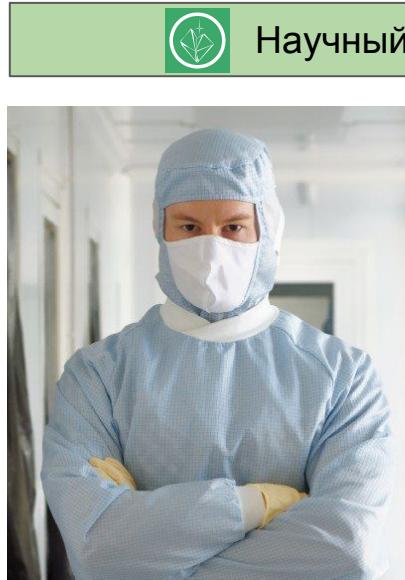


Приемы и хаки при обучении нейросетей

Артур Кузин
Lead Data scientist
Dbrain
@n01z3

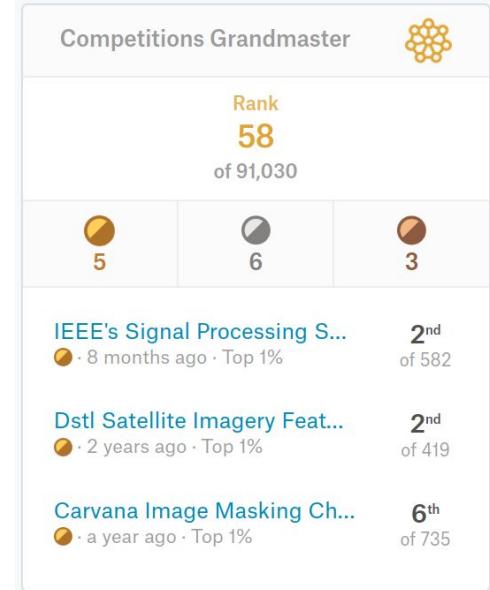
Timeline



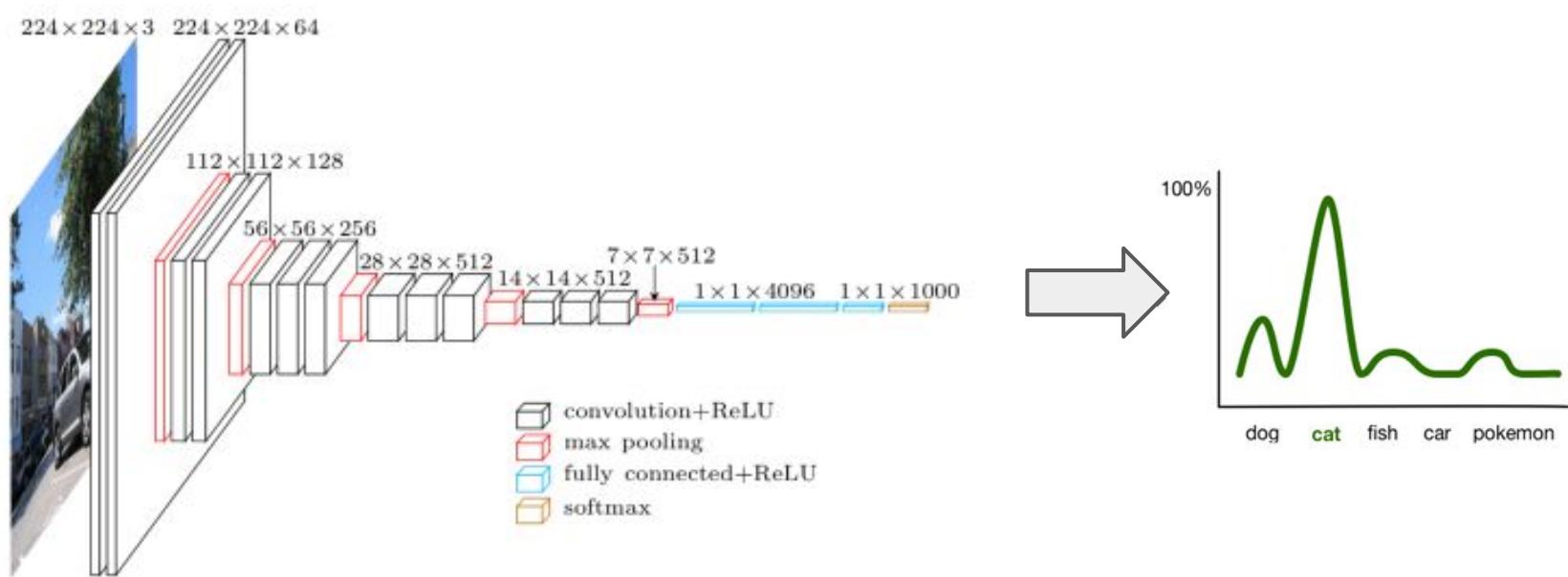
2008–2016
50+ публикаций
h-index: 9

Avito-2016: Распознавание
марки и модели автомашин
на изображениях
3 место

Avito-2016:
Распознавание категории
объявления
1 место



Немного теории



Представление изображения



<https://distill.pub/2017/feature-visualization/>

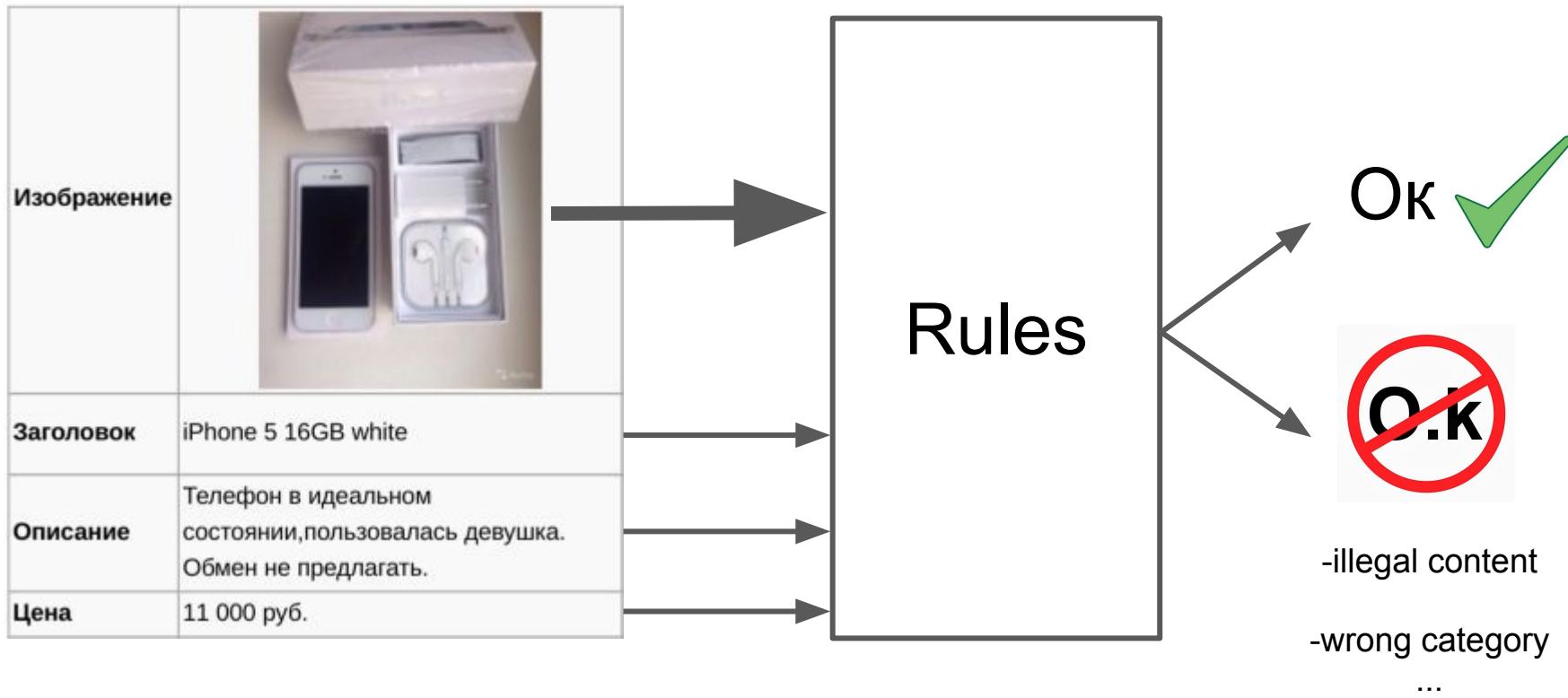
Imagenet



Imagenet 1k
1.2M изображений
1000 классов

Imagenet 21k
12M изображений
21000 классов

AvitoNet



AvitoNet



Проверка правил
модерации
~100

Определение категории
~300

Генерация заголовка
~2500

Поиск по фото

AvitoNet



+



AvitoNet

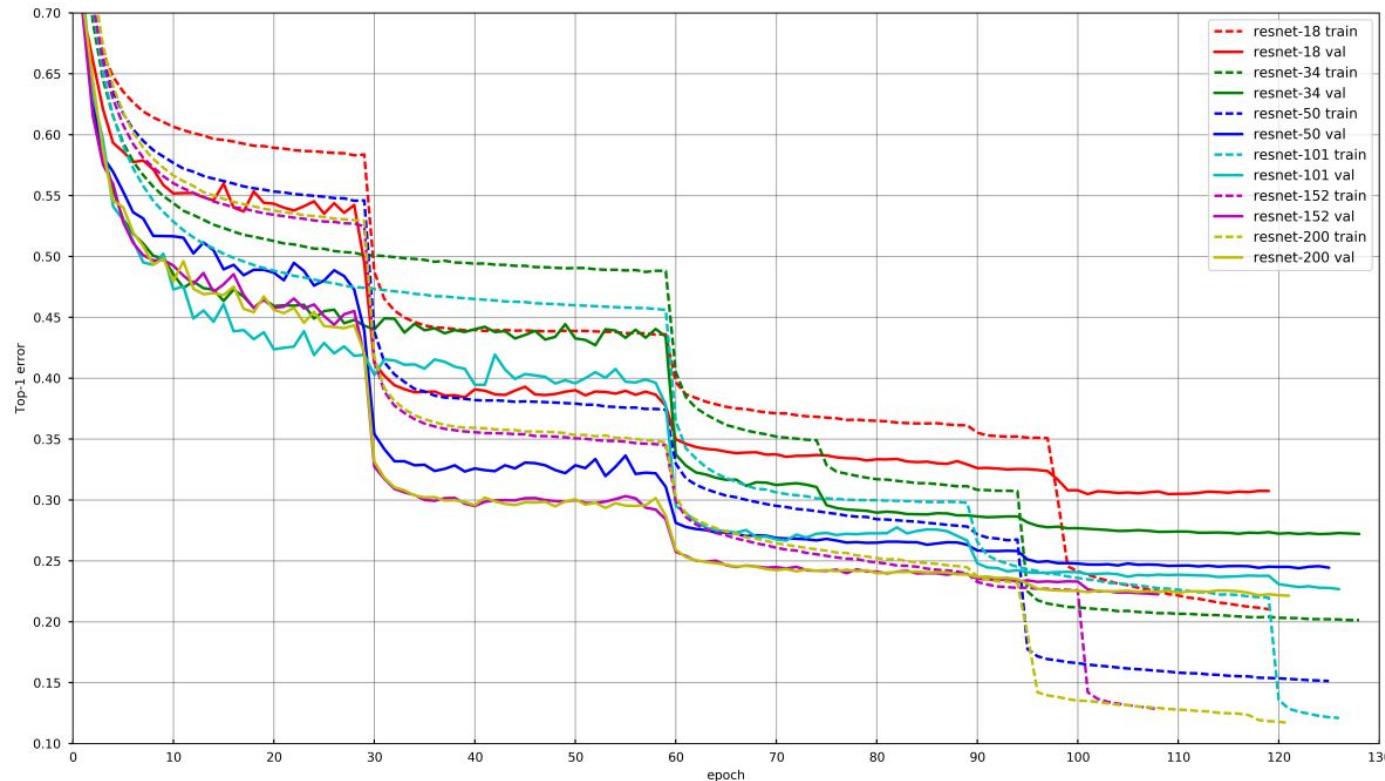
4000+ классов

8M+ изображений

Inria Aerial Image Labeling

Team	Date	IoU 50	IoU 70	IoU 80	IoU 90	IoU 95	IoU 99	IoU 99.5	IoU 99.9	IoU 99.95	IoU 99.99	IoU 99.995	IoU 99.999	IoU 99.9995
Ohleyer – ENS  	21-Jan-18	57.72	95.78	57.84	96.06	63.81	95.38	40.00	81.23	67.25	96.92	52.42	93.07	
