CONNECT TO GOOGLE DRIVE

In [ ]:
```
from google.colab import drive
drive.mount('/content/gdrive')
%cd /content
```

```
Mounted at /content/gdrive
/content
```

IMPORT DATA FROM KAGGLE

In [ ]:
```
!mkdir ~/.kaggle
!touch ~/.kaggle/kaggle.json
token = {"username":"<YOUR USERNAME>","key":"<YOUR KEY>"}
import json
with open('/root/.kaggle/kaggle.json', 'w') as file:
    json.dump(token, file)
!chmod 600 ~/.kaggle/kaggle.json
```

UNZIP IMPORTED DATA

In [ ]:
```
!kaggle datasets download -d tarunbisht11/yolo-animal-detection-small
!unzip yolo-animal-detection-small.zip
```

```
Downloading yolo-animal-detection-small.zip to /content
 82% 25.0M/30.4M [00:01<00:00, 15.6MB/s]
100% 30.4M/30.4M [00:01<00:00, 21.5MB/s]
Archive:  yolo-animal-detection-small.zip
  inflating: test.csv
  inflating: test.record
  inflating: train.csv
  inflating: train.record
  inflating: yolo-animal-detection-small/test/cats_000.jpg
  inflating: yolo-animal-detection-small/test/cats_000.xml
  inflating: yolo-animal-detection-small/test/cats_007.jpg
  inflating: yolo-animal-detection-small/test/cats_007.xml
  inflating: yolo-animal-detection-small/test/cats_050.jpg
  inflating: yolo-animal-detection-small/test/cats_050.xml
  inflating: yolo-animal-detection-small/test/cats_072.jpg
  inflating: yolo-animal-detection-small/test/cats_072.xml
  inflating: yolo-animal-detection-small/test/cats_076.jpg
  inflating: yolo-animal-detection-small/test/cats_076.xml
  inflating: yolo-animal-detection-small/test/cats_079.jpg
  inflating: yolo-animal-detection-small/test/cats_079.xml
  inflating: yolo-animal-detection-small/test/cats_088.jpg
  inflating: yolo-animal-detection-small/test/cats_088.xml
  inflating: yolo-animal-detection-small/test/cats_091.jpg
  inflating: yolo-animal-detection-small/test/cats_091.xml
  inflating: yolo-animal-detection-small/test/cats_099.jpg
  inflating: yolo-animal-detection-small/test/cats_099.xml
  inflating: yolo-animal-detection-small/test/cats_100.jpg
  inflating: yolo-animal-detection-small/test/cats_100.xml
  inflating: yolo-animal-detection-small/test/cats_and_monkeys_000.jpg
  inflating: yolo-animal-detection-small/test/cats_and_monkeys_000.xml
  inflating: yolo-animal-detection-small/test/cats_and_monkeys_002.jpg
  inflating: yolo-animal-detection-small/test/cats_and_monkeys_002.xml
  inflating: yolo-animal-detection-small/test/cats_and_monkeys_029.jpg
```

```
inflating: yolo-animal-detection-small/test/cats_and_monkeys_029.xml
inflating: yolo-animal-detection-small/test/cats_groups_031.jpg
inflating: yolo-animal-detection-small/test/cats_groups_031.xml
inflating: yolo-animal-detection-small/test/cats_groups_039.jpg
inflating: yolo-animal-detection-small/test/cats_groups_039.xml
inflating: yolo-animal-detection-small/test/cats_groups_057.jpg
inflating: yolo-animal-detection-small/test/cats_groups_057.xml
inflating: yolo-animal-detection-small/test/cats_groups_090.jpg
inflating: yolo-animal-detection-small/test/cats_groups_090.xml
inflating: yolo-animal-detection-small/test/cats_groups_092.jpg
inflating: yolo-animal-detection-small/test/cats_groups_092.xml
inflating: yolo-animal-detection-small/test/dog_and_monkey_035.jpg
inflating: yolo-animal-detection-small/test/dog_and_monkey_035.xml
inflating: yolo-animal-detection-small/test/dog_and_monkey_046.jpg
inflating: yolo-animal-detection-small/test/dog_and_monkey_046.xml
inflating: yolo-animal-detection-small/test/dog_and_monkey_049.jpg
inflating: yolo-animal-detection-small/test/dog_and_monkey_049.xml
inflating: yolo-animal-detection-small/test/dogs_033.jpg
inflating: yolo-animal-detection-small/test/dogs_033.xml
inflating: yolo-animal-detection-small/test/dogs_042.jpg
inflating: yolo-animal-detection-small/test/dogs_042.xml
inflating: yolo-animal-detection-small/test/dogs_062.jpg
inflating: yolo-animal-detection-small/test/dogs_062.xml
inflating: yolo-animal-detection-small/test/dogs_070.jpg
inflating: yolo-animal-detection-small/test/dogs_070.xml
inflating: yolo-animal-detection-small/test/dogs_072.jpg
inflating: yolo-animal-detection-small/test/dogs_072.xml
inflating: yolo-animal-detection-small/test/dogs_079.jpg
inflating: yolo-animal-detection-small/test/dogs_079.xml
inflating: yolo-animal-detection-small/test/dogs_086.jpg
inflating: yolo-animal-detection-small/test/dogs_086.xml
inflating: yolo-animal-detection-small/test/dogs_089.jpg
inflating: yolo-animal-detection-small/test/dogs_089.xml
inflating: yolo-animal-detection-small/test/dogs_093.jpg
inflating: yolo-animal-detection-small/test/dogs_093.xml
inflating: yolo-animal-detection-small/test/dogs_and_cats_014.jpg
inflating: yolo-animal-detection-small/test/dogs_and_cats_014.xml
inflating: yolo-animal-detection-small/test/dogs_and_cats_021.jpg
inflating: yolo-animal-detection-small/test/dogs_and_cats_021.xml
inflating: yolo-animal-detection-small/test/dogs_and_cats_043.jpg
inflating: yolo-animal-detection-small/test/dogs_and_cats_043.xml
inflating: yolo-animal-detection-small/test/dogs_and_cats_059.jpg
inflating: yolo-animal-detection-small/test/dogs_and_cats_059.xml
inflating: yolo-animal-detection-small/test/dogs_and_cats_079.jpg
inflating: yolo-animal-detection-small/test/dogs_and_cats_079.xml
inflating: yolo-animal-detection-small/test/dogs_and_cats_093.jpg
inflating: yolo-animal-detection-small/test/dogs_and_cats_093.xml
inflating: yolo-animal-detection-small/test/dogs_groups_009.jpg
inflating: yolo-animal-detection-small/test/dogs_groups_009.xml
inflating: yolo-animal-detection-small/test/dogs_groups_012.jpg
inflating: yolo-animal-detection-small/test/dogs_groups_012.xml
inflating: yolo-animal-detection-small/test/monkey_groups_005.jpg
inflating: yolo-animal-detection-small/test/monkey_groups_005.xml
inflating: yolo-animal-detection-small/test/monkey_groups_023.jpg
inflating: yolo-animal-detection-small/test/monkey_groups_023.xml
inflating: yolo-animal-detection-small/test/monkey_groups_056.jpg
inflating: yolo-animal-detection-small/test/monkey_groups_056.xml
inflating: yolo-animal-detection-small/test/monkey_groups_061.jpg
inflating: yolo-animal-detection-small/test/monkey_groups_061.xml
inflating: yolo-animal-detection-small/test/monkeys_001.jpg
inflating: yolo-animal-detection-small/test/monkeys_001.xml
inflating: yolo-animal-detection-small/test/monkeys_019.jpg
inflating: yolo-animal-detection-small/test/monkeys_019.xml
inflating: yolo-animal-detection-small/test/monkeys_022.jpg
inflating: yolo-animal-detection-small/test/monkeys_022.xml
inflating: yolo-animal-detection-small/test/monkeys_027.jpg
```

```
inflating: yolo-animal-detection-small/test/monkeys_027.xml
inflating: yolo-animal-detection-small/test/monkeys_037.jpg
inflating: yolo-animal-detection-small/test/monkeys_037.xml
inflating: yolo-animal-detection-small/test/monkeys_038.jpg
inflating: yolo-animal-detection-small/test/monkeys_038.xml
inflating: yolo-animal-detection-small/test/monkeys_085.jpg
inflating: yolo-animal-detection-small/test/monkeys_085.xml
inflating: yolo-animal-detection-small/test/monkeys_088.jpg
inflating: yolo-animal-detection-small/test/monkeys_088.xml
inflating: yolo-animal-detection-small/test/monkeys_093.jpg
inflating: yolo-animal-detection-small/test/monkeys_093.xml
inflating: yolo-animal-detection-small/train/cats_001.jpg
inflating: yolo-animal-detection-small/train/cats_001.xml
inflating: yolo-animal-detection-small/train/cats_002.jpg
inflating: yolo-animal-detection-small/train/cats_002.xml
inflating: yolo-animal-detection-small/train/cats_003.jpg
inflating: yolo-animal-detection-small/train/cats_003.xml
inflating: yolo-animal-detection-small/train/cats_004.jpg
inflating: yolo-animal-detection-small/train/cats_004.xml
inflating: yolo-animal-detection-small/train/cats_005.jpg
inflating: yolo-animal-detection-small/train/cats_005.xml
inflating: yolo-animal-detection-small/train/cats_006.jpg
inflating: yolo-animal-detection-small/train/cats_006.xml
inflating: yolo-animal-detection-small/train/cats_008.jpg
inflating: yolo-animal-detection-small/train/cats_008.xml
inflating: yolo-animal-detection-small/train/cats_009.jpg
inflating: yolo-animal-detection-small/train/cats_009.xml
inflating: yolo-animal-detection-small/train/cats_010.jpg
inflating: yolo-animal-detection-small/train/cats_010.xml
inflating: yolo-animal-detection-small/train/cats_011.jpg
inflating: yolo-animal-detection-small/train/cats_011.xml
inflating: yolo-animal-detection-small/train/cats_012.jpg
inflating: yolo-animal-detection-small/train/cats_012.xml
inflating: yolo-animal-detection-small/train/cats_013.jpg
inflating: yolo-animal-detection-small/train/cats_013.xml
inflating: yolo-animal-detection-small/train/cats_014.jpg
inflating: yolo-animal-detection-small/train/cats_014.xml
inflating: yolo-animal-detection-small/train/cats_015.jpg
inflating: yolo-animal-detection-small/train/cats_015.xml
inflating: yolo-animal-detection-small/train/cats_016.jpg
inflating: yolo-animal-detection-small/train/cats_016.xml
inflating: yolo-animal-detection-small/train/cats_017.jpg
inflating: yolo-animal-detection-small/train/cats_017.xml
inflating: yolo-animal-detection-small/train/cats_018.jpg
inflating: yolo-animal-detection-small/train/cats_018.xml
inflating: yolo-animal-detection-small/train/cats_019.jpg
inflating: yolo-animal-detection-small/train/cats_019.xml
inflating: yolo-animal-detection-small/train/cats_021.jpg
inflating: yolo-animal-detection-small/train/cats_021.xml
inflating: yolo-animal-detection-small/train/cats_022.jpg
inflating: yolo-animal-detection-small/train/cats_022.xml
inflating: yolo-animal-detection-small/train/cats_023.jpg
inflating: yolo-animal-detection-small/train/cats_023.xml
inflating: yolo-animal-detection-small/train/cats_024.jpg
inflating: yolo-animal-detection-small/train/cats_024.xml
inflating: yolo-animal-detection-small/train/cats_025.jpg
inflating: yolo-animal-detection-small/train/cats_025.xml
inflating: yolo-animal-detection-small/train/cats_026.jpg
inflating: yolo-animal-detection-small/train/cats_026.xml
inflating: yolo-animal-detection-small/train/cats_027.jpg
inflating: yolo-animal-detection-small/train/cats_027.xml
inflating: yolo-animal-detection-small/train/cats_028.jpg
inflating: yolo-animal-detection-small/train/cats_028.xml
inflating: yolo-animal-detection-small/train/cats_029.jpg
inflating: yolo-animal-detection-small/train/cats_029.xml
inflating: yolo-animal-detection-small/train/cats_030.jpg
```

```
inflating: yolo-animal-detection-small/train/cats_030.xml
inflating: yolo-animal-detection-small/train/cats_031.jpg
inflating: yolo-animal-detection-small/train/cats_031.xml
inflating: yolo-animal-detection-small/train/cats_032.jpg
inflating: yolo-animal-detection-small/train/cats_032.xml
inflating: yolo-animal-detection-small/train/cats_033.jpg
inflating: yolo-animal-detection-small/train/cats_033.xml
inflating: yolo-animal-detection-small/train/cats_034.jpg
inflating: yolo-animal-detection-small/train/cats_034.xml
inflating: yolo-animal-detection-small/train/cats_035.jpg
inflating: yolo-animal-detection-small/train/cats_035.xml
inflating: yolo-animal-detection-small/train/cats_036.jpg
inflating: yolo-animal-detection-small/train/cats_036.xml
inflating: yolo-animal-detection-small/train/cats_037.jpg
inflating: yolo-animal-detection-small/train/cats_037.xml
inflating: yolo-animal-detection-small/train/cats_038.jpg
inflating: yolo-animal-detection-small/train/cats_038.xml
inflating: yolo-animal-detection-small/train/cats_039.jpg
inflating: yolo-animal-detection-small/train/cats_039.xml
inflating: yolo-animal-detection-small/train/cats_040.jpg
inflating: yolo-animal-detection-small/train/cats_040.xml
inflating: yolo-animal-detection-small/train/cats_041.jpg
inflating: yolo-animal-detection-small/train/cats_041.xml
inflating: yolo-animal-detection-small/train/cats_042.jpg
inflating: yolo-animal-detection-small/train/cats_042.xml
inflating: yolo-animal-detection-small/train/cats_043.jpg
inflating: yolo-animal-detection-small/train/cats_043.xml
inflating: yolo-animal-detection-small/train/cats_044.jpg
inflating: yolo-animal-detection-small/train/cats_044.xml
inflating: yolo-animal-detection-small/train/cats_045.jpg
inflating: yolo-animal-detection-small/train/cats_045.xml
inflating: yolo-animal-detection-small/train/cats_046.jpg
inflating: yolo-animal-detection-small/train/cats_046.xml
inflating: yolo-animal-detection-small/train/cats_047.jpg
inflating: yolo-animal-detection-small/train/cats_047.xml
inflating: yolo-animal-detection-small/train/cats_048.jpg
inflating: yolo-animal-detection-small/train/cats_048.xml
inflating: yolo-animal-detection-small/train/cats_049.jpg
inflating: yolo-animal-detection-small/train/cats_049.xml
inflating: yolo-animal-detection-small/train/cats_052.jpg
inflating: yolo-animal-detection-small/train/cats_052.xml
inflating: yolo-animal-detection-small/train/cats_053.jpg
inflating: yolo-animal-detection-small/train/cats_053.xml
inflating: yolo-animal-detection-small/train/cats_055.jpg
inflating: yolo-animal-detection-small/train/cats_055.xml
inflating: yolo-animal-detection-small/train/cats_056.jpg
inflating: yolo-animal-detection-small/train/cats_056.xml
inflating: yolo-animal-detection-small/train/cats_058.jpg
inflating: yolo-animal-detection-small/train/cats_058.xml
inflating: yolo-animal-detection-small/train/cats_059.jpg
inflating: yolo-animal-detection-small/train/cats_059.xml
inflating: yolo-animal-detection-small/train/cats_060.jpg
inflating: yolo-animal-detection-small/train/cats_060.xml
inflating: yolo-animal-detection-small/train/cats_061.jpg
inflating: yolo-animal-detection-small/train/cats_061.xml
inflating: yolo-animal-detection-small/train/cats_062.jpg
inflating: yolo-animal-detection-small/train/cats_062.xml
inflating: yolo-animal-detection-small/train/cats_063.jpg
inflating: yolo-animal-detection-small/train/cats_063.xml
inflating: yolo-animal-detection-small/train/cats_064.jpg
inflating: yolo-animal-detection-small/train/cats_064.xml
inflating: yolo-animal-detection-small/train/cats_065.jpg
inflating: yolo-animal-detection-small/train/cats_065.xml
inflating: yolo-animal-detection-small/train/cats_067.jpg
inflating: yolo-animal-detection-small/train/cats_067.xml
inflating: yolo-animal-detection-small/train/cats_068.jpg
```

```
inflating: yolo-animal-detection-small/train/cats_068.xml
inflating: yolo-animal-detection-small/train/cats_069.jpg
inflating: yolo-animal-detection-small/train/cats_069.xml
inflating: yolo-animal-detection-small/train/cats_070.jpg
inflating: yolo-animal-detection-small/train/cats_070.xml
inflating: yolo-animal-detection-small/train/cats_071.jpg
inflating: yolo-animal-detection-small/train/cats_071.xml
inflating: yolo-animal-detection-small/train/cats_073.jpg
inflating: yolo-animal-detection-small/train/cats_073.xml
inflating: yolo-animal-detection-small/train/cats_074.jpg
inflating: yolo-animal-detection-small/train/cats_074.xml
inflating: yolo-animal-detection-small/train/cats_075.jpg
inflating: yolo-animal-detection-small/train/cats_075.xml
inflating: yolo-animal-detection-small/train/cats_077.jpg
inflating: yolo-animal-detection-small/train/cats_077.xml
inflating: yolo-animal-detection-small/train/cats_078.jpg
inflating: yolo-animal-detection-small/train/cats_078.xml
inflating: yolo-animal-detection-small/train/cats_080.jpg
inflating: yolo-animal-detection-small/train/cats_080.xml
inflating: yolo-animal-detection-small/train/cats_081.jpg
inflating: yolo-animal-detection-small/train/cats_081.xml
inflating: yolo-animal-detection-small/train/cats_082.jpg
inflating: yolo-animal-detection-small/train/cats_082.xml
inflating: yolo-animal-detection-small/train/cats_083.jpg
inflating: yolo-animal-detection-small/train/cats_083.xml
inflating: yolo-animal-detection-small/train/cats_084.jpg
inflating: yolo-animal-detection-small/train/cats_084.xml
inflating: yolo-animal-detection-small/train/cats_085.jpg
inflating: yolo-animal-detection-small/train/cats_085.xml
inflating: yolo-animal-detection-small/train/cats_086.jpg
inflating: yolo-animal-detection-small/train/cats_086.xml
inflating: yolo-animal-detection-small/train/cats_087.jpg
inflating: yolo-animal-detection-small/train/cats_087.xml
inflating: yolo-animal-detection-small/train/cats_089.jpg
inflating: yolo-animal-detection-small/train/cats_089.xml
inflating: yolo-animal-detection-small/train/cats_090.jpg
inflating: yolo-animal-detection-small/train/cats_090.xml
inflating: yolo-animal-detection-small/train/cats_092.jpg
inflating: yolo-animal-detection-small/train/cats_092.xml
inflating: yolo-animal-detection-small/train/cats_093.jpg
inflating: yolo-animal-detection-small/train/cats_093.xml
inflating: yolo-animal-detection-small/train/cats_094.jpg
inflating: yolo-animal-detection-small/train/cats_094.xml
inflating: yolo-animal-detection-small/train/cats_095.jpg
inflating: yolo-animal-detection-small/train/cats_095.xml
inflating: yolo-animal-detection-small/train/cats_096.jpg
inflating: yolo-animal-detection-small/train/cats_096.xml
inflating: yolo-animal-detection-small/train/cats_097.jpg
inflating: yolo-animal-detection-small/train/cats_097.xml
inflating: yolo-animal-detection-small/train/cats_098.jpg
inflating: yolo-animal-detection-small/train/cats_098.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_001.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_001.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_004.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_004.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_009.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_009.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_011.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_011.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_015.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_015.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_017.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_017.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_018.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_018.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_019.jpg
```

```
inflating: yolo-animal-detection-small/train/cats_and_monkeys_019.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_021.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_021.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_022.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_022.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_023.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_023.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_024.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_024.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_025.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_025.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_028.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_028.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_030.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_030.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_039.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_039.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_041.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_041.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_042.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_042.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_044.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_044.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_047.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_047.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_054.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_054.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_057.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_057.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_064.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_064.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_068.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_068.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_071.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_071.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_085.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_085.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_088.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_088.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_089.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_089.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_091.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_091.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_093.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_093.xml
inflating: yolo-animal-detection-small/train/cats_and_monkeys_097.jpg
inflating: yolo-animal-detection-small/train/cats_and_monkeys_097.xml
inflating: yolo-animal-detection-small/train/cats_groups_000.jpg
inflating: yolo-animal-detection-small/train/cats_groups_000.xml
inflating: yolo-animal-detection-small/train/cats_groups_001.jpg
inflating: yolo-animal-detection-small/train/cats_groups_001.xml
inflating: yolo-animal-detection-small/train/cats_groups_002.jpg
inflating: yolo-animal-detection-small/train/cats_groups_002.xml
inflating: yolo-animal-detection-small/train/cats_groups_003.jpg
inflating: yolo-animal-detection-small/train/cats_groups_003.xml
inflating: yolo-animal-detection-small/train/cats_groups_005.jpg
inflating: yolo-animal-detection-small/train/cats_groups_005.xml
inflating: yolo-animal-detection-small/train/cats_groups_006.jpg
inflating: yolo-animal-detection-small/train/cats_groups_006.xml
inflating: yolo-animal-detection-small/train/cats_groups_007.jpg
inflating: yolo-animal-detection-small/train/cats_groups_007.xml
inflating: yolo-animal-detection-small/train/cats_groups_008.jpg
inflating: yolo-animal-detection-small/train/cats_groups_008.xml
inflating: yolo-animal-detection-small/train/cats_groups_009.jpg
inflating: yolo-animal-detection-small/train/cats_groups_009.xml
inflating: yolo-animal-detection-small/train/cats_groups_010.jpg
```

```
inflating: yolo-animal-detection-small/train/cats_groups_010.xml
inflating: yolo-animal-detection-small/train/cats_groups_011.jpg
inflating: yolo-animal-detection-small/train/cats_groups_011.xml
inflating: yolo-animal-detection-small/train/cats_groups_012.jpg
inflating: yolo-animal-detection-small/train/cats_groups_012.xml
inflating: yolo-animal-detection-small/train/cats_groups_016.jpg
inflating: yolo-animal-detection-small/train/cats_groups_016.xml
inflating: yolo-animal-detection-small/train/cats_groups_018.jpg
inflating: yolo-animal-detection-small/train/cats_groups_018.xml
inflating: yolo-animal-detection-small/train/cats_groups_021.jpg
inflating: yolo-animal-detection-small/train/cats_groups_021.xml
inflating: yolo-animal-detection-small/train/cats_groups_022.jpg
inflating: yolo-animal-detection-small/train/cats_groups_022.xml
inflating: yolo-animal-detection-small/train/cats_groups_026.jpg
inflating: yolo-animal-detection-small/train/cats_groups_026.xml
inflating: yolo-animal-detection-small/train/cats_groups_027.jpg
inflating: yolo-animal-detection-small/train/cats_groups_027.xml
inflating: yolo-animal-detection-small/train/cats_groups_028.jpg
inflating: yolo-animal-detection-small/train/cats_groups_028.xml
inflating: yolo-animal-detection-small/train/cats_groups_030.jpg
inflating: yolo-animal-detection-small/train/cats_groups_030.xml
inflating: yolo-animal-detection-small/train/cats_groups_033.jpg
inflating: yolo-animal-detection-small/train/cats_groups_033.xml
inflating: yolo-animal-detection-small/train/cats_groups_035.jpg
inflating: yolo-animal-detection-small/train/cats_groups_035.xml
inflating: yolo-animal-detection-small/train/cats_groups_036.jpg
inflating: yolo-animal-detection-small/train/cats_groups_036.xml
inflating: yolo-animal-detection-small/train/cats_groups_037.jpg
inflating: yolo-animal-detection-small/train/cats_groups_037.xml
inflating: yolo-animal-detection-small/train/cats_groups_040.jpg
inflating: yolo-animal-detection-small/train/cats_groups_040.xml
inflating: yolo-animal-detection-small/train/cats_groups_043.jpg
inflating: yolo-animal-detection-small/train/cats_groups_043.xml
inflating: yolo-animal-detection-small/train/cats_groups_044.jpg
inflating: yolo-animal-detection-small/train/cats_groups_044.xml
inflating: yolo-animal-detection-small/train/cats_groups_047.jpg
inflating: yolo-animal-detection-small/train/cats_groups_047.xml
inflating: yolo-animal-detection-small/train/cats_groups_053.jpg
inflating: yolo-animal-detection-small/train/cats_groups_053.xml
inflating: yolo-animal-detection-small/train/cats_groups_055.jpg
inflating: yolo-animal-detection-small/train/cats_groups_055.xml
inflating: yolo-animal-detection-small/train/cats_groups_056.jpg
inflating: yolo-animal-detection-small/train/cats_groups_056.xml
inflating: yolo-animal-detection-small/train/cats_groups_058.jpg
inflating: yolo-animal-detection-small/train/cats_groups_058.xml
inflating: yolo-animal-detection-small/train/cats_groups_059.jpg
inflating: yolo-animal-detection-small/train/cats_groups_059.xml
inflating: yolo-animal-detection-small/train/cats_groups_060.jpg
inflating: yolo-animal-detection-small/train/cats_groups_060.xml
inflating: yolo-animal-detection-small/train/cats_groups_065.jpg
inflating: yolo-animal-detection-small/train/cats_groups_065.xml
inflating: yolo-animal-detection-small/train/cats_groups_066.jpg
inflating: yolo-animal-detection-small/train/cats_groups_066.xml
inflating: yolo-animal-detection-small/train/cats_groups_067.jpg
inflating: yolo-animal-detection-small/train/cats_groups_067.xml
inflating: yolo-animal-detection-small/train/cats_groups_070.jpg
inflating: yolo-animal-detection-small/train/cats_groups_070.xml
inflating: yolo-animal-detection-small/train/cats_groups_071.jpg
inflating: yolo-animal-detection-small/train/cats_groups_071.xml
inflating: yolo-animal-detection-small/train/cats_groups_072.jpg
inflating: yolo-animal-detection-small/train/cats_groups_072.xml
inflating: yolo-animal-detection-small/train/cats_groups_080.jpg
inflating: yolo-animal-detection-small/train/cats_groups_080.xml
inflating: yolo-animal-detection-small/train/cats_groups_083.jpg
inflating: yolo-animal-detection-small/train/cats_groups_083.xml
inflating: yolo-animal-detection-small/train/cats_groups_091.jpg
```

```
inflating: yolo-animal-detection-small/train/cats_groups_091.xml
inflating: yolo-animal-detection-small/train/cats_groups_093.jpg
inflating: yolo-animal-detection-small/train/cats_groups_093.xml
inflating: yolo-animal-detection-small/train/cats_groups_096.jpg
inflating: yolo-animal-detection-small/train/cats_groups_096.xml
inflating: yolo-animal-detection-small/train/cats_groups_097.jpg
inflating: yolo-animal-detection-small/train/cats_groups_097.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_000.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_000.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_001.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_001.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_003.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_003.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_005.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_005.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_012.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_012.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_014.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_014.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_016.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_016.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_019.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_019.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_022.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_022.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_023.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_023.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_024.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_024.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_028.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_028.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_031.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_031.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_032.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_032.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_033.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_033.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_034.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_034.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_039.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_039.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_040.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_040.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_042.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_042.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_043.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_043.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_045.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_045.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_048.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_048.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_050.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_050.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_053.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_053.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_057.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_057.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_063.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_063.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_065.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_065.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_078.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_078.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_081.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_081.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_085.jpg
```

```
inflating: yolo-animal-detection-small/train/dog_and_monkey_085.xml
inflating: yolo-animal-detection-small/train/dog_and_monkey_089.jpg
inflating: yolo-animal-detection-small/train/dog_and_monkey_089.xml
inflating: yolo-animal-detection-small/train/dogs_000.jpg
inflating: yolo-animal-detection-small/train/dogs_000.xml
inflating: yolo-animal-detection-small/train/dogs_001.jpg
inflating: yolo-animal-detection-small/train/dogs_001.xml
inflating: yolo-animal-detection-small/train/dogs_002.jpg
inflating: yolo-animal-detection-small/train/dogs_002.xml
inflating: yolo-animal-detection-small/train/dogs_003.jpg
inflating: yolo-animal-detection-small/train/dogs_003.xml
inflating: yolo-animal-detection-small/train/dogs_004.jpg
inflating: yolo-animal-detection-small/train/dogs_004.xml
inflating: yolo-animal-detection-small/train/dogs_005.jpg
inflating: yolo-animal-detection-small/train/dogs_005.xml
inflating: yolo-animal-detection-small/train/dogs_006.jpg
inflating: yolo-animal-detection-small/train/dogs_006.xml
inflating: yolo-animal-detection-small/train/dogs_007.jpg
inflating: yolo-animal-detection-small/train/dogs_007.xml
inflating: yolo-animal-detection-small/train/dogs_008.jpg
inflating: yolo-animal-detection-small/train/dogs_008.xml
inflating: yolo-animal-detection-small/train/dogs_009.jpg
inflating: yolo-animal-detection-small/train/dogs_009.xml
inflating: yolo-animal-detection-small/train/dogs_010.jpg
inflating: yolo-animal-detection-small/train/dogs_010.xml
