

✓ Подготовка к обучению

Для обучения модели YOLOv8n мы воспользовались библиотекой *ultralitics*, которая предоставляет удобный интерфейс и большое количество возможностей

```
!pip install ultralitics
```

```
Collecting ultralitics
  Downloading ultralitics-8.1.19-py3-none-any.whl.metadata (40 kB)
    40.4/40.4 kB 2.1 MB/s eta 0:00:00
Requirement already satisfied: matplotlib>=3.3.0 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (3.7.4)
Requirement already satisfied: opencv-python>=4.6.0 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (4.9.0.80)
Requirement already satisfied: pillow>=7.1.2 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (9.5.0)
Requirement already satisfied: pyyaml>=5.3.1 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (6.0.1)
Requirement already satisfied: requests>=2.23.0 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (2.31.0)
Requirement already satisfied: scipy>=1.4.1 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (1.11.4)
Requirement already satisfied: torch>=1.8.0 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (2.1.2)
Requirement already satisfied: torchvision>=0.9.0 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (0.16.2)
Requirement already satisfied: tqdm>=4.64.0 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (4.66.1)
Requirement already satisfied: psutil in /opt/conda/lib/python3.10/site-packages (from ultralitics) (5.9.3)
Requirement already satisfied: py-cpuinfo in /opt/conda/lib/python3.10/site-packages (from ultralitics) (9.0.0)
Collecting thop>=0.1.1 (from ultralitics)
  Downloading thop-0.1.1.post2209072238-py3-none-any.whl.metadata (2.7 kB)
Requirement already satisfied: pandas>=1.1.4 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (2.1.4)
Requirement already satisfied: seaborn>=0.11.0 in /opt/conda/lib/python3.10/site-packages (from ultralitics) (0.12.2)
Requirement already satisfied: contourpy>=1.0.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralitics) (1.0.7)
Requirement already satisfied: cycler>=0.10 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralitics) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralitics) (4.22.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralitics) (1.4.5)
Requirement already satisfied: numpy<2, >=1.20 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralitics) (1.24.3)
Requirement already satisfied: packaging>=20.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralitics) (21.3)
Requirement already satisfied: pyparsing>=2.3.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralitics) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralitics) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in /opt/conda/lib/python3.10/site-packages (from pandas>=1.1.4->ultralitics) (2023.3.0)
Requirement already satisfied: tzdata>=2022.1 in /opt/conda/lib/python3.10/site-packages (from pandas>=1.1.4->ultralitics) (2023.4)
Requirement already satisfied: charset-normalizer<4, >=2 in /opt/conda/lib/python3.10/site-packages (from requests>=2.23.0->ultralitics) (3.1.0)
Requirement already satisfied: idna<4, >=2.5 in /opt/conda/lib/python3.10/site-packages (from requests>=2.23.0->ultralitics) (3.6)
Requirement already satisfied: urllib3<3, >=1.21.1 in /opt/conda/lib/python3.10/site-packages (from requests>=2.23.0->ultralitics) (2.0.4)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/lib/python3.10/site-packages (from requests>=2.23.0->ultralitics) (2023.7.22)
Requirement already satisfied: filelock in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralitics) (3.13.1)
Requirement already satisfied: typing-extensions in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralitics) (4.9.0)
Requirement already satisfied: sympy in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralitics) (1.12)
Requirement already satisfied: networkx in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralitics) (3.2.1)
Requirement already satisfied: Jinja2 in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralitics) (3.1.2)
Requirement already satisfied: fsspec in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralitics) (2023.12.2)
Requirement already satisfied: six>=1.5 in /opt/conda/lib/python3.10/site-packages (from python-dateutil>=2.7->matplotlib>=3.3.0->ultralitics) (1.16.0)
Requirement already satisfied: MarkupSafe>=2.0 in /opt/conda/lib/python3.10/site-packages (from Jinja2->torch>=1.8.0->ultralitics) (2.1.2)
Requirement already satisfied: mpmath>=0.19 in /opt/conda/lib/python3.10/site-packages (from sympy->torch>=1.8.0->ultralitics) (1.3.0)
  Downloading ultralitics-8.1.19-py3-none-any.whl (716 kB)
    716.2/716.2 kB 19.8 MB/s eta 0:00:00:00:01
  Downloading thop-0.1.1.post2209072238-py3-none-any.whl (15 kB)
Installing collected packages: thop, ultralitics
Successfully installed thop-0.1.1.post2209072238 ultralitics-8.1.19
```

✓ Обучение

Датасет для обучения модели (67 тысяч) был загружен в *Ultralytics Hub*, после чего мы начинали обучение модели в сервисе Kaggle. Обучение модели заняло 11 часов.

```
from ultralytics import YOLO, checks, hub
checks()
```

```
hub.login('e62e77e6b80328a2b56c20d5a97958d3fc52964697')
```

```
model = YOLO('https://hub.ultralitics.com/models/dEftPEJcOLs1RS8CTEAn')
results = model.train()
```

```
Ultralytics YOLOv8.1.19 Python-3.10.13 torch-2.1.2 CUDA:0 (Tesla P100-PCIE-16GB, 16276MiB)
Setup complete (4 CPUs, 31.4 GB RAM, 5432.4/8062.4 GB disk)
requirements: Ultralytics requirement ['hub-sdk>=0.0.2'] not found, attempting AutoUpdate...
Collecting hub-sdk>=0.0.2
  Downloading hub_sdk-0.0.4-py3-none-any.whl.metadata (9.2 kB)
Requirement already satisfied: requests in /opt/conda/lib/python3.10/site-packages (from hub-sdk>=0.0.2) (2.31.0)
Requirement already satisfied: charset-normalizer<4, >=2 in /opt/conda/lib/python3.10/site-packages (from requests->hub-sdk>=0.0.2) (3.1.0)
Requirement already satisfied: idna<4, >=2.5 in /opt/conda/lib/python3.10/site-packages (from requests->hub-sdk>=0.0.2) (3.6)
Requirement already satisfied: urllib3<3, >=1.21.1 in /opt/conda/lib/python3.10/site-packages (from requests->hub-sdk>=0.0.2) (2.0.4)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/lib/python3.10/site-packages (from requests->hub-sdk>=0.0.2) (2023.7.22)
  Downloading hub_sdk-0.0.4-py3-none-any.whl (40 kB)
    40.9/40.9 kB 8.2 MB/s eta 0:00:00
```

