

# Group 1: Marine-Animal Detection

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## Detection System Overview

- Input:** Images with marine animals.
- Method:** Object Detection on transfer learning and fine-tuning with supervised DL model.
- Output:** Images with marine animals bounded out and classified to 20 categories.



## Dataset with Colored Images

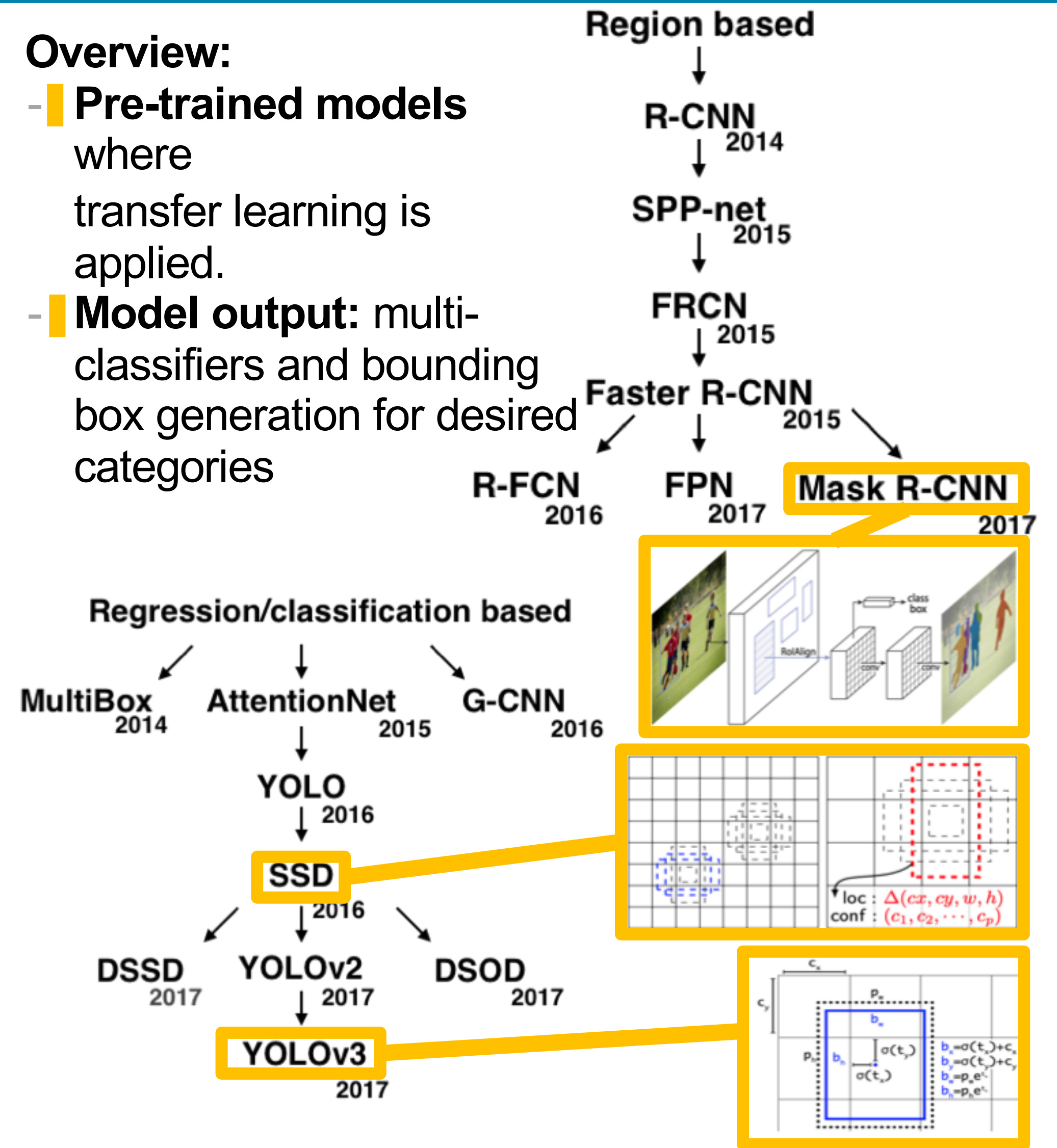
- Sources:**
  - Marine animal data scripted from Google Images
  - Underwater camera data from OBSEA (UPC)
- Quantity:**
  - 1000+ JPEG images in varied sizes
- Types:**
  - Different types of marine lives (fishes and mammals)