inflating: yolo-animal-detection-small/train/dogs_011.jpg
inflating: yolo-animal-detection-small/train/dogs_011.xml
inflating: yolo-animal-detection-small/train/dogs_012.jpg
inflating: yolo-animal-detection-small/train/dogs_012.xml
inflating: yolo-animal-detection-small/train/dogs_013.jpg
inflating: yolo-animal-detection-small/train/dogs_013.xml
inflating: yolo-animal-detection-small/train/dogs_014.jpg
inflating: yolo-animal-detection-small/train/dogs_014.xml
inflating: yolo-animal-detection-small/train/dogs_015.jpg
inflating: yolo-animal-detection-small/train/dogs_015.xml
inflating: yolo-animal-detection-small/train/dogs_016.jpg
inflating: yolo-animal-detection-small/train/dogs_016.xml
inflating: yolo-animal-detection-small/train/dogs_018.jpg
inflating: yolo-animal-detection-small/train/dogs_018.xml
inflating: yolo-animal-detection-small/train/dogs_019.jpg
inflating: yolo-animal-detection-small/train/dogs_019.xml
inflating: yolo-animal-detection-small/train/dogs_020.jpg
inflating: yolo-animal-detection-small/train/dogs_020.xml
inflating: yolo-animal-detection-small/train/dogs_021.jpg
inflating: yolo-animal-detection-small/train/dogs_021.xml
inflating: yolo-animal-detection-small/train/dogs_023.jpg
inflating: yolo-animal-detection-small/train/dogs_023.xml
inflating: yolo-animal-detection-small/train/dogs_024.jpg
inflating: yolo-animal-detection-small/train/dogs_024.xml
inflating: yolo-animal-detection-small/train/dogs_025.jpg
inflating: yolo-animal-detection-small/train/dogs_025.xml
inflating: yolo-animal-detection-small/train/dogs_026.jpg
inflating: yolo-animal-detection-small/train/dogs_026.xml
inflating: yolo-animal-detection-small/train/dogs_027.jpg
inflating: yolo-animal-detection-small/train/dogs_027.xml
inflating: yolo-animal-detection-small/train/dogs_028.jpg
inflating: yolo-animal-detection-small/train/dogs_028.xml
inflating: yolo-animal-detection-small/train/dogs_029.jpg
inflating: yolo-animal-detection-small/train/dogs_029.xml
inflating: yolo-animal-detection-small/train/dogs_030.jpg
inflating: yolo-animal-detection-small/train/dogs_030.xml
inflating: yolo-animal-detection-small/train/dogs_031.jpg
inflating: yolo-animal-detection-small/train/dogs_031.xml
inflating: yolo-animal-detection-small/train/dogs_032.jpg
inflating: yolo-animal-detection-small/train/dogs_032.xml
inflating: yolo-animal-detection-small/train/dogs_034.jpg
```

```
inflating: yolo-animal-detection-small/train/dogs_034.xml
inflating: yolo-animal-detection-small/train/dogs_036.jpg
inflating: yolo-animal-detection-small/train/dogs_036.xml
inflating: yolo-animal-detection-small/train/dogs_037.jpg
inflating: yolo-animal-detection-small/train/dogs_037.xml
inflating: yolo-animal-detection-small/train/dogs_039.jpg
inflating: yolo-animal-detection-small/train/dogs_039.xml
inflating: yolo-animal-detection-small/train/dogs_040.jpg
inflating: yolo-animal-detection-small/train/dogs_040.xml
inflating: yolo-animal-detection-small/train/dogs_041.jpg
inflating: yolo-animal-detection-small/train/dogs_041.xml
inflating: yolo-animal-detection-small/train/dogs_043.jpg
inflating: yolo-animal-detection-small/train/dogs_043.xml
inflating: yolo-animal-detection-small/train/dogs_044.jpg
inflating: yolo-animal-detection-small/train/dogs_044.xml
inflating: yolo-animal-detection-small/train/dogs_045.jpg
inflating: yolo-animal-detection-small/train/dogs_045.xml
inflating: yolo-animal-detection-small/train/dogs_046.jpg
inflating: yolo-animal-detection-small/train/dogs_046.xml
inflating: yolo-animal-detection-small/train/dogs_047.jpg
inflating: yolo-animal-detection-small/train/dogs_047.xml
inflating: yolo-animal-detection-small/train/dogs_049.jpg
inflating: yolo-animal-detection-small/train/dogs_049.xml
inflating: yolo-animal-detection-small/train/dogs_050.jpg
inflating: yolo-animal-detection-small/train/dogs_050.xml
inflating: yolo-animal-detection-small/train/dogs_051.jpg
inflating: yolo-animal-detection-small/train/dogs_051.xml
inflating: yolo-animal-detection-small/train/dogs_052.jpg
inflating: yolo-animal-detection-small/train/dogs_052.xml
inflating: yolo-animal-detection-small/train/dogs_053.jpg
inflating: yolo-animal-detection-small/train/dogs_053.xml
inflating: yolo-animal-detection-small/train/dogs_054.jpg
inflating: yolo-animal-detection-small/train/dogs_054.xml
inflating: yolo-animal-detection-small/train/dogs_055.jpg
inflating: yolo-animal-detection-small/train/dogs_055.xml
inflating: yolo-animal-detection-small/train/dogs_056.jpg
inflating: yolo-animal-detection-small/train/dogs_056.xml
inflating: yolo-animal-detection-small/train/dogs_057.jpg
inflating: yolo-animal-detection-small/train/dogs_057.xml
inflating: yolo-animal-detection-small/train/dogs_058.jpg
inflating: yolo-animal-detection-small/train/dogs_058.xml
inflating: yolo-animal-detection-small/train/dogs_060.jpg
inflating: yolo-animal-detection-small/train/dogs_060.xml
inflating: yolo-animal-detection-small/train/dogs_061.jpg
inflating: yolo-animal-detection-small/train/dogs_061.xml
inflating: yolo-animal-detection-small/train/dogs_063.jpg
inflating: yolo-animal-detection-small/train/dogs_063.xml
inflating: yolo-animal-detection-small/train/dogs_064.jpg
inflating: yolo-animal-detection-small/train/dogs_064.xml
inflating: yolo-animal-detection-small/train/dogs_065.jpg
inflating: yolo-animal-detection-small/train/dogs_065.xml
inflating: yolo-animal-detection-small/train/dogs_066.jpg
inflating: yolo-animal-detection-small/train/dogs_066.xml
inflating: yolo-animal-detection-small/train/dogs_067.jpg
inflating: yolo-animal-detection-small/train/dogs_067.xml
inflating: yolo-animal-detection-small/train/dogs_068.jpg
inflating: yolo-animal-detection-small/train/dogs_068.xml
inflating: yolo-animal-detection-small/train/dogs_069.jpg
inflating: yolo-animal-detection-small/train/dogs_069.xml
inflating: yolo-animal-detection-small/train/dogs_071.jpg
inflating: yolo-animal-detection-small/train/dogs_071.xml
inflating: yolo-animal-detection-small/train/dogs_073.jpg
inflating: yolo-animal-detection-small/train/dogs_073.xml
inflating: yolo-animal-detection-small/train/dogs_074.jpg
inflating: yolo-animal-detection-small/train/dogs_074.xml
inflating: yolo-animal-detection-small/train/dogs_075.jpg
```

```
inflating: yolo-animal-detection-small/train/dogs_075.xml
inflating: yolo-animal-detection-small/train/dogs_076.jpg
inflating: yolo-animal-detection-small/train/dogs_076.xml
inflating: yolo-animal-detection-small/train/dogs_077.jpg
inflating: yolo-animal-detection-small/train/dogs_077.xml
inflating: yolo-animal-detection-small/train/dogs_078.jpg
inflating: yolo-animal-detection-small/train/dogs_078.xml
inflating: yolo-animal-detection-small/train/dogs_081.jpg
inflating: yolo-animal-detection-small/train/dogs_081.xml
inflating: yolo-animal-detection-small/train/dogs_082.jpg
inflating: yolo-animal-detection-small/train/dogs_082.xml
inflating: yolo-animal-detection-small/train/dogs_083.jpg
inflating: yolo-animal-detection-small/train/dogs_083.xml
inflating: yolo-animal-detection-small/train/dogs_084.jpg
inflating: yolo-animal-detection-small/train/dogs_084.xml
inflating: yolo-animal-detection-small/train/dogs_087.jpg
inflating: yolo-animal-detection-small/train/dogs_087.xml
inflating: yolo-animal-detection-small/train/dogs_088.jpg
inflating: yolo-animal-detection-small/train/dogs_088.xml
inflating: yolo-animal-detection-small/train/dogs_090.jpg
inflating: yolo-animal-detection-small/train/dogs_090.xml
inflating: yolo-animal-detection-small/train/dogs_091.jpg
inflating: yolo-animal-detection-small/train/dogs_091.xml
inflating: yolo-animal-detection-small/train/dogs_092.jpg
inflating: yolo-animal-detection-small/train/dogs_092.xml
inflating: yolo-animal-detection-small/train/dogs_094.jpg
inflating: yolo-animal-detection-small/train/dogs_094.xml
inflating: yolo-animal-detection-small/train/dogs_095.jpg
inflating: yolo-animal-detection-small/train/dogs_095.xml
inflating: yolo-animal-detection-small/train/dogs_096.jpg
inflating: yolo-animal-detection-small/train/dogs_096.xml
inflating: yolo-animal-detection-small/train/dogs_097.jpg
inflating: yolo-animal-detection-small/train/dogs_097.xml
inflating: yolo-animal-detection-small/train/dogs_099.jpg
inflating: yolo-animal-detection-small/train/dogs_099.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_000.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_000.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_002.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_002.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_005.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_005.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_006.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_006.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_010.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_010.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_011.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_011.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_012.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_012.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_013.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_013.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_015.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_015.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_018.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_018.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_020.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_020.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_023.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_023.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_024.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_024.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_025.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_025.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_026.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_026.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_027.jpg
```

```
inflating: yolo-animal-detection-small/train/dogs_and_cats_027.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_029.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_029.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_031.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_031.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_033.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_033.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_034.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_034.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_035.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_035.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_036.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_036.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_038.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_038.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_039.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_039.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_040.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_040.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_042.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_042.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_044.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_044.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_045.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_045.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_046.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_046.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_048.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_048.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_052.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_052.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_053.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_053.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_054.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_054.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_056.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_056.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_057.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_057.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_066.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_066.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_069.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_069.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_070.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_070.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_071.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_071.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_073.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_073.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_075.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_075.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_076.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_076.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_081.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_081.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_083.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_083.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_084.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_084.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_086.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_086.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_088.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_088.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_089.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_089.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_090.jpg
```

```
inflating: yolo-animal-detection-small/train/dogs_and_cats_090.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_092.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_092.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_094.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_094.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_095.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_095.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_097.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_097.xml
inflating: yolo-animal-detection-small/train/dogs_and_cats_098.jpg
inflating: yolo-animal-detection-small/train/dogs_and_cats_098.xml
inflating: yolo-animal-detection-small/train/dogs_groups_002.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_002.xml
inflating: yolo-animal-detection-small/train/dogs_groups_004.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_004.xml
inflating: yolo-animal-detection-small/train/dogs_groups_005.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_005.xml
inflating: yolo-animal-detection-small/train/dogs_groups_007.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_007.xml
inflating: yolo-animal-detection-small/train/dogs_groups_017.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_017.xml
inflating: yolo-animal-detection-small/train/dogs_groups_018.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_018.xml
inflating: yolo-animal-detection-small/train/dogs_groups_019.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_019.xml
inflating: yolo-animal-detection-small/train/dogs_groups_020.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_020.xml
inflating: yolo-animal-detection-small/train/dogs_groups_022.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_022.xml
inflating: yolo-animal-detection-small/train/dogs_groups_026.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_026.xml
inflating: yolo-animal-detection-small/train/dogs_groups_049.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_049.xml
inflating: yolo-animal-detection-small/train/dogs_groups_053.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_053.xml
inflating: yolo-animal-detection-small/train/dogs_groups_057.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_057.xml
inflating: yolo-animal-detection-small/train/dogs_groups_063.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_063.xml
inflating: yolo-animal-detection-small/train/dogs_groups_066.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_066.xml
inflating: yolo-animal-detection-small/train/dogs_groups_077.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_077.xml
inflating: yolo-animal-detection-small/train/dogs_groups_081.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_081.xml
inflating: yolo-animal-detection-small/train/dogs_groups_082.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_082.xml
inflating: yolo-animal-detection-small/train/dogs_groups_085.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_085.xml
inflating: yolo-animal-detection-small/train/dogs_groups_088.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_088.xml
inflating: yolo-animal-detection-small/train/dogs_groups_089.jpg
inflating: yolo-animal-detection-small/train/dogs_groups_089.xml
inflating: yolo-animal-detection-small/train/monkey_groups_000.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_000.xml
inflating: yolo-animal-detection-small/train/monkey_groups_001.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_001.xml
inflating: yolo-animal-detection-small/train/monkey_groups_002.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_002.xml
inflating: yolo-animal-detection-small/train/monkey_groups_003.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_003.xml
inflating: yolo-animal-detection-small/train/monkey_groups_004.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_004.xml
inflating: yolo-animal-detection-small/train/monkey_groups_007.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_007.xml
inflating: yolo-animal-detection-small/train/monkey_groups_009.jpg
```

```
inflating: yolo-animal-detection-small/train/monkey_groups_009.xml
inflating: yolo-animal-detection-small/train/monkey_groups_013.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_013.xml
inflating: yolo-animal-detection-small/train/monkey_groups_014.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_014.xml
inflating: yolo-animal-detection-small/train/monkey_groups_015.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_015.xml
inflating: yolo-animal-detection-small/train/monkey_groups_016.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_016.xml
inflating: yolo-animal-detection-small/train/monkey_groups_017.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_017.xml
inflating: yolo-animal-detection-small/train/monkey_groups_018.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_018.xml
inflating: yolo-animal-detection-small/train/monkey_groups_020.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_020.xml
inflating: yolo-animal-detection-small/train/monkey_groups_021.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_021.xml
inflating: yolo-animal-detection-small/train/monkey_groups_022.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_022.xml
inflating: yolo-animal-detection-small/train/monkey_groups_024.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_024.xml
inflating: yolo-animal-detection-small/train/monkey_groups_025.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_025.xml
inflating: yolo-animal-detection-small/train/monkey_groups_026.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_026.xml
inflating: yolo-animal-detection-small/train/monkey_groups_028.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_028.xml
inflating: yolo-animal-detection-small/train/monkey_groups_030.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_030.xml
inflating: yolo-animal-detection-small/train/monkey_groups_043.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_043.xml
inflating: yolo-animal-detection-small/train/monkey_groups_045.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_045.xml
inflating: yolo-animal-detection-small/train/monkey_groups_050.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_050.xml
inflating: yolo-animal-detection-small/train/monkey_groups_055.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_055.xml
inflating: yolo-animal-detection-small/train/monkey_groups_057.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_057.xml
inflating: yolo-animal-detection-small/train/monkey_groups_059.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_059.xml
inflating: yolo-animal-detection-small/train/monkey_groups_060.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_060.xml
inflating: yolo-animal-detection-small/train/monkey_groups_066.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_066.xml
inflating: yolo-animal-detection-small/train/monkey_groups_070.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_070.xml
inflating: yolo-animal-detection-small/train/monkey_groups_072.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_072.xml
inflating: yolo-animal-detection-small/train/monkey_groups_074.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_074.xml
inflating: yolo-animal-detection-small/train/monkey_groups_078.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_078.xml
inflating: yolo-animal-detection-small/train/monkey_groups_082.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_082.xml
inflating: yolo-animal-detection-small/train/monkey_groups_083.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_083.xml
inflating: yolo-animal-detection-small/train/monkey_groups_084.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_084.xml
inflating: yolo-animal-detection-small/train/monkey_groups_093.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_093.xml
inflating: yolo-animal-detection-small/train/monkey_groups_095.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_095.xml
inflating: yolo-animal-detection-small/train/monkey_groups_097.jpg
inflating: yolo-animal-detection-small/train/monkey_groups_097.xml
inflating: yolo-animal-detection-small/train/monkey_groups_099.jpg
```

```
inflating: yolo-animal-detection-small/train/monkey_groups_099.xml
inflating: yolo-animal-detection-small/train/monkeys_000.jpg
inflating: yolo-animal-detection-small/train/monkeys_000.xml
inflating: yolo-animal-detection-small/train/monkeys_002.jpg
inflating: yolo-animal-detection-small/train/monkeys_002.xml
inflating: yolo-animal-detection-small/train/monkeys_003.jpg
inflating: yolo-animal-detection-small/train/monkeys_003.xml
inflating: yolo-animal-detection-small/train/monkeys_004.jpg
inflating: yolo-animal-detection-small/train/monkeys_004.xml
inflating: yolo-animal-detection-small/train/monkeys_005.jpg
inflating: yolo-animal-detection-small/train/monkeys_005.xml
inflating: yolo-animal-detection-small/train/monkeys_006.jpg
inflating: yolo-animal-detection-small/train/monkeys_006.xml
inflating: yolo-animal-detection-small/train/monkeys_007.jpg
inflating: yolo-animal-detection-small/train/monkeys_007.xml
inflating: yolo-animal-detection-small/train/monkeys_008.jpg
inflating: yolo-animal-detection-small/train/monkeys_008.xml
inflating: yolo-animal-detection-small/train/monkeys_009.jpg
inflating: yolo-animal-detection-small/train/monkeys_009.xml
inflating: yolo-animal-detection-small/train/monkeys_011.jpg
inflating: yolo-animal-detection-small/train/monkeys_011.xml
inflating: yolo-animal-detection-small/train/monkeys_012.jpg
inflating: yolo-animal-detection-small/train/monkeys_012.xml
inflating: yolo-animal-detection-small/train/monkeys_013.jpg
inflating: yolo-animal-detection-small/train/monkeys_013.xml
inflating: yolo-animal-detection-small/train/monkeys_014.jpg
inflating: yolo-animal-detection-small/train/monkeys_014.xml
inflating: yolo-animal-detection-small/train/monkeys_015.jpg
inflating: yolo-animal-detection-small/train/monkeys_015.xml
inflating: yolo-animal-detection-small/train/monkeys_016.jpg
inflating: yolo-animal-detection-small/train/monkeys_016.xml
inflating: yolo-animal-detection-small/train/monkeys_017.jpg
inflating: yolo-animal-detection-small/train/monkeys_017.xml
inflating: yolo-animal-detection-small/train/monkeys_018.jpg
inflating: yolo-animal-detection-small/train/monkeys_018.xml
inflating: yolo-animal-detection-small/train/monkeys_021.jpg
inflating: yolo-animal-detection-small/train/monkeys_021.xml
inflating: yolo-animal-detection-small/train/monkeys_023.jpg
inflating: yolo-animal-detection-small/train/monkeys_023.xml
inflating: yolo-animal-detection-small/train/monkeys_024.jpg
inflating: yolo-animal-detection-small/train/monkeys_024.xml
inflating: yolo-animal-detection-small/train/monkeys_025.jpg
inflating: yolo-animal-detection-small/train/monkeys_025.xml
inflating: yolo-animal-detection-small/train/monkeys_026.jpg
inflating: yolo-animal-detection-small/train/monkeys_026.xml
inflating: yolo-animal-detection-small/train/monkeys_028.jpg
inflating: yolo-animal-detection-small/train/monkeys_028.xml
inflating: yolo-animal-detection-small/train/monkeys_029.jpg
inflating: yolo-animal-detection-small/train/monkeys_029.xml
inflating: yolo-animal-detection-small/train/monkeys_030.jpg
inflating: yolo-animal-detection-small/train/monkeys_030.xml
inflating: yolo-animal-detection-small/train/monkeys_031.jpg
inflating: yolo-animal-detection-small/train/monkeys_031.xml
inflating: yolo-animal-detection-small/train/monkeys_032.jpg
inflating: yolo-animal-detection-small/train/monkeys_032.xml
inflating: yolo-animal-detection-small/train/monkeys_034.jpg
inflating: yolo-animal-detection-small/train/monkeys_034.xml
inflating: yolo-animal-detection-small/train/monkeys_035.jpg
inflating: yolo-animal-detection-small/train/monkeys_035.xml
inflating: yolo-animal-detection-small/train/monkeys_036.jpg
inflating: yolo-animal-detection-small/train/monkeys_036.xml
inflating: yolo-animal-detection-small/train/monkeys_039.jpg
inflating: yolo-animal-detection-small/train/monkeys_039.xml
inflating: yolo-animal-detection-small/train/monkeys_040.jpg
inflating: yolo-animal-detection-small/train/monkeys_040.xml
inflating: yolo-animal-detection-small/train/monkeys_041.jpg
```

```
inflating: yolo-animal-detection-small/train/monkeys_041.xml
inflating: yolo-animal-detection-small/train/monkeys_042.jpg
inflating: yolo-animal-detection-small/train/monkeys_042.xml
inflating: yolo-animal-detection-small/train/monkeys_043.jpg
inflating: yolo-animal-detection-small/train/monkeys_043.xml
inflating: yolo-animal-detection-small/train/monkeys_044.jpg
inflating: yolo-animal-detection-small/train/monkeys_044.xml
inflating: yolo-animal-detection-small/train/monkeys_045.jpg
inflating: yolo-animal-detection-small/train/monkeys_045.xml
inflating: yolo-animal-detection-small/train/monkeys_049.jpg
inflating: yolo-animal-detection-small/train/monkeys_049.xml
inflating: yolo-animal-detection-small/train/monkeys_050.jpg
inflating: yolo-animal-detection-small/train/monkeys_050.xml
inflating: yolo-animal-detection-small/train/monkeys_051.jpg
inflating: yolo-animal-detection-small/train/monkeys_051.xml
inflating: yolo-animal-detection-small/train/monkeys_052.jpg
inflating: yolo-animal-detection-small/train/monkeys_052.xml
inflating: yolo-animal-detection-small/train/monkeys_053.jpg
inflating: yolo-animal-detection-small/train/monkeys_053.xml
inflating: yolo-animal-detection-small/train/monkeys_054.jpg
inflating: yolo-animal-detection-small/train/monkeys_054.xml
inflating: yolo-animal-detection-small/train/monkeys_056.jpg
inflating: yolo-animal-detection-small/train/monkeys_056.xml
inflating: yolo-animal-detection-small/train/monkeys_057.jpg
inflating: yolo-animal-detection-small/train/monkeys_057.xml
inflating: yolo-animal-detection-small/train/monkeys_058.jpg
inflating: yolo-animal-detection-small/train/monkeys_058.xml
inflating: yolo-animal-detection-small/train/monkeys_061.jpg
inflating: yolo-animal-detection-small/train/monkeys_061.xml
inflating: yolo-animal-detection-small/train/monkeys_063.jpg
inflating: yolo-animal-detection-small/train/monkeys_063.xml
inflating: yolo-animal-detection-small/train/monkeys_064.jpg
inflating: yolo-animal-detection-small/train/monkeys_064.xml
inflating: yolo-animal-detection-small/train/monkeys_066.jpg
inflating: yolo-animal-detection-small/train/monkeys_066.xml
inflating: yolo-animal-detection-small/train/monkeys_067.jpg
inflating: yolo-animal-detection-small/train/monkeys_067.xml
inflating: yolo-animal-detection-small/train/monkeys_068.jpg
inflating: yolo-animal-detection-small/train/monkeys_068.xml
inflating: yolo-animal-detection-small/train/monkeys_069.jpg
inflating: yolo-animal-detection-small/train/monkeys_069.xml
inflating: yolo-animal-detection-small/train/monkeys_070.jpg
inflating: yolo-animal-detection-small/train/monkeys_070.xml
inflating: yolo-animal-detection-small/train/monkeys_071.jpg
inflating: yolo-animal-detection-small/train/monkeys_071.xml
inflating: yolo-animal-detection-small/train/monkeys_072.jpg
inflating: yolo-animal-detection-small/train/monkeys_072.xml
inflating: yolo-animal-detection-small/train/monkeys_073.jpg
inflating: yolo-animal-detection-small/train/monkeys_073.xml
inflating: yolo-animal-detection-small/train/monkeys_075.jpg
inflating: yolo-animal-detection-small/train/monkeys_075.xml
inflating: yolo-animal-detection-small/train/monkeys_076.jpg
inflating: yolo-animal-detection-small/train/monkeys_076.xml
inflating: yolo-animal-detection-small/train/monkeys_077.jpg
inflating: yolo-animal-detection-small/train/monkeys_077.xml
inflating: yolo-animal-detection-small/train/monkeys_078.jpg
inflating: yolo-animal-detection-small/train/monkeys_078.xml
inflating: yolo-animal-detection-small/train/monkeys_079.jpg
inflating: yolo-animal-detection-small/train/monkeys_079.xml
inflating: yolo-animal-detection-small/train/monkeys_080.jpg
inflating: yolo-animal-detection-small/train/monkeys_080.xml
inflating: yolo-animal-detection-small/train/monkeys_082.jpg
inflating: yolo-animal-detection-small/train/monkeys_082.xml
inflating: yolo-animal-detection-small/train/monkeys_083.jpg
inflating: yolo-animal-detection-small/train/monkeys_083.xml
inflating: yolo-animal-detection-small/train/monkeys_084.jpg
```

```
  inflating: yolo-animal-detection-small/train/monkeys_084.xml
  inflating: yolo-animal-detection-small/train/monkeys_086.jpg
  inflating: yolo-animal-detection-small/train/monkeys_086.xml
  inflating: yolo-animal-detection-small/train/monkeys_087.jpg
  inflating: yolo-animal-detection-small/train/monkeys_087.xml
  inflating: yolo-animal-detection-small/train/monkeys_089.jpg
  inflating: yolo-animal-detection-small/train/monkeys_089.xml
  inflating: yolo-animal-detection-small/train/monkeys_090.jpg
  inflating: yolo-animal-detection-small/train/monkeys_090.xml
  inflating: yolo-animal-detection-small/train/monkeys_091.jpg
  inflating: yolo-animal-detection-small/train/monkeys_091.xml
  inflating: yolo-animal-detection-small/train/monkeys_092.jpg
  inflating: yolo-animal-detection-small/train/monkeys_092.xml
  inflating: yolo-animal-detection-small/train/monkeys_094.jpg
  inflating: yolo-animal-detection-small/train/monkeys_094.xml
  inflating: yolo-animal-detection-small/train/monkeys_095.jpg
  inflating: yolo-animal-detection-small/train/monkeys_095.xml
  inflating: yolo-animal-detection-small/train/monkeys_097.jpg
  inflating: yolo-animal-detection-small/train/monkeys_097.xml
  inflating: yolo-animal-detection-small/train/monkeys_098.jpg
  inflating: yolo-animal-detection-small/train/monkeys_098.xml
  inflating: yolo-animal-detection-small/train/monkeys_099.jpg
  inflating: yolo-animal-detection-small/train/monkeys_099.xml
  inflating: yolo-animal-detection-small/train/monkeys_100.jpg
  inflating: yolo-animal-detection-small/train/monkeys_100.xml
```

