboxes the only two bboxes left with non-zero class score value.

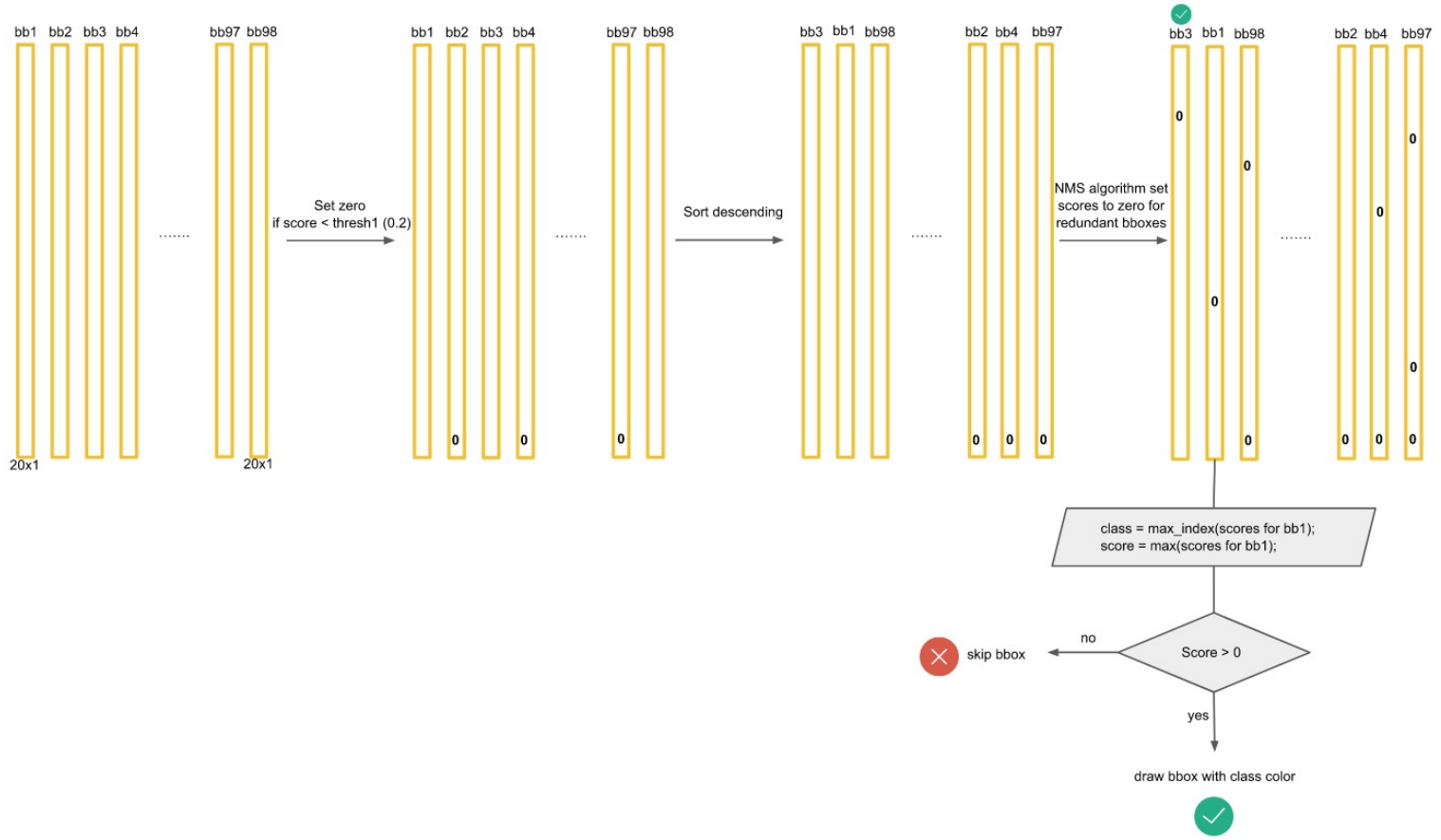
Slide credit: Deep Systems (https://goo.gl/Am4vQB)