## Related Work & Details of Models

### Overview:

- Pre-trained models** where transfer learning is applied.
- Model output:** multi-classifiers and bounding box generation for desired categories

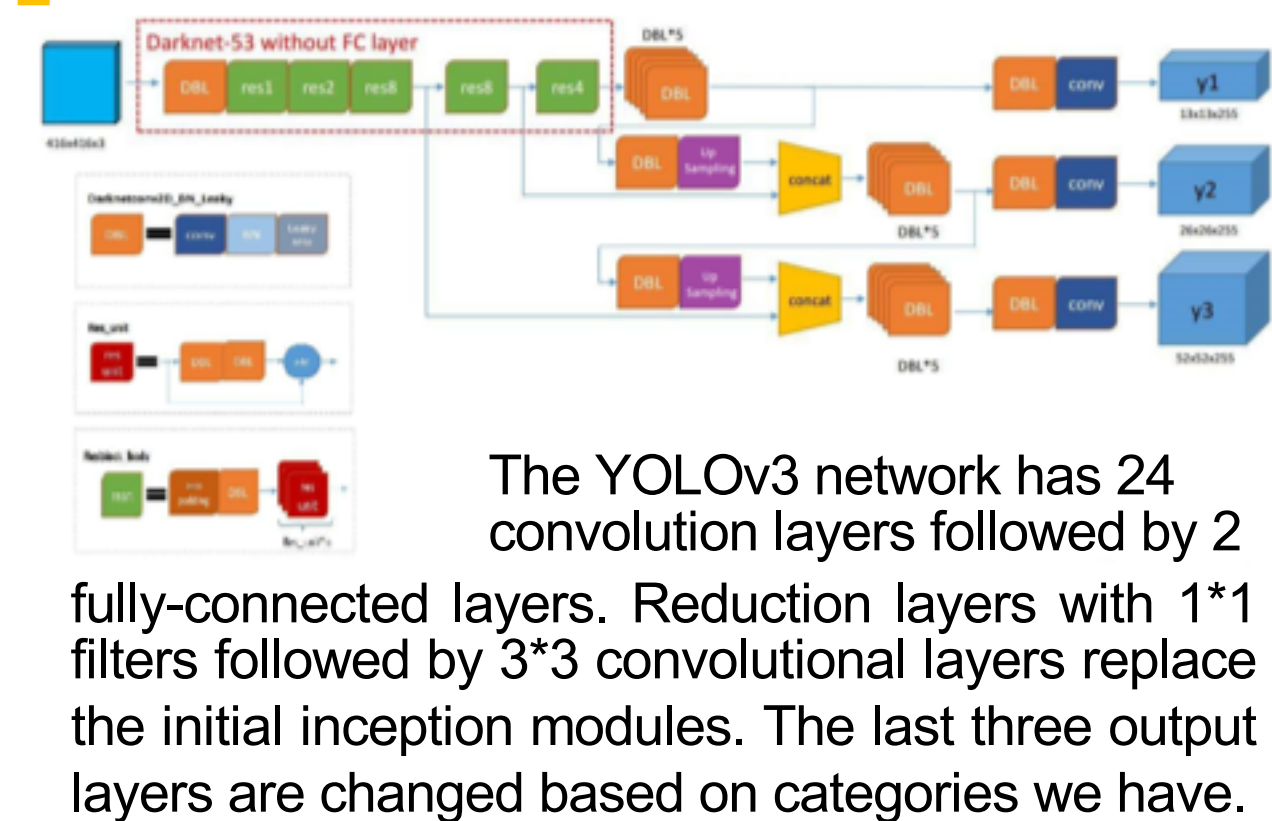