Tao Hu3  	23-Jan-18	70.73	97.10	69.75	97.15	76.58	97.26	76.10	91.80	78.63	98.11	74.95	96.29	
Xiang Li  	6-Feb-18	67.08	96.65	61.86	96.37	70.20	96.44	74.90	91.61	71.90	97.47	71.03	95.71	
Xiang Li2  	7-Feb-18	67.32	96.67	62.28	96.43	70.51	96.47	74.76	91.57	72.38	97.53	71.16	95.73	
Tao Hu4  	8-Feb-18	70.73	97.09	69.98	97.22	76.74	97.29	76.73	92.34	79.09	98.17	75.33	96.42	
Kang Zhao  	23-Feb-18	56.11	95.37	50.40	95.27	61.03	95.37	61.38	87.00	62.51	96.62	59.31	93.93	
Vladimir Iglovikov  	27-Feb-18	72.24	97.13	72.10	97.28	74.57	96.85	72.40	90.60	78.33	98.01	73.41	95.97	
Alexander Buslaev  	4-Mar-18	72.38	97.16	76.89	97.76	76.68	97.21	78.67	92.81	79.85	98.21	77.39	96.63	
Alexander Buslaev2  	8-Mar-18	72.89	97.27	78.21	97.93	77.98	97.42	79.71	93.29	80.47	98.28	78.39	96.84	
Romanian Academy  	8-Mar-18	68.46	96.72	65.58	96.50	71.16	96.37	65.07	85.58	73.92	97.57	67.45	94.55	
Ales Zhuk  	9-Mar-18	43.12	91.74	25.92	83.43	46.29	90.71	65.93	87.47	40.03	90.80	47.46	88.83	
Mi Zhang  	10-Mar-18	55.58	93.66	56.43	94.24	70.38	96.09	72.60	90.11	71.84	97.13	66.92	94.25	
Vladimir Iglovikov2  	12-Mar-18	71.85	97.02	59.06	94.77	78.50	97.44	79.77	93.12	81.13	98.31	75.28	96.13	

