

Обучить модель семантической сегментации (человек-vs-фон) на подмножестве датасета MS COCO

## Установка зависимостей

```
!pip install tensorflow==1.14 umap-learn
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/
Requirement already satisfied: tensorflow==1.14 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: umap-learn in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: tensorboard<1.15.0,>=1.14.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: keras-applications>=1.0.6 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: six>=1.10.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: google-pasta>=0.1.6 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: tensorflow-estimator<1.15.0rc0,>=1.14.0rc0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: gast>=0.2.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: astor>=0.6.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: wrapt>=1.11.1 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: wheel>=0.26 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: protobuf>=3.6.1 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: absl-py>=0.7.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: grpcio>=1.8.6 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: numpy<2.0,>=1.14.5 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: keras-preprocessing>=1.0.5 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: h5py in /usr/local/lib/python3.7/dist-packages (from tensorflow<1.15.0rc0,>=1.14.0rc0)
Requirement already satisfied: setuptools>=41.0.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: werkzeug>=0.11.15 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: importlib-metadata>=4.4 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages (from tensorflow<1.15.0rc0,>=1.14.0rc0)
Requirement already satisfied: typing-extensions>=3.6.4 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: numba>=0.49 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: tqdm in /usr/local/lib/python3.7/dist-packages (from tensorflow<1.15.0rc0,>=1.14.0rc0)
Requirement already satisfied: pynndescent>=0.5 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: scikit-learn>=0.22 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: scipy>=1.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: llvmlite<0.40,>=0.39.0dev0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: cached-property in /usr/local/lib/python3.7/dist-packages
```

```
!eta install models
```

```
Deleting existing directory /usr/local/lib/python3.7/dist-packages/eta/tensorflow/models
Cloning https://github.com/voxel51/models
Cloning into '/usr/local/lib/python3.7/dist-packages/eta/tensorflow/models'...
remote: Enumerating objects: 30876, done.
remote: Total 30876 (delta 0), reused 0 (delta 0), pack-reused 30876
Receiving objects: 100% (30876/30876), 532.07 MiB | 16.94 MiB/s, done.
Resolving deltas: 100% (19430/19430), done.
Installing protobuf
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/
```

```
Requirement already satisfied: protobuf in /usr/local/lib/python3.7/dist-packages (3
Requirement already satisfied: six>=1.9 in /usr/local/lib/python3.7/dist-packages (fr
Found protoc
Compiling protocol buffers
Installing tf_slim
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/
Requirement already satisfied: tf_slim in /usr/local/lib/python3.7/dist-packages (1.1
Requirement already satisfied: absl-py>=0.2.2 in /usr/local/lib/python3.7/dist-packag
Installation complete
```

```
!pip install fiftyone
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-whee
Requirement already satisfied: fiftyone in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: boto3 in /usr/local/lib/python3.7/dist-packages (f
Requirement already satisfied: dacite>=1.6.0 in /usr/local/lib/python3.7/dist-pac
Requirement already satisfied: ndjson in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: mongoengine==0.20.0 in /usr/local/lib/python3.7/di
