

Homework 3

- Remove your duplicate submission file and rename your filename without postfix
- Also backup your final submission file incase someone mis-delete your file
- I will keep updating results till 23:59

Name ↑



mAP_0.45_0610001.json





Selected Topics in Visual Recognition using Deep Learning

Homework 4 announcement

TA: 楊証琨, Jimmy







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Homework 4: Instance segmentation

- **Deadline: 12/19, Thr at 23:59**

1. Upload your **report.pdf** and **submission file** in this [Google drive](#)

My Drive > CS_IOC5008 > HW4 ▾ 					
Name	Owner	Last modifi...	↓		
 submission	me	5:40 PM me			
 dataset	me	5:40 PM me			
 reports	me	5:39 PM me			



HW4 Introduction: Tiny PASCAL VOC dataset

- Tiny VOC dataset contains only 1,349 training images, 100 test images with 20 common object classes
- **NO external data should be used and only ImageNet pre-trained model can be used**
- Deal with the overfitting problem!



Learn to process PASCAL VOC dataset

- PASCAL VOC dataset are often evaluated on current computer vision models

	mean	aero plane	bicycle	bird	boat	bottle	bus	car
	▼	▼	▼	▼	▼	▼	▼	▼
RecoNet152_coco [?]	89.0	97.3	80.4	96.5	83.8	89.5	97.6	95.4
DeepLabv3+_JFT [?]	89.0	97.5	77.9	96.2	80.4	90.8	98.3	95.5
SRC-B-MachineLearningLab [?]	88.5	97.2	78.6	97.1	80.6	89.7	97.4	93.7
DeepLabv3+_AASPP [?]	88.5	97.4	80.3	97.1	80.1	89.3	97.4	94.1
SepaNet [?]	88.3	97.2	80.2	96.2	80.0	89.2	97.3	94.7
EMANet152 [?]	88.2	96.8	79.4	96.0	83.6	88.1	97.1	95.0
MSCI [?]	88.0	96.8	76.8	97.0	80.6	89.3	97.4	93.8
ExFuse [?]	87.9	96.8	80.3	97.0	82.5	87.8	96.3	92.6
DeepLabv3+ [?]	87.8	97.0	77.1	97.1	79.3	89.3	97.4	93.2
CFNet [?]	87.2	96.7	79.7	94.3	78.4	83.0	97.7	91.6
DeepLabv3-JFT [?]	86.9	96.9	73.2	95.5	78.4	86.5	96.8	90.3



HW4 Get the dataset

- Download the dataset from this [Google Drive](#)
- The annotations are saved in **json file**. You can use [pycocotools](#) to read this file
- See [data_loader.ipynb](#) for more details



Upload your submission.json file [here](#)

- Free version Kaggle doesn't provide the metrics :(
- Upload your submission file into the Google Drive. I will evaluate and return the performance on your filename every midnight
- filename should be STUDENTID.json

My Drive > CS_IOC5008 > HW3 ▾



Name ↑	Owner	Last modified	File size
dataset	me	1:00 AM me	—
submission	me	1:52 AM me	—

