

# DEEP LEARNING

## FOR COMPUTER VISION

Summer School at UPC TelecomBCN Barcelona. June 28-July 4, 2018



# Hake instance segmentation and size measurement

**Github repo:** <https://github.com/telecombcn-dl/2018-dlcv-team5>

Our trained model: [link](#)



# Outline

**The problem**

**AI Approach**

**Results  
&  
Conclusions**

**Questions**

**The team**



# The team



**Amaya Álvarez**  
Marine Science Doctor



**Christian Tutivén**  
Data Scientist



/in/christian-tutiven/



**Luis Salgueiro**  
Ph.d. Candidate



in/luis-salgueiro



**Martin Rais**  
Computer Vision Engineer



/in/martin-rai/



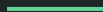
**Oscar Mañas**  
Computer Vision Engineer



/in/oscmansan/

# PROBLEM

BIOLOGISTS + 2K fish  
images/day





- Artisanal fleet provides above 50% of total fish consumed all around the world.
- Mediterranean artisanal boats represent the 80% of the fleet but last decades are suffering continuous economical loss

# GENERAL OBJECTIVE

- Reinforce the Mediterranean Artisanal fleet through the use of economical and ecological models

## SPECIFIC OBJECTIVE

- Obtain the number and size of hake fish from images of harbour boxes



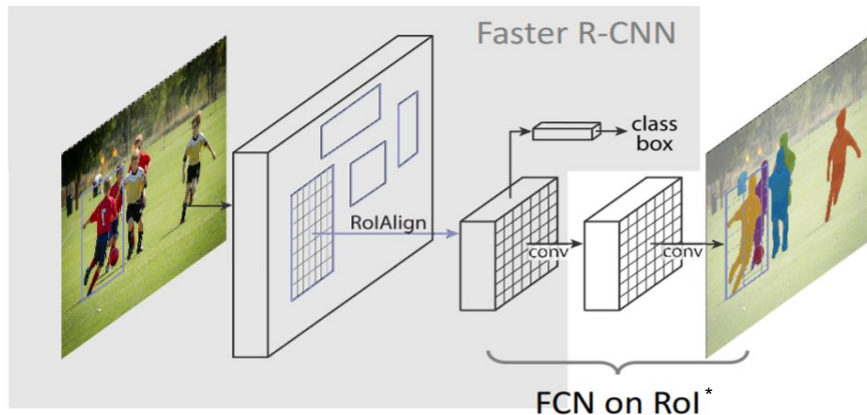
# AI APPROACH

INSTANCE SEGMENTATION

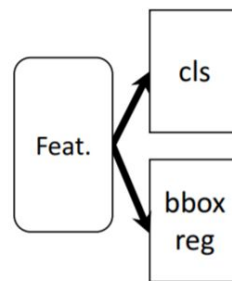
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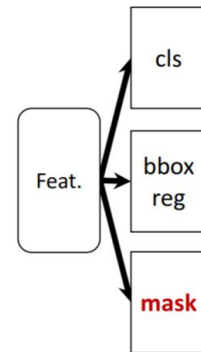
# Mask RCNN



- Instance Segmentation
- Faster R-CNN with FCN on Rols



Fast/er R-CNN\*



Mask R-CNN\*

\* [http://kaiminghe.com/iccv17tutorial/maskrcnn\\_iccv2017\\_tutorial\\_kaiminghe.pdf](http://kaiminghe.com/iccv17tutorial/maskrcnn_iccv2017_tutorial_kaiminghe.pdf)



