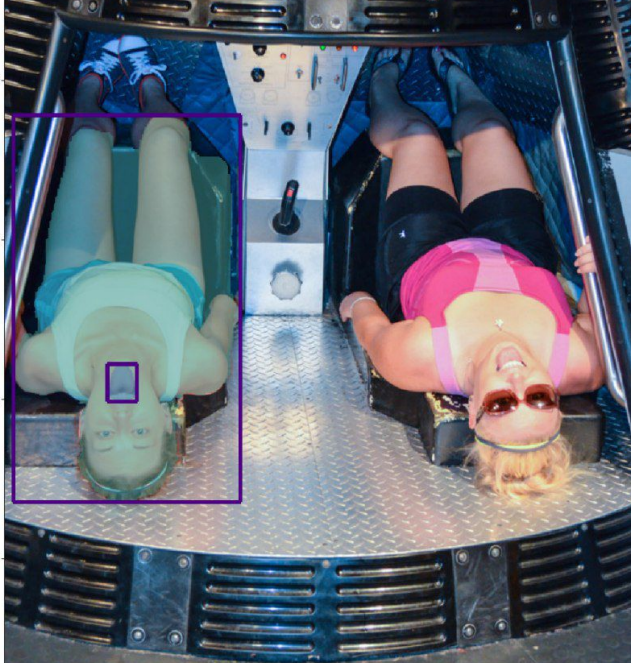# Cook warm, then make it cool
2nd Place Solution to
Instance Segmentation track

Artur Kuzin @n01z3
Head of Computer Vision, X5 Retail Group
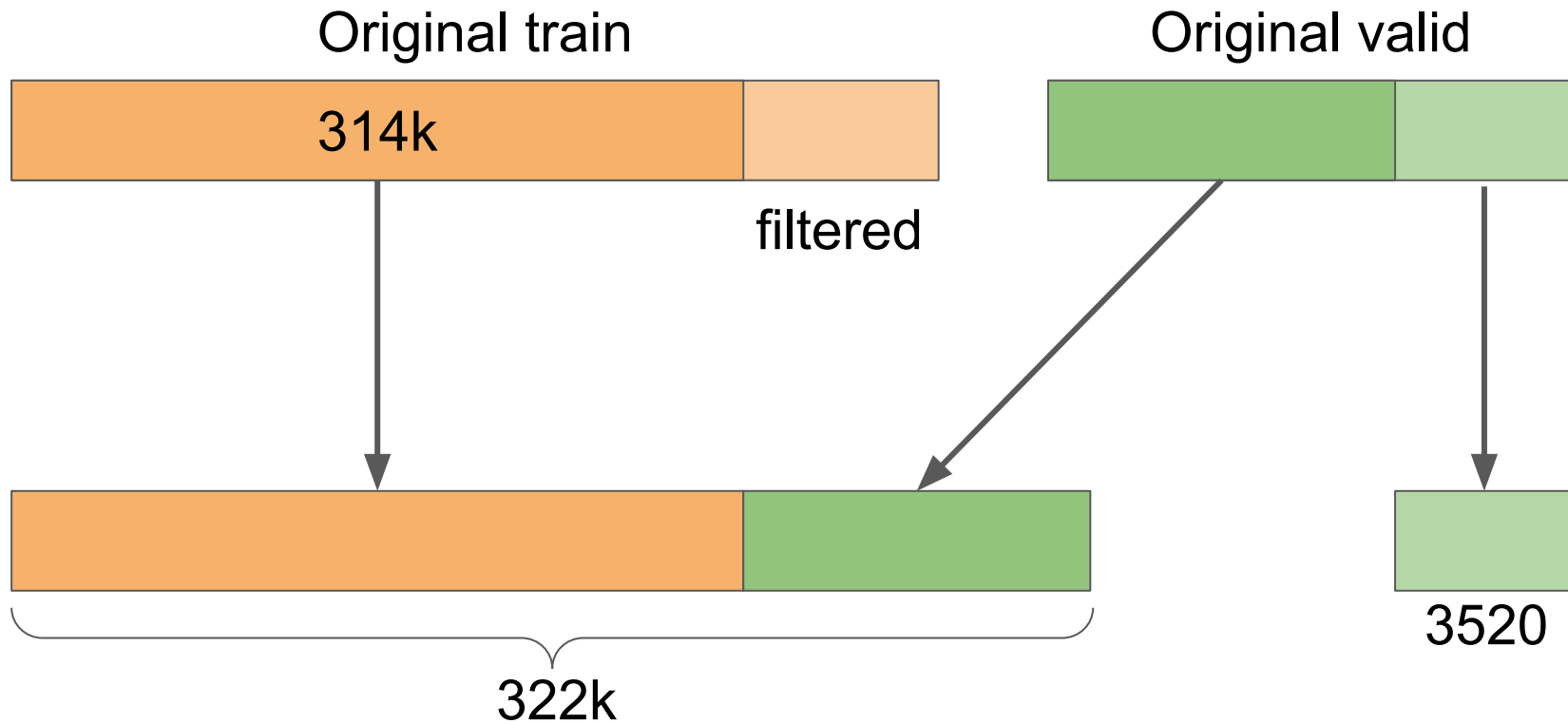Kaggle Competition Grandmaster, Rank 6