Name ↑



0610001.json



Name ↑

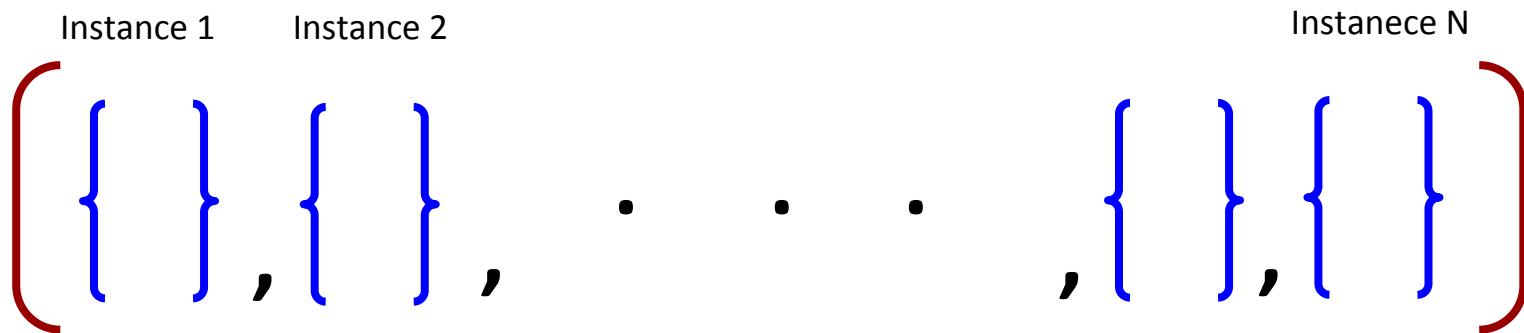


mAP_0.45_0610001.json



Submission.json file format

- List of dictionaries, $\text{len}(\text{list}) = \text{number of detected instance in all test images}$. Find pseudo code [here](#) in *Prepare submission file*
- Each dictionary contains three keys
 - “**image_id**”: id of test image, which is the key in “test.json”, **int**
 - “**score**”: probability for the class of this instance, **float**
 - “**category_id**”: category id of this instance, **int**
 - “**segmentation**”: Encode the mask in RLE by provide function, **str**



Evaluation metrics: mean Average Precision

- Most common metric for object detection/segmentation
- Measure the average precision on different threshold and also the IOU between GT and prediction

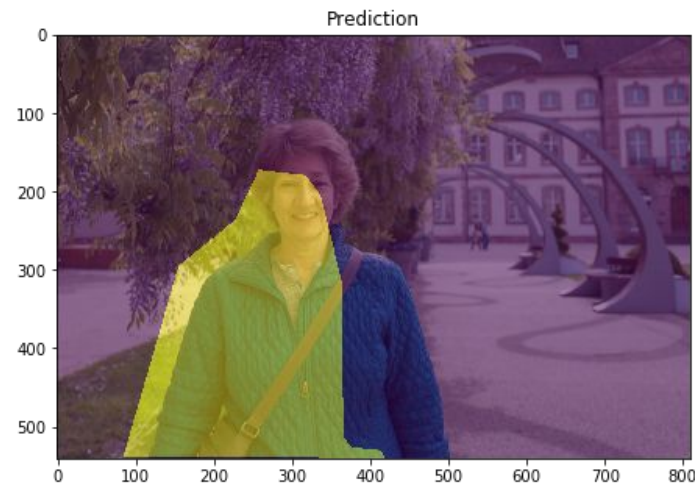
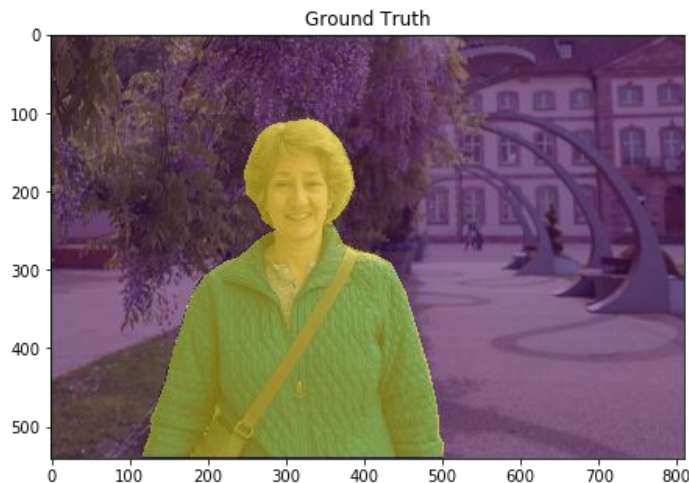
	backbone	cascade	AP	AP ₅₀	AP ₇₅
Faster R-CNN	AlexNet	✗	29.4	63.2	23.7
		✓	38.9	66.5	40.5
Faster R-CNN	VGG	✗	42.9	76.4	44.1
		✓	51.2	79.1	56.3
R-FCN	RetNet-50	✗	44.8	77.5	46.8
		✓	51.8	78.5	57.1
R-FCN	ResNet-101	✗	49.4	79.8	53.2
		✓	54.2	79.6	59.2

TABLE 11: Detection results on PASCAL VOC 2007 test.



Evaluation metrics: mean Average Precision

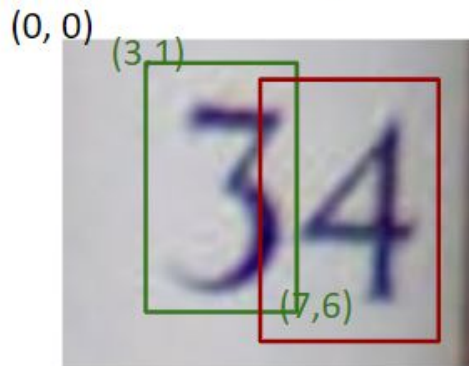
- Use mask to measure the Intersection-of-Union of predictions and ground truth
- We use average precision at IOU=0.5 to evaluate your results