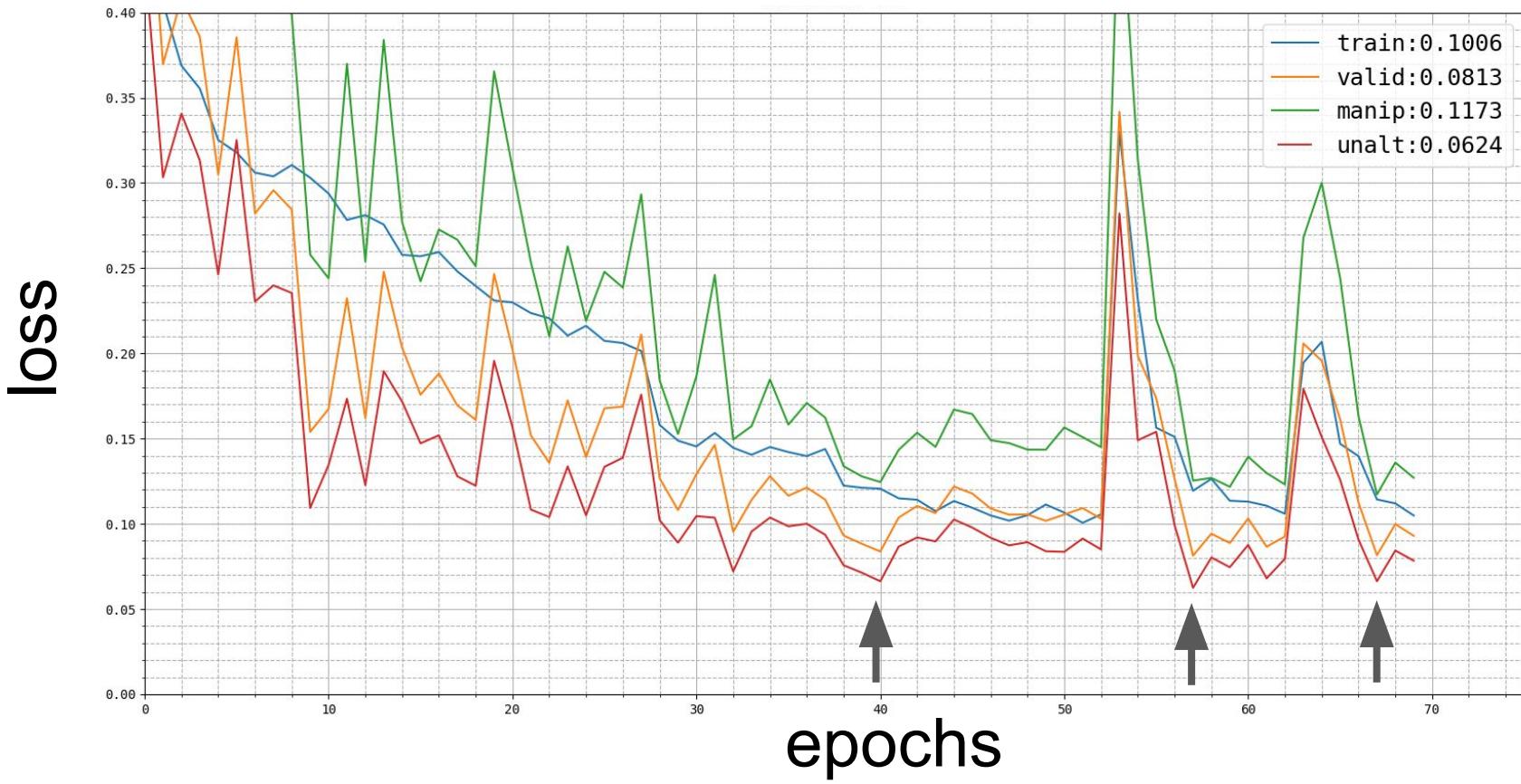
Training curve



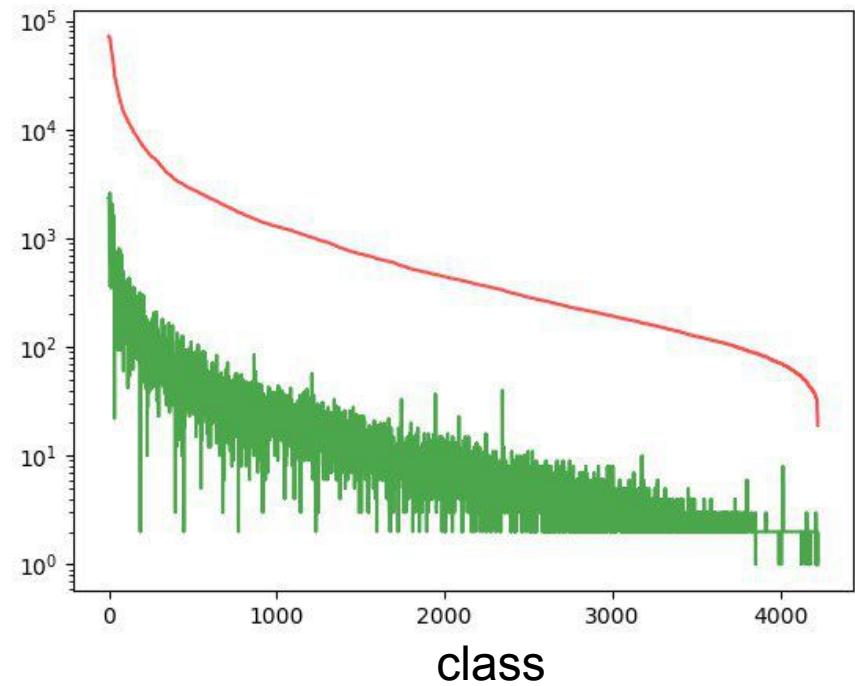
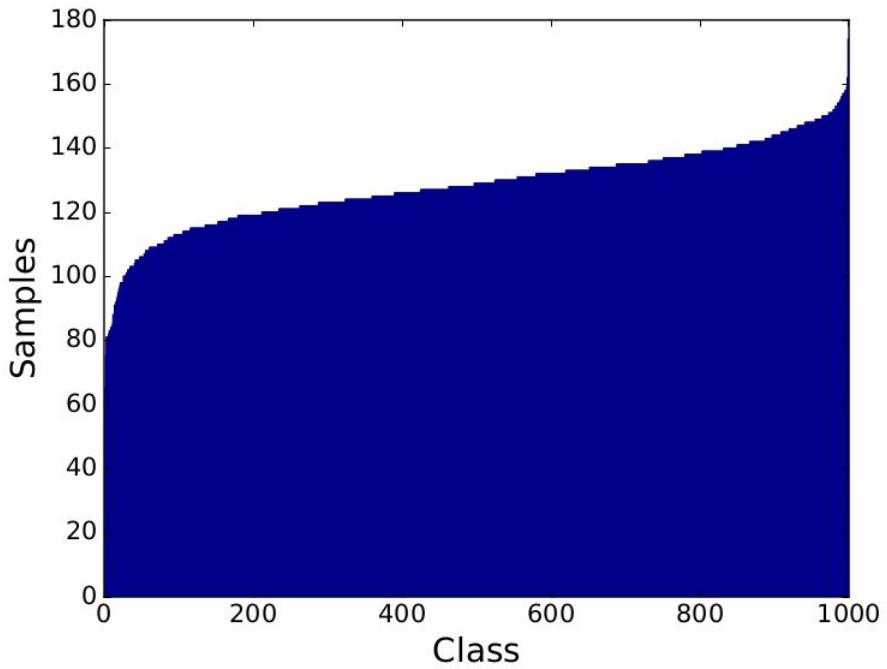
Модификации