Data filtering

Data filtering

if annotated_objects > **count_thresh** or klass in **rare_klass**:
    take_sample()

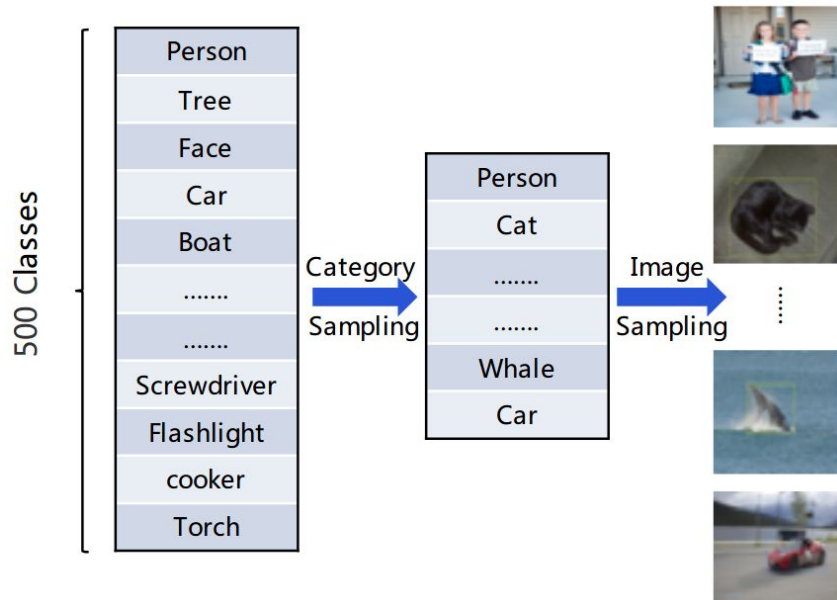init: **count_thresh** = 8, **appearance-threshold** > 500

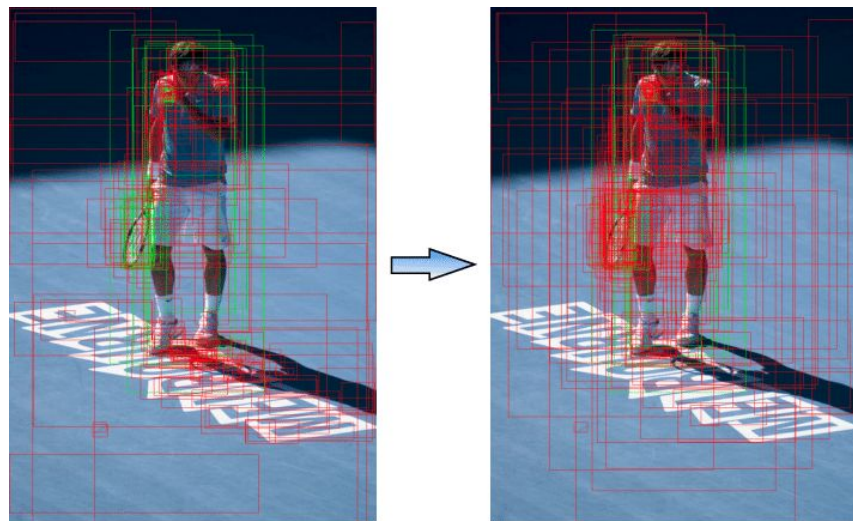final**: count_thresh** = 2, **appearance-threshold** > 1000