## Feature Extraction

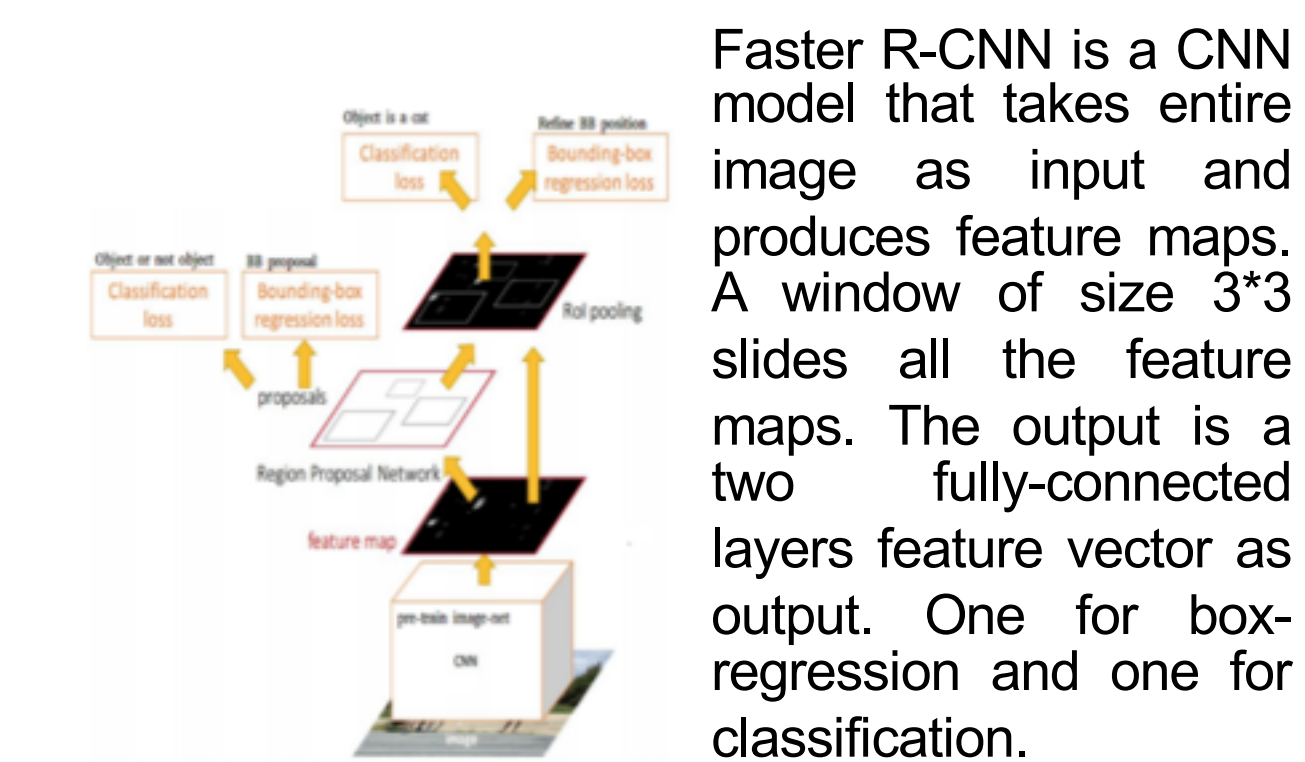
- Data Processing:** bounding box transform and image transform
- Feature Compression:** CNN
- Evaluation:** mean Average Precision (mAP) & Accuracy of Classifying each category (AC)