# Fine Tuning

## Github fork:

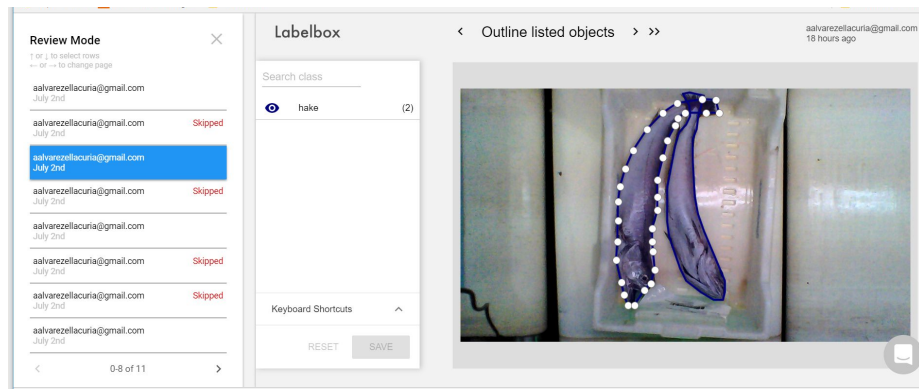
[https://github.com/matterport/Mask\\_RCNN](https://github.com/matterport/Mask_RCNN)

The repository includes:

- **Source code of Mask R-CNN built on FPN and ResNet101.**
- **Training code for MS COCO**
- **Pre-trained weights for MS COCO**
- Jupyter notebooks to visualize the detection pipeline at every step
- ParallelModel class for multi-GPU training
- Evaluation on MS COCO metrics (AP)
- **Example of training on your own dataset**