Data split

Original train

314k

filtered

Original valid

322k

3520

Sampling

Class Aware Sampling

500 Classes

Person
Tree
Face
Car
Boat
....
....
Screwdriver
Flashlight
cooker
Torch

Category
Sampling →

Person
Cat
....
....
Whale
Car

Image
Sampling →

IoU-Balanced Sampling

Random Sampling → IoU-Balanced Sampling

https://arxiv.org/pdf/1810.06208.pdf

https://arxiv.org/pdf/1904.02701.pdf

Augmentations with Albumentations

- RandomBrightnessContrast, p = 0.5
- CLAHE, p = 0.5
- ToGray, p = 0.2
- Cutout, p = 0.9
- JpegCompression, p = 0.4, quality-lower = 70, quality-upper = 99
- RandomRotate90, p = 0.1
- RandomFlip, p = 0.5

https://arxiv.org/abs/1809.06839

Model selection from mmdetection

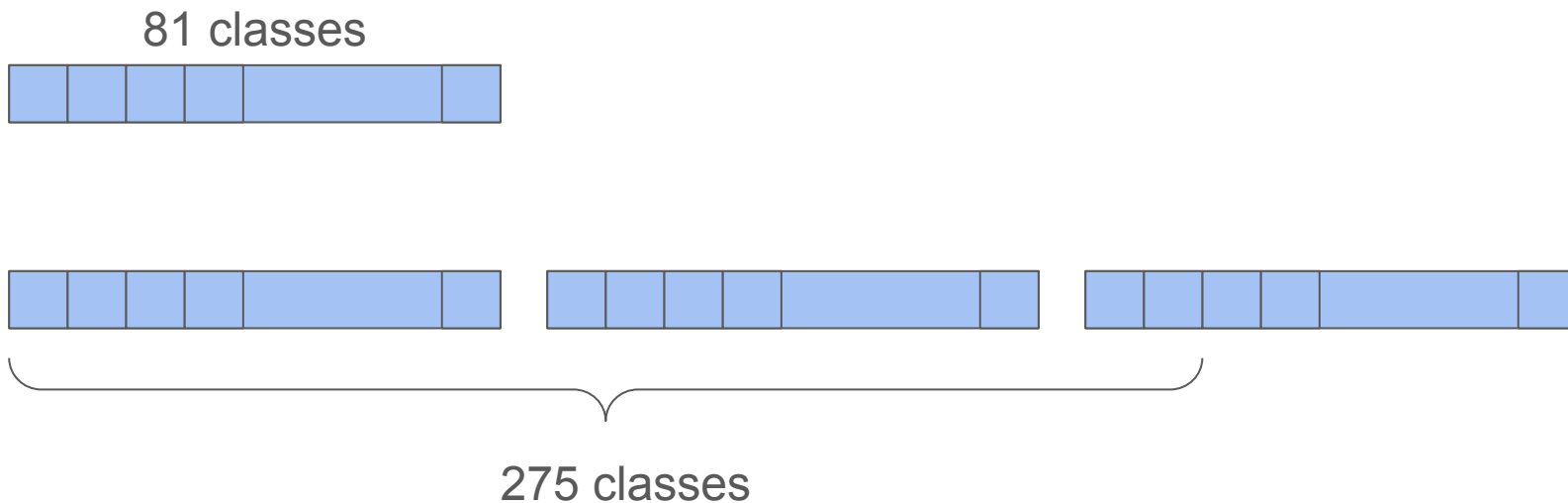Basic architecture: Hybrid Task Cascade Mask R-CNN

Final ensemble:

- X-101-64x4d-FPN DCN(c3-c5)
- X-101-32x4d-FPN, with adding DCN during train

Best single model:
- WSL resnext101 + neck-head from X-101-64x4d-FPN DCN(c3-c5)