Requirement already satisfied: Jinja2>=3 in /usr/local/lib/python3.7/dist-package
Requirement already satisfied: motor<3,>=2.3 in /usr/local/lib/python3.7/dist-pac
Requirement already satisfied: setuptools in /usr/local/lib/python3.7/dist-pacak
Requirement already satisfied: strawberry-graphql==0.96.0 in /usr/local/lib/pytho
Requirement already satisfied: hypercorn>=0.13.2 in /usr/local/lib/python3.7/dist
Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-package
Requirement already satisfied: fiftyone-db<0.4,>=0.3 in /usr/local/lib/python3.7/
Requirement already satisfied: retrying in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: scikit-learn in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (f
Requirement already satisfied: pandas in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: pymongo<4,>=3.11 in /usr/local/lib/python3.7/dist-
Requirement already satisfied: scikit-image in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: sseclient-py<2,>=1.7.2 in /usr/local/lib/python3.7
Requirement already satisfied: plotly>=4.14 in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: voxel51-eta<0.9,>=0.8.1 in /usr/local/lib/python3.
Requirement already satisfied: kaleido in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: future in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: xmltodict in /usr/local/lib/python3.7/dist-package
Requirement already satisfied: universal-analytics-python3<2,>=1.0.1 in /usr/loca
Requirement already satisfied: opencv-python-headless in /usr/local/lib/python3.7
Requirement already satisfied: sse-starlette<1,>=0.10.3 in /usr/local/lib/python3
Requirement already satisfied: PyYAML in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: starlette==0.16.0 in /usr/local/lib/python3.7/dist
Requirement already satisfied: aiofiles in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (fr
Requirement already satisfied: fiftyone-brain<0.10,>=0.9.1 in /usr/local/lib/pyth
Requirement already satisfied: psutil in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: pprintpp in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: argcomplete in /usr/local/lib/python3.7/dist-packa
Requirement already satisfied: Deprecated in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: Pillow>=6.2 in /usr/local/lib/python3.7/dist-packa
Requirement already satisfied: tabulate in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: eventlet in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist
Requirement already satisfied: anyio<4,>=3.0.0 in /usr/local/lib/python3.7/dist-p
Requirement already satisfied: graphql-core<3.2.0,>=3.1.0 in /usr/local/lib/pytho
Requirement already satisfied: sentinel<0.4.0,>=0.3.0 in /usr/local/lib/python3.7
```

```
Requirement already satisfied: click<9.0,>=7.0 in /usr/local/lib/python3.7/dist-p  
Requirement already satisfied: python-multipart<0.0.6,>=0.0.5 in /usr/local/lib/p  
Requirement already satisfied: backports.cached-property<2.0.0,>=1.0.1 in /usr/lo  
Requirement already satisfied: pygments<3.0,>=2.3 in /usr/local/lib/python3.7/dis  
Requirement already satisfied: python-dateutil<3.0.0,>=2.7.0 in /usr/local/lib/py  
Requirement already satisfied: sniffio>=1.1 in /usr/local/lib/python3.7/dist-pack  
Requirement already satisfied: idna>=2.8 in /usr/local/lib/python3.7/dist-package  
Requirement already satisfied: scipy>=1.2.0 in /usr/local/lib/python3.7/dist-pack  
Requirement already satisfied: priority in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: wsproto>=0.14.0 in /usr/local/lib/python3.7/dist-p  
Requirement already satisfied: toml in /usr/local/lib/python3.7/dist-packages (fr
```

```
import pandas as pd  
import numpy as np  
import matplotlib.pyplot as plt  
import os  
import seaborn as sns  
from tensorflow import keras  
import tensorflow as tf  
# import tensorflow_datasets as tfds  
import cv2  
import PIL  
from IPython.display import clear_output  
# import tensorflow_models as tfm
```