1. Finetune (from imagenet 1k) ResNeXt-101
2. Conv freeze, FC only, ~ 3 epoch
3. SGD (LR $1e-2 \rightarrow 1e-3 \rightarrow 1e-4$), hard augs
4. SGD, LR $1e-4$, light augs (only crop)
5. 3 Cycle annealing

Snapshot Ensembles



Imagenet vs real life

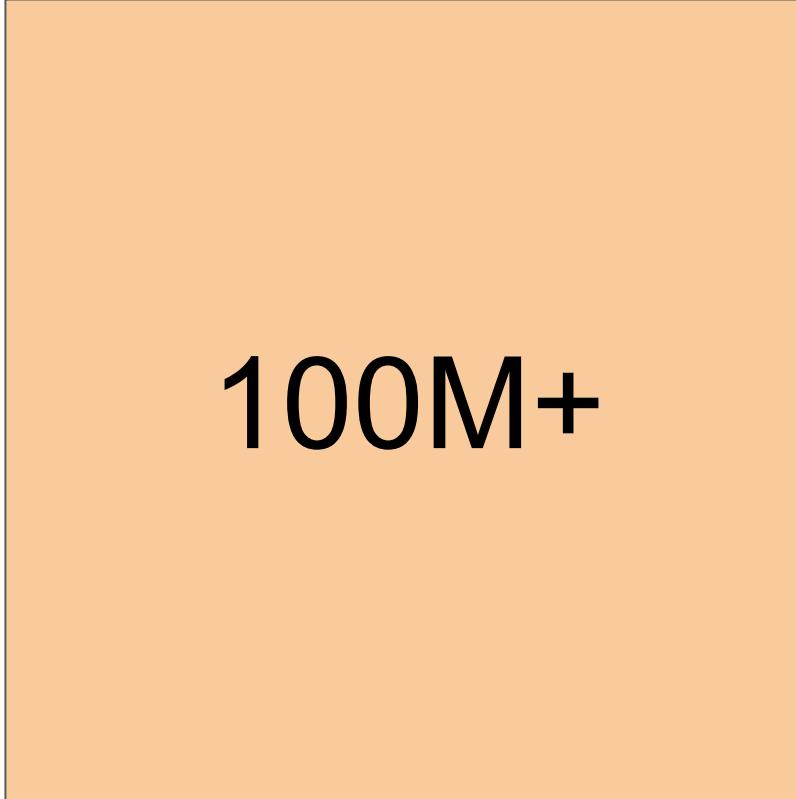


More Data

8M+



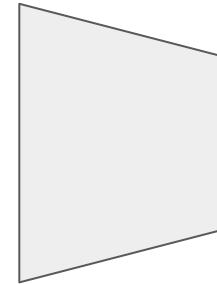
100M+



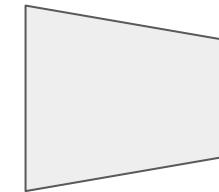