REMOVE UNECESSARY FILES

In [ ]:
```
!rm -r /content/sample_data
!rm /content/yolo-animal-detection-small.zip
!rm /content/train.record
!rm /content/test.record
```

IMPORT LIBRARIES

In [ ]:
```
import os
import math
import imagesize
import cv2 as cv
import numpy as np
import pandas as pd
import random as rn
import tensorflow as tf
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
```

READ TRAINING AND TESTING CSV FILE

In [ ]:
```
train_df = pd.read_csv('/content/train.csv')
train_df = pd.DataFrame(train_df)
test_df = pd.read_csv('/content/test.csv')
test_df = pd.DataFrame(test_df)
train_df.head()
```

Out[ ]:

	filename	width	height	class	xmin	ymin	xmax	ymax
0	cats_001.jpg	474	266	cat	132	1	347	264

1	cats_002.jpg	474	474	cat	176	44	467	433
2	cats_003.jpg	474	314	cat	53	1	397	314
3	cats_004.jpg	474	355	cat	1	1	393	335
4	cats_005.jpg	474	316	cat	80	1	407	316

CONVERT FILENAME TO FULLPATHS

In [ ]:
```
train_df['filename'] = '/content/yolo-animal-detection-small/train/' + train_df['filenam
test_df['filename'] = '/content/yolo-animal-detection-small/test/' + test_df['filename']
train_df.head()
```

Out[ ]:

	filename	width	height	class	xmin	ymin	xmax	ymax
0	/content/yolo-animal-detection-small/train/cat...	474	266	cat	132	1	347	264
1	/content/yolo-animal-detection-small/train/cat...	474	474	cat	176	44	467	433
2	/content/yolo-animal-detection-small/train/cat...	474	314	cat	53	1	397	314
3	/content/yolo-animal-detection-small/train/cat...	474	355	cat	1	1	393	335
4	/content/yolo-animal-detection-small/train/cat...	474	316	cat	80	1	407	316

FILTER BOUNDING BOX ON TRAINING DATAFRAME WITH HIGHEST AREA

In [ ]:
```
train_df = train_df.sample(frac=1)
train_df.reset_index(drop=True, inplace=True)
filenames = []
cats = []
xmins = []
ymins = []
xmaxs = []
ymaxs = []
for i in range(train_df.shape[0]):
    img_path = train_df['filename'][i]
    bboxes = train_df[train_df['filename'] == img_path]
    bboxes.reset_index(drop=True, inplace=True)
    filenames.append(img_path)
    max_area = 0
    index = 0
    for j in range(bboxes.shape[0]):
        xmin = bboxes['xmin'][j]
        ymin = bboxes['ymin'][j]
        xmax = bboxes['xmax'][j]
        ymax = bboxes['ymax'][j]
        area = (xmax - xmin) * (ymax - ymin)
        if area > max_area:
            max_area = area
            index = j
    cats.append(bboxes['class'][index])
    xmins.append(bboxes['xmin'][index])
    ymins.append(bboxes['ymin'][index])
    xmaxs.append(bboxes['xmax'][index])
    ymaxs.append(bboxes['ymax'][index])
train_df = pd.DataFrame({'filename': filenames, 'class': cats, 'xmin': xmins, 'ymin': ym
```

```
train_df = train_df.drop_duplicates(subset='filename', keep='first', ignore_index=True)
train_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 469 entries, 0 to 468
Data columns (total 6 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   filename  469 non-null    object
 1   class     469 non-null    object
 2   xmin      469 non-null    int64 
 3   ymin      469 non-null    int64 
 4   xmax      469 non-null    int64 
 5   ymax      469 non-null    int64 
dtypes: int64(4), object(2)
memory usage: 22.1+ KB
```

FILTER BOUNDING BOX ON TESTING DATAFRAME WITH HIGHEST AREA

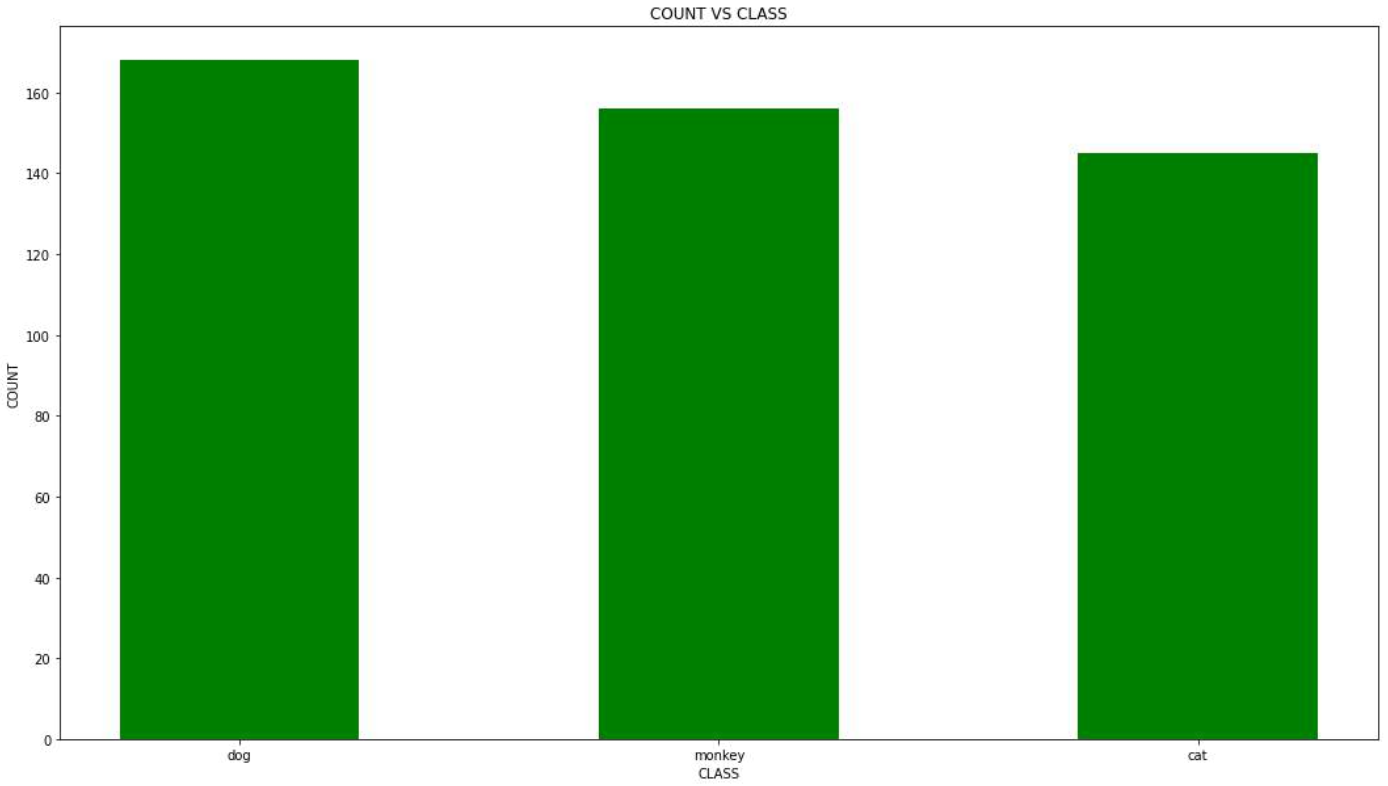
In [ ]:
```
test_df = test_df.sample(frac=1)
test_df.reset_index(drop=True, inplace=True)
filenames = []
cats = []
xmins = []
ymins = []
xmaxs = []
ymaxs = []
for i in range(test_df.shape[0]):
    img_path = test_df['filename'][i]
    bboxes = test_df[test_df['filename'] == img_path]
    bboxes.reset_index(drop=True, inplace=True)
    filenames.append(img_path)
    max_area = 0
    index = 0
    for j in range(bboxes.shape[0]):
        xmin = bboxes['xmin'][j]
        ymin = bboxes['ymin'][j]
        xmax = bboxes['xmax'][j]
        ymax = bboxes['ymax'][j]
        area = (xmax - xmin) * (ymax - ymin)
        if area > max_area:
            max_area = area
            index = j
    cats.append(bboxes['class'][index])
    xmins.append(bboxes['xmin'][index])
    ymins.append(bboxes['ymin'][index])
    xmaxs.append(bboxes['xmax'][index])
    ymaxs.append(bboxes['ymax'][index])
test_df = pd.DataFrame({'filename': filenames, 'class': cats, 'xmin': xmins, 'ymin': ymi
test_df = test_df.drop_duplicates(subset='filename', keep='first', ignore_index=True)
test_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 51 entries, 0 to 50
Data columns (total 6 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   filename  51 non-null     object
 1   class     51 non-null     object
 2   xmin      51 non-null     int64 
 3   ymin      51 non-null     int64 
 4   xmax      51 non-null     int64 
 5   ymax      51 non-null     int64 
```

```
dtypes: int64(4), object(2)
memory usage: 2.5+ KB
```

PLOT COUNT VS CLASS IN TRAINING DATA

In [ ]:
```
class_dict = dict(train_df['class'].value_counts())
cat = list(class_dict.keys())
count = list(class_dict.values())
plt.figure(figsize=(18, 10))
plt.bar(cat, count, color='green', width=0.5)
plt.xlabel('CLASS')
plt.ylabel('COUNT')
plt.title('COUNT VS CLASS')
plt.show()
```



GET STATISTICAL INFORMATION FROM TRAINING DATA

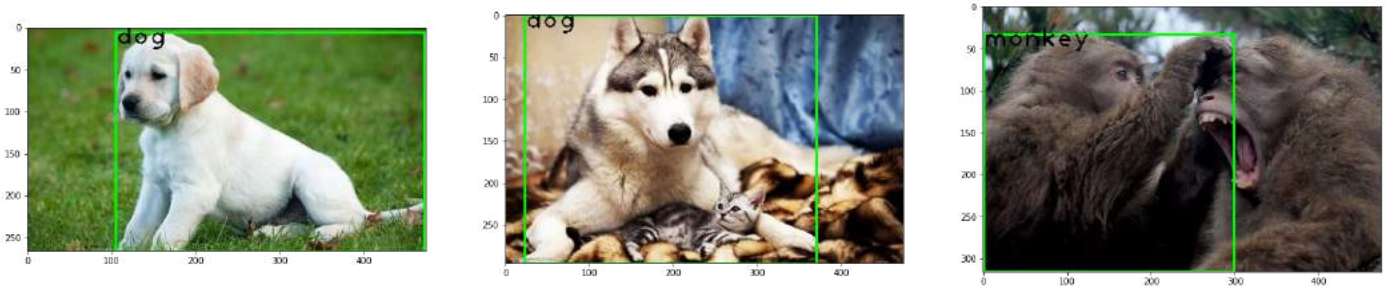
In [ ]:
```
train_df.describe()
```

Out[ ]:

	xmin	ymin	xmax	ymax
count	469.000000	469.000000	469.000000	469.000000
mean	95.076759	44.582090	381.622601	338.820896
std	90.105888	51.569928	91.120848	119.823722
min	1.000000	1.000000	98.000000	100.000000
25%	18.000000	7.000000	336.000000	266.000000
50%	69.000000	27.000000	407.000000	311.000000
75%	150.000000	65.000000	459.000000	355.000000
max	396.000000	392.000000	474.000000	746.000000

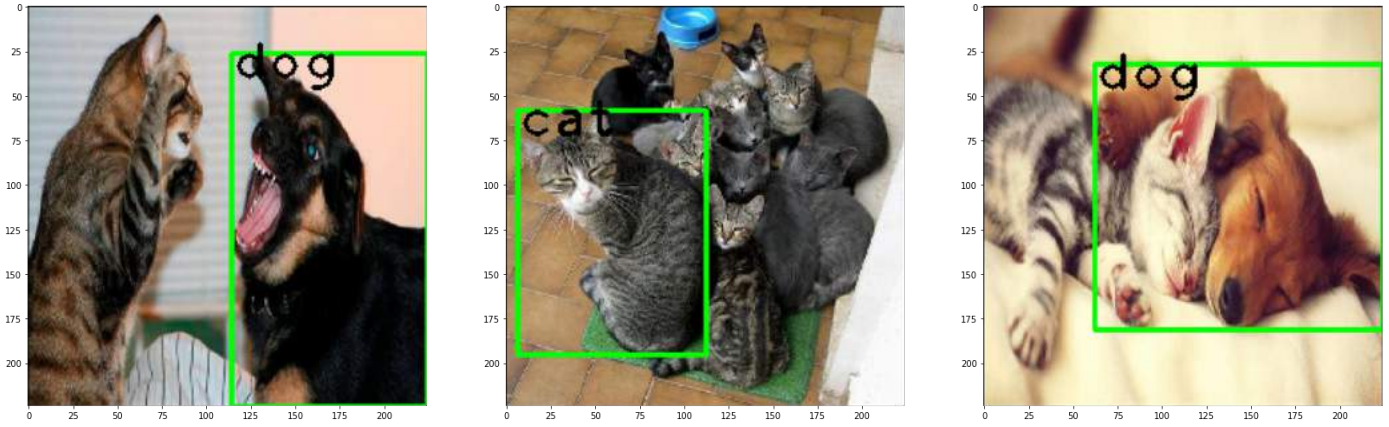
DISPLAY IMAGES AND BOUNDING BOXES

In [ ]:
```
def plot_images_and_bboxes(dataframe):
    rows = 1
    cols = 3
    fig, ax = plt.subplots(rows, cols, figsize=(28, 13))
    for i in range(cols):
        index = rn.randint(0, dataframe.shape[0] - 1)
        img_path = dataframe['filename'][index]
        img = cv.imread(img_path)
        img = cv.cvtColor(img, cv.COLOR_BGR2RGB)
        cat = dataframe['class'][index]
        xmin = int(dataframe['xmin'][index])
        ymin = int(dataframe['ymin'][index])
        xmax = int(dataframe['xmax'][index])
        ymax = int(dataframe['ymax'][index])
        img = cv.rectangle(img, (xmin, ymin), (xmax, ymax), (0, 255, 0), 2)
        img = cv.putText(img, f'{cat}', (xmin, ymin + 15), cv.FONT_HERSHEY_PLAIN, 2, (0,
        ax[i].imshow(img)
    plt.show()
plot_images_and_bboxes(train_df)
```



DISPLAY RESIZED IMAGES AND CORRESPONDING BOUNDING BOXES

In [ ]:
```
def plot_resized_images_and_bboxes(dataframe, img_h, img_w):
    rows = 1
    cols = 3
    fig, ax = plt.subplots(rows, cols, figsize=(28, 13))
    for i in range(cols):
        index = rn.randint(0, dataframe.shape[0] - 1)
        img_path = dataframe['filename'][index]
        img = cv.imread(img_path)
        img = cv.cvtColor(img, cv.COLOR_BGR2RGB)
        h, w, _ = img.shape
        img = cv.resize(img, (img_w, img_h), interpolation=cv.INTER_CUBIC)
        h_ratio = h / img_h
        w_ratio = w / img_w
        cat = dataframe['class'][index]
        xmin = int(dataframe['xmin'][index] / w_ratio)
        ymin = int(dataframe['ymin'][index] / h_ratio)
        xmax = int(dataframe['xmax'][index] / w_ratio)
        ymax = int(dataframe['ymax'][index] / h_ratio)
        img = cv.rectangle(img, (xmin, ymin), (xmax, ymax), (0, 255, 0), 2)
        img = cv.putText(img, f'{cat}', (xmin, ymin + 15), cv.FONT_HERSHEY_PLAIN, 2, (0,
        ax[i].imshow(img)
    plt.show()
H, W, C = 224, 224, 3
plot_resized_images_and_bboxes(train_df, H, W)
```



LABEL ENCODE CLASSES

In [ ]:
```
encoder = LabelEncoder()
train_df['class'] = encoder.fit_transform(train_df['class'])
test_df['class'] = encoder.transform(test_df['class'])
encoder.classes_
```

Out[ ]:
```
array(['cat', 'dog', 'monkey'], dtype=object)
```

SPLIT TESTING DATA INTO VALIDATION AND TESTING

In [ ]:
```
val_df, test_df = train_test_split(test_df, test_size=0.5, random_state=24)
val_df.reset_index(drop=True, inplace=True)
test_df.reset_index(drop=True, inplace=True)
train_df.shape, val_df.shape, test_df.shape
```

Out[ ]:
```
((469, 6), (25, 6), (26, 6))
```

CREATE DATA PIPELINE

In [ ]:
```
class Pipeline(tf.keras.utils.Sequence):
    def __init__(self, dataframe, xcol, ycol, batch_size, img_h, img_w, img_c, classes):
        super(Pipeline, self).__init__()
        self.dataframe = dataframe
        self.xcol = xcol
        self.ycol = ycol
        self.batch_size = batch_size
        self.img_h = img_h
        self.img_w = img_w
        self.img_c = img_c
        self.classes = classes

    def __len__(self):
        return self.dataframe.shape[0] // self.batch_size

    def on_epoch_end(self):
        self.dataframe = self.dataframe.sample(frac=1)
        self.dataframe.reset_index(drop=True, inplace=True)

    def preprocess_img(self, img_path):
        img = tf.io.read_file(img_path)
        img = tf.io.decode_image(img, channels=self.img_c, dtype=tf.float32)
        img = tf.image.resize(img, (self.img_h, self.img_w))
```

```
        img = tf.expand_dims(img, axis=0)
        img = img / 255.
        return img

    def __getitem__(self, item):
        X = []
        Y = []
        for i in range(self.batch_size):
            img_path = self.dataframe[self.xcol][i + (self.batch_size * item)]
            img = self.preprocess_img(img_path)
            X.append(img)
            img = cv.imread(img_path)
            h, w, _ = img.shape
            h_ratio = h / self.img_h
            w_ratio = w / self.img_w
            cat = self.dataframe[self.ycol[0]][i + (self.batch_size * item)]
            cat = list(tf.keras.utils.to_categorical(cat, num_classes=len(self.classes))
            xmin = self.dataframe[self.ycol[1]][i + (self.batch_size * item)] / (w_ratio
            ymin = self.dataframe[self.ycol[2]][i + (self.batch_size * item)] / (h_ratio
            xmax = self.dataframe[self.ycol[3]][i + (self.batch_size * item)] / (w_ratio
            ymax = self.dataframe[self.ycol[4]][i + (self.batch_size * item)] / (h_ratio
            p = 1.0
            cat.extend([p, xmin, ymin, xmax, ymax])
            cat =np.array(cat, dtype='float32')
            cat = cat.reshape(-1, 5 + len(self.classes))
            Y.append(cat)
        X = tf.concat(X, axis=0)
        Y = tf.concat(Y, axis=0)
        return tf.convert_to_tensor(X, dtype=tf.float32), tf.convert_to_tensor(Y, dtype=
B = 5
N = list(encoder.classes_)
train_gen = Pipeline(train_df, 'filename', ['class', 'xmin', 'ymin', 'xmax', 'ymax'], B,
val_gen = Pipeline(val_df, 'filename', ['class', 'xmin', 'ymin', 'xmax', 'ymax'], B, H,
test_gen = Pipeline(test_df, 'filename', ['class', 'xmin', 'ymin', 'xmax', 'ymax'], B, H
train_gen.__getitem__(0)[0].shape, train_gen.__getitem__(0)[1].shape, train_gen.__getite
```

Out[ ]:
```
(TensorShape([5, 224, 224, 3]), TensorShape([5, 8]), 0.0, 1.0)
```

CREATE CUSTOM BLOCK FOR CUSTOM MODEL

In [ ]:
```
class BGBlock(tf.keras.layers.Layer):
    def __init__(self, f, k, s, p, d, pool, stage):
        super(BhavyaBlock, self).__init__(trainable=True, name=f'BGBlock{stage}')
        self.f = f
        self.k = k
        self.s = s
        self.p = p
        self.d = d
        self.pool = pool
        self.stage = stage

    def build(self, input_shape):
        setattr(self, f'conv0_stage{self.stage}', tf.keras.layers.Conv2D(filters=self.f[
                                                                         kernel_size=self
                                                                         strides=self.s[0
                                                                         padding=self.p[0
                                                                         dilation_rate=se
                                                                         kernel_initializ
                                                                         kernel_regulariz
                                                                         activation='relu
                                                                         name=f'conv0_sta
                                                                         input_shape=inpu
        setattr(self, f'leaky0_stage{self.stage}', tf.keras.layers.LeakyReLU(alpha=0.1,
```

```
        setattr(self, f'batch0_stage{self.stage}', tf.keras.layers.BatchNormalization(na
        for i in range(1, len(self.f), 1):
            setattr(self, f'conv{i}_stage{self.stage}',  tf.keras.layers.Conv2D(filters=
                                                                                kernel_siz
                                                                                strides=se
                                                                                padding=se
                                                                                dilation_r
                                                                                kernel_ini
                                                                                kernel_reg
                                                                                activation
                                                                                name=f'con
            # vars(self)[f'leaky{i}_stage{self.stage}'] = tf.keras.layers.LeakyReLU(name
            setattr(self, f'batch{i}_stage{self.stage}',  tf.keras.layers.BatchNormaliza
        self.pool = tf.keras.layers.MaxPooling2D(pool_size=self.pool, strides=2, padding

    def call(self, inputs):
        x = inputs
        for i in range(len(self.f)):
            x = getattr(self, f'conv{i}_stage{self.stage}')(x)
            # x = vars(self)[f'leaky{i}_stage{self.stage}'](x)
            x = getattr(self, f'batch{i}_stage{self.stage}')(x)
        x = self.pool(x)
        return x
```

CREATE CUSTOM MODEL 1

In [ ]:

```
class BGNet(tf.keras.Model):
    def __init__(self, img_h, img_w, img_c, batch_size, classes):
        super(BGNet, self).__init__(name='BGNet')
        self.img_h = img_h
        self.img_w = img_w
        self.img_c = img_c
        self.batch_size = batch_size
        self.classes = classes
        # (224, 224, 3)
        self.block0 = BhavyaBlock(f=[32, 32, 32, 32],
                                  k=[7, 5, 5, 5],
                                  s=[1, 1, 1, 1],
                                  p=['same', 'same', 'same', 'same'],
                                  d=[1, 2, 1, 2],
                                  pool=2,
                                  stage=0)
        # (112, 112, 32)
        self.block1 = BhavyaBlock(f=[64, 64, 64, 64],
                                  k=[5, 5, 5, 3],
                                  s=[1, 1, 1, 1],
                                  p=['same', 'same', 'same', 'same'],
                                  d=[2, 1, 2, 1],
                                  pool=2,
                                  stage=1)
        # (56, 56, 64)
        self.block2 = BhavyaBlock(f=[128, 128, 128, 128],
                                  k=[5, 5, 3, 3],
                                  s=[1, 1, 1, 1],
                                  p=['same', 'same', 'same', 'same'],
                                  d=[1, 2, 2, 1],
                                  pool=2,
                                  stage=2)
        # (28, 28, 128)
        self.block3 = BhavyaBlock(f=[256, 256, 256, 256],
                                  k=[5, 3, 3, 3],
                                  s=[1, 1, 1, 1],
                                  p=['same', 'same', 'same', 'same'],
```

```
                                d=[2, 1, 1, 2],
                                pool=2,
                                stage=3)
        # (14, 14, 512)
        self.block4 = BhavyaBlock(f=[512, 512, 512, 512],
                                k=[3, 3, 3, 1],
                                s=[1, 1, 1, 1],
                                p=['same', 'same', 'same', 'same'],
                                d=[2, 2, 1, 1],
                                pool=2,
                                stage=4)
        # (7, 7, 512)
        self.block5 = BhavyaBlock(f=[1024, 1024, 1024],
                                k=[3, 3, 1],
                                s=[1, 2, 1],
                                p=['same', 'same', 'same'],
                                d=[1, 1, 2],
                                pool=2,
                                stage=5)
        # (4, 4, 1024)
        self.block6 = BhavyaBlock(f=[2048, 2048],
                                k=[1, 1],
                                s=[2, 1],
                                p=['same', 'same', 'same', 'same'],
                                d=[1, 1, 2, 1],
                                pool=2,
                                stage=6)
        # (2, 2, 2048)
        self.flatten = tf.keras.layers.Flatten(name='flatten')
        self.dense1 = tf.keras.layers.Dense(1024, activation='tanh', name='dense1')
        self.dropout1 = tf.keras.layers.Dropout(0.4, name='dropout1')
        self.dense2 = tf.keras.layers.Dense(512, activation='relu', name='dense2')
        self.dropout2 = tf.keras.layers.Dropout(0.3, name='dropout2')
        self.dense3 = tf.keras.layers.Dense(256, activation='sigmoid', name='dense3')
        self.dropout3 = tf.keras.layers.Dropout(0.2, name='dropout3')
        self.final = tf.keras.layers.Dense(5 + len(self.classes), name='final')

    def call(self, input_tensor, training=True):
        x = self.block0(input_tensor)
        x = self.block1(x)
        x = self.block2(x)
        x = self.block3(x)
        x = self.block4(x)
        x = self.block5(x)
        x = self.block6(x)
        x = self.flatten(x)
        x = self.dense1(x)
        x = self.dropout1(x)
        x = self.dense2(x)
        x = self.dropout2(x)
        x = self.dense3(x)
        x = self.dropout3(x)
        x = self.final(x)
        return x

model1 = BhavyaNet(H, W, C, B, N)
model1.build(input_shape=(B, H, W, C))
model1.call(tf.keras.layers.Input(shape=(H, W, C), batch_size=B))
model1.summary(print_fn=tf.print, expand_nested=True, show_trainable=True)
```

```
Model: "BhavyaNet"
_________________________________________________________________________
 Layer (type)                Output Shape              Param #   Trainable
=========================================================================
 BhavyaBlock0 (BhavyaBlock)  (5, 112, 112, 32)         82144     Y
```

```
 BhavyaBlock1 (BhavyaBlock)   (5, 56, 56, 64)          294144    Y

 BhavyaBlock2 (BhavyaBlock)   (5, 28, 28, 128)         911872    Y

 BhavyaBlock3 (BhavyaBlock)   (5, 14, 14, 256)         2593792   Y

 BhavyaBlock4 (BhavyaBlock)   (5, 7, 7, 512)           6170624   Y

 BhavyaBlock5 (BhavyaBlock)   (5, 2, 2, 1024)          15219712  Y

 BhavyaBlock6 (BhavyaBlock)   (5, 1, 1, 2048)          6311936   Y

 flatten (Flatten)            (5, 2048)                0         Y

 dense1 (Dense)               (5, 1024)                2098176   Y

 dropout1 (Dropout)           (5, 1024)                0         Y

 dense2 (Dense)               (5, 512)                 524800    Y

 dropout2 (Dropout)           (5, 512)                 0         Y

 dense3 (Dense)               (5, 256)                 131328    Y

 dropout3 (Dropout)           (5, 256)                 0         Y

 final (Dense)                (5, 8)                   2056      Y

================================================================================
Total params: 34,340,584
Trainable params: 34,318,312
Non-trainable params: 22,272
________________________________________________________________________________
```

