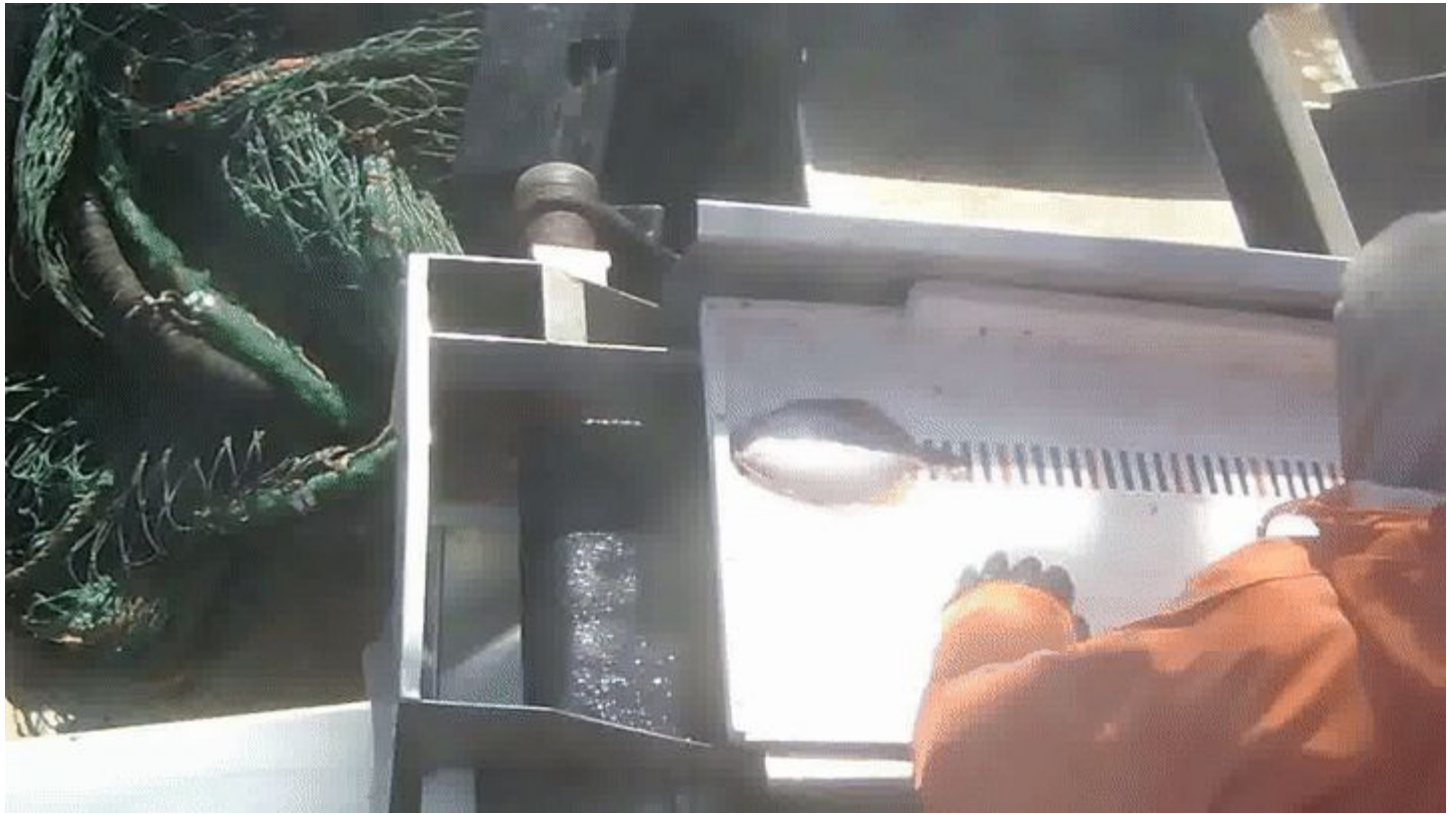
Avito

Open Data Science

Подсчет, определение размера и классификация рыб по видео Driven Data N+1 fish, N+2 fish

Артур Кузин
@n01z3

Setup



Setup with annotation

https://spark-in.me/post/fish-object-detection-ssd-yolo

Metric

$$f(y, \hat{y}) = \underbrace{\alpha_N * (1 - EDIT(y_N, \hat{y}_N))}_{\text{Sequence of fish}} + \underbrace{\alpha_L * R^2(y_L, \hat{y}_L)}_{\text{length}} + \underbrace{\alpha_S * (2 * AUC(y_S, \hat{y}_S) - 1)}_{\text{Fish AUC}}$$