Загружать буду через Fiftyone тк он позволяет загрузить только тот сегмент который мне нужен

```
import fiftyone as fo  
import fiftyone.zoo as foz  
  
dataset = foz.load_zoo_dataset(  
    "coco-2017",  
    split="train",  
    label_types=["detections", "segmentations"],  
    classes=["person"],  
    shuffle=True,  
    seed=51,  
    max_samples=300,  
)  
session = fo.launch_app(dataset)
```

```
Downloading split 'train' to '/root/fiftyone/coco-2017/train' if necessary
INFO:fiftyone.zoo.datasets:Downloading split 'train' to '/root/fiftyone/coco-2017'
Found annotations at '/root/fiftyone/coco-2017/raw/instances_train2017.json'
INFO:fiftyone.utils.coco:Found annotations at '/root/fiftyone/coco-2017/raw/insta
Sufficient images already downloaded
INFO:fiftyone.utils.coco:Sufficient images already downloaded
Existing download of split 'train' is sufficient
INFO:fiftyone.zoo.datasets:Existing download of split 'train' is sufficient
Loading existing dataset 'coco-2017-train-300'. To reload from disk, either delet
INFO:fiftyone.zoo.datasets:Loading existing dataset 'coco-2017-train-300'. To rel
```

The screenshot shows the FiftyOne dataset viewer interface. At the top, it displays the dataset name "coco-2017-train-300". Below the title, there are tabs for "Sample tags", "Label tags", "Labels", and "Other fields". A "FILTER" section on the left contains dropdown menus for "SAMPLES TAGS" (with "train" selected), "LABEL TAGS" (empty), "METADATA" (including width, height, and num\_channels), and "LABELS" (with "detections", "segmentations", and "predictions" checked). The main area shows a 4x3 grid of images, each with multiple orange bounding boxes indicating detected objects like people, animals, and vehicles.

## Модель TensorFlow

```
model = foz.load_zoo_model("ssd-mobilenet-v1-coco-tf")
```

```
dataset.apply_model(model, label_field="predictions", confidence_thresh=0.5)
```

```
100% |██████████| 300/300 [55.8s elapsed, 0s remaining, 3.4 samples/s]
INFO:eta.core.utils: 100% |██████████| 300/300 [55.8s elapsed, 0s remaining, 3.4 samples/s]
```

Поскольку мы указали эти классы при загрузке набора данных, все изображения гарантированно будут относиться к классам "person", нам просто нужно отфильтровать отдельные метки.

```
from fiftyone import ViewField as F

oi_classes = ["person"]
coco_classes = ["person"]

eval_view = (
    dataset
    .filter_labels("detections", F("label").is_in(oi_classes), only_matches=False)
    .filter_labels("predictions", F("label").is_in(coco_classes), only_matches=False)
    .map_labels("predictions", {"person": "person"})
)
```

## Оценка

```
results = eval_view.evaluate_detections(
    "predictions",
    gt_field="detections",
    method="open-images",
)

Evaluating detections...
INFO:fiftyone.utils.eval.detection:Evaluating detections...
100% |██████████| 300/300 [4.1s elapsed, 0s remaining, 75.8 samples/s]
INFO:eta.core.utils: 100% |██████████| 300/300 [4.1s elapsed, 0s remaining, 75.8 samples/s]
```

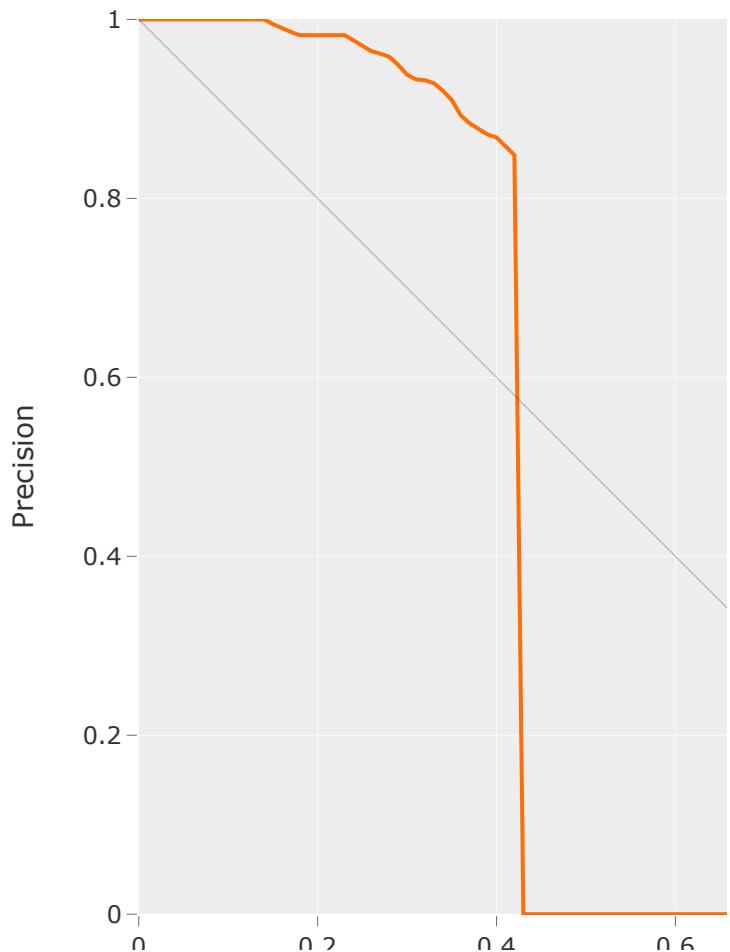
средняя точность (mAP) для указанного класса.

```
results.mAP()

0.40914979190388434
```