Evaluation metrics: mean Average Precision

- Set IOU threshold=0.5
- We got 1 TP, 1 FP, precision=0.5, recall=0.5
- But if we change the probability threshold to 0.7, the red box will disappear, then we got 1 TP, precision=1, recall=0.5
- We also miss one GT, so when recall=1, precision=0.5
- E.g., your model output two boxes on image, the dictionary will be

```
dict = {"bbox": [(1, 3, 6, 7), (4, 5, 8, 12)],  
       "label": [3, 5],  
       "score": [0.87, 0.61]}
```



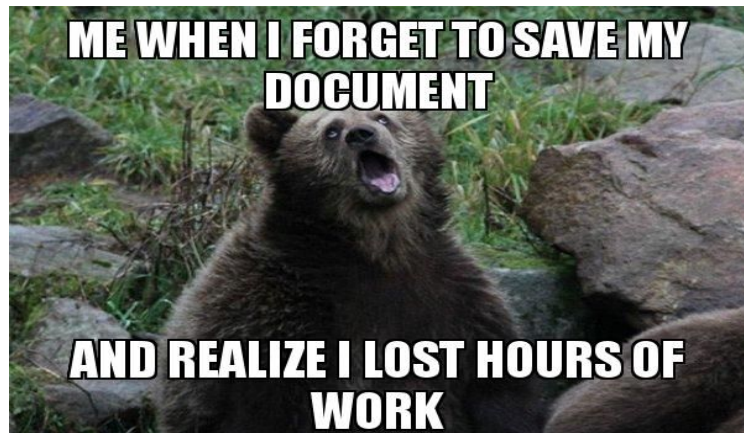
Grading policy: Model performance (70 points)

- Get at least 56% ($70\% \times 0.8$) by scoring over the baseline
- baseline (mAP@0.5): 0.247



Grading policy: Reports (20 points)

- Document your work (in PDF)
 - GitHub/ GitLab link of your code
 - **reference if you used code from GitHub**
 - Brief introduction
 - Methodology (Data pre-process, Model architecture, Hyperparameters,...)
 - Findings or Summary



Grading policy: Code readability (10 points)

- Write beautiful Python code with [PEP8 guidelines](#) for readability. Base requirement: use whitespace correctly!

Python

Recommended

```
def function(default_parameter=5):  
    # ...
```

Not recommended

```
def function(default_parameter = 5):  
    # ...
```

Python

Recommended

```
my_list = [1, 2, 3]
```

Not recommended

```
my_list = [ 1, 2, 3, ]
```

Python

```
x = 5
```

```
y = 6
```

Recommended

```
print(x, y)
```

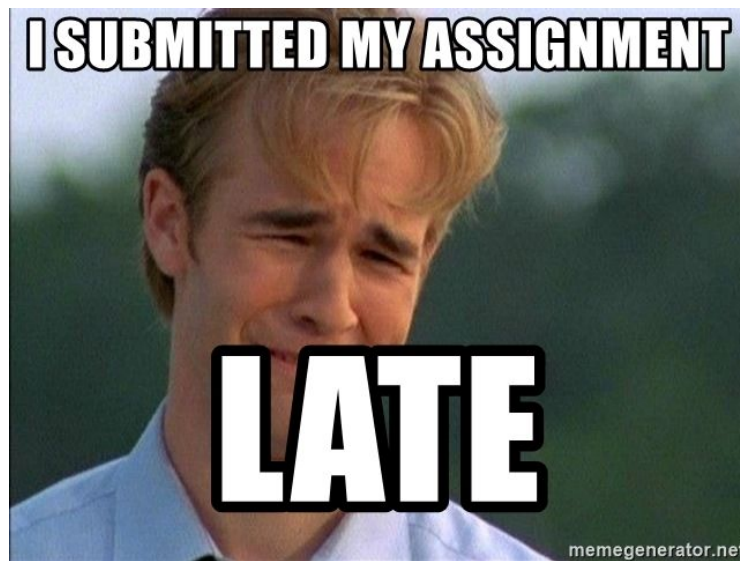
Not recommended

```
print(x , y)
```



Late Policy

- We will deduct a late penalty of 20 points per additional late day
- For example, If you get 90% of HW but delay for two days, your will get only 90 points- (20 points x 2) = 50 points!



Keywords

- Beat the baseline
 - Mask R-CNN
 - Data-augmentation
 - Regularization (Dropout, L2-norm,...)
- Rank Top 3!
 - Read some paper from CVPR2019, ICCV2019 and try to implement it!