Installing collected packages: hub-sdk
Successfully installed hub-sdk-0.0.4

requirements: AutoUpdate success ✔ 11.4s, installed 1 package: ['hub-sdk>=0.0.2']
requirements: ⚠ Restart runtime or rerun command for updates to take effect

Ultralytics HUB: New authentication successful ✔

Ultralytics HUB: View model at <https://hub.ultralytics.com/models/dEFtPEJcOLs1RS8CTEAN> 🔗

Ultralytics YOLOv8.1.19 🔗 Python-3.10.13 torch-2.1.2 CUDA:0 (Tesla P100-PCIE-16GB, 16276MiB)

engine/trainer: task=detect, mode=train, model=yolov8n.pt, data=<https://storage.googleapis.com/ultralytics-hub.appspot.com/users/Findhttps://storage.googleapis.com/ultralytics-hub.appspot.com/users/u5yKelVTS0e6WqT5aZmBfdnT1et2/datasets/esjKhkKzCY2TbpnEzYZs>

WARNING ⚠ Skipping 1.zip unzip as destination directory /kaggle/working/datasets/1 is not empty.
Downloading <https://ultralytics.com/assets/Arial.ttf> to '/root/.config/Ultralytics/Arial.ttf'...

100%|██████████| 755k/755k [00:00<00:00, 24.1MB/s]

2024-02-27 02:11:28,152 INFO util.py:124 -- Outdated packages:

ipywidgets==7.7.1 found, needs ipywidgets>=8

Run 'pip install -U ipywidgets', then restart the notebook server for rich notebook output.

2024-02-27 02:11:28,991 INFO util.py:124 -- Outdated packages:

ipywidgets==7.7.1 found, needs ipywidgets>=8

Run 'pip install -U ipywidgets', then restart the notebook server for rich notebook output.

2024-02-27 02:11:31.306053: E external/local_xla/xla/stream_executor/cuda/cuda_dnn.cc:9261] Unable to register cuDNN factory: Att

2024-02-27 02:11:31.306151: E external/local_xla/xla/stream_executor/cuda/cuda_fft.cc:607] Unable to register cuFFT factory: Atte

2024-02-27 02:11:31.440026: E external/local_xla/xla/stream_executor/cuda/cuda_blas.cc:1515] Unable to register cuBLAS factory: A

Overriding model.yaml nc=80 with nc=1

	from	n	params	module	arguments
0	-1	1	464	ultralytics.nn.modules.conv.Conv	[3, 16, 3, 2]
1	-1	1	4672	ultralytics.nn.modules.conv.Conv	[16, 32, 3, 2]
2	-1	1	7360	ultralytics.nn.modules.block.C2f	[32, 32, 1, True]
3	-1	1	18560	ultralytics.nn.modules.conv.Conv	[32, 64, 3, 2]
4	-1	2	49664	ultralytics.nn.modules.block.C2f	[64, 64, 2, True]
5	-1	1	73984	ultralytics.nn.modules.conv.Conv	[64, 128, 3, 2]
6	-1	2	197632	ultralytics.nn.modules.block.C2f	[128, 128, 2, True]
7	-1	1	295424	ultralytics.nn.modules.conv.Conv	[128, 256, 3, 2]
8	-1	1	460288	ultralytics.nn.modules.block.C2f	[256, 256, 1, True]
9	-1	1	164608	ultralytics.nn.modules.block.SPPF	[256, 256, 5]
10	-1	1	0	torch.nn.modules.upsampling.Upsample	[None, 2, 'nearest']
11	[-1, 6]	1	0	ultralytics.nn.modules.conv.Concat	[1]
12	-1	1	148224	ultralytics.nn.modules.block.C2f	[384, 128, 1]
13	-1	1	0	torch.nn.modules.upsampling.Upsample	[None, 2, 'nearest']
14	[-1, 4]	1	0	ultralytics.nn.modules.conv.Concat	[1]
15	-1	1	37248	ultralytics.nn.modules.block.C2f	[192, 64, 1]
16	-1	1	36992	ultralytics.nn.modules.conv.Conv	[64, 64, 3, 2]
17	[-1, 12]	1	0	ultralytics.nn.modules.conv.Concat	[1]
18	-1	1	123648	ultralytics.nn.modules.block.C2f	[192, 128, 1]

✓ Результаты обучения

В процессе обучения модели в Kaggle было замечено, что в нём не отображался вывод полностью, но в тоже время выполнялось обучение модели.

Результаты обучения вы можете посмотреть по ссылке

<https://hub.ultralytics.com/models/dEFtPEJcOLs1RS8CTEAN>(<https://hub.ultralytics.com/models/dEFtPEJcOLs1RS8CTEAN>).

А также вы можете посмотреть в изображении ниже:

```
from IPython.display import Image
```

```
display(Image(filename='results.png', width = 640))
```