CREATING A CUSTOM LOSS

In [ ]:

```python
class CustomLoss1(tf.keras.losses.Loss):
    def __init__(self, classes):
        super(CustomLoss1, self).__init__()
        self.classes = classes

    def unpack_values(self, y):
        c = tf.slice(y, [0, 0], [-1, len(self.classes)])
        p = tf.slice(y, [0, len(self.classes) + 0], [-1, 1])
        x1 = tf.slice(y, [0, len(self.classes) + 1], [-1, 1])
        y1 = tf.slice(y, [0, len(self.classes) + 2], [-1, 1])
        x2 = tf.slice(y, [0, len(self.classes) + 3], [-1, 1])
        y2 = tf.slice(y, [0, len(self.classes) + 4], [-1, 1])
        return c, p, x1, y1, x2, y2

    def call(self, y_true, y_pred):
        c_t, p_t, x1_t, y1_t, x2_t, y2_t = self.unpack_values(y_true)
        c_p, p_p, x1_p, y1_p, x2_p, y2_p = self.unpack_values(y_pred)
        c_loss = tf.keras.losses.mse(c_t, c_p)
        p_loss = tf.keras.losses.mse(p_t, p_p)
        x1_loss = tf.keras.losses.mse(x1_t, x1_p)
        y1_loss = tf.keras.losses.mse(y1_t, y1_p)
        x2_loss = tf.keras.losses.mse(x2_t, x2_p)
        y2_loss = tf.keras.losses.mse(y2_t, y2_p)
        loss = c_loss + p_loss + x1_loss + y1_loss + x2_loss + y2_loss
        return tf.reduce_mean(loss)
loss = CustomLoss1(N)
```

CREATING A CUSTOM METRIC FOR LOCALIZATION

In [ ]:
```
class CustomMetric1(tf.keras.metrics.Metric):
    def __init__(self, name, classes):
        super(CustomMetric1, self).__init__(name=name)
        self.classes = classes
        self.total_metric = self.add_weight(name='total_metric', initializer='zeros')
        self.examples = self.add_weight(name='total_examples', initializer='zeros')

    def unpack_values(self, y):
        c = tf.slice(y, [0, 0], [-1, len(self.classes)])
        p = tf.slice(y, [0, len(self.classes) + 0], [-1, 1])
        x1 = tf.slice(y, [0, len(self.classes) + 1], [-1, 1])
        y1 = tf.slice(y, [0, len(self.classes) + 2], [-1, 1])
        x2 = tf.slice(y, [0, len(self.classes) + 3], [-1, 1])
        y2 = tf.slice(y, [0, len(self.classes) + 4], [-1, 1])
        return c, p, x1, y1, x2, y2

    def get_iou(self, x1_t, y1_t, x2_t, y2_t, x1_p, y1_p, x2_p, y2_p):
        x1_i = tf.maximum(x1_t, x1_p)
        y1_i = tf.maximum(y1_t, y1_p)
        x2_i = tf.minimum(x2_t, x2_p)
        y2_i = tf.minimum(y2_t, y2_p)
        area_i = tf.maximum(0.0, x2_i - x1_i + 1.0) * tf.maximum(0.0, y2_i - y1_i + 1.0)
        area_t = (x2_t - x1_t + 1.0) * (y2_t - y1_t + 1.0)
        area_p = (x2_p - x1_p + 1.0) * (y2_p - y1_p + 1.0)
        area_u = area_t + area_p - area_i
        return area_i / area_u

    def update_state(self, y_true, y_pred, sample_weight=None):
        c_t, p_t, x1_t, y1_t, x2_t, y2_t = self.unpack_values(y_true)
        c_p, p_p, x1_p, y1_p, x2_p, y2_p = self.unpack_values(y_pred)
        iou = self.get_iou(x1_t, y1_t, x2_t, y2_t, x1_p, y1_p, x2_p, y2_p)
        self.total_metric.assign_add(tf.reduce_mean(iou))
        self.examples.assign_add(1.0)

    def result(self):
        return self.total_metric / self.examples

    def reset_state(self):
        self.total_metric = self.add_weight(name='total_metric', initializer='zeros')
        self.examples = self.add_weight(name='total_examples', initializer='zeros')
metric1 = CustomMetric1('iou_metric', N)
```

CREATING A CUSTOM METRIC FOR CONFIDENCE

In [ ]:
```
class CustomMetric2(tf.keras.metrics.Metric):
    def __init__(self, name, classes):
        super(CustomMetric2, self).__init__(name=name)
        self.classes = classes
        self.total_metric = self.add_weight(name='total_metric', initializer='zeros')
        self.examples = self.add_weight(name='total_examples', initializer='zeros')

    def unpack_values(self, y):
        c = tf.slice(y, [0, 0], [-1, len(self.classes)])
        p = tf.slice(y, [0, len(self.classes) + 0], [-1, 1])
        x1 = tf.slice(y, [0, len(self.classes) + 1], [-1, 1])
        y1 = tf.slice(y, [0, len(self.classes) + 2], [-1, 1])
        x2 = tf.slice(y, [0, len(self.classes) + 3], [-1, 1])
        y2 = tf.slice(y, [0, len(self.classes) + 4], [-1, 1])
        return c, p, x1, y1, x2, y2
```

```
    def update_state(self, y_true, y_pred, sample_weight=None):
        c_t, p_t, x1_t, y1_t, x2_t, y2_t = self.unpack_values(y_true)
        c_p, p_p, x1_p, y1_p, x2_p, y2_p = self.unpack_values(y_pred)
        b_acc = tf.keras.metrics.binary_accuracy(p_t, p_p)
        self.total_metric.assign_add(tf.reduce_mean(b_acc))
        self.examples.assign_add(1.0)

    def result(self):
        return self.total_metric / self.examples

    def reset_state(self):
        self.total_metric = self.add_weight(name='total_metric', initializer='zeros')
        self.examples = self.add_weight(name='total_examples', initializer='zeros')
metric2 = CustomMetric2('p_metric', N)
```

CREATING A CUSTOM METRIC FOR CLASSIFICATION

In [ ]:
```
class CustomMetric3(tf.keras.metrics.Metric):
    def __init__(self, name, classes):
        super(CustomMetric3, self).__init__(name=name)
        self.classes = classes
        self.total_metric = self.add_weight(name='total_metric', initializer='zeros')
        self.examples = self.add_weight(name='total_examples', initializer='zeros')

    def unpack_values(self, y):
        c = tf.slice(y, [0, 0], [-1, len(self.classes)])
        p = tf.slice(y, [0, len(self.classes) + 0], [-1, 1])
        x1 = tf.slice(y, [0, len(self.classes) + 1], [-1, 1])
        y1 = tf.slice(y, [0, len(self.classes) + 2], [-1, 1])
        x2 = tf.slice(y, [0, len(self.classes) + 3], [-1, 1])
        y2 = tf.slice(y, [0, len(self.classes) + 4], [-1, 1])
        return c, p, x1, y1, x2, y2

    def update_state(self, y_true, y_pred, sample_weight=None):
        c_t, p_t, x1_t, y1_t, x2_t, y2_t = self.unpack_values(y_true)
        c_p, p_p, x1_p, y1_p, x2_p, y2_p = self.unpack_values(y_pred)
        c_acc = tf.keras.metrics.categorical_accuracy(c_t, c_p)
        self.total_metric.assign_add(tf.reduce_mean(c_acc))
        self.examples.assign_add(1.0)

    def result(self):
        return self.total_metric / self.examples

    def reset_state(self):
        self.total_metric = self.add_weight(name='total_metric', initializer='zeros')
        self.examples = self.add_weight(name='total_examples', initializer='zeros')
metric3 = CustomMetric3('c_metric', N)
```

CREATE A CUSTOM CALLBACK TO PRINT RESIZED IMAGES AND BOUNDING BOXES AFTER EVERY EPOCH

In [ ]:
```
class CustomCallback1(tf.keras.callbacks.Callback):
    def __init__(self, dataframe, xcol, ycol, cols, img_h, img_w, img_c, classes):
        super(CustomCallback1, self).__init__()
        self.dataframe = dataframe
        self.xcol = xcol
        self.ycol = ycol
        self.rows = 1
        self.cols = cols
```

```
        self.img_h = img_h
        self.img_w = img_w
        self.img_c = img_c
        self.classes = classes

    def get_iou(self, x1_t, y1_t, x2_t, y2_t, x1_p, y1_p, x2_p, y2_p):
        x1_i = max(x1_t, x1_p)
        y1_i = max(y1_t, y1_p)
        x2_i = min(x2_t, x2_p)
        y2_i = min(y2_t, y2_p)
        area_i = max(0, x2_i - x1_i) * max(0, y2_i - y1_i)
        area_t = (x2_t - x1_t) * (y2_t - y1_t)
        area_p = (x2_p - x1_p) * (y2_p - y1_p)
        area_u = area_t + area_p - area_i
        return area_i / area_u

    def predict(self, image_path):
        img = tf.io.read_file(image_path)
        img = tf.io.decode_image(img, channels=self.img_c)
        img = tf.image.resize(img, (self.img_h, self.img_w))
        img = tf.expand_dims(img, axis=0)
        img = img / 255.0
        pred = self.model.predict(img)
        return pred

    def on_epoch_end(self, epoch, logs=None):
        fig, ax = plt.subplots(self.rows, self.cols, figsize=(28, 13))
        for i in range(self.cols):
            index = rn.randint(0, self.dataframe.shape[0] - 1)
            img_path = self.dataframe[self.xcol][index]
            img = cv.imread(img_path)
            h, w, _ = img.shape
            w_ratio = w / self.img_w
            h_ratio = h / self.img_h
            cat = self.dataframe[self.ycol[0]][index]
            cat = self.classes[cat]
            x1_t = int(self.dataframe[self.ycol[1]][index] / w_ratio)
            y1_t = int(self.dataframe[self.ycol[2]][index] / h_ratio)
            x2_t = int(self.dataframe[self.ycol[3]][index] / w_ratio)
            y2_t = int(self.dataframe[self.ycol[4]][index] / h_ratio)
            img = cv.cvtColor(img, cv.COLOR_BGR2RGB)
            img = cv.resize(img, (self.img_w, self.img_h))
            img = cv.rectangle(img, (x1_t, y1_t), (x2_t, y2_t), (0, 255, 0), 1)
            # img = cv.putText(img, cat, (x1, y1 + 10), cv.FONT_HERSHEY_PLAIN, 1, (0, 25
            pred = self.predict(img_path)
            c = np.argmax(pred[0][0: len(self.classes)], axis=0)
            conf = round(pred[0][0: len(self.classes)][c], 3)
            c = self.classes[c]
            p = round(pred[0][len(self.classes) + 0], 3)
            x1_p = int(pred[0][len(self.classes) + 1] * self.img_w)
            y1_p = int(pred[0][len(self.classes) + 2] * self.img_h)
            x2_p = int(pred[0][len(self.classes) + 3] * self.img_w)
            y2_p = int(pred[0][len(self.classes) + 4] * self.img_h)
            img = cv.rectangle(img, (x1_p, y1_p), (x2_p, y2_p), (255, 0, 255), 1)
            # img = cv.putText(img, f'{c}: {p}', (x1, y1 + 10), cv.FONT_HERSHEY_PLAIN, 1
            ax[i].imshow(img)
            ax[i].set_ylabel(f'TRUE LABEL: {cat}')
            ax[i].set_xlabel(f'PRED LABEL: {c}, C: {conf}, P: {p}')
            ax[i].set_title(f'IOU: {self.get_iou(x1_t, y1_t, x2_t, y2_t, x1_p, y1_p, x2_
        plt.show()
cb1 = CustomCallback1(val_df, 'filename', ['class', 'xmin', 'ymin', 'xmax', 'ymax'], 4,
```

TEST PREDICTION RANGE

In [ ]:
```
model1.predict(np.random.rand(1, H, W, C))
```

Out[ ]:
```
array([[nan, nan, nan, nan, nan, nan, nan, nan]], dtype=float32)
```

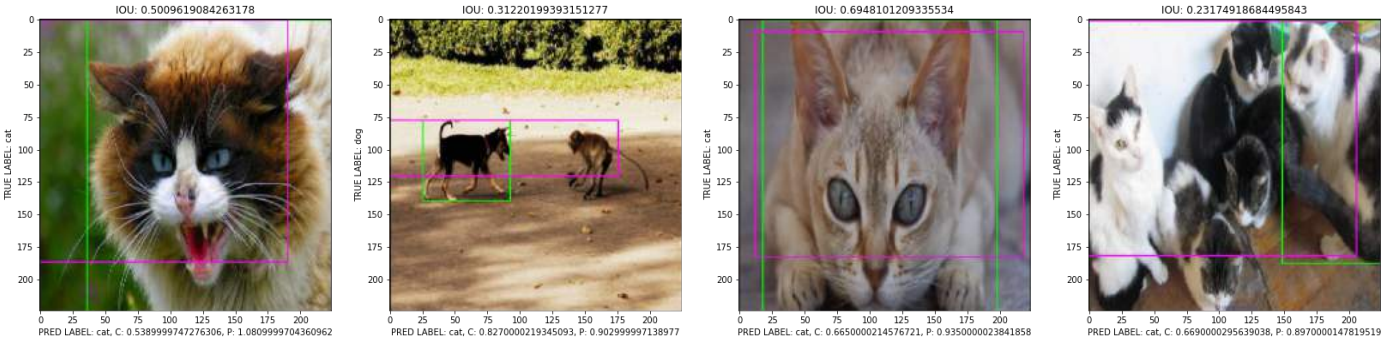
DEFINE NECESSARY OBJECTS AND FUNCTIONS

In [ ]:
```
e = 1000
es = tf.keras.callbacks.EarlyStopping(monitor='val_loss', mode='min', patience=5, restor
rlrop = tf.keras.callbacks.ReduceLROnPlateau(monitor='val_loss', mode='min', patience=3,
metric = [metric1, metric2, metric3]
callback = [es, rlrop, cb1]
def plot_metric(f, m):
    plt.figure(figsize=(14, 8))
    plt.plot(f.history[m])
    plt.plot(f.history['val_' + m])
    plt.title('model ' + m)
    plt.ylabel(m)
    plt.xlabel('epoch')
    plt.legend(['train', 'val'], loc='upper left')
    plt.show()
```

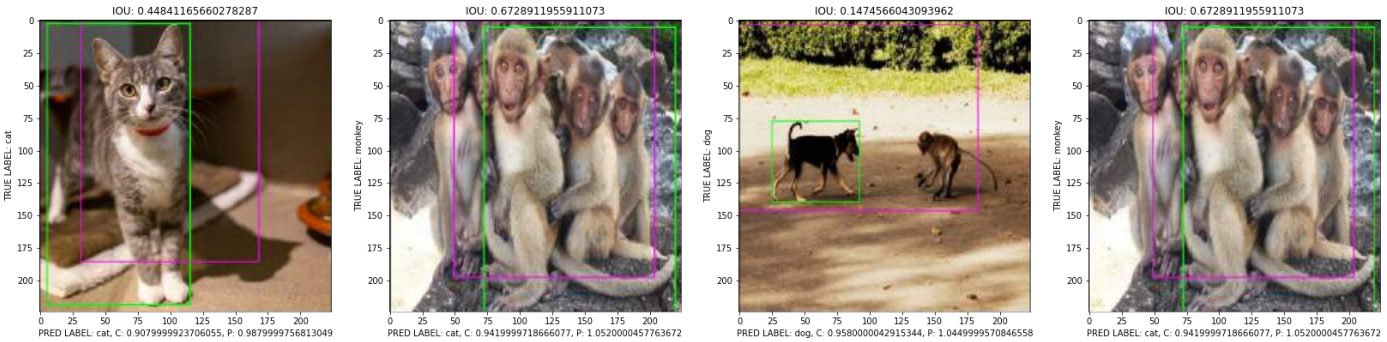
START MODEL 1 TRAINING

In [ ]:
```
model1.compile(optimizer=tf.keras.optimizers.RMSprop(learning_rate=1e-4),
               loss=loss,
               metrics=metric)
fit1 = model1.fit(train_gen,
                  epochs=e,
                  batch_size=B,
                  callbacks=callback,
                  validation_data=val_gen,
                  validation_batch_size=B)
```

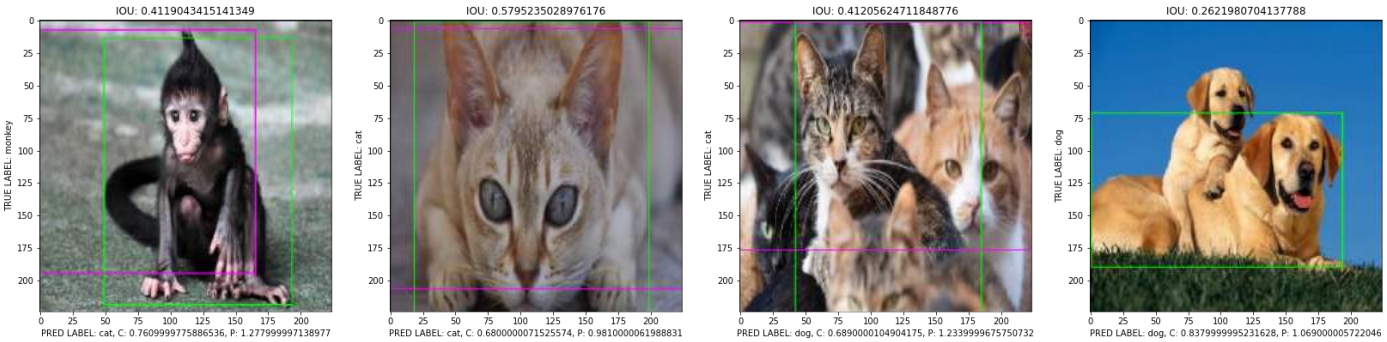
```
Epoch 1/100
93/93 [==============================] - ETA: 0s - loss: 141421.8125 - iou_metric: 0.338
8 - p_metric: 0.6903 - c_metric: 0.3054
```



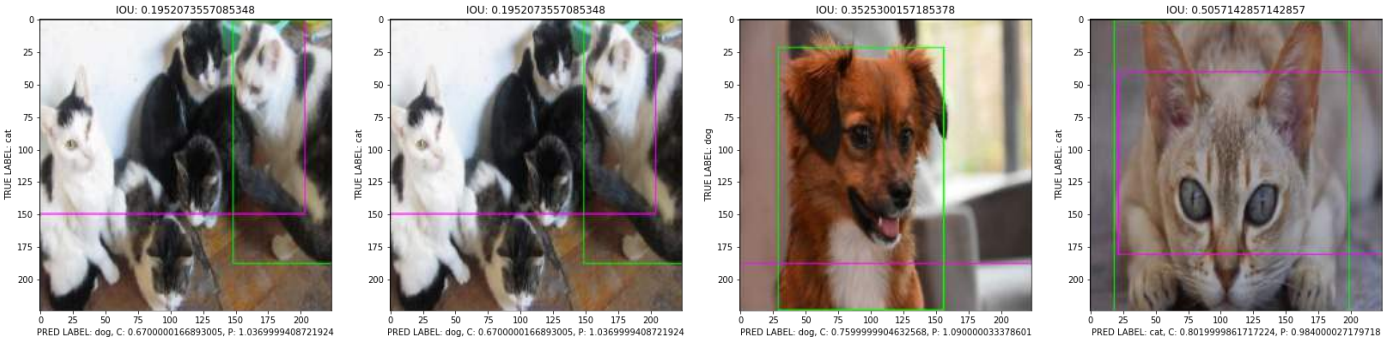

```
93/93 [==============================] - 33s 227ms/step - loss: 141421.8125 - iou_metri
c: 0.3388 - p_metric: 0.6903 - c_metric: 0.3054 - val_loss: 140997.9062 - val_iou_metri
c: 0.6628 - val_p_metric: 1.0000 - val_c_metric: 0.2800 - lr: 1.0000e-04
Epoch 2/100
93/93 [==============================] - ETA: 0s - loss: 140605.2969 - iou_metric: 0.393
9 - p_metric: 0.7753 - c_metric: 0.3011
```



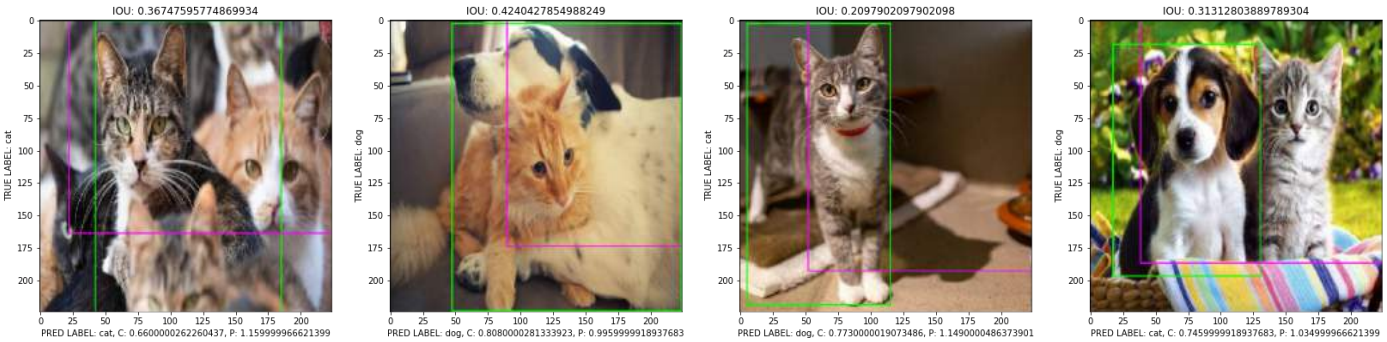

```
93/93 [==============================] - 21s 226ms/step - loss: 140605.2969 - iou_metri
c: 0.3939 - p_metric: 0.7753 - c_metric: 0.3011 - val_loss: 140193.7969 - val_iou_metri
c: 0.6701 - val_p_metric: 1.0000 - val_c_metric: 0.2200 - lr: 1.0000e-04
Epoch 3/100
93/93 [==============================] - ETA: 0s - loss: 139769.5312 - iou_metric: 0.416
7 - p_metric: 0.8093 - c_metric: 0.3075
```




```
93/93 [==============================] - 20s 215ms/step - loss: 139769.5312 - iou_metri
c: 0.4167 - p_metric: 0.8093 - c_metric: 0.3075 - val_loss: 139336.7656 - val_iou_metri
c: 0.6697 - val_p_metric: 1.0000 - val_c_metric: 0.2533 - lr: 1.0000e-04
Epoch 4/100
93/93 [==============================] - ETA: 0s - loss: 138906.0938 - iou_metric: 0.431
4 - p_metric: 0.8355 - c_metric: 0.3177
```

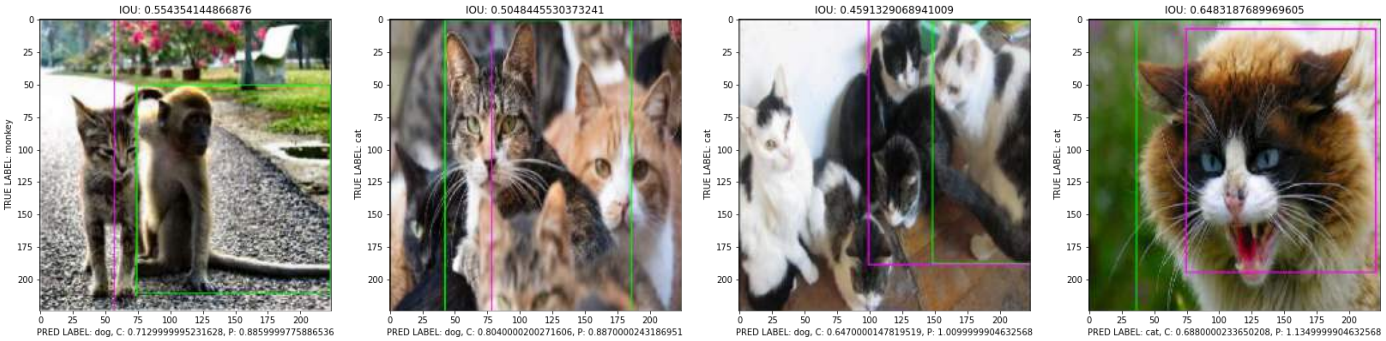



```
93/93 [==============================] - 19s 203ms/step - loss: 138906.0938 - iou_metri
c: 0.4314 - p_metric: 0.8355 - c_metric: 0.3177 - val_loss: 138465.8594 - val_iou_metri
c: 0.6736 - val_p_metric: 1.0000 - val_c_metric: 0.2400 - lr: 1.0000e-04
Epoch 5/100
93/93 [==============================] - ETA: 0s - loss: 138061.9375 - iou_metric: 0.444
8 - p_metric: 0.8516 - c_metric: 0.3247
```