Sequence of fish

Levenshtein distance

W = 0.6

length

R2

W = 0.1

Fish AUC

per class AUCs

[0.5, 1] -> [0, 1]

If AUC fail: MAE 

W = 0.3

Type of fish

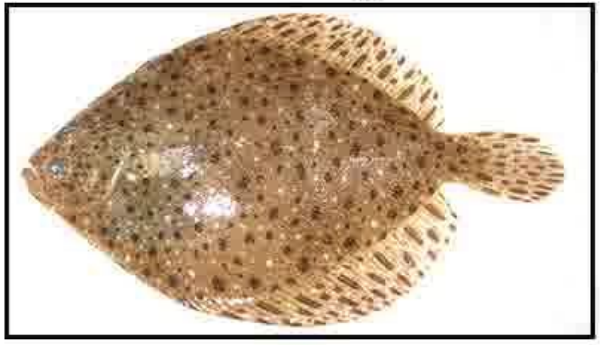
Four Spot

Grey Sole

Plaice

Winter

Windowpane



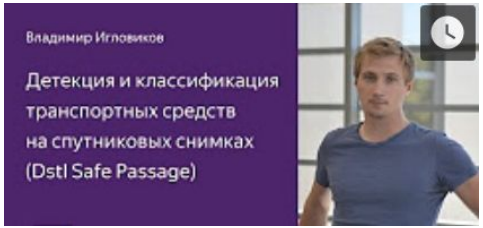
Summer

Type of boats

Detection + Classification

https://github.com/apache/incubator-mxnet/tree/master/example/rcnn

@ternaus



https://youtu.be/NV9LSUIVkWA

@vla

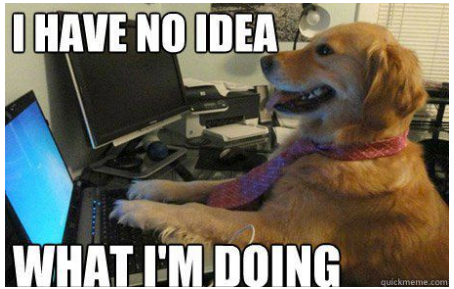
https://youtu.be/nPcSGIXiiMM

- VGG head
- Standard augs
- No validation
- Batch 4 (1 sample per GPU)

Pros:

- Fast enough
- Easy multi-GPU

Cons:



Result

Length regression

@nizhib

https://youtu.be/soE8r0inDpU

- Linknet (https://arxiv.org/abs/1707.03718)
- Full size (1280 x 720)
- Gaussian for point
- 1 Net for head
- 1 Net for tail

@romul

https://youtu.be/MtCodWOuAkw

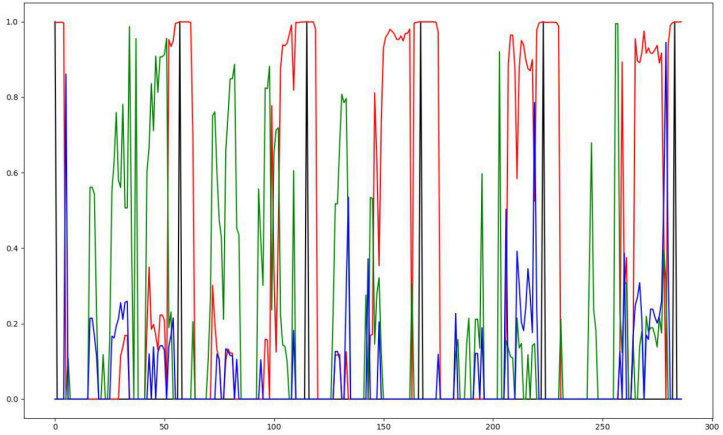
Pros:

- from easygold.Carvana import linknet
- Faster than U-net
- Accurate enough
- Easy multi-GPU