Inference



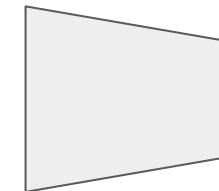
224x224



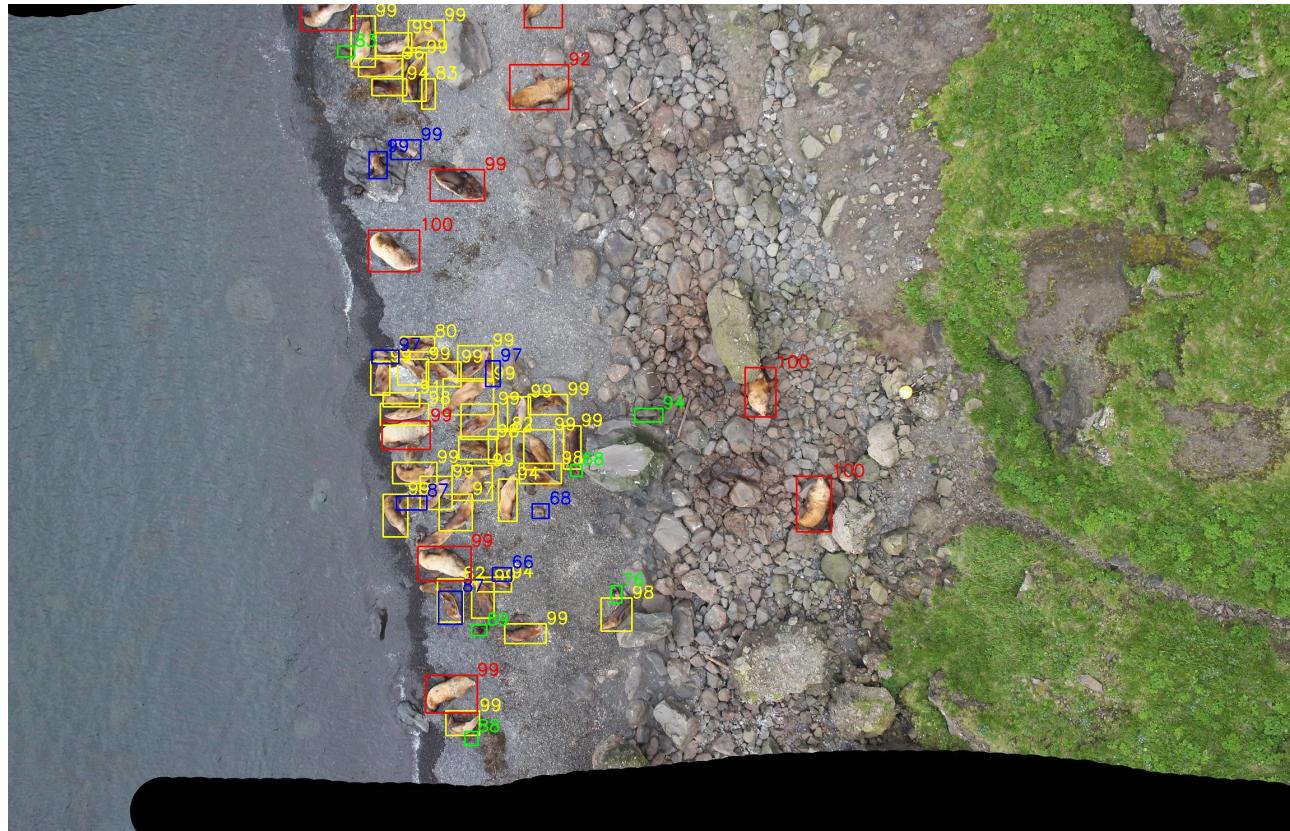
224x320



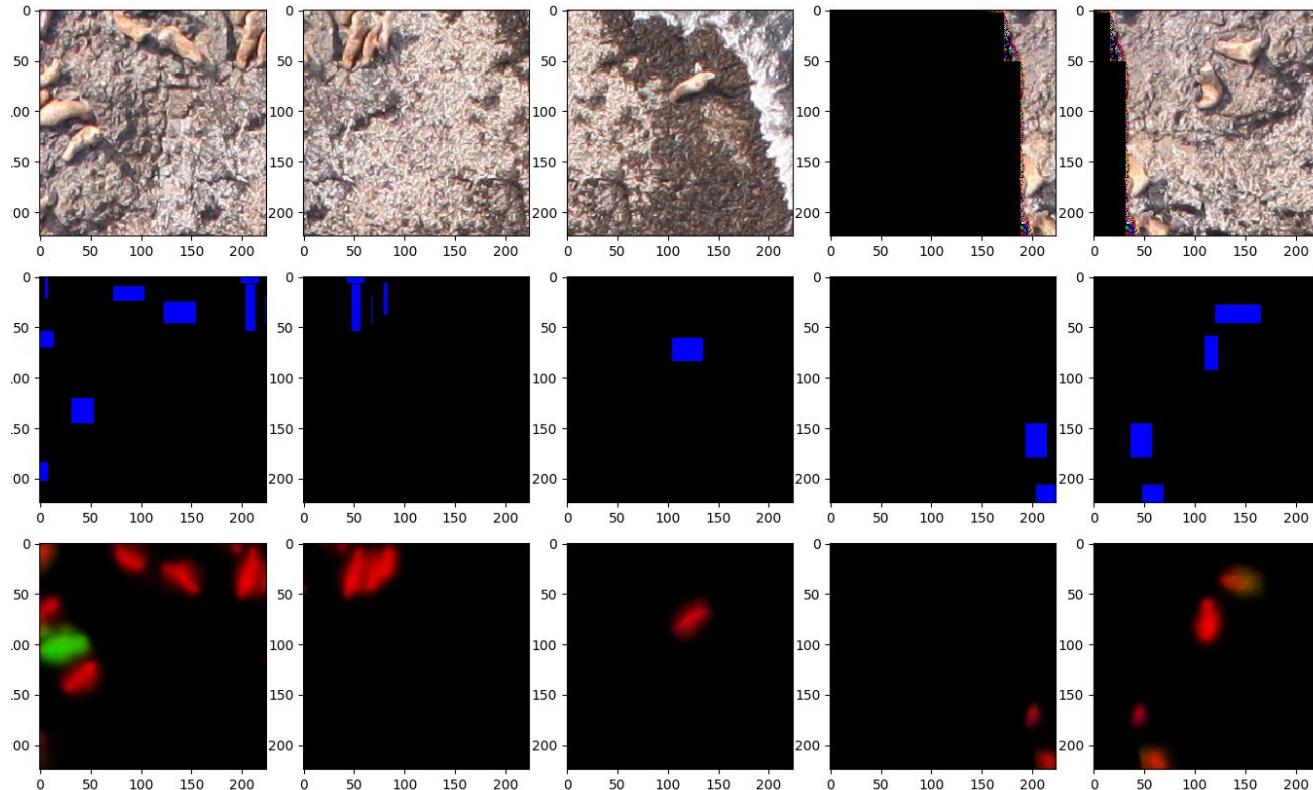
320x224



Подсчет морских котиков



bbox as mask



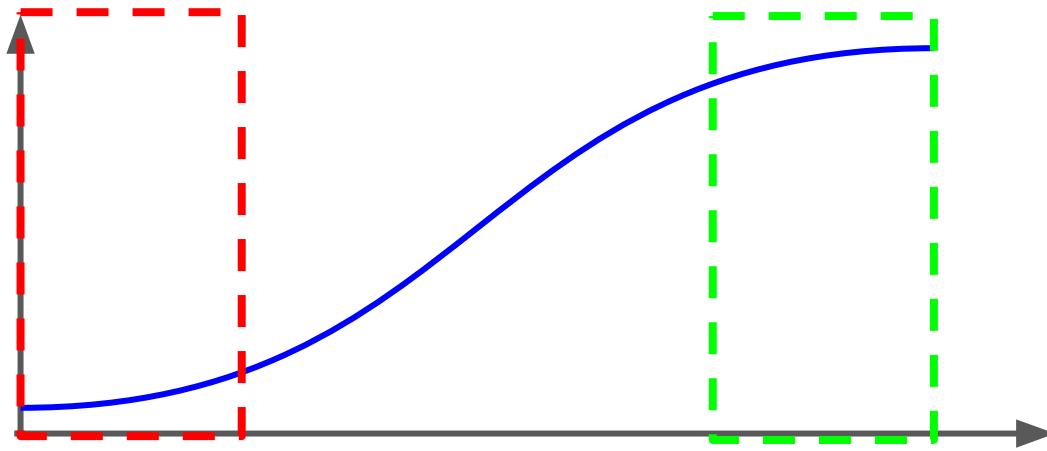
Размер данных

Train
~1k

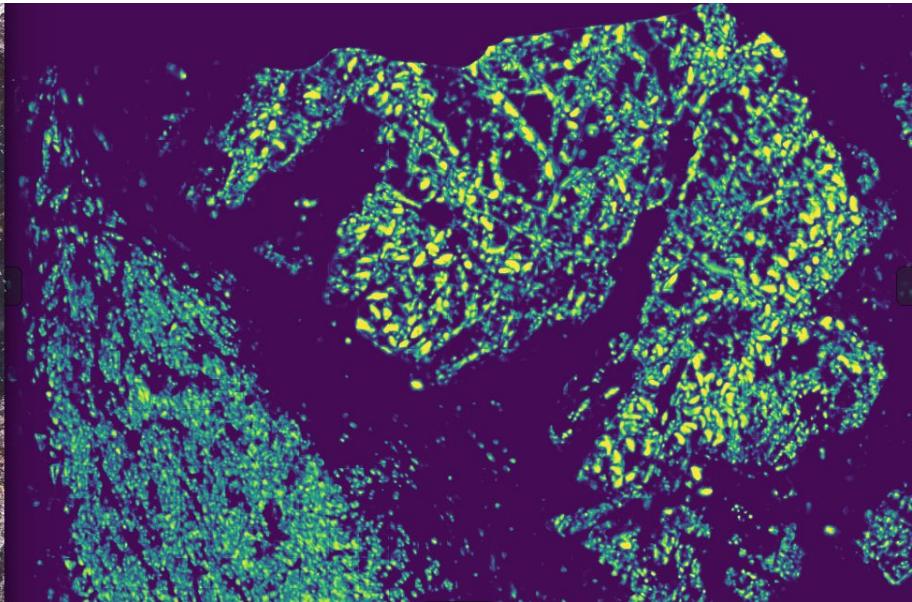
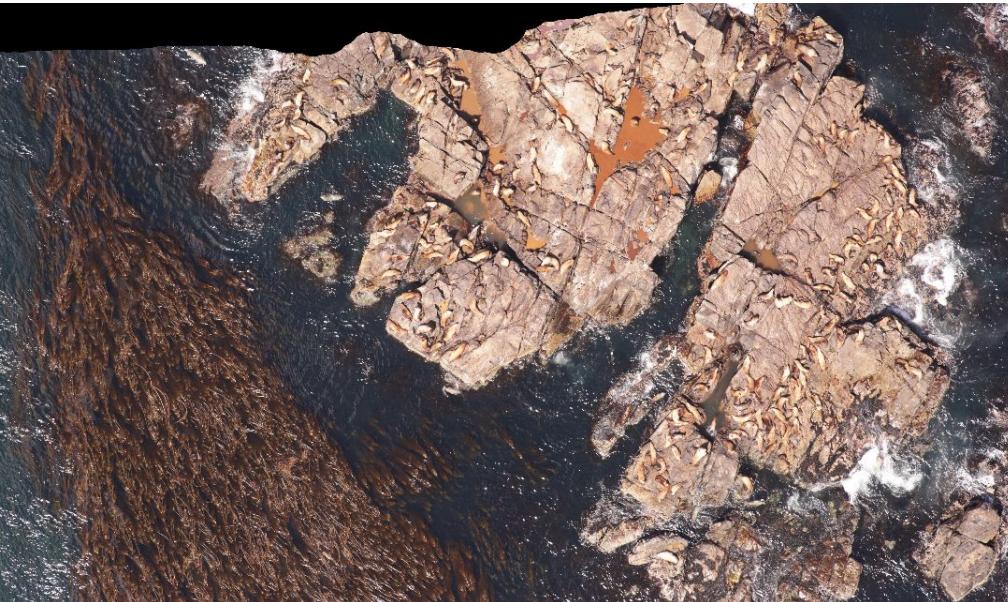