## Proposed Model

### YOLOv3:

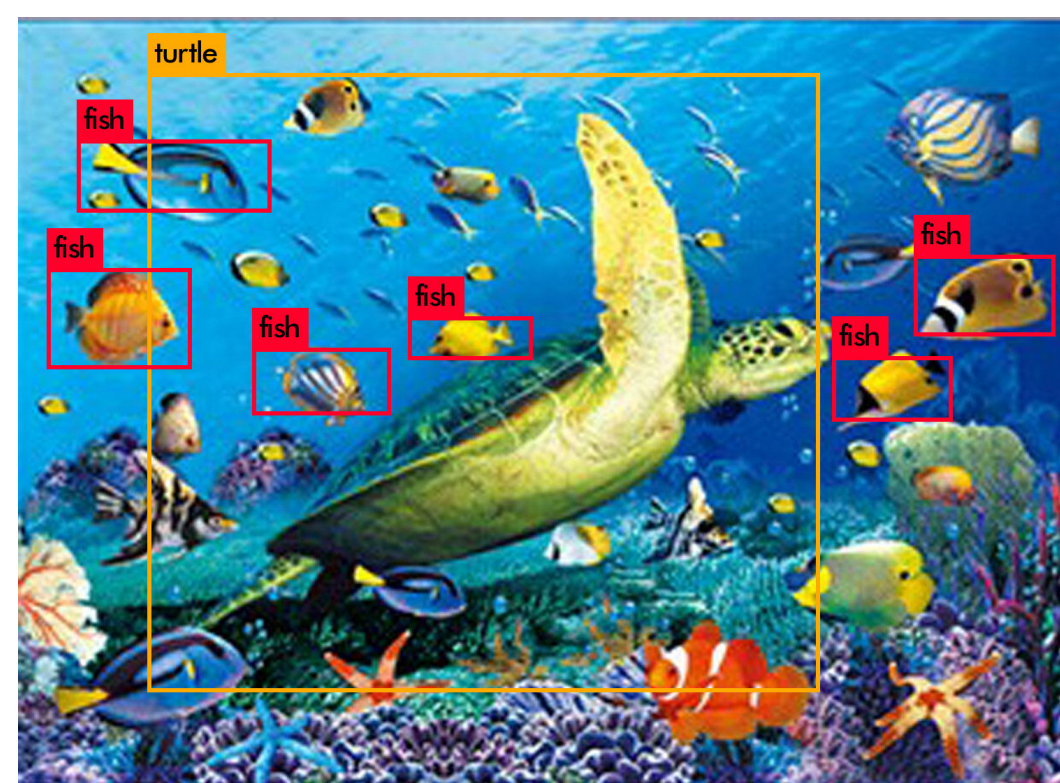


### Faster RCNN:



## Results: Proposed Model Outperforms Others

### Comparison of mAP and AC among Models

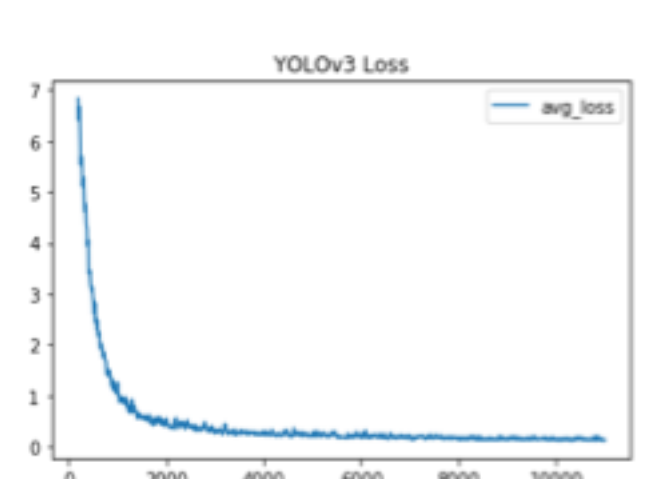


**YOLOv3:** Starfish and some other species in the background are not detected

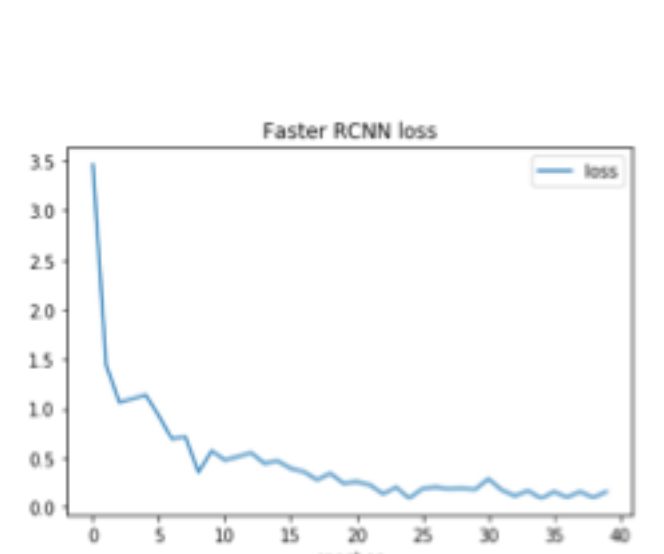
**Faster RCNN:** most of the species are detected and correct labels are provided

### Training Loss Comparison

#### YOLOv3



#### Faster RCNN



## Future Work

- Further improve model based on the constraints.
- Carry out more related works to improve model performance
- Promote model into real-world applications.

## Discussion

- Large variations in viewpoints, pose, blockage and lighting conditions
- Complicated underwater background with lots of oceanic flora
- Limited amount of data
- Pretrained model and its performance over very large test set

## Reference

- [1] The Western Mediterranean Expandable Seafloor Observatory (obsea), <http://www.obsea.es>
- [2] Ren, Shaoqing & He, Kaiming & Girshick, Ross & Sun, Jian. (2015). Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks. IEEE Transactions on Pattern Analysis and Machine Intelligence. 39. 10.1109/TPAMI.2016.2577031.
- [3] Redmon, Joseph & Farhadi, Ali. (2018). YOLOv3: An Incremental Improvement.
- [4] He, Kaiming & Gkioxari, Georgia & Dollár, Piotr & Girshick, Ross. (2017). Mask R-CNN.

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