Results

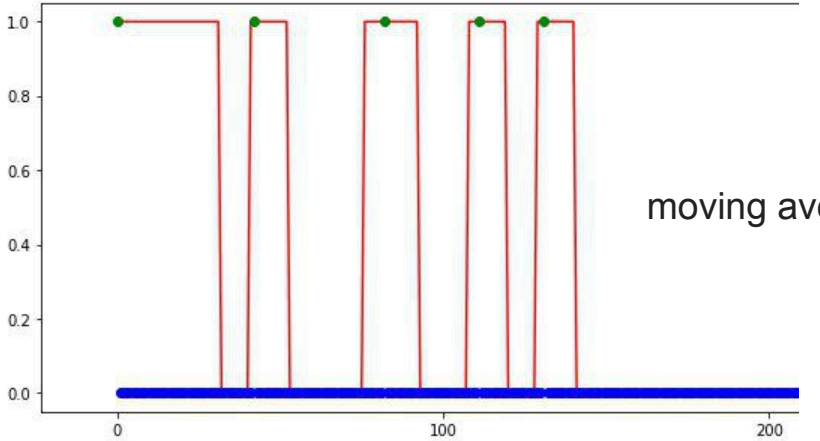
Put all together

Raw



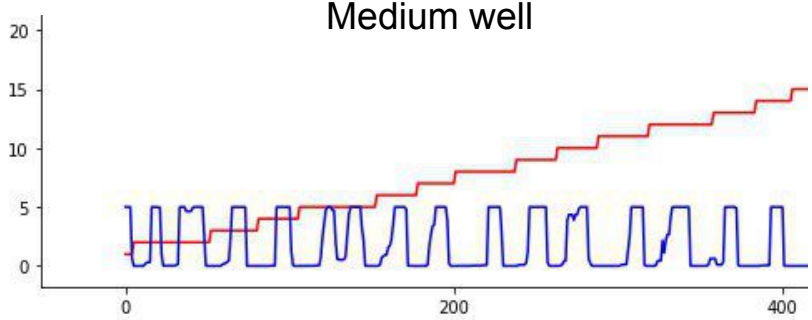
Probability from faster-rcnn

Medium

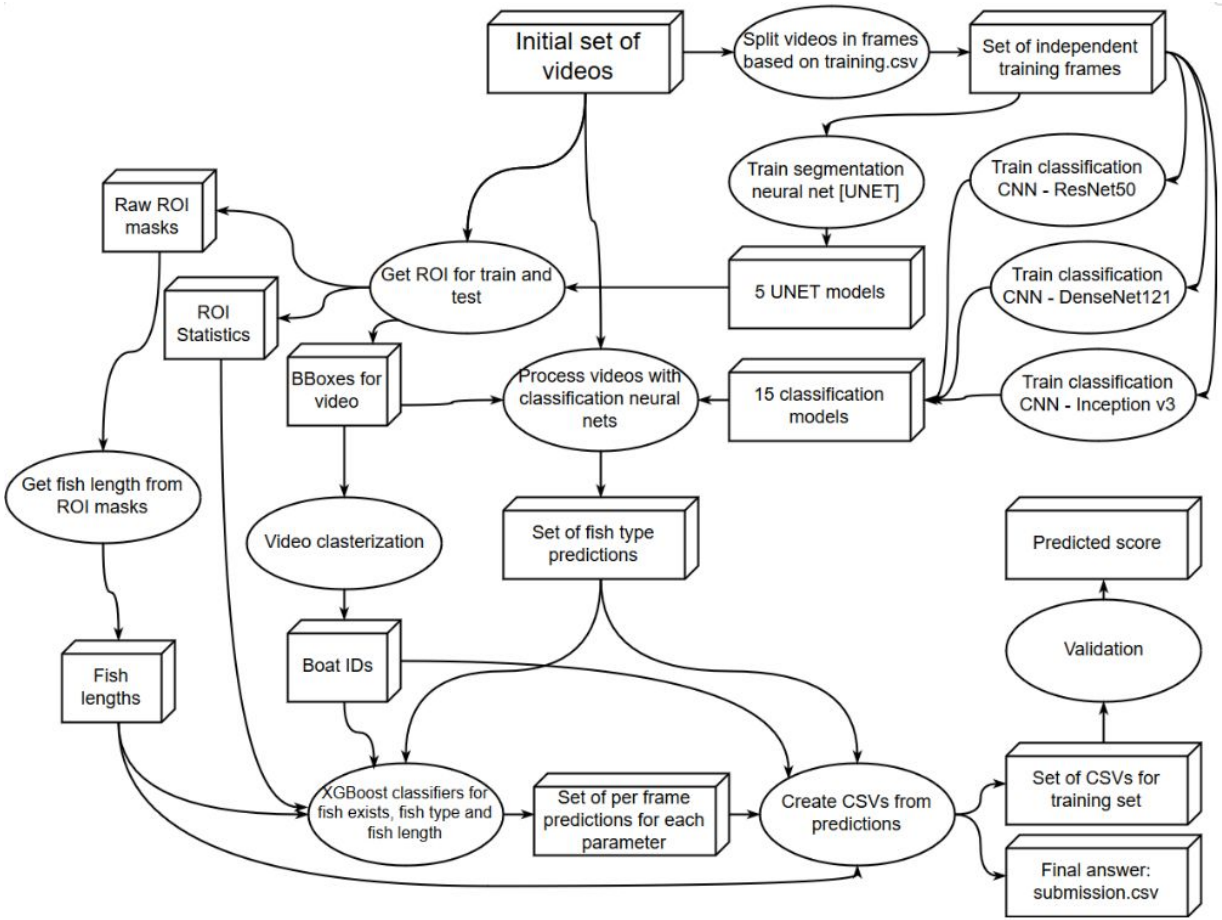


moving average

Medium well

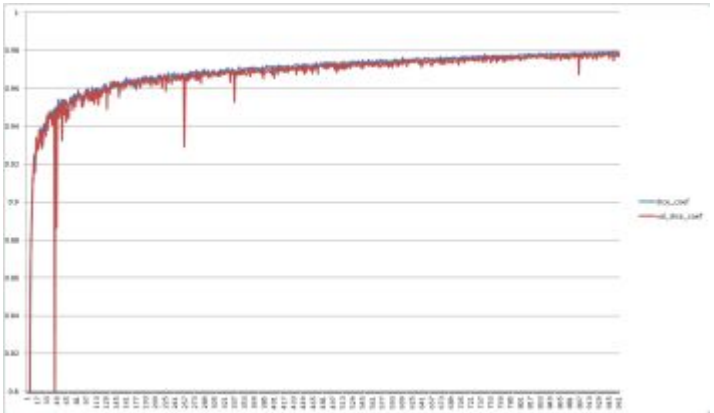


2n place - Roman Solovyev @ZFTurbo



Segmentation rules

- U-net
- Full size (1280 x 720)
- Dice loss



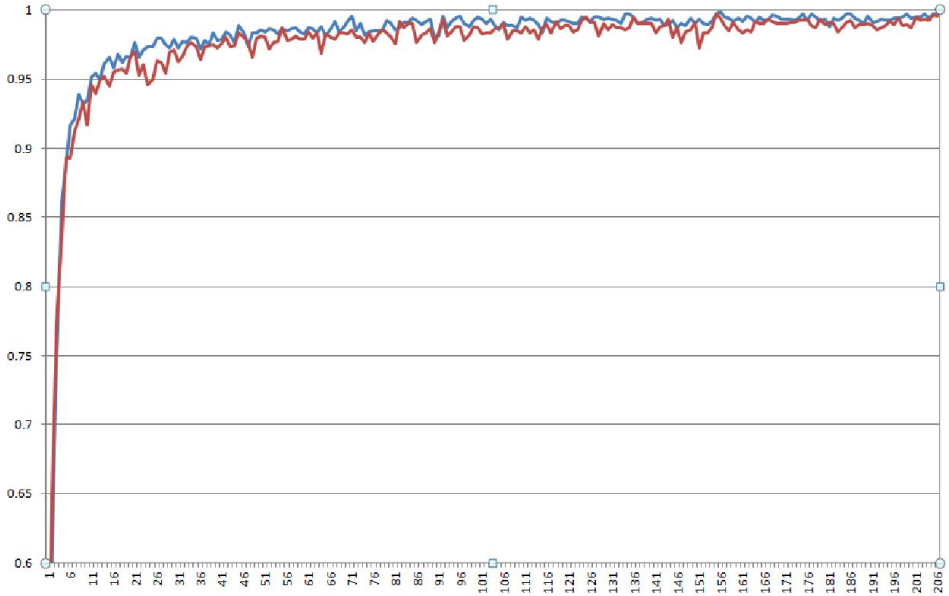
Classification

- 8 classes
  6 fish, 1 other, 1 no fish

- Finetune from:
  DenseNet_121, ResNet50
  and Inception v3

- Augmentations