https://arxiv.org/abs/1901.07518

Weights rebuild

Head from COCO: new_weights = np.vstack([old_weights] * 9000) [:new_amount]
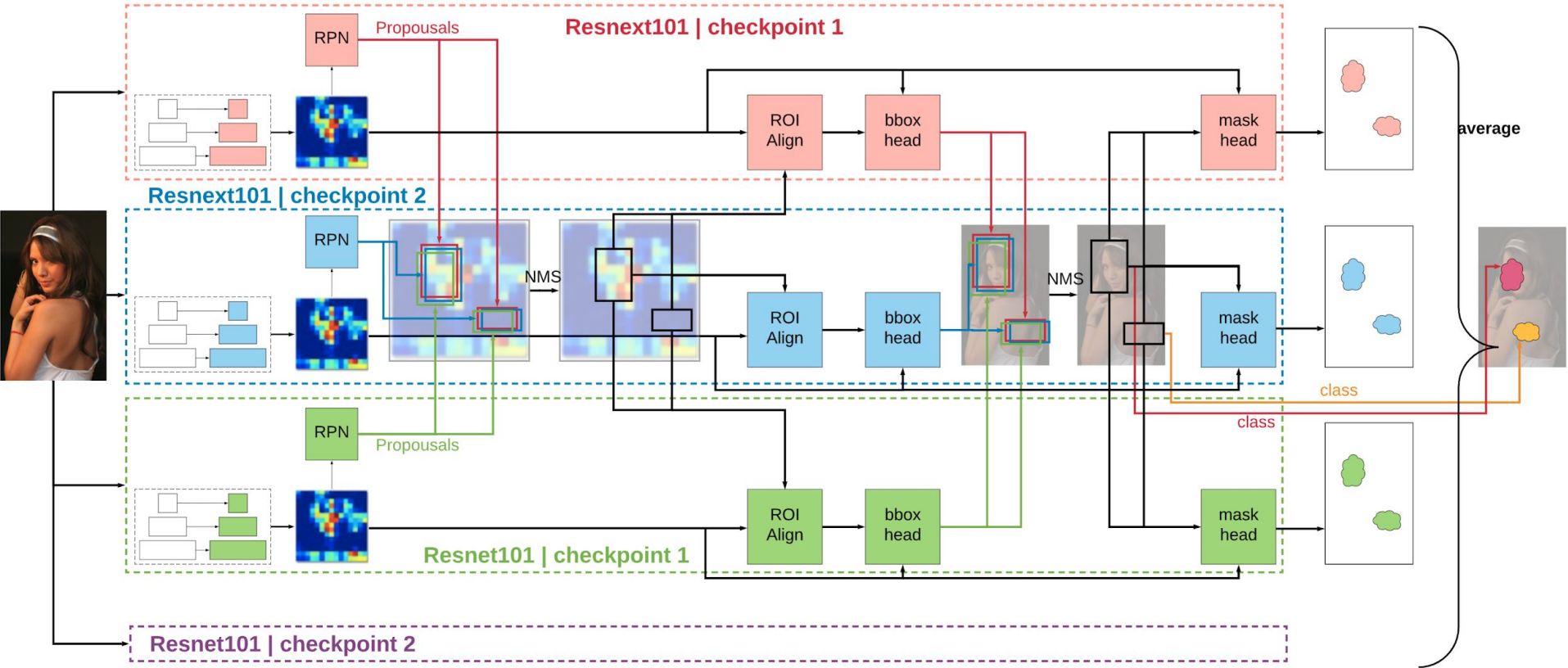
81 classes

275 classes

Train procedure

1. Rebuild weights from COCO
2. Freeze backbone, train neck and heads
3. Unfreeze 4th conv group
4. Unfreeze 3rd conv group
5. Full train except stem
6. Freeze backbone, train neck and heads on large batch (on V100 32Gb)
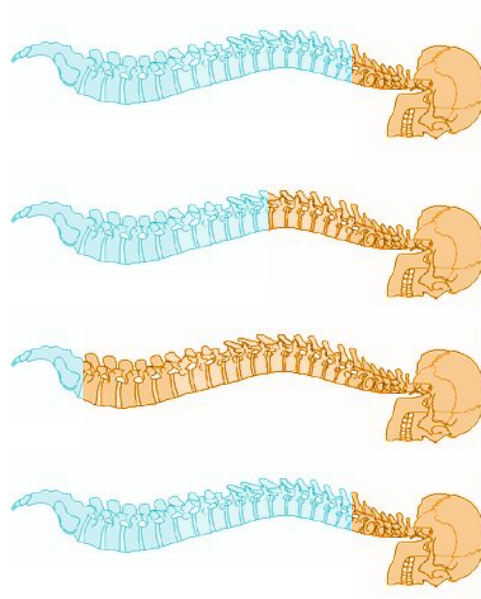
Ensembling

Post processing

test_cfg = (

    rpn=dict(nms_across_levels=False, nms_pre=**12000**, nms_post=**2000**, max_num=**2000**, nms_thr=0.75, min_bbox_size=0),

    rcnn=dict(score_thr=**0.0001**, nms=dict(type="**soft_nms**", iou_thr=0.5, min_score=**0.0001**), max_per_img=**400**, mask_thr_binary=0.5),

    keep_all_stages=False

)

Grape that didn't work