FAQ

- Can I use any code/tools/Library from GitHub or other resources?
 - Yes! We encourage you to learn how to apply existing tools on your own task, such as [Keras-Mask R-CNN](#), [Pytorch-maskrcnn-benchmark](#), [TF-object-detection-API](#)
- But DO NOT copy code from your classmate!**
- Why my testing results are so bad?
 - CNN model prone to overfitting with small dataset. Use some techniques such as regularization, data-augmentation to solve it!



Notice

- Check your email regularly, we will mail you if there are any updates or problems of the homework
- If you have any questions or comments for the homework, please mail me and cc Prof. Lin
 - Prof. Lin: lin@cs.nctu.edu.tw
 - Jimmy: d08922002@ntu.edu.tw



Have fun!





Selected Topics in Visual Recognition using Deep Learning

Final project announcement

TA: 楊証琨, Jimmy

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Final project: Join competition on Kaggle

- Presentation: **12/26, 01/02**, Thr
 1. Team up! **3 person per team** and mail me (cc Prof. Lin) your
1) name of team 2) names 3) student IDs by your team leader
before **12/03, Tue**
 2. Select one of competition by your team leader and mail me
(cc Prof. Lin) before **12/06, Sat**
- We will randomly match up if you can't find a team after 12/03

mailto: d08922002@ntu.edu.tw, cc: lin@cs.nctu.edu.tw

Hi Jimmy



Final project: Join competition on Kaggle

1. Join the provided competitions and beat the baseline
2. Make a 18 mins presentation of your methodology and 2 mins QA
3. Upload your report and slides by team (one report for each team)
4. Grade your teammate!



Competitions on Kaggle

1. [iNaturalist Competition](#) (CVPR 2019 workshop): Image multi-class classification
 2. [iMet Collection 2019](#) (CVPR 2019 workshop): Image multi-label classification
 3. [Carvana Image Masking Challenge](#): Semantic segmentation
 4. [NOAA fisheries Steller Sea Lion Population Count](#): Object counting
 5. [Data Science bowl 2018](#): Instance segmentation
- Submit reports/code before presentation
 - Presented by this order, depends on the distribution of all teams



Baseline



Competition Medals

Competition medals are awarded for top competition results. The number of medals awarded per competition varies depending on the size of the competition. Note that InClass, playground, and getting started competitions do not award medals.

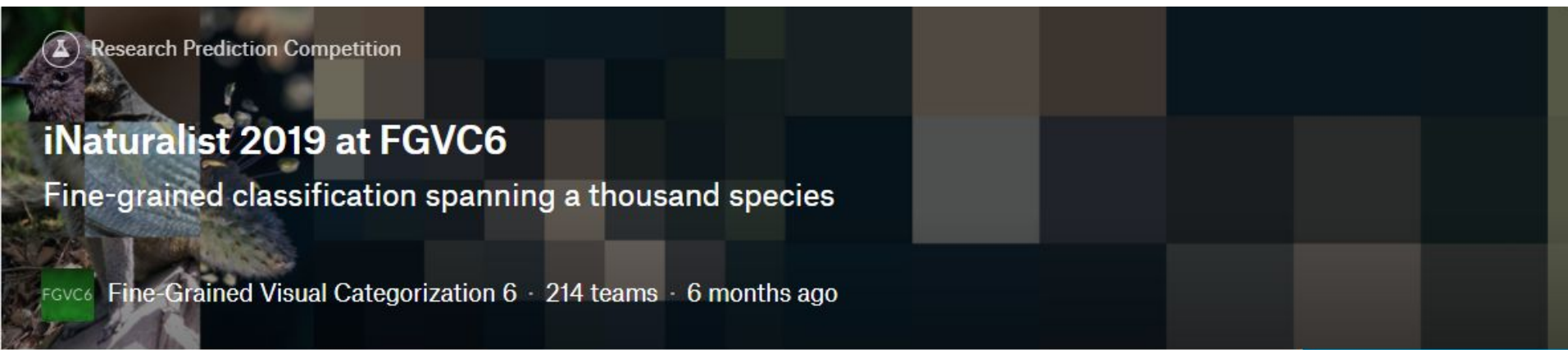
	0-99 Teams	100-249 Teams	250-999 Teams	1000+ Teams
Bronze	Top 40%	Top 40%	Top 100	Top 10%
Silver	Top 20%	Top 20%	Top 50	Top 5%
Gold	Top 10%	Top 10	Top 10 + 0.2%*	Top 10 + 0.2%*

* (Top 10 + 0.2%) means that an extra gold medal will be awarded for every 500 additional teams in the competition. For example, a competition with 500 teams will award gold medals to the top 11 teams and a competition with 5000 teams will award gold medals to the top 20 teams.