YOLO



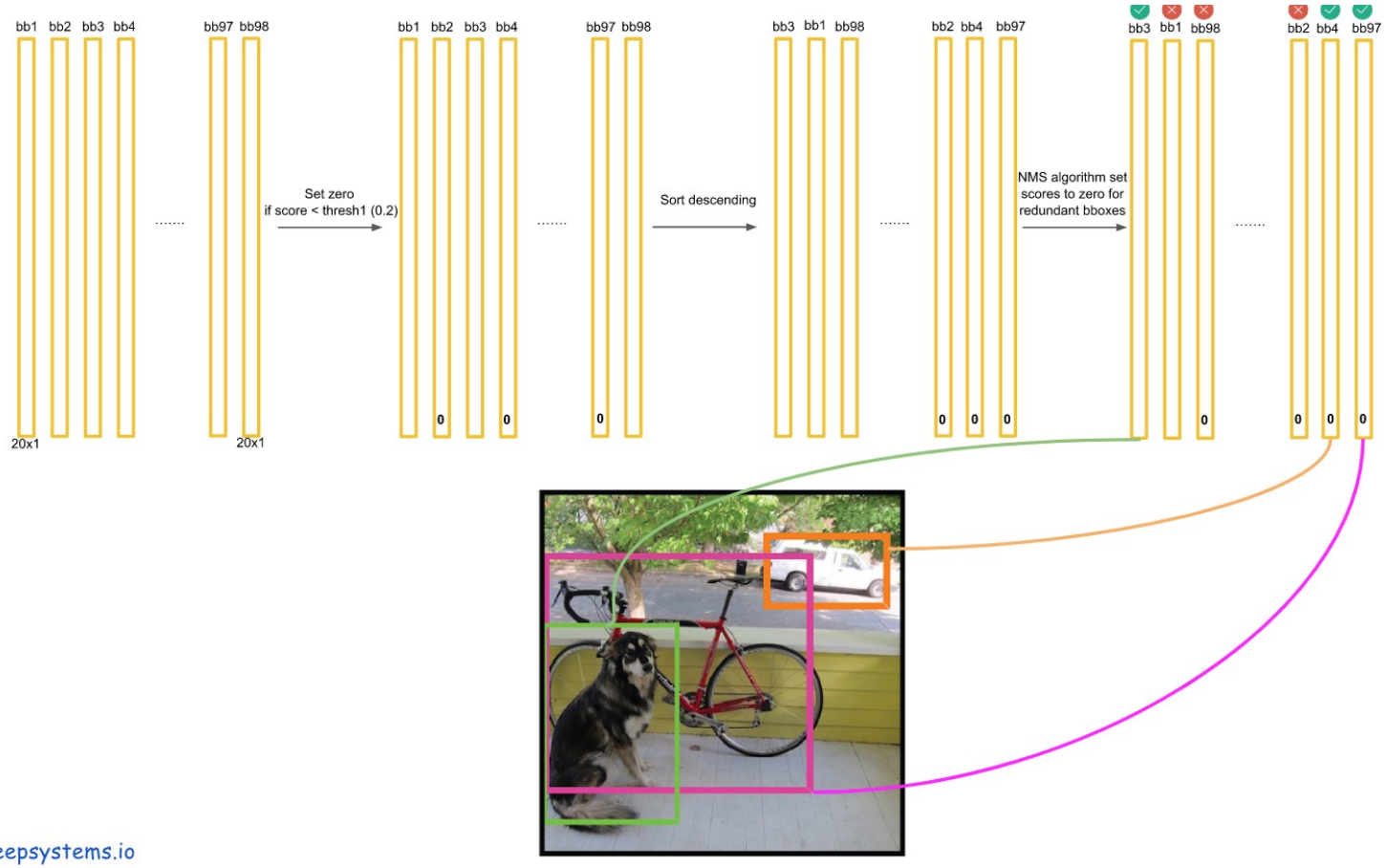
Slide credit: Deep Systems
(https://goo.gl/Am4vQB)

YOLO



Slide credit: Deep Systems (https://goo.gl/Am4vQB)

YOLO



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Slide credit: Deep Systems
(https://goo.gl/Am4vQB)

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Thank you!