## Datasets

- Coco format
- Train: 20 images segmented with **Labelbox**
- Test: 11 images



# RESULTS & CONCLUSIONS

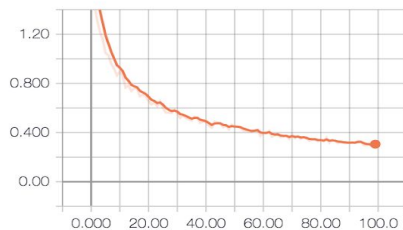
FIRST APPROACH

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# Results

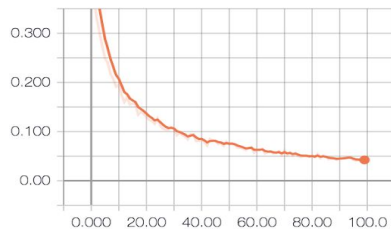
loss

loss



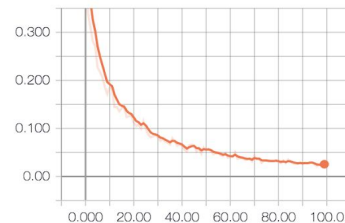
mrcnn\_bbox\_loss

mrcnn\_bbox\_loss



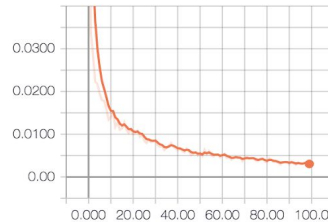
rpn\_bbox\_loss

rpn\_bbox\_loss



rpn\_class\_loss

rpn\_class\_loss

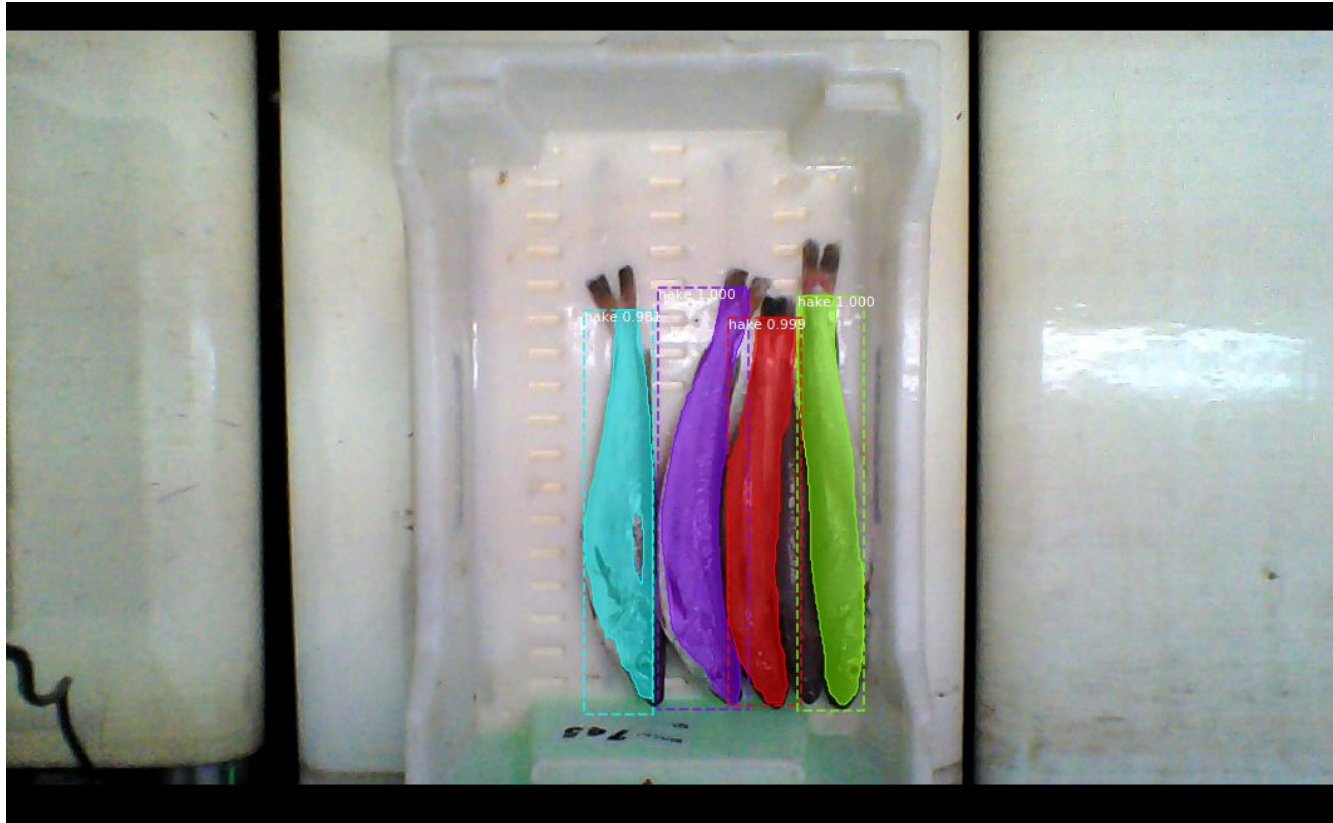


**mAP-50:** 0.65 (7 test images)

**Github repo:** <https://github.com/telecombcn-dl/2018-dlcv-team5>

Our trained model: [link](#)

# Results



fish 0: 321.08px, 38.73cm  
fish 1: 329.31px, 39.72cm  
fish 2: 301.25px, 36.34cm  
fish 3: 313.51px, 37.82cm

# Results



fish 0: 314.25px, 37.91cm

fish 1: 316.21px, 38.14cm

# Results



fish 0: 268.49px, 32.39cm  
fish 1: 220.51px, 26.60cm  
fish 2: 294.60px, 35.54cm  
fish 3: 232.60px, 28.06cm



# Results



## Measurement Results

fish 0: 173.00px, 20.87cm  
fish 1: 159.00px, 19.18cm  
fish 2: 128.00px, 15.44cm  
fish 3: 85.00px, 10.25cm



# Conclusion

- Segmentation of Hake ✓
- Instance Segmentation ✓
- Acceptable results with tiny train dataset

## Future Work

- Increase dataset
- Diversity of classes
- Fine-tuning

# References

- He et al, “Mask R-CNN”, arXiv 2017. Consulted in July-2018. Available in <https://arxiv.org/pdf/1703.06870.pdf>
- Github repo baseline: [https://github.com/matterport/Mask\\_RCNN](https://github.com/matterport/Mask_RCNN)