  crop, rotate, flip, mirror, color

- XGBoost on top
  Boat ID, ROI statistics,
  frames predicts

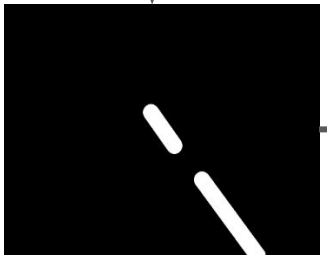


Result

https://youtu.be/OlDPPF_0lWY

1st place - Dmytro Poplavskiy @dmytro

U-net



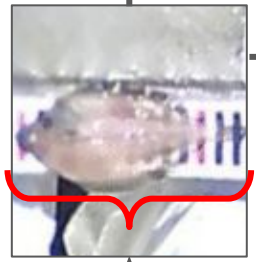
SSD
Resnet-50

DenseNet

Species

No fish
Fish & hand
Clear fish

Inception v3

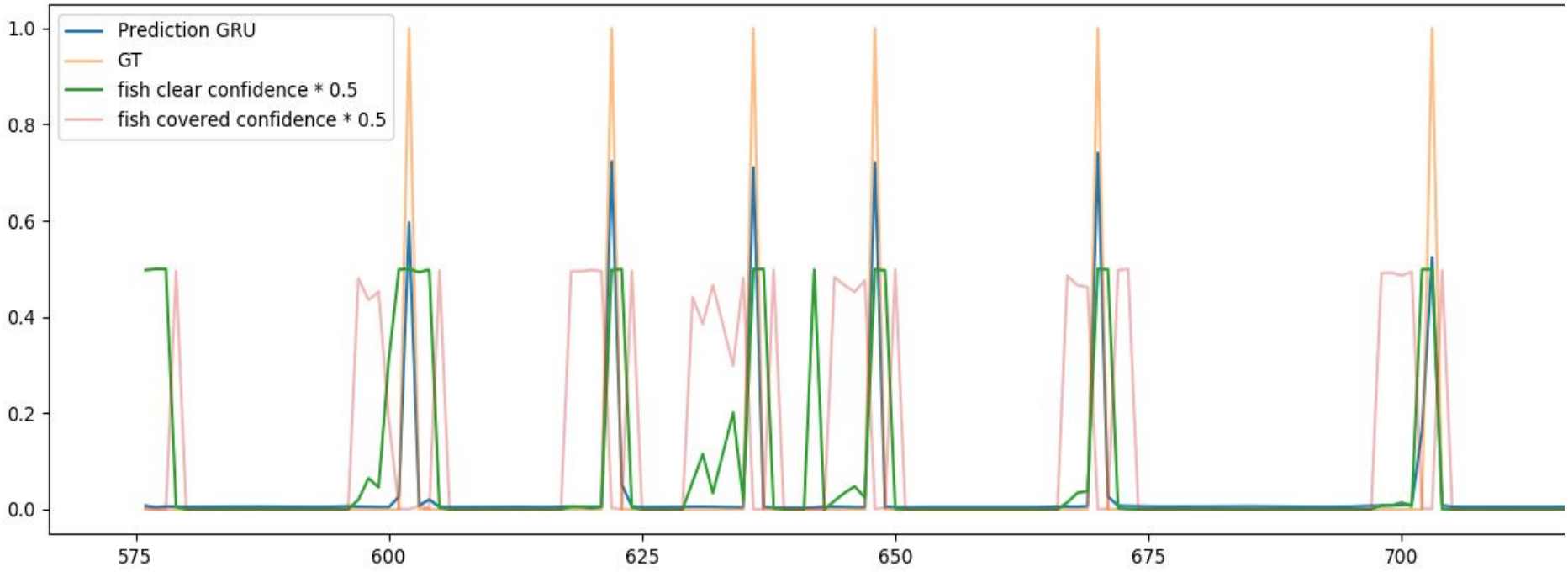


Length

RNN
2 layers
bidirectional
GRU

Key frame

Result


Prediction GRU
GT
fish clear confidence * 0.5
fish covered confidence * 0.5
1.0
0.8
0.6
0.4
0.2
0.0
575
600
625
650
675
700

Leaderboard

	User or team	Public	Private	Timestamp	Trend	# Entries
	dmytro	0.7661	0.7754	Oct. 28, 2017, 10:36 p.m.		26
	ZFTurbo	0.7294	0.7365	Oct. 30, 2017, 6:10 p.m.		37
	Daniel_FG	0.7224	0.7316	Oct. 29, 2017, 11:56 p.m.		13
	harshml	0.7036	0.7156	Oct. 30, 2017, 5:23 p.m.		39
	selim_sef	0.6949	0.7031	Oct. 30, 2017, 12:16 a.m.		40
	vlazhib	0.6890	0.6941	Oct. 30, 2017, 9:43 p.m.		19
	n01z3	0.6702	0.6732	Oct. 29, 2017, 11:52 p.m.		6
	justart	0.6492	0.6490	Oct. 29, 2017, 3:56 p.m.		8
	lopuhin	0.6261	0.6365	Oct. 26, 2017, 10:38 a.m.		17