1. iNaturalist competition

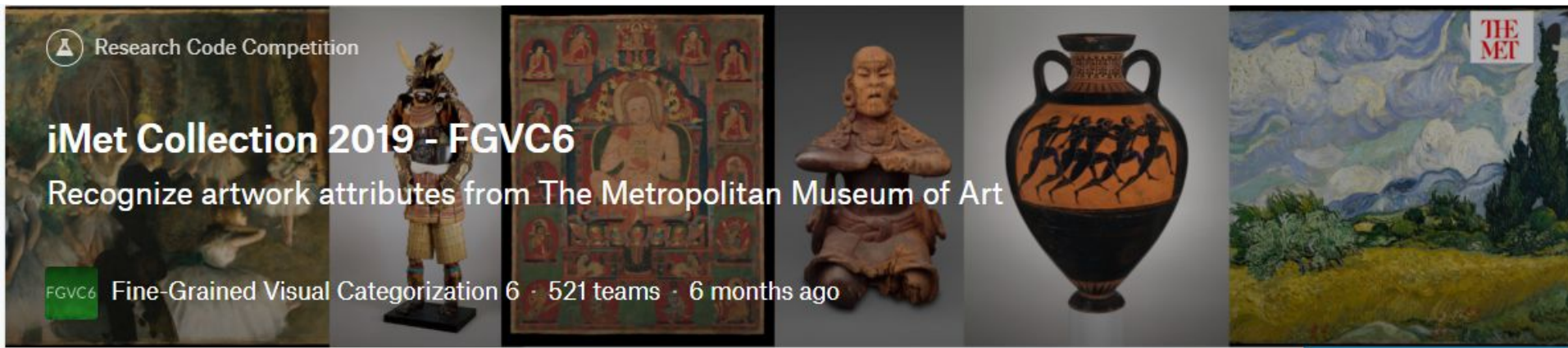
- Dataset: 1,010 species, 268,243 images (800x600), 82 GB, multi-class classification
- Evaluation: Top-1 error rate
- Baseline: silver medal in private (top 20% of 214 teams)
- [CVPR 2019 workshop](#)

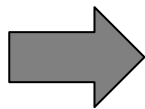




2. iMet collection competition

- Dataset: 1,103 attributes, 116,717 images (300x500), 29 GB, multi-label classification
- Evaluation: F2-score
- Baseline: silver medal in private (top 20% of 521 teams)
- [CVPR 2019 workshop](#)



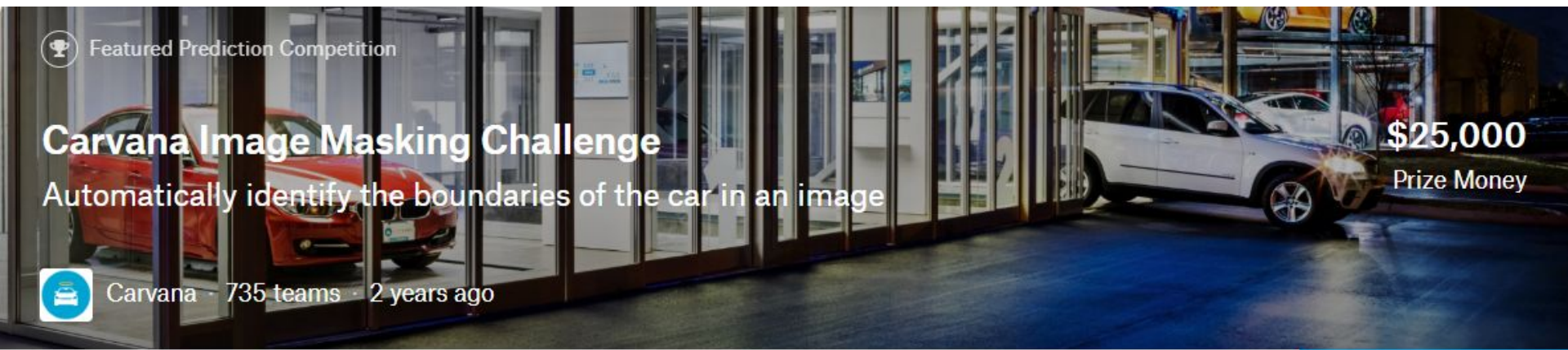


culture::japan
culture::china
tag::tigers
tag::documents



3. Carvana Image Masking Challenge

- Dataset: 5,088 images (1920x1080), 24 GB, semantic segmentation
- Evaluation: Dice coefficient
- Baseline: sliver medal (top 50 of 521 teams)