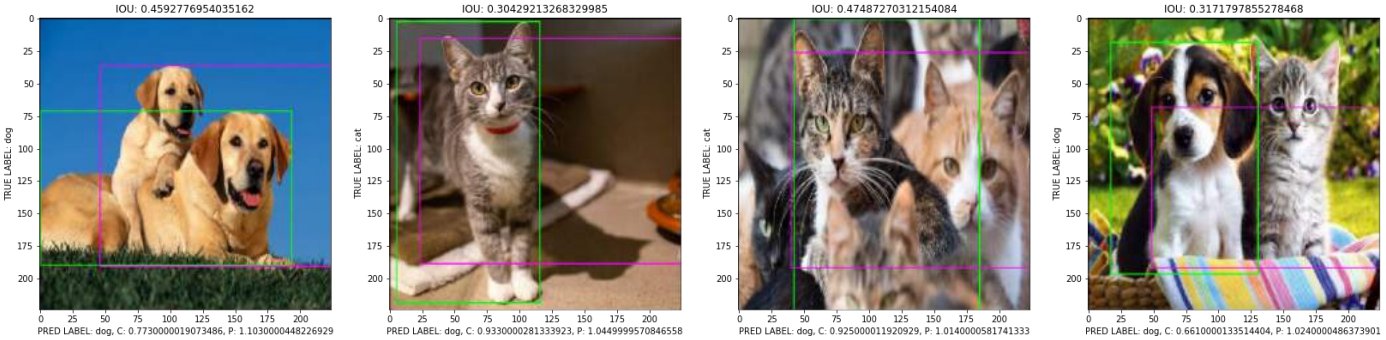



```
93/93 [==============================] - 19s 203ms/step - loss: 138061.9375 - iou_metri
c: 0.4448 - p_metric: 0.8516 - c_metric: 0.3247 - val_loss: 137623.5938 - val_iou_metri
c: 0.6705 - val_p_metric: 1.0000 - val_c_metric: 0.2800 - lr: 1.0000e-04
Epoch 6/100
```

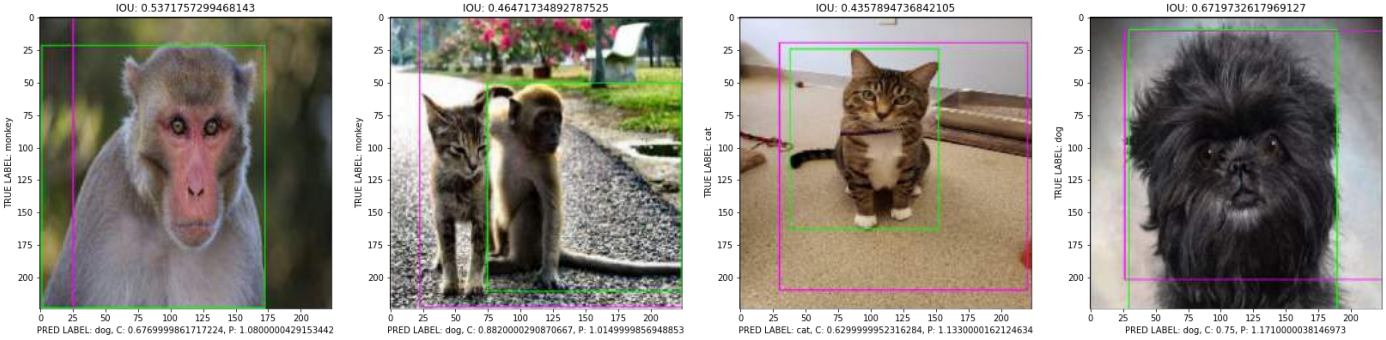
93/93 [==============================] - ETA: 0s - loss: 137213.0312 - iou_metric: 0.455
7 - p_metric: 0.8638 - c_metric: 0.3237



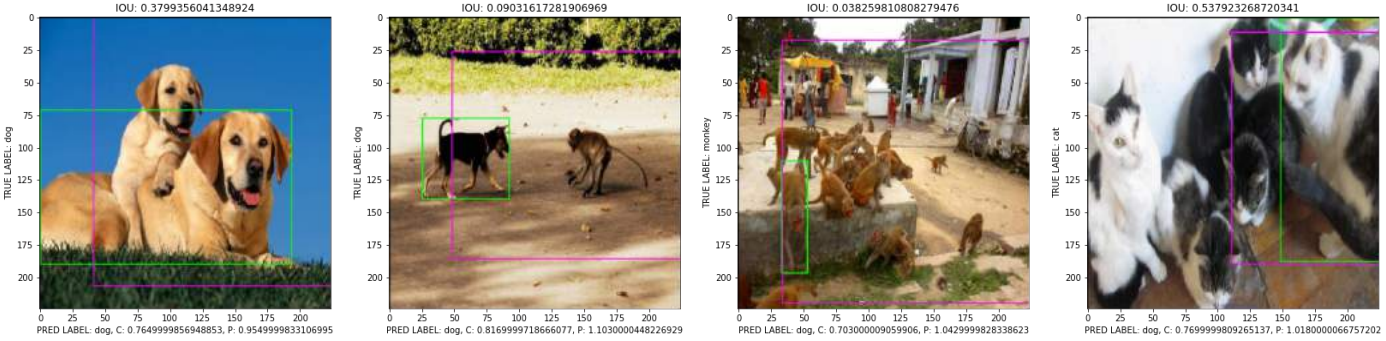
93/93 [==============================] - 19s 209ms/step - loss: 137213.0312 - iou_metri
c: 0.4557 - p_metric: 0.8638 - c_metric: 0.3237 - val_loss: 136784.3750 - val_iou_metri
c: 0.6765 - val_p_metric: 1.0000 - val_c_metric: 0.3000 - lr: 1.0000e-04
Epoch 7/100
93/93 [==============================] - ETA: 0s - loss: 136348.3750 - iou_metric: 0.466
3 - p_metric: 0.8722 - c_metric: 0.3269



93/93 [==============================] - 19s 205ms/step - loss: 136348.3750 - iou_metri
c: 0.4663 - p_metric: 0.8722 - c_metric: 0.3269 - val_loss: 135912.1406 - val_iou_metri
c: 0.6739 - val_p_metric: 1.0000 - val_c_metric: 0.2971 - lr: 1.0000e-04
Epoch 8/100
93/93 [==============================] - ETA: 0s - loss: 135480.9531 - iou_metric: 0.475
8 - p_metric: 0.8815 - c_metric: 0.3347

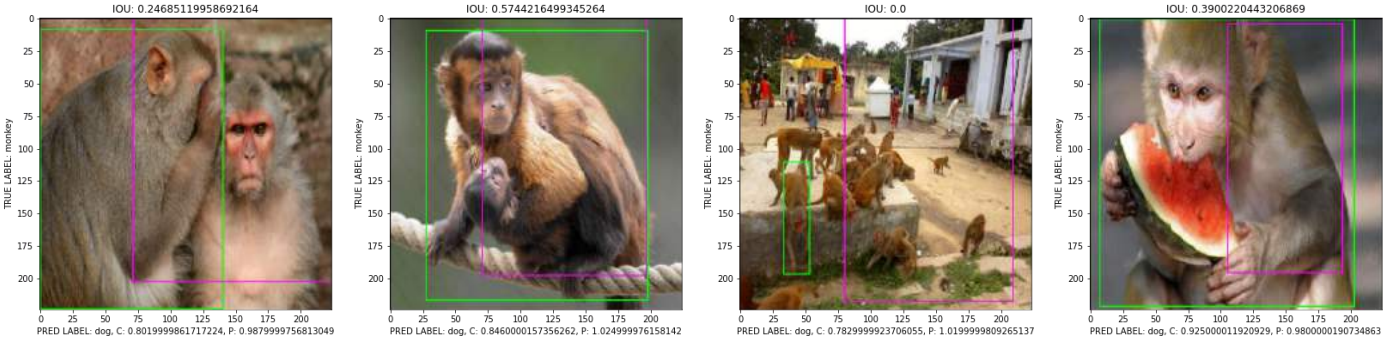


93/93 [==============================] - 19s 206ms/step - loss: 135480.9531 - iou_metri
c: 0.4758 - p_metric: 0.8815 - c_metric: 0.3347 - val_loss: 135040.7031 - val_iou_metri
c: 0.6757 - val_p_metric: 1.0000 - val_c_metric: 0.3050 - lr: 1.0000e-04
Epoch 9/100
93/93 [==============================] - ETA: 0s - loss: 134615.7969 - iou_metric: 0.485
6 - p_metric: 0.8903 - c_metric: 0.3419

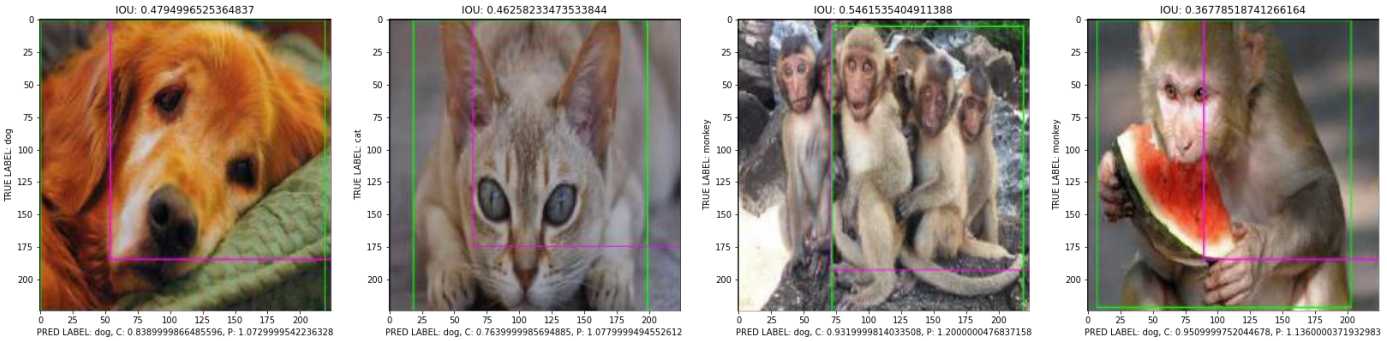


93/93 [==============================] - 19s 206ms/step - loss: 134615.7969 - iou_metri
c: 0.4856 - p_metric: 0.8903 - c_metric: 0.3419 - val_loss: 134160.8750 - val_iou_metri

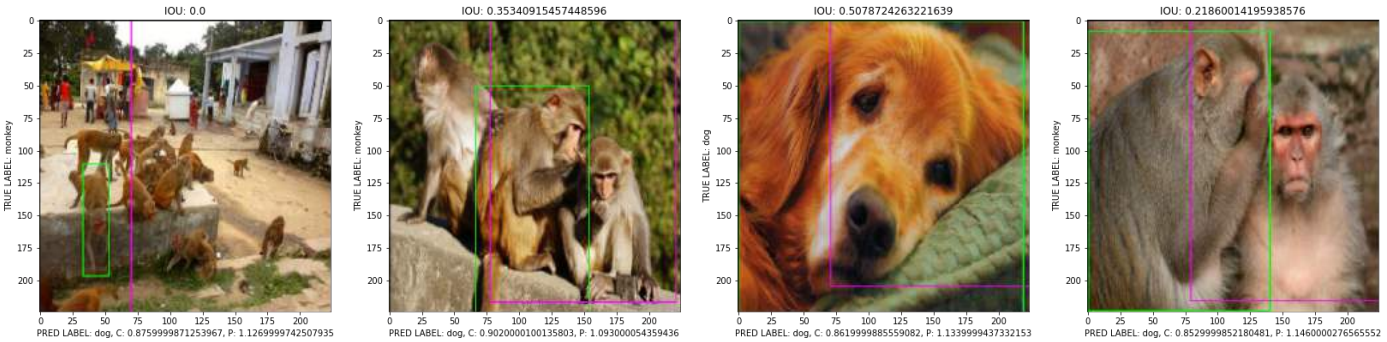
c: 0.6781 - val_p_metric: 1.0000 - val_c_metric: 0.3200 - lr: 1.0000e-04
Epoch 10/100
93/93 [==============================] - ETA: 0s - loss: 133706.9219 - iou_metric: 0.495
0 - p_metric: 0.8985 - c_metric: 0.3404



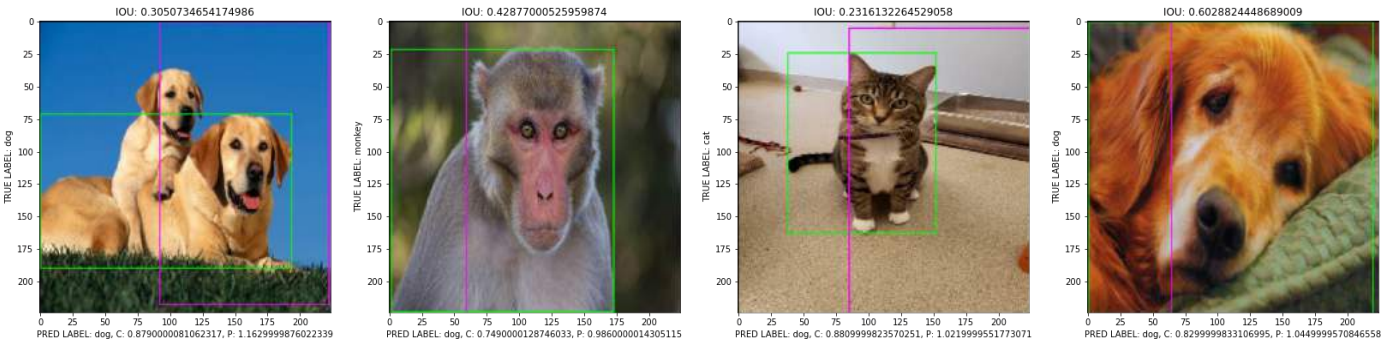
93/93 [==============================] - 19s 206ms/step - loss: 133706.9219 - iou_metri
c: 0.4950 - p_metric: 0.8985 - c_metric: 0.3404 - val_loss: 133244.1406 - val_iou_metri
c: 0.6795 - val_p_metric: 1.0000 - val_c_metric: 0.3320 - lr: 1.0000e-04
Epoch 11/100
93/93 [==============================] - ETA: 0s - loss: 132804.3125 - iou_metric: 0.502
7 - p_metric: 0.9054 - c_metric: 0.3429



93/93 [==============================] - 19s 208ms/step - loss: 132804.3125 - iou_metri
c: 0.5027 - p_metric: 0.9054 - c_metric: 0.3429 - val_loss: 132356.6875 - val_iou_metri
c: 0.6802 - val_p_metric: 1.0000 - val_c_metric: 0.3491 - lr: 1.0000e-04
Epoch 12/100
93/93 [==============================] - ETA: 0s - loss: 131909.8438 - iou_metric: 0.509
6 - p_metric: 0.9118 - c_metric: 0.3446

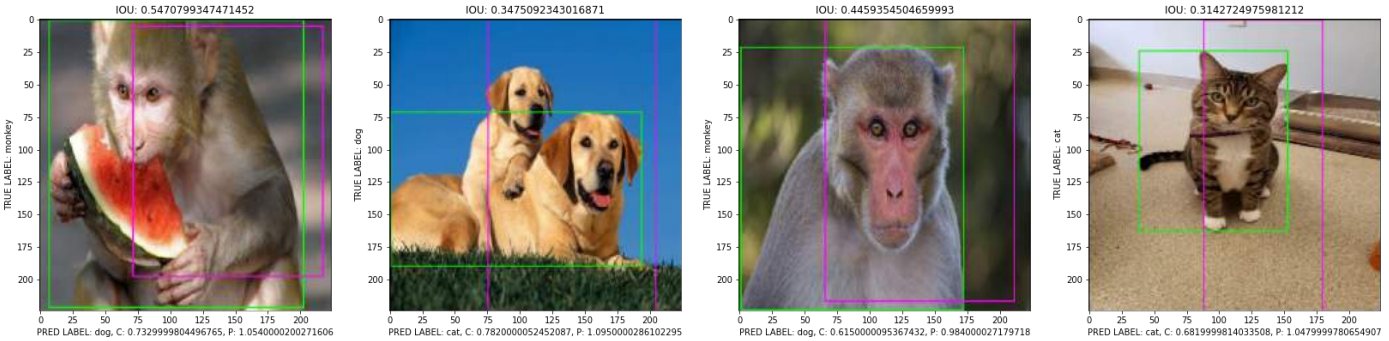


93/93 [==============================] - 19s 209ms/step - loss: 131909.8438 - iou_metri
c: 0.5096 - p_metric: 0.9118 - c_metric: 0.3446 - val_loss: 131444.8438 - val_iou_metri
c: 0.6839 - val_p_metric: 1.0000 - val_c_metric: 0.3500 - lr: 1.0000e-04
Epoch 13/100
93/93 [==============================] - ETA: 0s - loss: 130983.0469 - iou_metric: 0.517
3 - p_metric: 0.9175 - c_metric: 0.3469

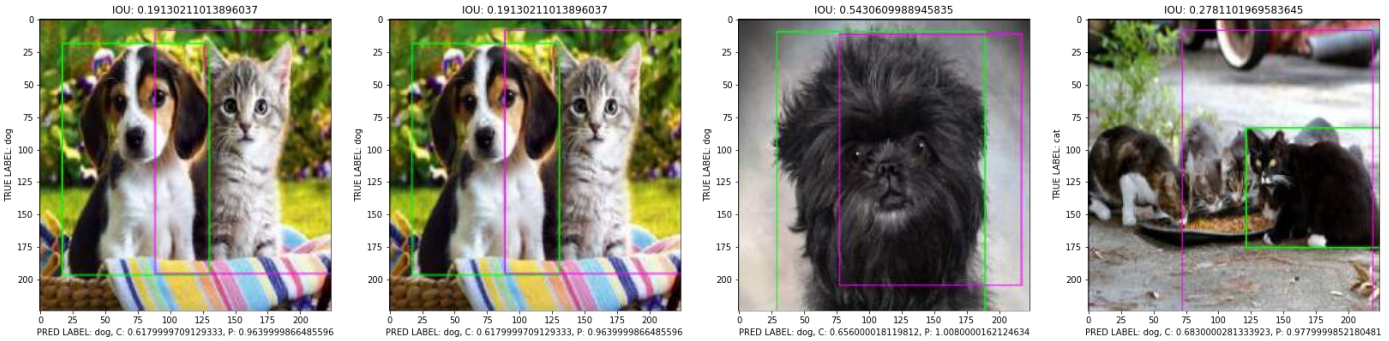


93/93 [==============================] - 19s 208ms/step - loss: 130983.0469 - iou_metric: 0.5173 - p_metric: 0.9175 - c_metric: 0.3469 - val_loss: 130521.6562 - val_iou_metric: 0.6871 - val_p_metric: 1.0000 - val_c_metric: 0.3538 - lr: 1.0000e-04
Epoch 14/100
93/93 [==============================] - ETA: 0s - loss: 130060.1641 - iou_metric: 0.5246 - p_metric: 0.9226 - c_metric: 0.3464

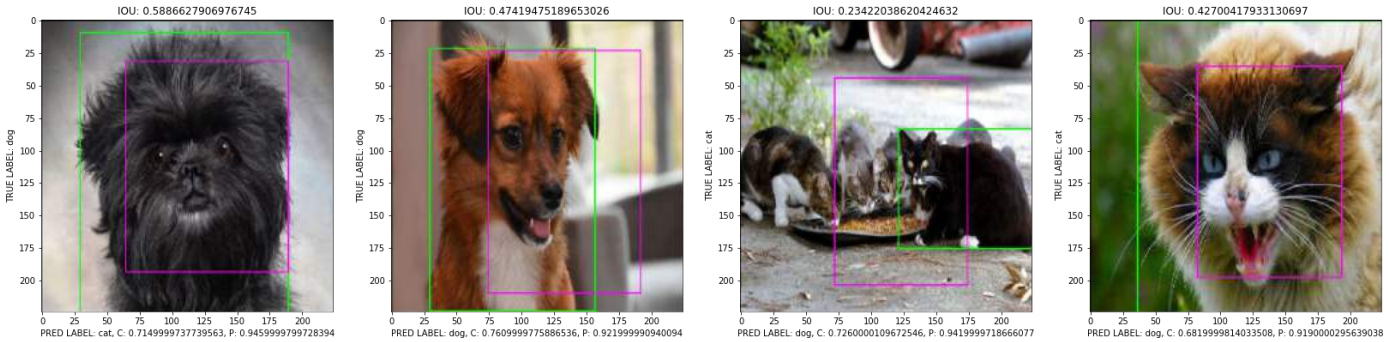
93/93 [==============================] - 20s 210ms/step - loss: 130060.1641 - iou_metric: 0.5246 - p_metric: 0.9226 - c_metric: 0.3464 - val_loss: 129593.5312 - val_iou_metric: 0.6878 - val_p_metric: 1.0000 - val_c_metric: 0.3514 - lr: 1.0000e-04
Epoch 15/100
93/93 [==============================] - ETA: 0s - loss: 129121.2578 - iou_metric: 0.5323 - p_metric: 0.9273 - c_metric: 0.3495



93/93 [==============================] - 19s 207ms/step - loss: 129121.2578 - iou_metric: 0.5323 - p_metric: 0.9273 - c_metric: 0.3495 - val_loss: 128634.8203 - val_iou_metric: 0.6904 - val_p_metric: 1.0000 - val_c_metric: 0.3493 - lr: 1.0000e-04
Epoch 16/100
93/93 [==============================] - ETA: 0s - loss: 128169.5391 - iou_metric: 0.5394 - p_metric: 0.9319 - c_metric: 0.3504



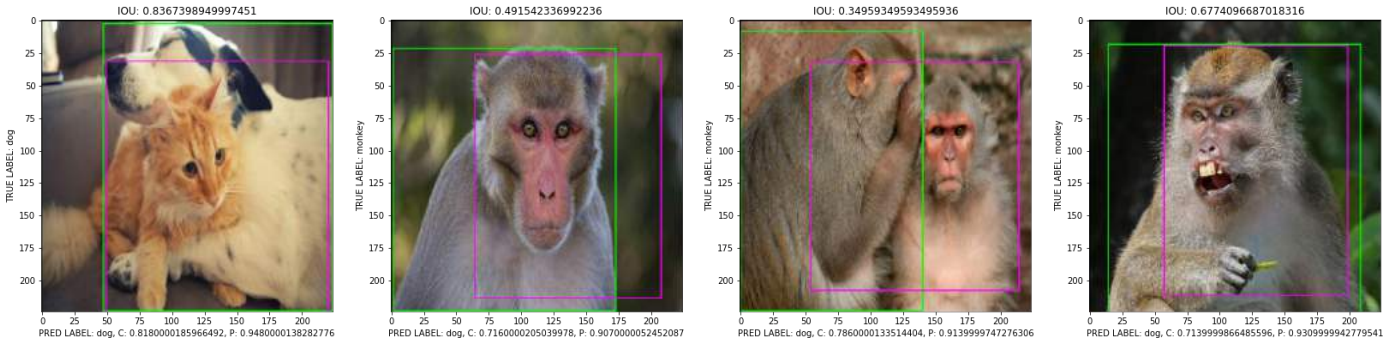
93/93 [==============================] - 19s 207ms/step - loss: 128169.5391 - iou_metric: 0.5394 - p_metric: 0.9319 - c_metric: 0.3504 - val_loss: 127682.6562 - val_iou_metric: 0.6943 - val_p_metric: 1.0000 - val_c_metric: 0.3700 - lr: 1.0000e-04
Epoch 17/100
93/93 [==============================] - ETA: 0s - loss: 127229.0703 - iou_metric: 0.5460 - p_metric: 0.9356 - c_metric: 0.3523



93/93 [==============================] - 19s 208ms/step - loss: 127229.0703 - iou_metric: 0.5460 - p_metric: 0.9356 - c_metric: 0.3523 - val_loss: 126760.2188 - val_iou_metric: 0.6969 - val_p_metric: 1.0000 - val_c_metric: 0.3788 - lr: 1.0000e-04

Epoch 18/100

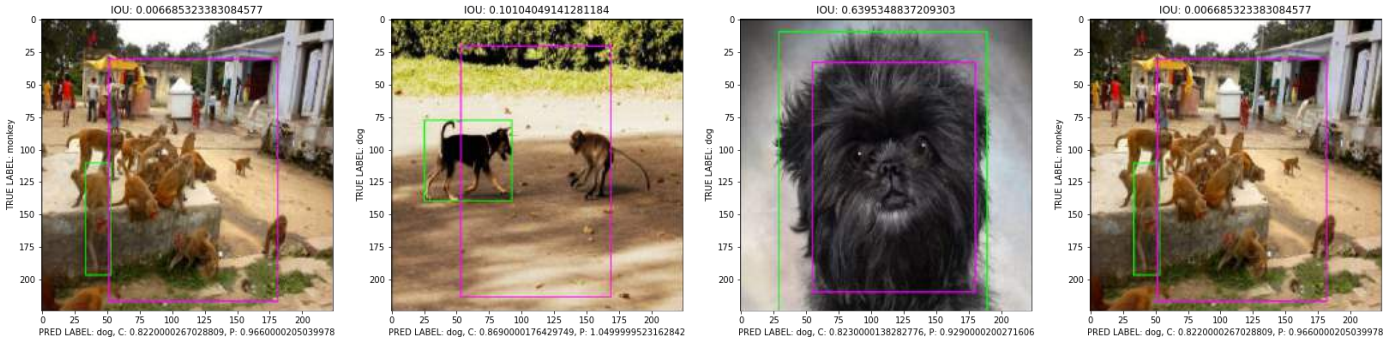
93/93 [==============================] - ETA: 0s - loss: 126300.7656 - iou_metric: 0.5524 - p_metric: 0.9392 - c_metric: 0.3538



93/93 [==============================] - 20s 210ms/step - loss: 126300.7656 - iou_metric: 0.5524 - p_metric: 0.9392 - c_metric: 0.3538 - val_loss: 125836.5312 - val_iou_metric: 0.7002 - val_p_metric: 1.0000 - val_c_metric: 0.3800 - lr: 1.0000e-04