Test ~20k+

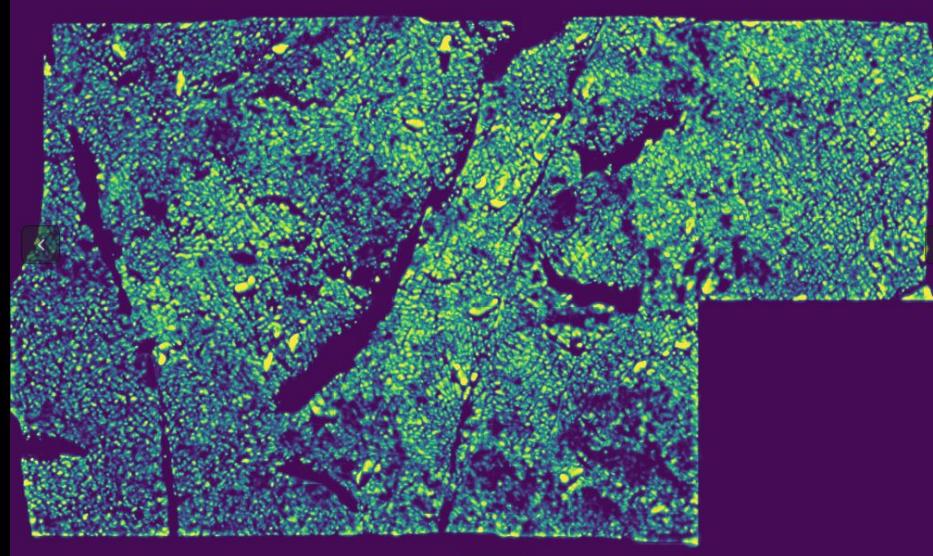
Confidence



Easy mining hard samples



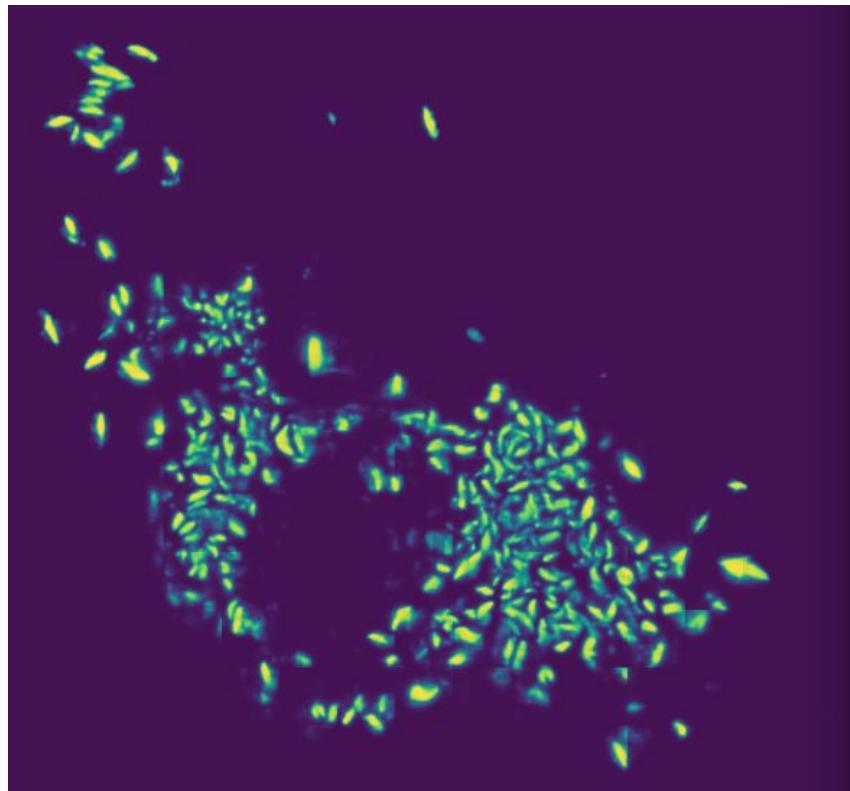
Easy mining hard samples



Unsupervised fin segmentation



Unsupervised fin segmentation



Hard mining

```
for i, (x, y) in tqdm(enumerate(trn), total=len(trn)):
    x, y = x.numpy(), y.numpy()
    batch = mx.io.DataBatch([mx.nd.array(x, ctx=mx.cpu())], [mx.nd.array(y, ctx=mx.cpu())])
    mod.forward_backward(batch)
    mod.update()
    mod.update_metric(acc_trn, batch.label)