Raw image



Binary mask



4. NOAA Fisheries Steller Sea Lion Population Count

- Dataset: 5 classes, 900 train images (5760x3840), 96 GB, object counting
- Evaluation: RMSE
- Baseline: bronze medal (top 100 of 385 teams)



Featured Prediction Competition

NOAA Fisheries Steller Sea Lion Population Count

How many sea lions do you see?

\$25,000

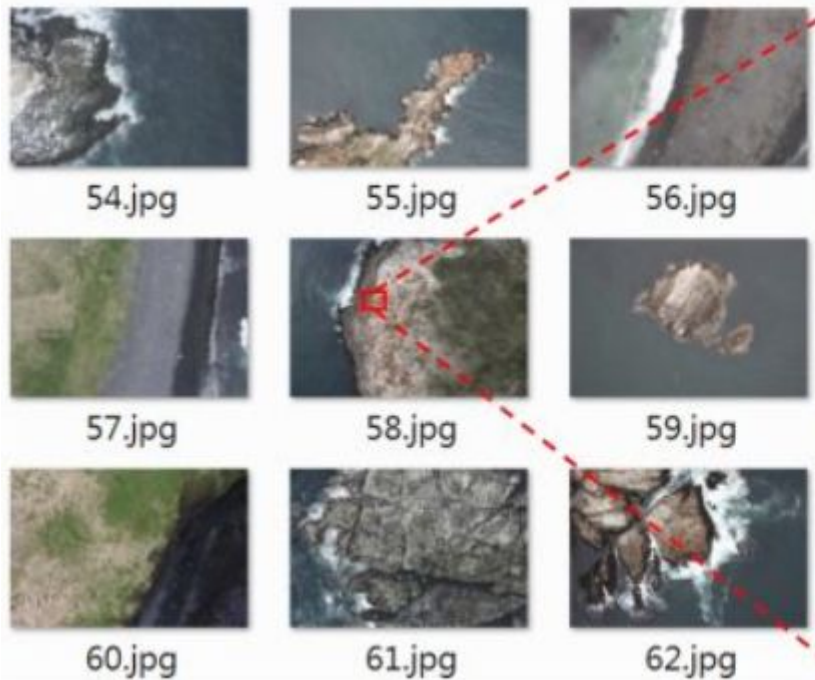
Prize Money



NOAA · 385 teams · 2 years ago

Training data

Raw image



Same image with colored dot





Type	Counts
Adult males	2
Subadult males	10
Adult females	3
Juveniles	4
Pups	6



5. 2018 Data Science Bowl

- Dataset: 7,103 images (256x256), 358 MB, instance segmentation
- Evaluation: mean Average Precision
- Baseline: bronze medal (top 10% of 3,634 teams)



Featured Prediction Competition

2018 Data Science Bowl

Find the nuclei in divergent images to advance medical discovery



Passion. Curiosity. Purpose.

\$100,000

Prize Money

Booz
Allen



Booz Allen Hamilton · 3,634 teams · 2 years ago

Presented by
Booz | Allen | Hamilton & kaggle



Grading policy

- Model performance: 50 points
 - Screenshot your rank in the reports
- Presentation: 30 points
 - Completeness
 - Innovation
 - Organization
- Reports & code: 10 points
- Within-group peer review: 10 points

162...	Gaurav Gooner Roy		0.56459	1	22d
162...	jimmy15923		0.56459	1	now

Your First Entry ⬆

Welcome to the leaderboard!



Your score represents your submission's accuracy. For example, a score of 0.7 in this competition indicates you predicted Titanic survival correctly for 70% of people.

What next? You've got a few options:

- 🧠 Learn skills that can improve your score in our [Intro to Machine Learning](#) course by Dan Becker.
- 🔍 Check out the [discussion forum](#) to find lots of tutorials and insights from other competitors.
- 🏆 Find a new challenge by entering one of our [open, active competitions](#) or searching our [public datasets](#).



Important dates

Event	date
Teamup	12/03 Tue  Jimmy
Select competition	12/06 Fri  Jimmy
Final presentation I	12/26 Thr
Final presentation II	01/02 Thr



Good luck!