Epoch 19/100

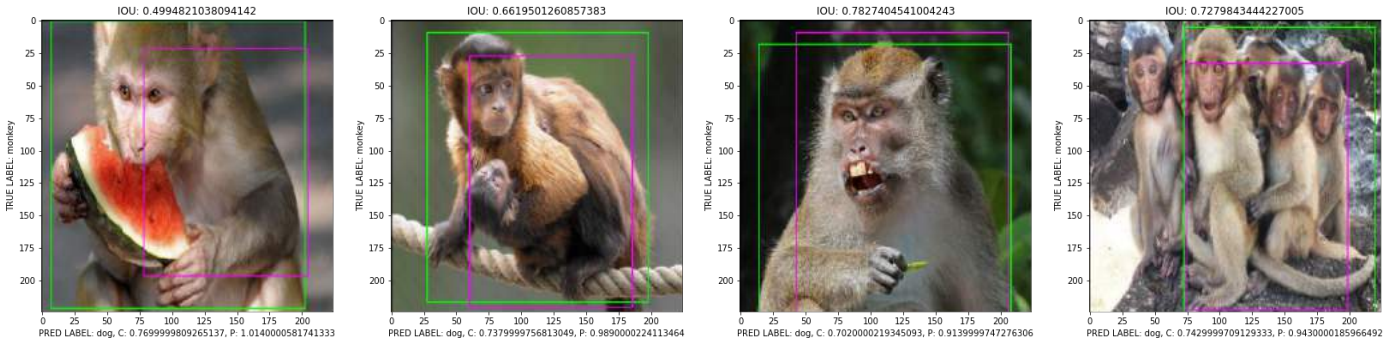
93/93 [==============================] - ETA: 0s - loss: 125373.3359 - iou_metric: 0.5587 - p_metric: 0.9422 - c_metric: 0.3548



93/93 [==============================] - 20s 214ms/step - loss: 125373.3359 - iou_metric: 0.5587 - p_metric: 0.9422 - c_metric: 0.3548 - val_loss: 124898.0000 - val_iou_metric: 0.7006 - val_p_metric: 1.0000 - val_c_metric: 0.3895 - lr: 1.0000e-04

Epoch 20/100

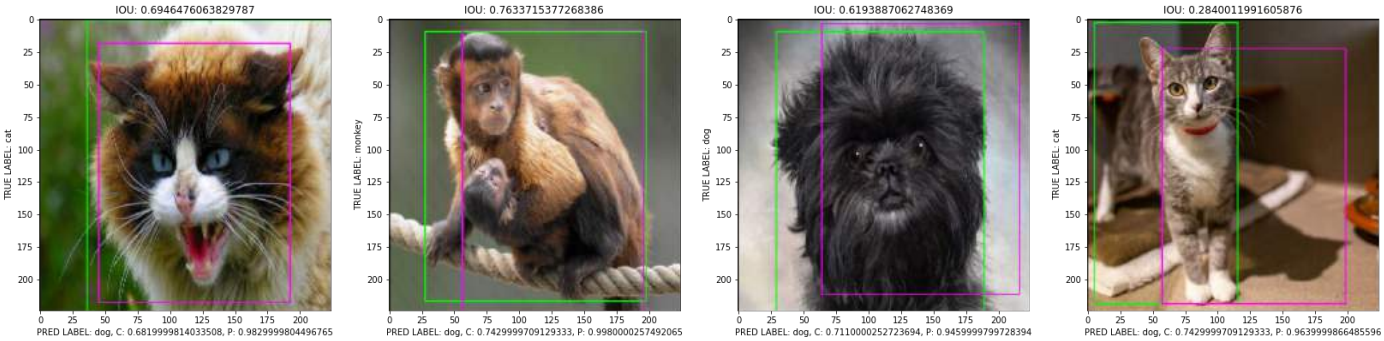
93/93 [==============================] - ETA: 0s - loss: 124438.2891 - iou_metric: 0.5647 - p_metric: 0.9451 - c_metric: 0.3554



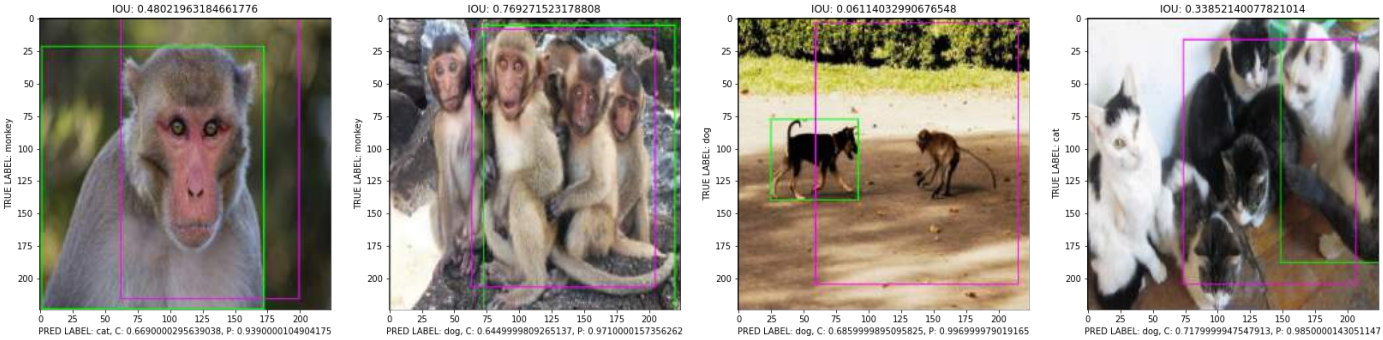
93/93 [==============================] - 20s 217ms/step - loss: 124438.2891 - iou_metric: 0.5647 - p_metric: 0.9451 - c_metric: 0.3554 - val_loss: 123963.6562 - val_iou_metric: 0.7026 - val_p_metric: 1.0000 - val_c_metric: 0.3960 - lr: 1.0000e-04

Epoch 21/100

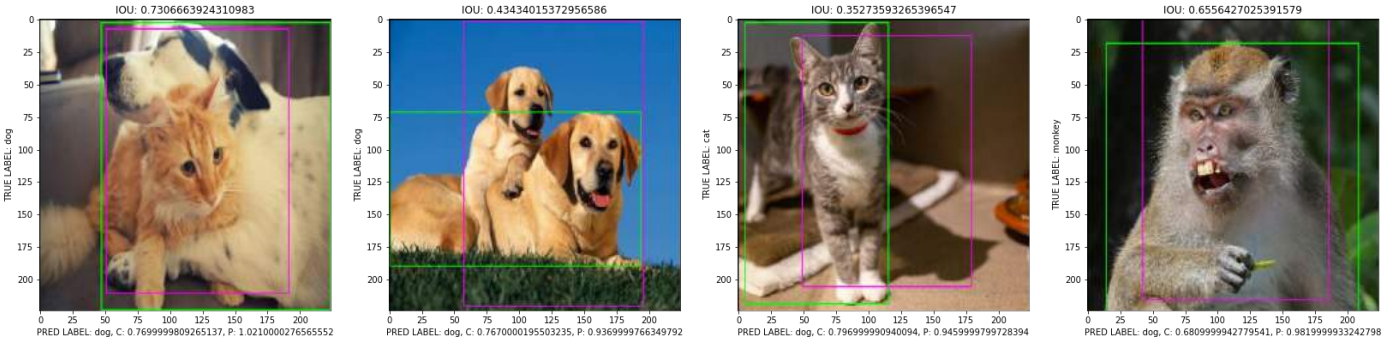
93/93 [==============================] - ETA: 0s - loss: 123507.1016 - iou_metric: 0.570
0 - p_metric: 0.9477 - c_metric: 0.3570



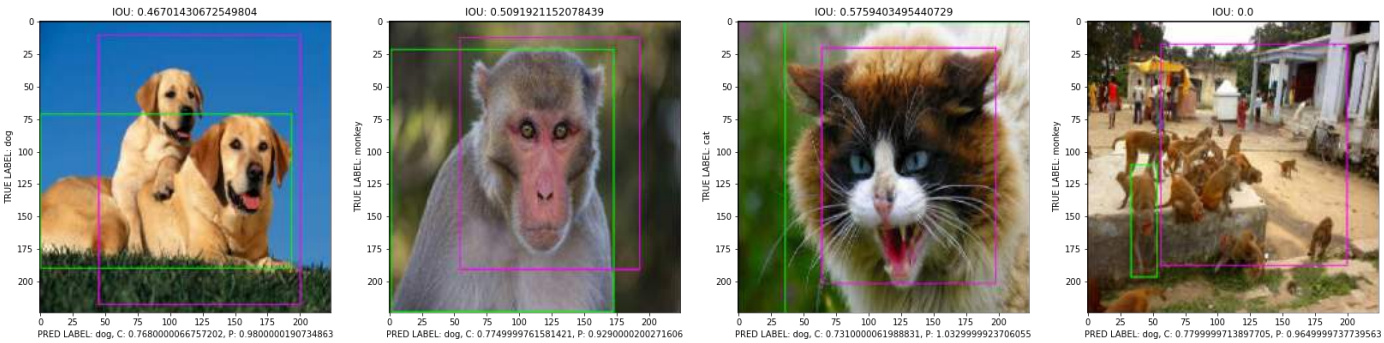
93/93 [==============================] - 20s 218ms/step - loss: 123507.1016 - iou_metri
c: 0.5700 - p_metric: 0.9477 - c_metric: 0.3570 - val_loss: 123043.7578 - val_iou_metri
c: 0.7042 - val_p_metric: 1.0000 - val_c_metric: 0.4000 - lr: 1.0000e-04
Epoch 22/100
93/93 [==============================] - ETA: 0s - loss: 122585.9531 - iou_metric: 0.575
4 - p_metric: 0.9500 - c_metric: 0.3577



93/93 [==============================] - 20s 218ms/step - loss: 122585.9531 - iou_metri
c: 0.5754 - p_metric: 0.9500 - c_metric: 0.3577 - val_loss: 122117.6094 - val_iou_metri
c: 0.7065 - val_p_metric: 1.0000 - val_c_metric: 0.4091 - lr: 1.0000e-04
Epoch 23/100
93/93 [==============================] - ETA: 0s - loss: 121655.0547 - iou_metric: 0.580
4 - p_metric: 0.9522 - c_metric: 0.3583

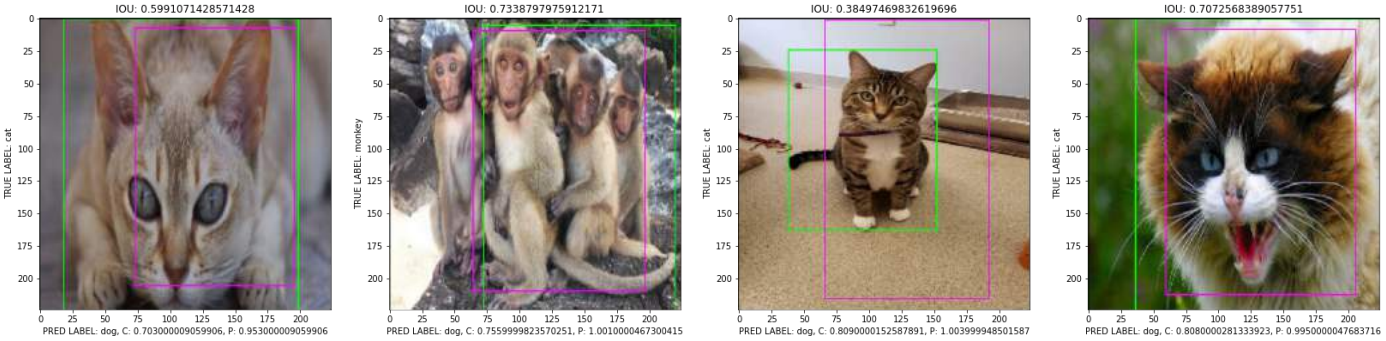


93/93 [==============================] - 20s 219ms/step - loss: 121655.0547 - iou_metri
c: 0.5804 - p_metric: 0.9522 - c_metric: 0.3583 - val_loss: 121185.1094 - val_iou_metri
c: 0.7089 - val_p_metric: 1.0000 - val_c_metric: 0.4104 - lr: 1.0000e-04
Epoch 24/100
93/93 [==============================] - ETA: 0s - loss: 120726.8359 - iou_metric: 0.585
0 - p_metric: 0.9542 - c_metric: 0.3577

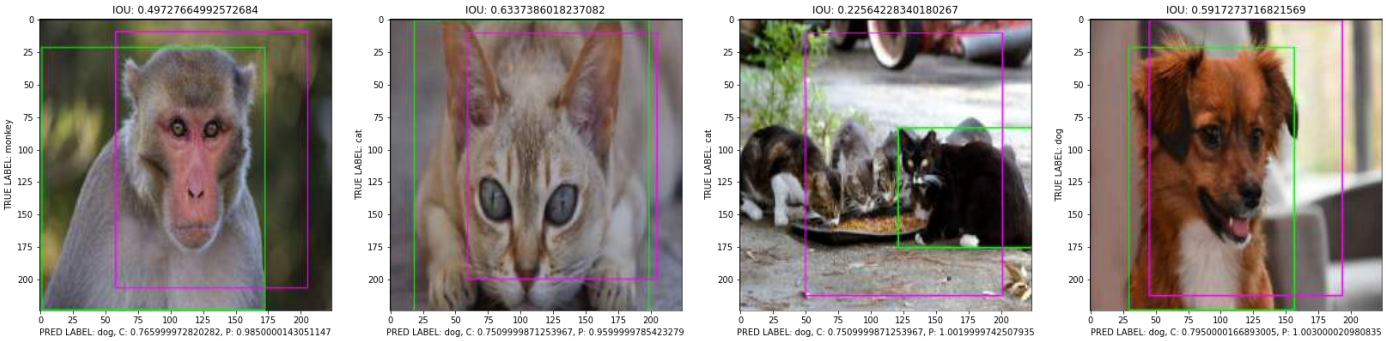


93/93 [==============================] - 20s 219ms/step - loss: 120726.8359 - iou_metri
c: 0.5850 - p_metric: 0.9542 - c_metric: 0.3577 - val_loss: 120255.7266 - val_iou_metri

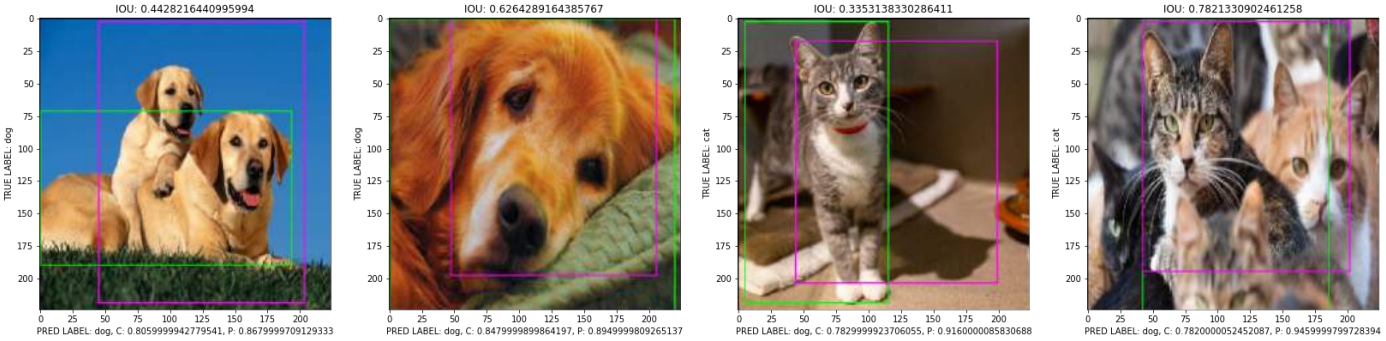
c: 0.7104 - val_p_metric: 1.0000 - val_c_metric: 0.4150 - lr: 1.0000e-04
Epoch 25/100
93/93 [==============================] - ETA: 0s - loss: 119805.1641 - iou_metric: 0.589
4 - p_metric: 0.9560 - c_metric: 0.3583



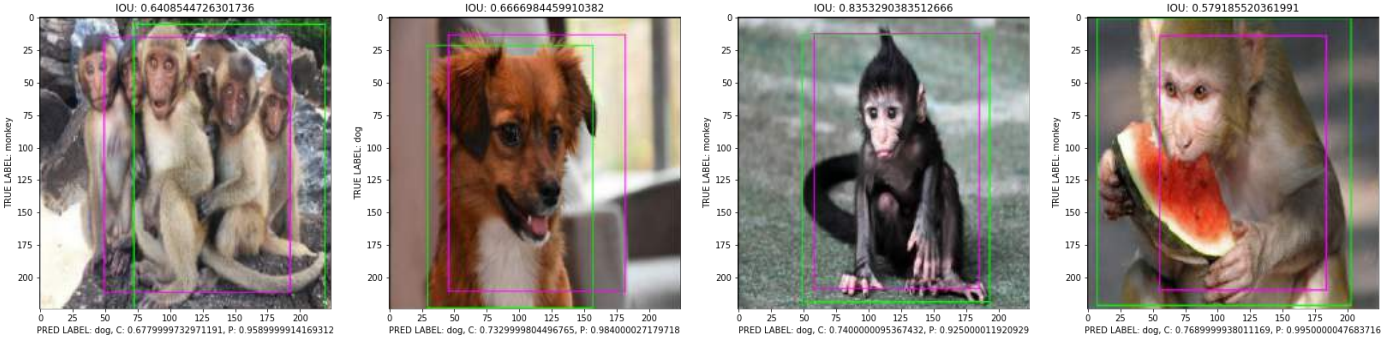
93/93 [==============================] - 21s 222ms/step - loss: 119805.1641 - iou_metri
c: 0.5894 - p_metric: 0.9560 - c_metric: 0.3583 - val_loss: 119347.2266 - val_iou_metri
c: 0.7120 - val_p_metric: 1.0000 - val_c_metric: 0.4224 - lr: 1.0000e-04
Epoch 26/100
93/93 [==============================] - ETA: 0s - loss: 118891.8281 - iou_metric: 0.593
5 - p_metric: 0.9577 - c_metric: 0.3605



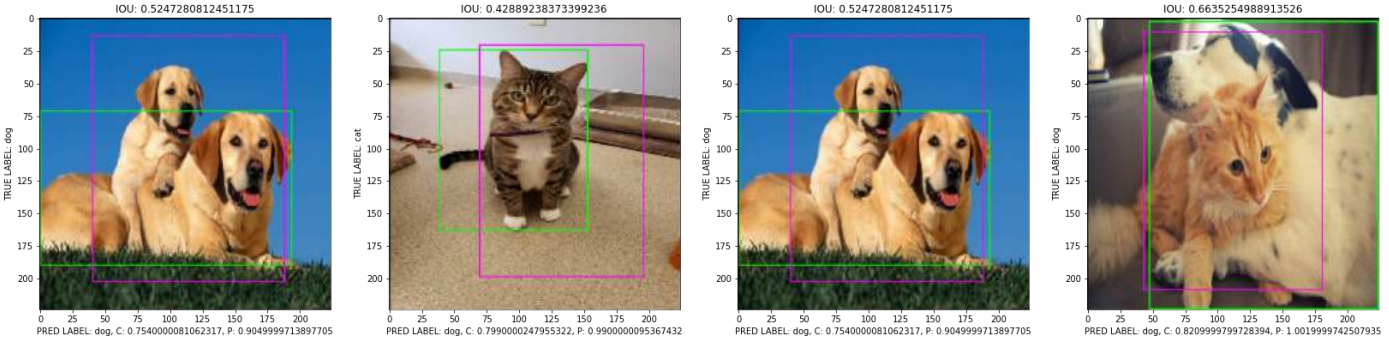
93/93 [==============================] - 21s 221ms/step - loss: 118891.8281 - iou_metri
c: 0.5935 - p_metric: 0.9577 - c_metric: 0.3605 - val_loss: 118422.5000 - val_iou_metri
c: 0.7137 - val_p_metric: 1.0000 - val_c_metric: 0.4215 - lr: 1.0000e-04
Epoch 27/100
93/93 [==============================] - ETA: 0s - loss: 117971.8828 - iou_metric: 0.597
4 - p_metric: 0.9592 - c_metric: 0.3629



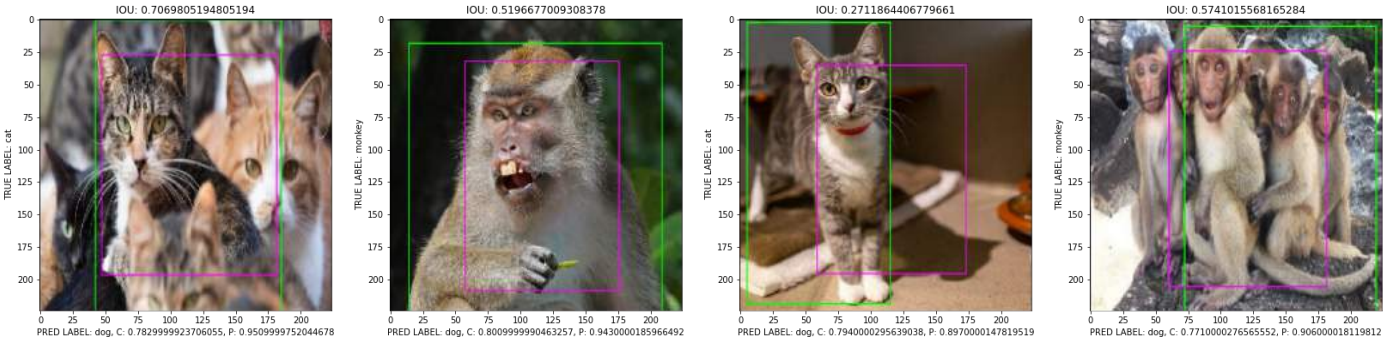
93/93 [==============================] - 20s 217ms/step - loss: 117971.8828 - iou_metri
c: 0.5974 - p_metric: 0.9592 - c_metric: 0.3629 - val_loss: 117510.2031 - val_iou_metri
c: 0.7154 - val_p_metric: 1.0000 - val_c_metric: 0.4193 - lr: 1.0000e-04
Epoch 28/100
93/93 [==============================] - ETA: 0s - loss: 117051.7812 - iou_metric: 0.601
3 - p_metric: 0.9607 - c_metric: 0.3643



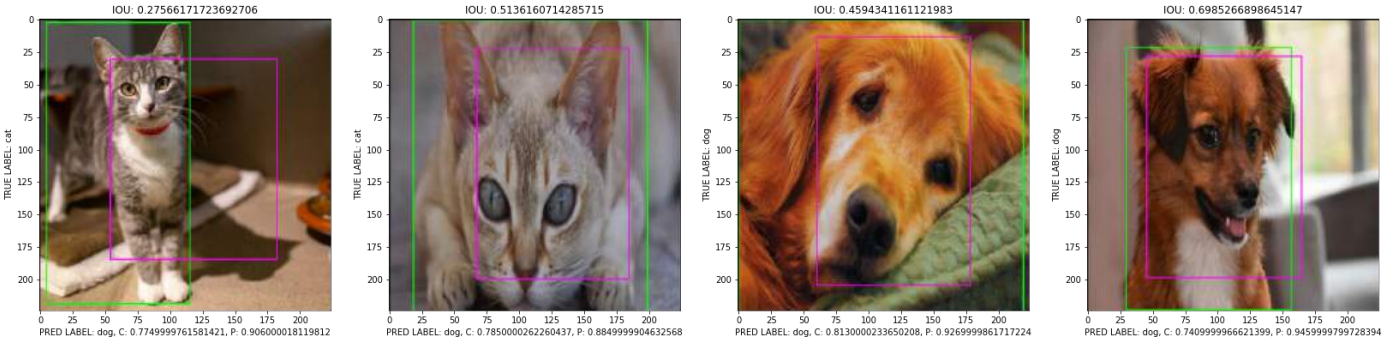
93/93 [==============================] - 20s 219ms/step - loss: 117051.7812 - iou_metric: 0.6013 - p_metric: 0.9607 - c_metric: 0.3643 - val_loss: 116588.5000 - val_iou_metric: 0.7163 - val_p_metric: 1.0000 - val_c_metric: 0.4157 - lr: 1.0000e-04
Epoch 29/100
93/93 [==============================] - ETA: 0s - loss: 116129.0859 - iou_metric: 0.6048 - p_metric: 0.9620 - c_metric: 0.3665



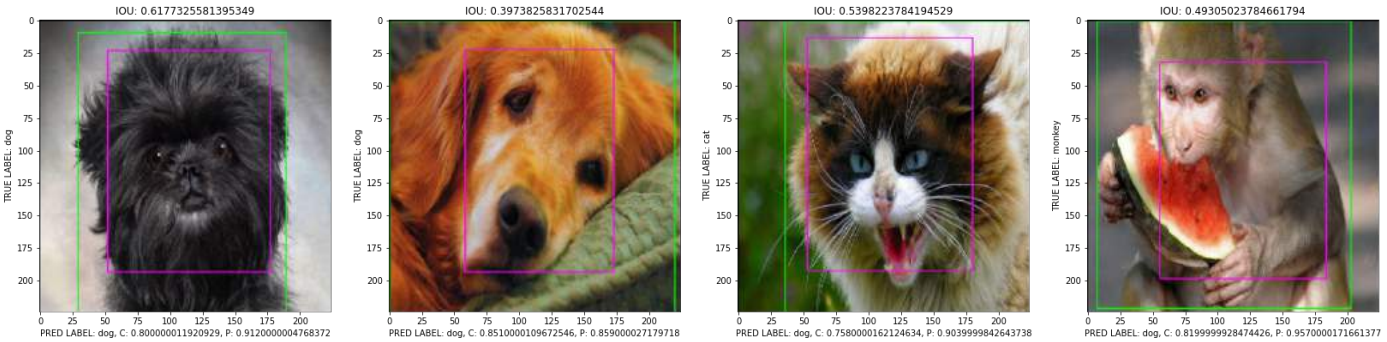
93/93 [==============================] - 20s 218ms/step - loss: 116129.0859 - iou_metric: 0.6048 - p_metric: 0.9620 - c_metric: 0.3665 - val_loss: 115664.3906 - val_iou_metric: 0.7180 - val_p_metric: 1.0000 - val_c_metric: 0.4097 - lr: 1.0000e-04
Epoch 30/100
93/93 [==============================] - ETA: 0s - loss: 115215.8203 - iou_metric: 0.6083 - p_metric: 0.9633 - c_metric: 0.3673



93/93 [==============================] - 20s 215ms/step - loss: 115215.8203 - iou_metric: 0.6083 - p_metric: 0.9633 - c_metric: 0.3673 - val_loss: 114756.8516 - val_iou_metric: 0.7189 - val_p_metric: 1.0000 - val_c_metric: 0.4133 - lr: 1.0000e-04
Epoch 31/100
93/93 [==============================] - ETA: 0s - loss: 114304.3672 - iou_metric: 0.6117 - p_metric: 0.9645 - c_metric: 0.3676