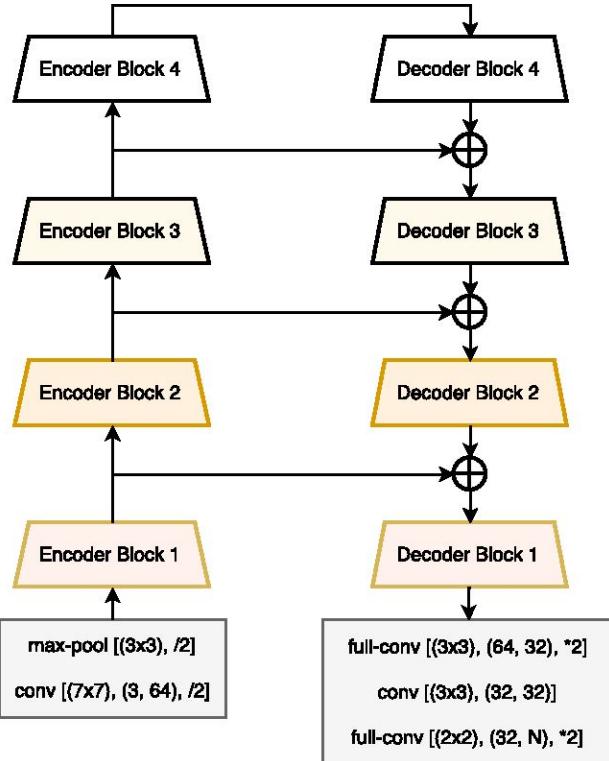
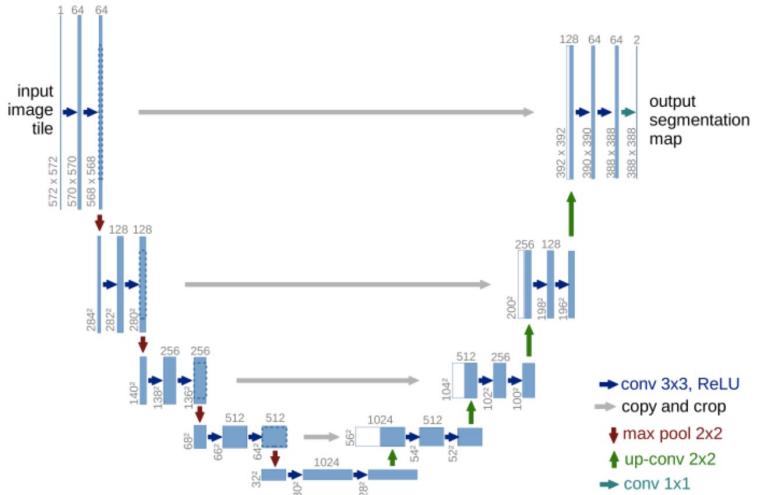
    ce_trn = logloss_score(y, mod.get_outputs()[0].asnumpy())

    if ce_trn > hrdce:
        hardb = batch
        hrdce = ce_trn

    if args.hnuse > 0 and itr % args.hnuse == 0 and itr > 0:
        mod.forward_backward(hardb)
        mod.update()
        mod.update_metric(acc_trn, batch.label)
```

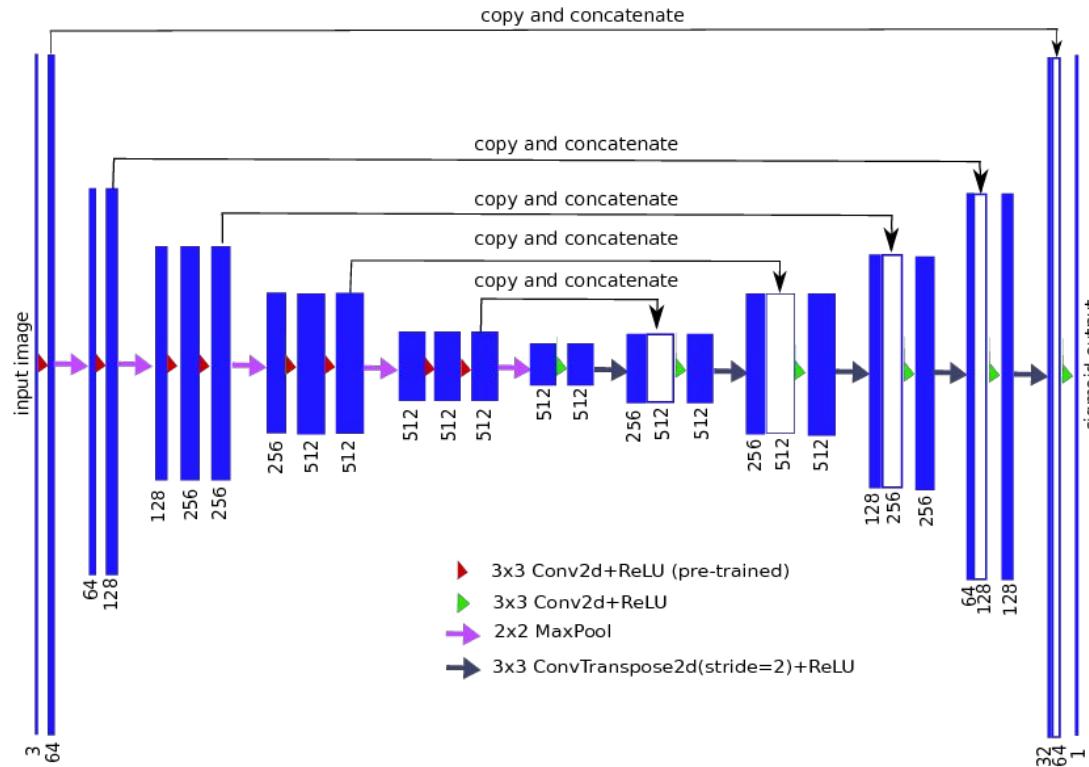
https://github.com/asanakoy/kaggle_carvana_segmentation/blob/master/albu/src/train.py#L124