## Анализ результатов

```
plot = results.plot_pr_curves()
plot.show()
```



```
session = fo.launch_app(view=eval_view)
```



FiftyOne

coco-2017-train-300



Have a Team?



Sample tags

Label tags

Labels

Other fields

Show

**LABEL TAGS**

No label tags

**METADATA** metadata.size\_bytes 0 metadata.mime\_type 0 metadata.width 300 metadata.height 300 metadata.num\_channels 0**LABELS**

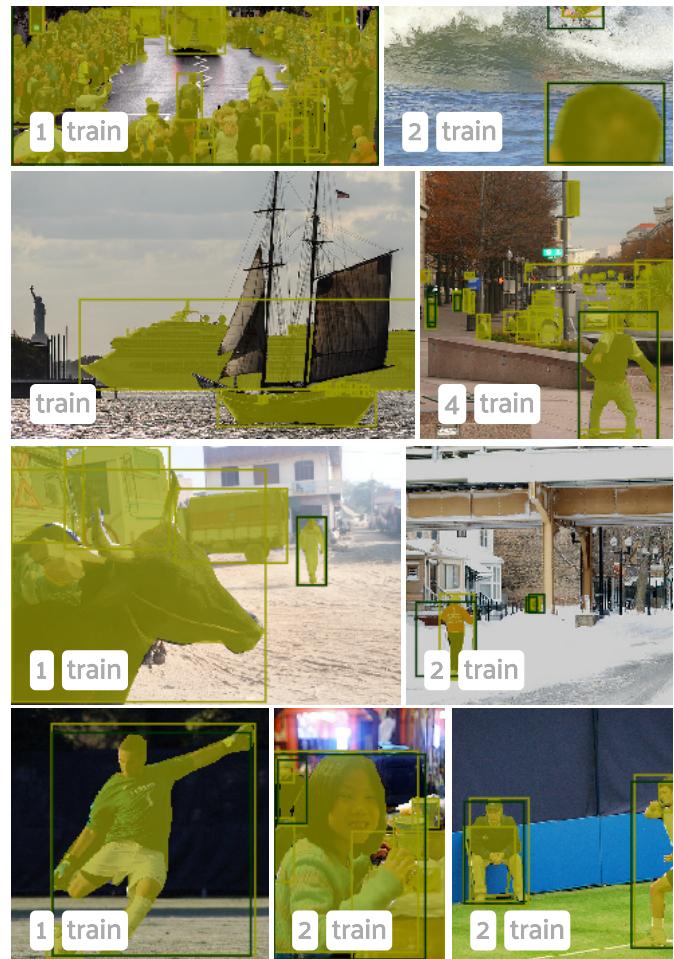
2

 detections 1 211 segmentations 2 790 predictions 617**PRIMITIVES**

1

 id 300 filepath 300 eval\_tp 300 eval\_fp 300 eval\_fn 300

300 samples



✓ 1 сек. выполнено в 06:36