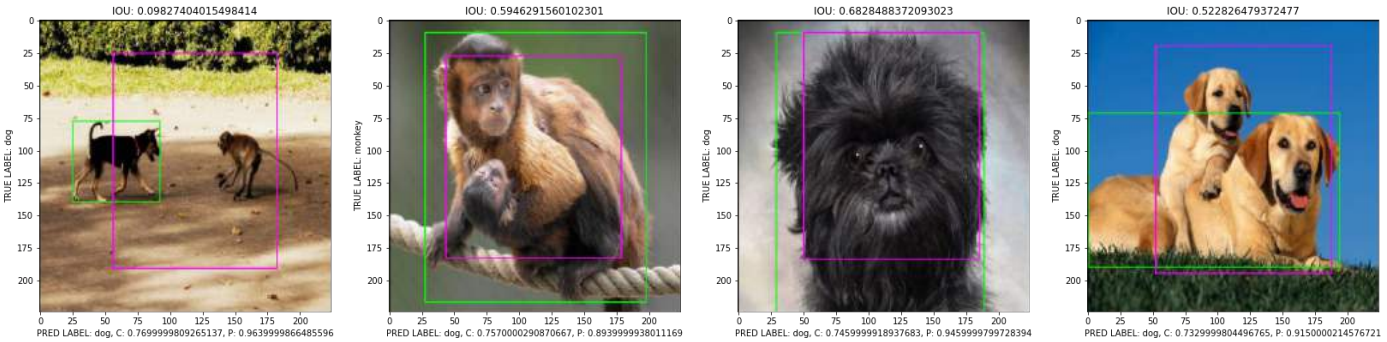
93/93 [==============================] - 20s 217ms/step - loss: 114304.3672 - iou_metric: 0.6117 - p_metric: 0.9645 - c_metric: 0.3676 - val_loss: 113848.5781 - val_iou_metric: 0.7199 - val_p_metric: 1.0000 - val_c_metric: 0.4142 - lr: 1.0000e-04
Epoch 32/100
93/93 [==============================] - ETA: 0s - loss: 113402.2500 - iou_metric: 0.6149 - p_metric: 0.9656 - c_metric: 0.3688



93/93 [==============================] - 20s 220ms/step - loss: 113402.2500 - iou_metric: 0.6149 - p_metric: 0.9656 - c_metric: 0.3688 - val_loss: 112951.6562 - val_iou_metric: 0.7204 - val_p_metric: 1.0000 - val_c_metric: 0.4163 - lr: 1.0000e-04

Epoch 33/100

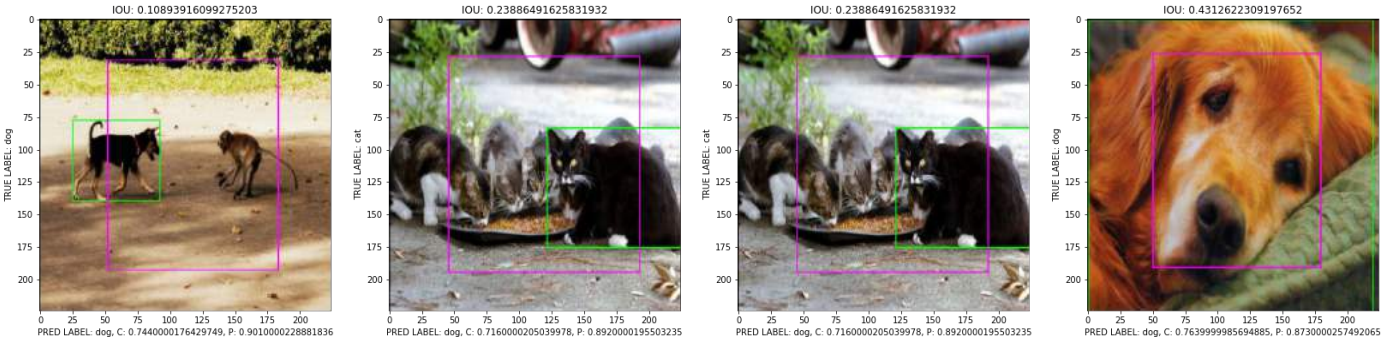
93/93 [==============================] - ETA: 0s - loss: 112512.7344 - iou_metric: 0.6179 - p_metric: 0.9666 - c_metric: 0.3698



93/93 [==============================] - 20s 218ms/step - loss: 112512.7344 - iou_metric: 0.6179 - p_metric: 0.9666 - c_metric: 0.3698 - val_loss: 112062.7500 - val_iou_metric: 0.7214 - val_p_metric: 1.0000 - val_c_metric: 0.4182 - lr: 1.0000e-04

Epoch 34/100

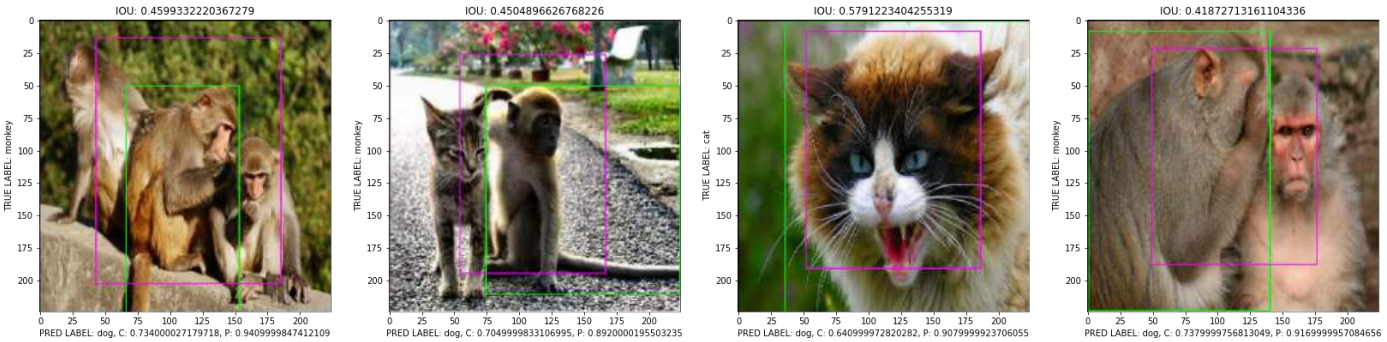
93/93 [==============================] - ETA: 0s - loss: 111622.8750 - iou_metric: 0.6207 - p_metric: 0.9676 - c_metric: 0.3704



93/93 [==============================] - 21s 221ms/step - loss: 111622.8750 - iou_metric: 0.6207 - p_metric: 0.9676 - c_metric: 0.3704 - val_loss: 111175.3828 - val_iou_metric: 0.7222 - val_p_metric: 1.0000 - val_c_metric: 0.4224 - lr: 1.0000e-04

Epoch 35/100

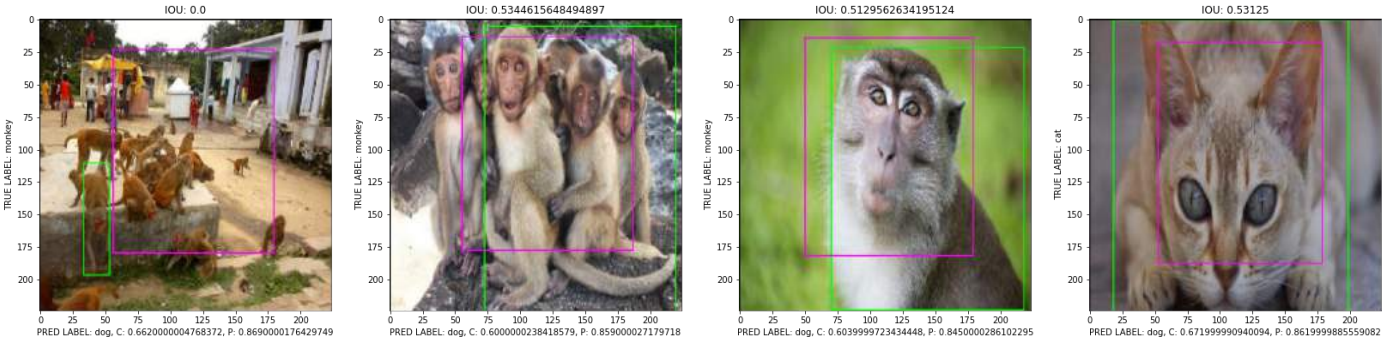
93/93 [==============================] - ETA: 0s - loss: 110721.2812 - iou_metric: 0.6236 - p_metric: 0.9685 - c_metric: 0.3714



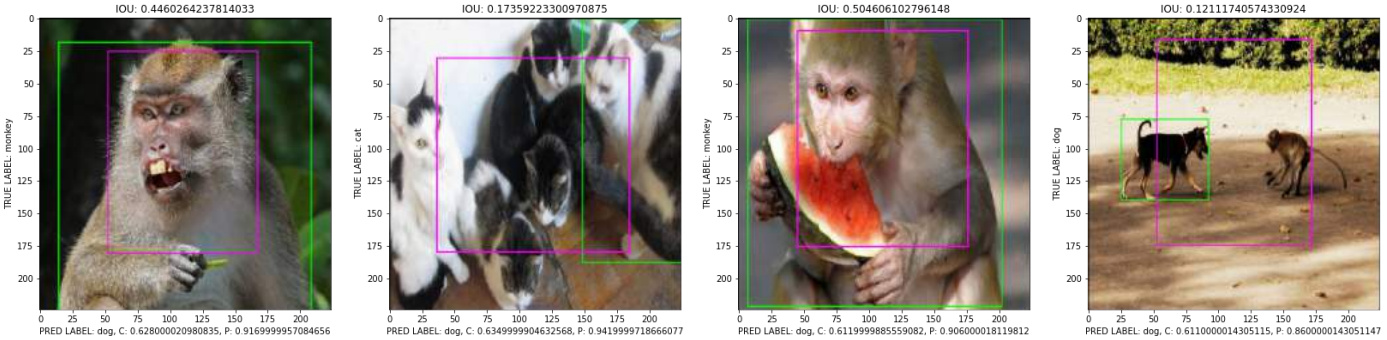
93/93 [==============================] - 21s 223ms/step - loss: 110721.2812 - iou_metric: 0.6236 - p_metric: 0.9685 - c_metric: 0.3714 - val_loss: 110259.0234 - val_iou_metric: 0.7223 - val_p_metric: 1.0000 - val_c_metric: 0.4251 - lr: 1.0000e-04

Epoch 36/100

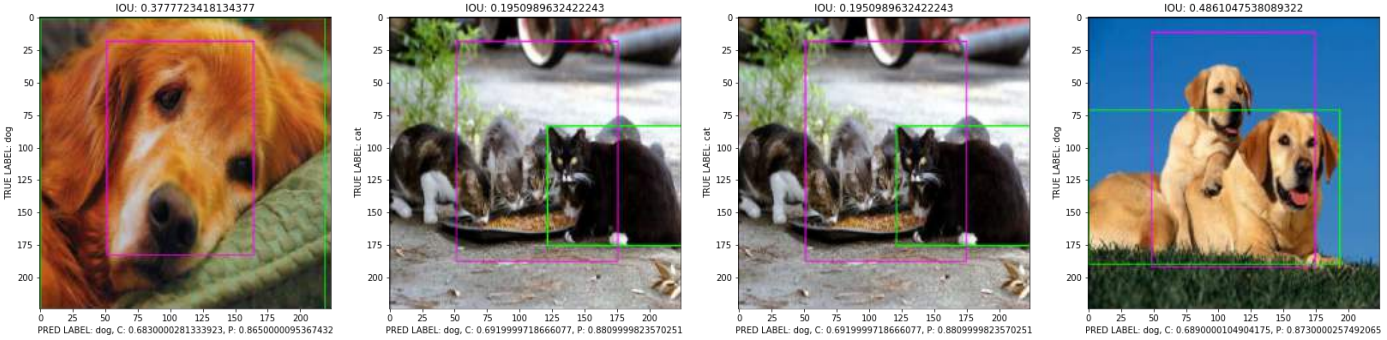
93/93 [==============================] - ETA: 0s - loss: 109816.3594 - iou_metric: 0.626
0 - p_metric: 0.9694 - c_metric: 0.3726



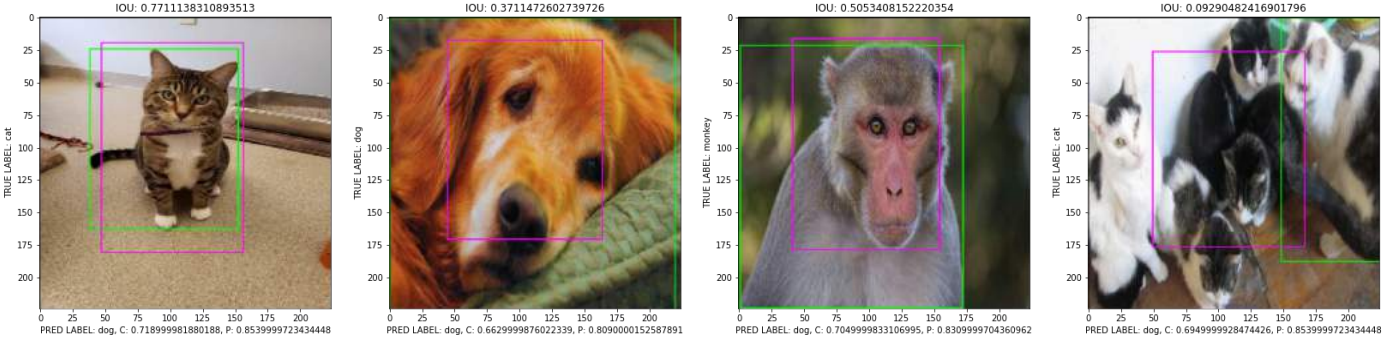
93/93 [==============================] - 20s 219ms/step - loss: 109816.3594 - iou_metri
c: 0.6260 - p_metric: 0.9694 - c_metric: 0.3726 - val_loss: 109366.1797 - val_iou_metri
c: 0.7232 - val_p_metric: 1.0000 - val_c_metric: 0.4256 - lr: 1.0000e-04
Epoch 37/100
93/93 [==============================] - ETA: 0s - loss: 108923.0000 - iou_metric: 0.628
5 - p_metric: 0.9702 - c_metric: 0.3726



93/93 [==============================] - 20s 218ms/step - loss: 108923.0000 - iou_metri
c: 0.6285 - p_metric: 0.9702 - c_metric: 0.3726 - val_loss: 108470.9609 - val_iou_metri
c: 0.7238 - val_p_metric: 1.0000 - val_c_metric: 0.4227 - lr: 1.0000e-04
Epoch 38/100
93/93 [==============================] - ETA: 0s - loss: 108021.2188 - iou_metric: 0.630
8 - p_metric: 0.9710 - c_metric: 0.3739

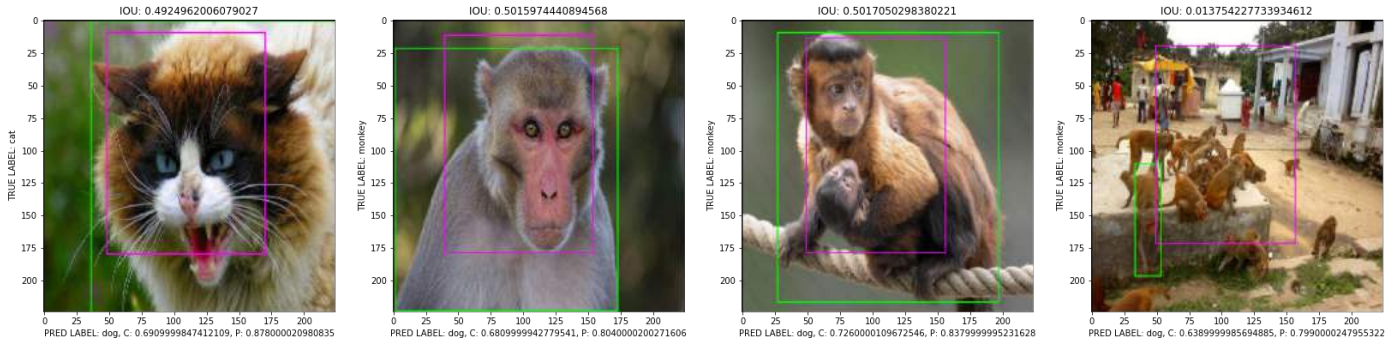


93/93 [==============================] - 20s 218ms/step - loss: 108021.2188 - iou_metri
c: 0.6308 - p_metric: 0.9710 - c_metric: 0.3739 - val_loss: 107568.1406 - val_iou_metri
c: 0.7243 - val_p_metric: 1.0000 - val_c_metric: 0.4221 - lr: 1.0000e-04
Epoch 39/100
93/93 [==============================] - ETA: 0s - loss: 107133.5391 - iou_metric: 0.633
0 - p_metric: 0.9718 - c_metric: 0.3761

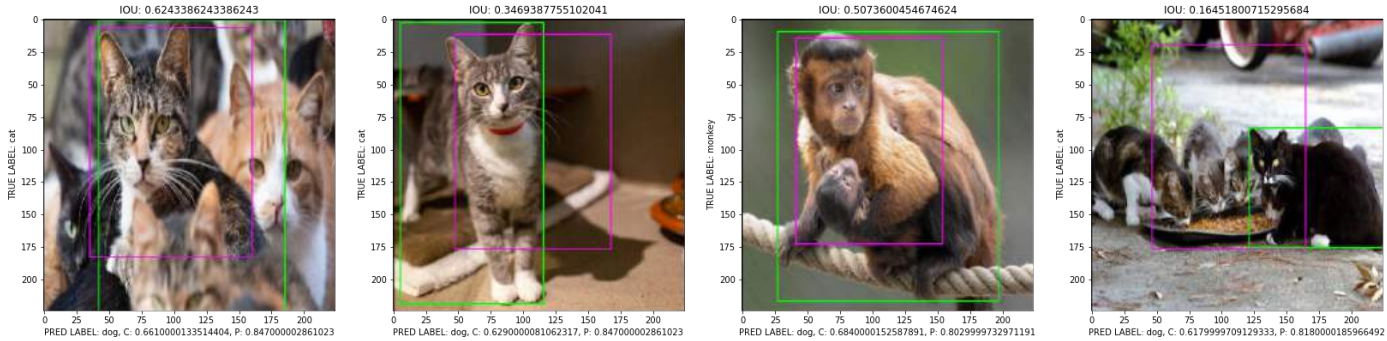


93/93 [==============================] - 20s 219ms/step - loss: 107133.5391 - iou_metri
c: 0.6330 - p_metric: 0.9718 - c_metric: 0.3761 - val_loss: 106691.2500 - val_iou_metri

c: 0.7249 - val_p_metric: 1.0000 - val_c_metric: 0.4226 - lr: 1.0000e-04
Epoch 40/100
93/93 [==============================] - ETA: 0s - loss: 106266.7266 - iou_metric: 0.635
2 - p_metric: 0.9725 - c_metric: 0.3768

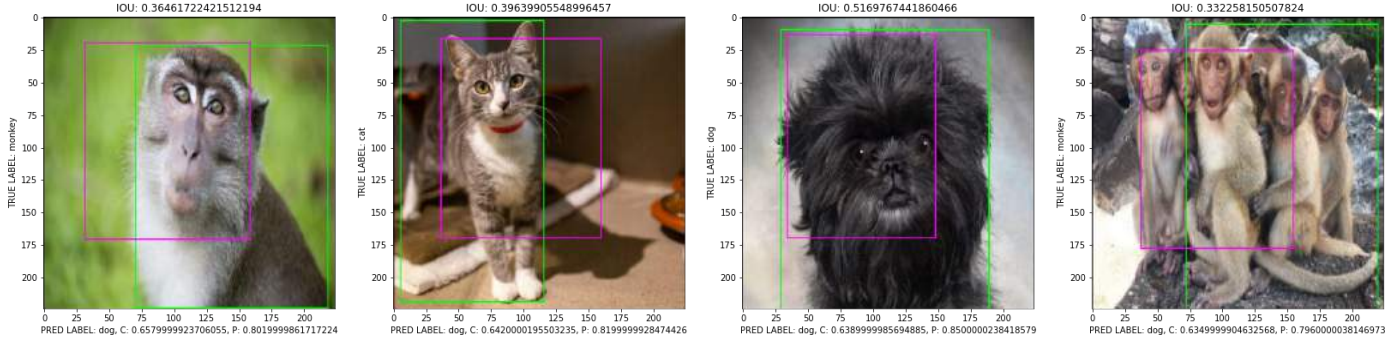


93/93 [==============================] - 20s 216ms/step - loss: 106266.7266 - iou_metri
c: 0.6352 - p_metric: 0.9725 - c_metric: 0.3768 - val_loss: 105830.9297 - val_iou_metri
c: 0.7262 - val_p_metric: 1.0000 - val_c_metric: 0.4220 - lr: 1.0000e-04
Epoch 41/100
93/93 [==============================] - ETA: 0s - loss: 105395.3125 - iou_metric: 0.637
3 - p_metric: 0.9731 - c_metric: 0.3776

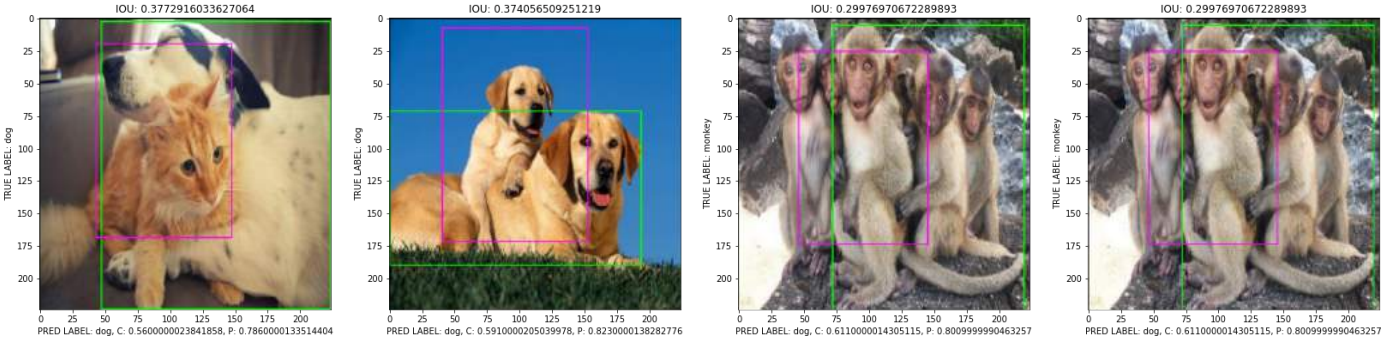


93/93 [==============================] - 20s 218ms/step - loss: 105395.3125 - iou_metri
c: 0.6373 - p_metric: 0.9731 - c_metric: 0.3776 - val_loss: 104954.9922 - val_iou_metri
c: 0.7266 - val_p_metric: 1.0000 - val_c_metric: 0.4244 - lr: 1.0000e-04
Epoch 42/100
93/93 [==============================] - ETA: 0s - loss: 104533.1250 - iou_metric: 0.639
3 - p_metric: 0.9738 - c_metric: 0.3775

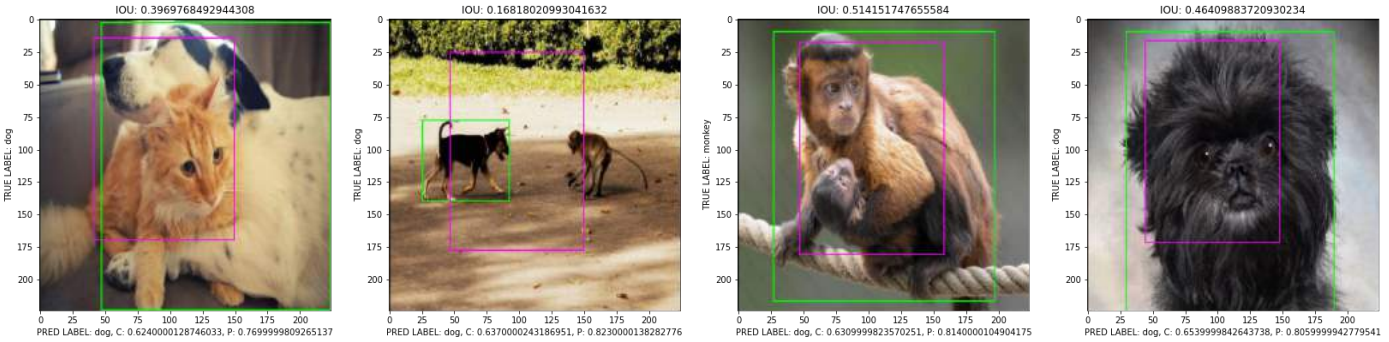
93/93 [==============================] - 20s 218ms/step - loss: 104533.1250 - iou_metri
c: 0.6393 - p_metric: 0.9738 - c_metric: 0.3775 - val_loss: 104099.8203 - val_iou_metri
c: 0.7270 - val_p_metric: 1.0000 - val_c_metric: 0.4219 - lr: 1.0000e-04
Epoch 43/100
93/93 [==============================] - ETA: 0s - loss: 103682.8672 - iou_metric: 0.641
2 - p_metric: 0.9744 - c_metric: 0.3783



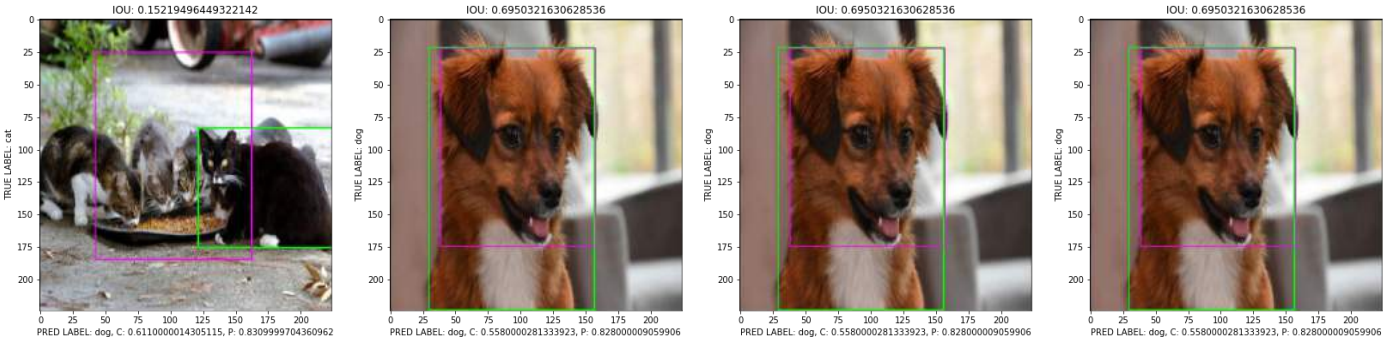
93/93 [==============================] - 20s 217ms/step - loss: 103682.8672 - iou_metric: 0.6412 - p_metric: 0.9744 - c_metric: 0.3783 - val_loss: 103253.1484 - val_iou_metric: 0.7278 - val_p_metric: 1.0000 - val_c_metric: 0.4223 - lr: 1.0000e-04
Epoch 44/100
93/93 [==============================] - ETA: 0s - loss: 102830.0547 - iou_metric: 0.6431 - p_metric: 0.9750 - c_metric: 0.3795