Архитектуры для сегментации



<https://youtu.be/soE8r0inDpU>

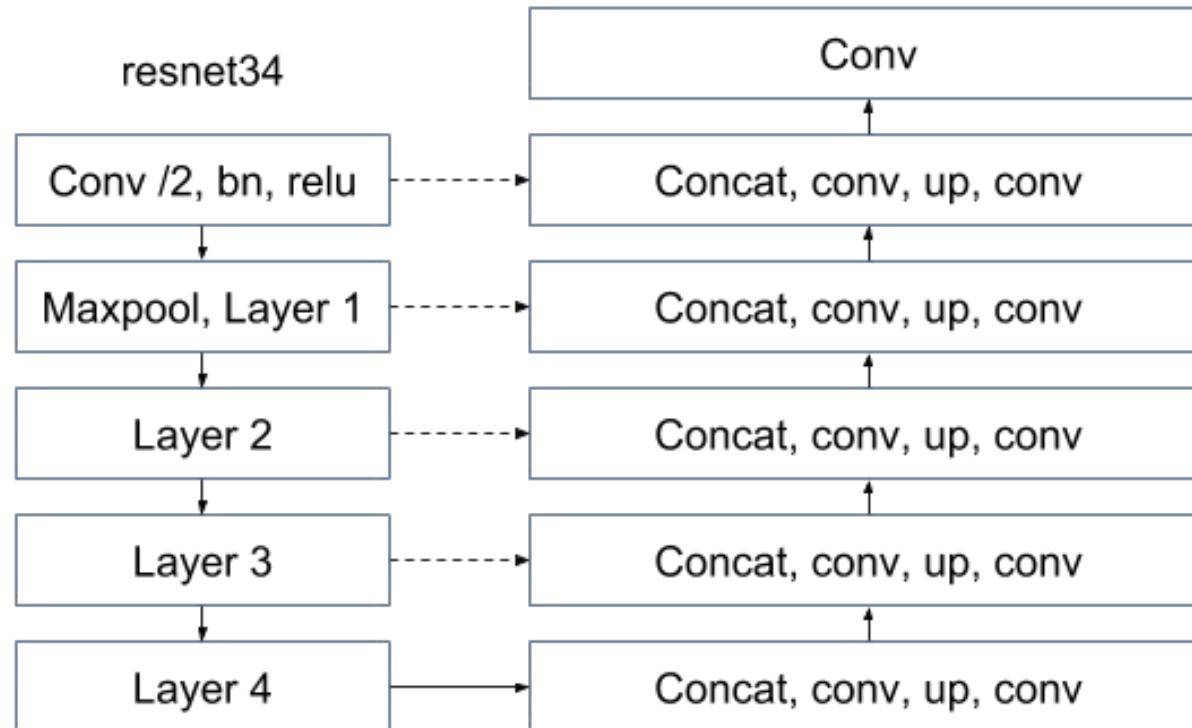
Ternausnet



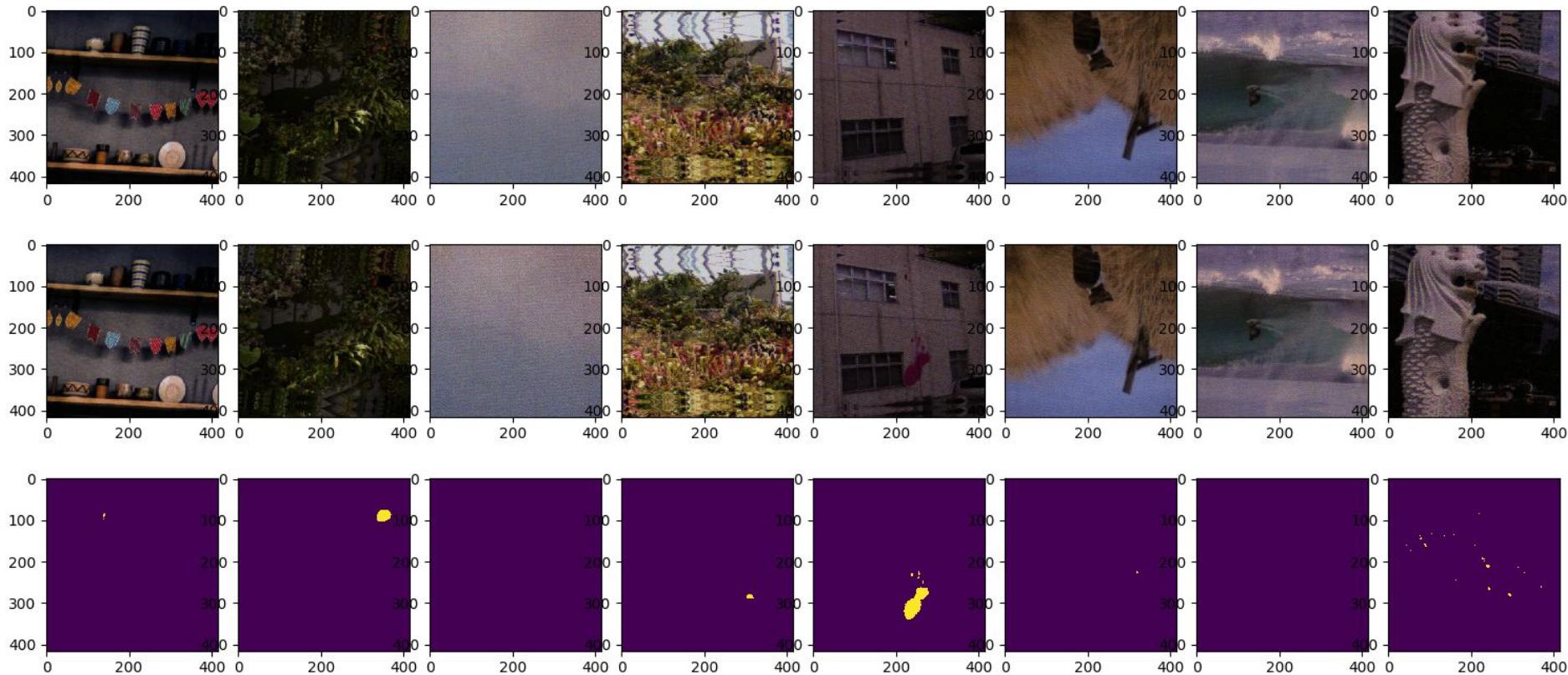
<https://arxiv.org/abs/1801.05746>

<https://github.com/ternaus/TernausNet>

Albu-net



Вместо заключения, topcoder-Abnormal



Изи топ-1



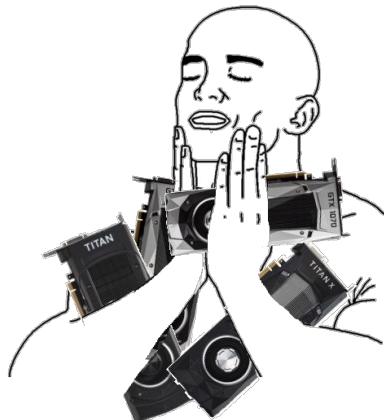
nizhib 5:53 PM

1. `cv2.findTransformECC(img, ref, np.eye(2, 3, dtype=np.float32), cv2.MOTION_EUCLIDEAN, criteria)` для выравнивания
2. `augment.ScaleAndCrop(scale=0.9858, padding=3)` для исправления кривых данных
3. Обычный юнэт прям как в учебнике, без весов
4. ???
5. Топ-1

Rank	Handle	Provisional Score	Final Score
1	nizhib	807,010.58	785,837.62
2	n01z3	801,152.65	777,559.13
3	albu	801,070.87	775,202.37
4	codecrux	797,608.39	764,023.51
5	selim_sef	790,481.22	756,822.47
6	cannab	785,037.06	755,475.96
7	wleite	791,016.02	751,224.69
8	ipraznik	780,653.56	747,202.84
9	nofto	760,183.48	717,308.10
10	Moody2000	740,908.33	714,981.75

Hardware

n01z3-dl1	i7-6700K	32Gb	2x Titan X Maxwell
n01z3-dl2	Xeon 2696v3	64Gb	5x 1080Ti
n01z3-dl3	i7-5930K	32Gb	3x 1080Ti
n01z3-home	i7-7700K	64Gb	2x 1080



Altar