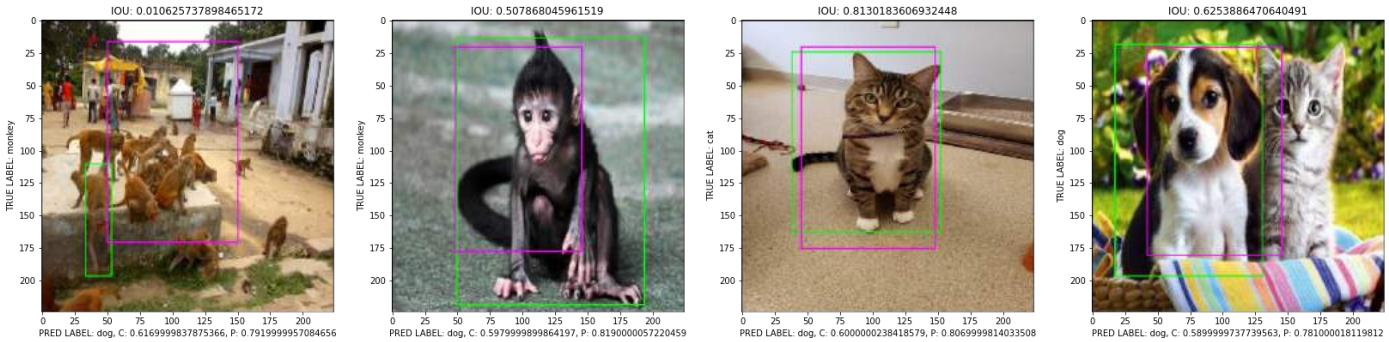
93/93 [==============================] - 20s 218ms/step - loss: 102830.0547 - iou_metric: 0.6431 - p_metric: 0.9750 - c_metric: 0.3795 - val_loss: 102398.3516 - val_iou_metric: 0.7285 - val_p_metric: 1.0000 - val_c_metric: 0.4218 - lr: 1.0000e-04
Epoch 45/100
93/93 [==============================] - ETA: 0s - loss: 101984.8750 - iou_metric: 0.6448 - p_metric: 0.9755 - c_metric: 0.3803



93/93 [==============================] - 20s 219ms/step - loss: 101984.8750 - iou_metric: 0.6448 - p_metric: 0.9755 - c_metric: 0.3803 - val_loss: 101578.8516 - val_iou_metric: 0.7292 - val_p_metric: 1.0000 - val_c_metric: 0.4204 - lr: 1.0000e-04
Epoch 46/100
93/93 [==============================] - ETA: 0s - loss: 101168.4219 - iou_metric: 0.6465 - p_metric: 0.9761 - c_metric: 0.3809



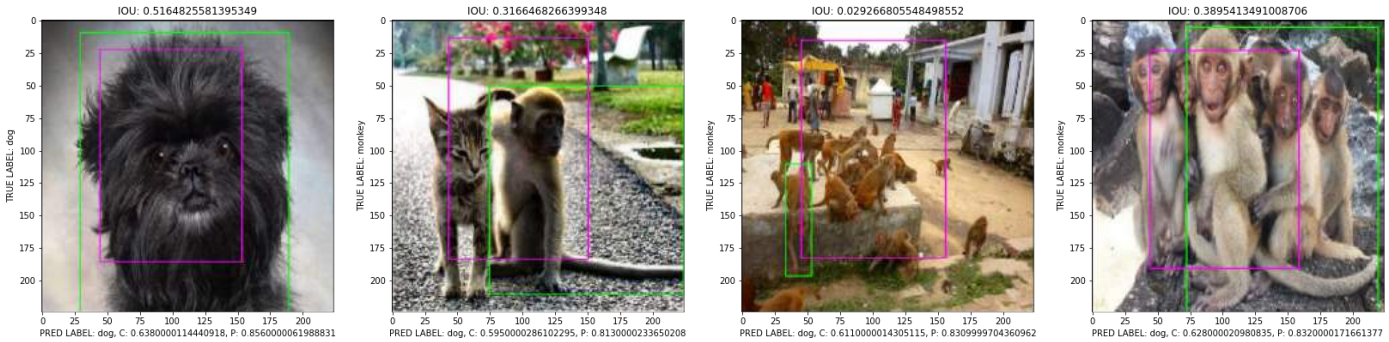
93/93 [==============================] - 20s 218ms/step - loss: 101168.4219 - iou_metric: 0.6465 - p_metric: 0.9761 - c_metric: 0.3809 - val_loss: 100742.0312 - val_iou_metric: 0.7298 - val_p_metric: 1.0000 - val_c_metric: 0.4243 - lr: 1.0000e-04
Epoch 47/100
93/93 [==============================] - ETA: 0s - loss: 100331.7188 - iou_metric: 0.6481 - p_metric: 0.9766 - c_metric: 0.3819



93/93 [==============================] - 20s 219ms/step - loss: 100331.7188 - iou_metric: 0.6481 - p_metric: 0.9766 - c_metric: 0.3819 - val_loss: 99913.2891 - val_iou_metric: 0.7306 - val_p_metric: 1.0000 - val_c_metric: 0.4264 - lr: 1.0000e-04

Epoch 48/100

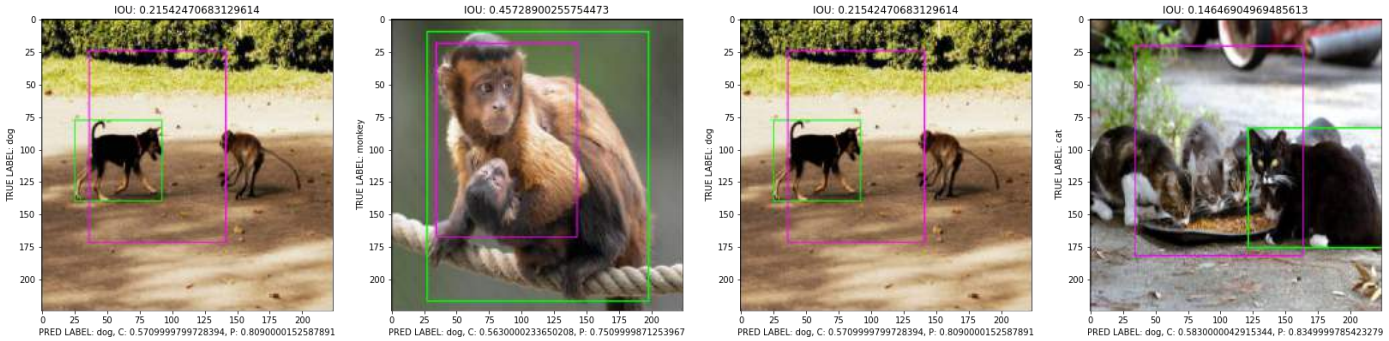
93/93 [==============================] - ETA: 0s - loss: 99494.4766 - iou_metric: 0.6496 - p_metric: 0.9771 - c_metric: 0.3820



93/93 [==============================] - 20s 218ms/step - loss: 99494.4766 - iou_metric: 0.6496 - p_metric: 0.9771 - c_metric: 0.3820 - val_loss: 99068.9062 - val_iou_metric: 0.7312 - val_p_metric: 1.0000 - val_c_metric: 0.4283 - lr: 1.0000e-04

Epoch 49/100

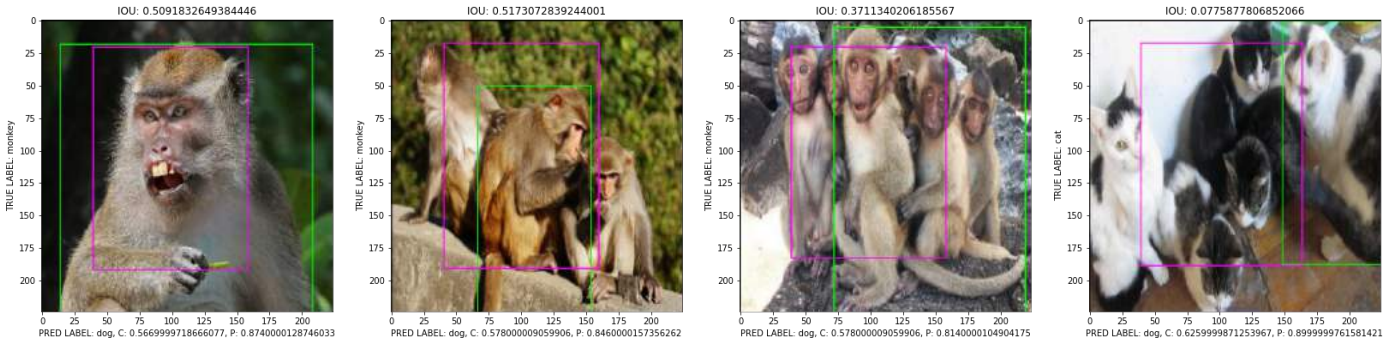
93/93 [==============================] - ETA: 0s - loss: 98658.8125 - iou_metric: 0.6513 - p_metric: 0.9775 - c_metric: 0.3831



93/93 [==============================] - 20s 217ms/step - loss: 98658.8125 - iou_metric: 0.6513 - p_metric: 0.9775 - c_metric: 0.3831 - val_loss: 98237.2812 - val_iou_metric: 0.7320 - val_p_metric: 1.0000 - val_c_metric: 0.4302 - lr: 1.0000e-04

Epoch 50/100

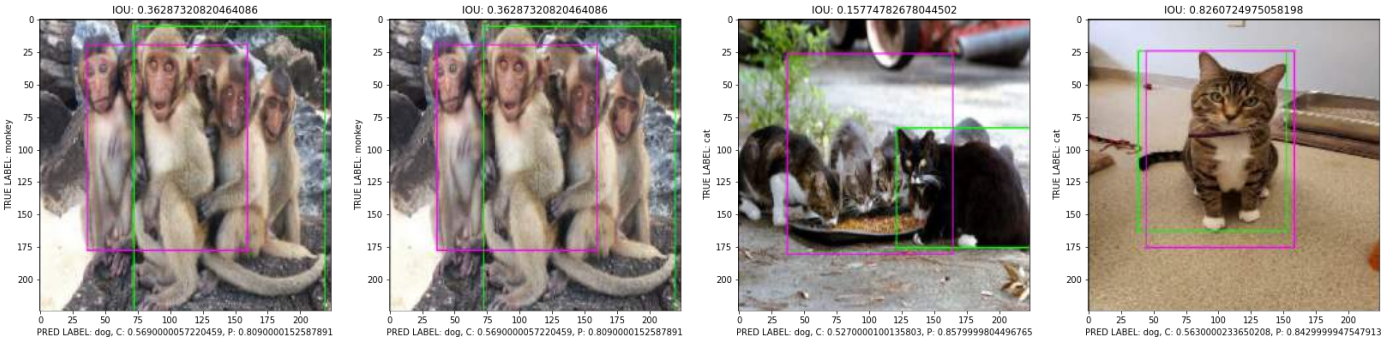
93/93 [==============================] - ETA: 0s - loss: 97829.7500 - iou_metric: 0.6528 - p_metric: 0.9780 - c_metric: 0.3847



93/93 [==============================] - 20s 216ms/step - loss: 97829.7500 - iou_metric: 0.6528 - p_metric: 0.9780 - c_metric: 0.3847 - val_loss: 97410.7500 - val_iou_metric: 0.7327 - val_p_metric: 1.0000 - val_c_metric: 0.4304 - lr: 1.0000e-04

Epoch 51/100

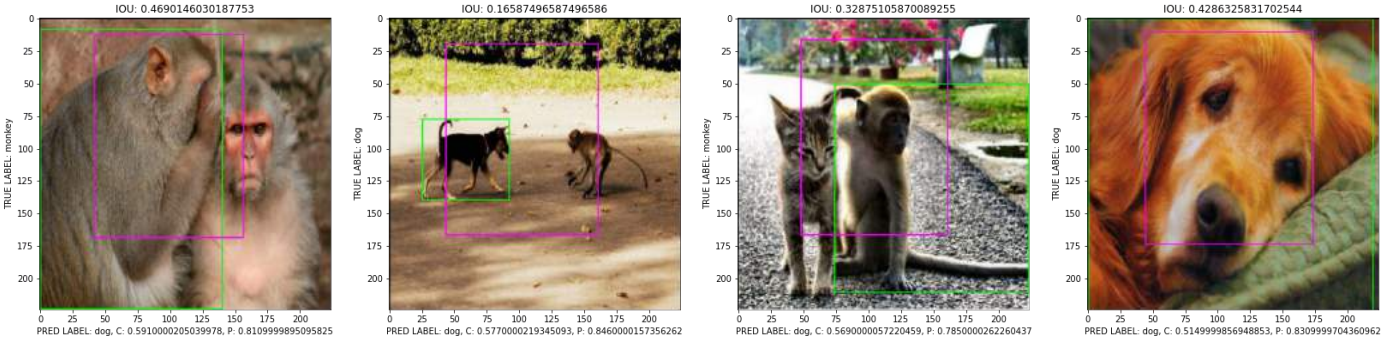
93/93 [==============================] - ETA: 0s - loss: 97003.3906 - iou_metric: 0.6542 - p_metric: 0.9784 - c_metric: 0.3851



93/93 [==============================] - 20s 215ms/step - loss: 97003.3906 - iou_metric: 0.6542 - p_metric: 0.9784 - c_metric: 0.3851 - val_loss: 96582.3438 - val_iou_metric: 0.7333 - val_p_metric: 1.0000 - val_c_metric: 0.4290 - lr: 1.0000e-04

Epoch 52/100

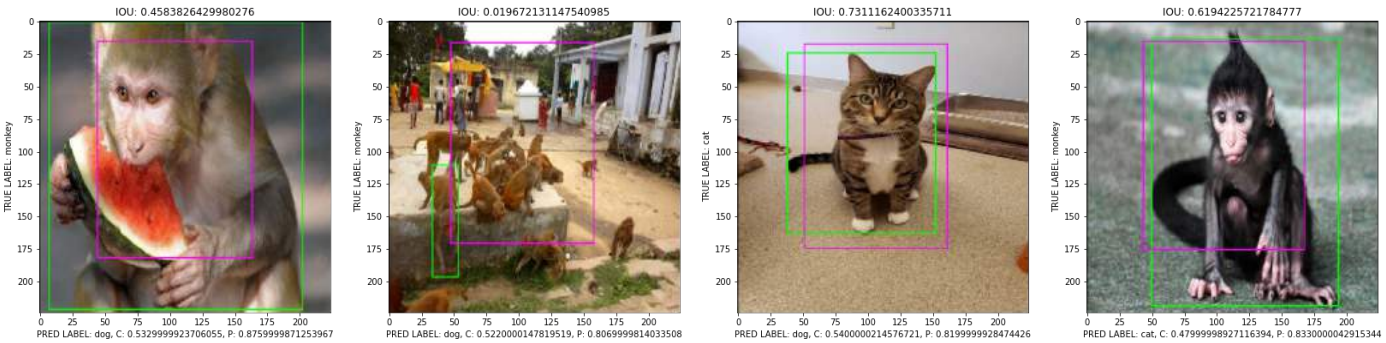
93/93 [==============================] - ETA: 0s - loss: 96173.3828 - iou_metric: 0.6557 - p_metric: 0.9788 - c_metric: 0.3851



93/93 [==============================] - 20s 216ms/step - loss: 96173.3828 - iou_metric: 0.6557 - p_metric: 0.9788 - c_metric: 0.3851 - val_loss: 95755.6406 - val_iou_metric: 0.7339 - val_p_metric: 1.0000 - val_c_metric: 0.4308 - lr: 1.0000e-04

Epoch 53/100

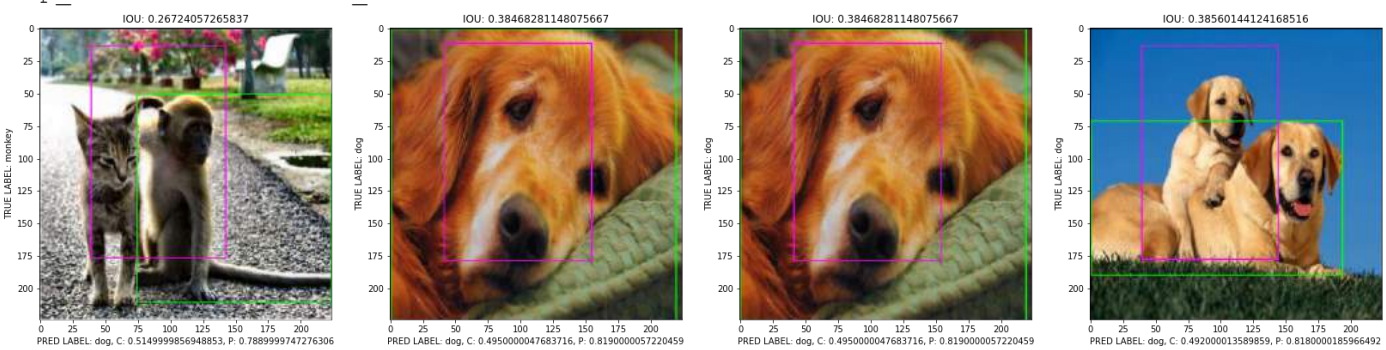
93/93 [==============================] - ETA: 0s - loss: 95359.4141 - iou_metric: 0.6570 - p_metric: 0.9792 - c_metric: 0.3858



93/93 [==============================] - 20s 218ms/step - loss: 95359.4141 - iou_metric: 0.6570 - p_metric: 0.9792 - c_metric: 0.3858 - val_loss: 94957.9375 - val_iou_metric: 0.7345 - val_p_metric: 1.0000 - val_c_metric: 0.4317 - lr: 1.0000e-04

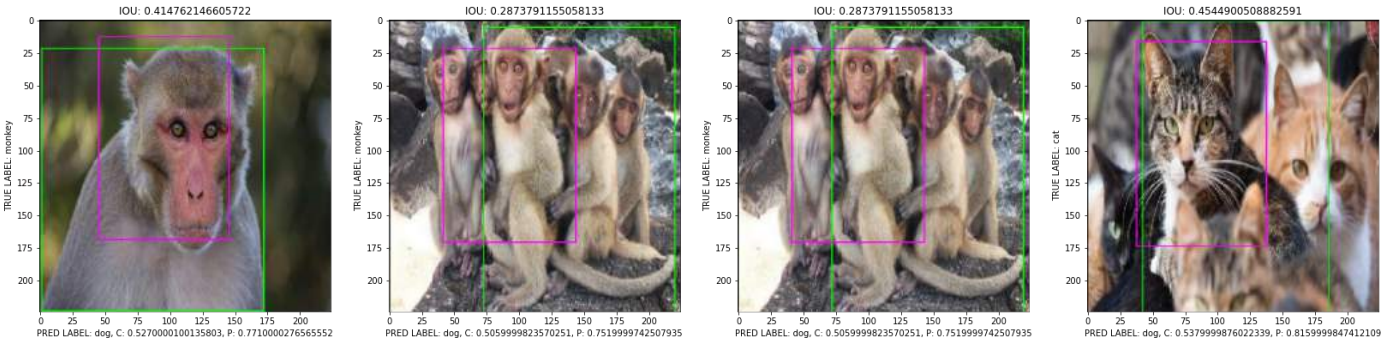
Epoch 54/100

93/93 [==============================] - ETA: 0s - loss: 94554.4844 - iou_metric: 0.6584 - p_metric: 0.9796 - c_metric: 0.3858

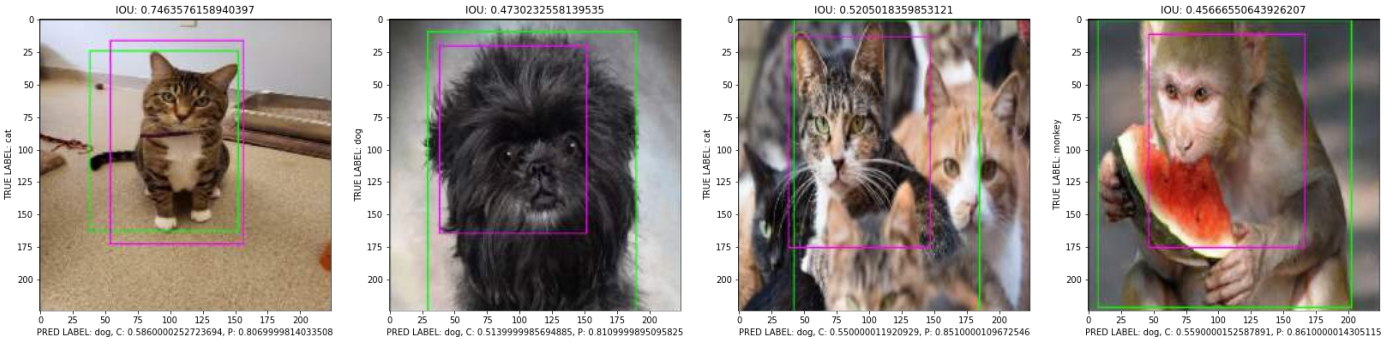


93/93 [==============================] - 20s 219ms/step - loss: 94554.4844 - iou_metric: 0.6584 - p_metric: 0.9796 - c_metric: 0.3858 - val_loss: 94147.6484 - val_iou_metric: 0.

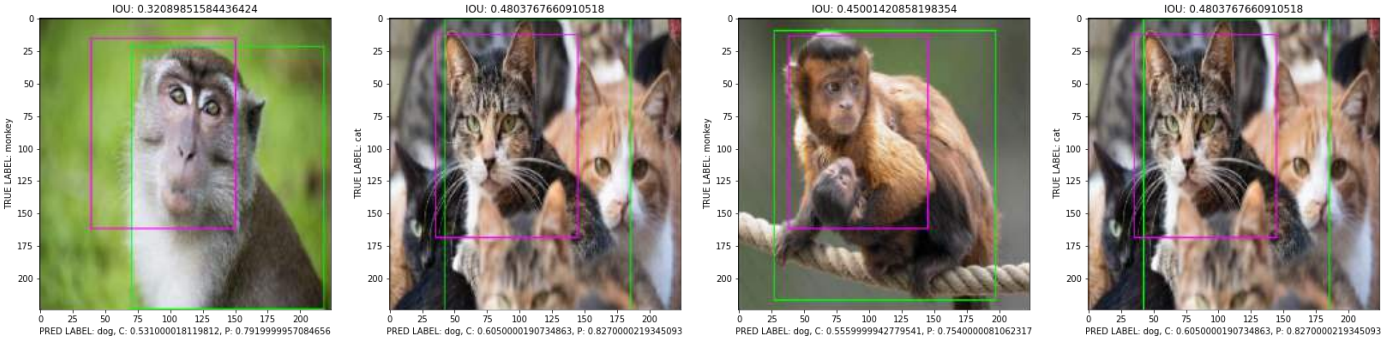
7348 - val_p_metric: 1.0000 - val_c_metric: 0.4356 - lr: 1.0000e-04
Epoch 55/100
93/93 [==============================] - ETA: 0s - loss: 93752.5234 - iou_metric: 0.6596 - p_metric: 0.9800 - c_metric: 0.3865



93/93 [==============================] - 20s 217ms/step - loss: 93752.5234 - iou_metric: 0.6596 - p_metric: 0.9800 - c_metric: 0.3865 - val_loss: 93351.7578 - val_iou_metric: 0.7353 - val_p_metric: 1.0000 - val_c_metric: 0.4356 - lr: 1.0000e-04
Epoch 56/100
93/93 [==============================] - ETA: 0s - loss: 92951.1562 - iou_metric: 0.6608 - p_metric: 0.9803 - c_metric: 0.3871

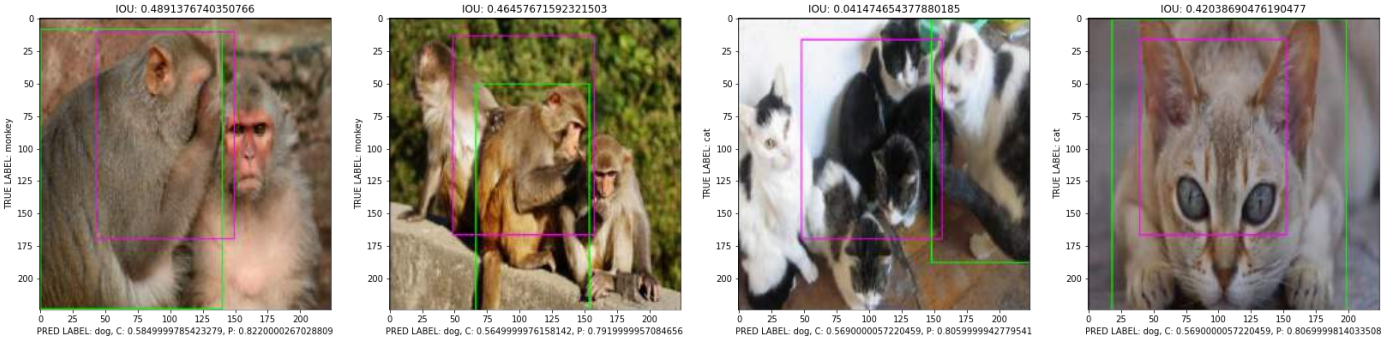


93/93 [==============================] - 20s 218ms/step - loss: 92951.1562 - iou_metric: 0.6608 - p_metric: 0.9803 - c_metric: 0.3871 - val_loss: 92542.7031 - val_iou_metric: 0.7357 - val_p_metric: 1.0000 - val_c_metric: 0.4379 - lr: 1.0000e-04
Epoch 57/100
93/93 [==============================] - ETA: 0s - loss: 92151.8984 - iou_metric: 0.6619 - p_metric: 0.9807 - c_metric: 0.3877

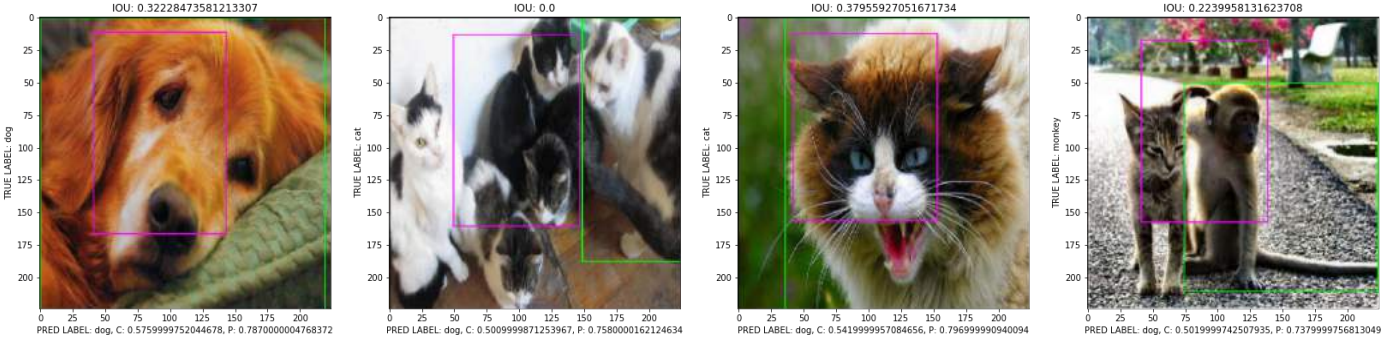


93/93 [==============================] - 21s 223ms/step - loss: 92151.8984 - iou_metric: 0.6619 - p_metric: 0.9807 - c_metric: 0.3877 - val_loss: 91753.3984 - val_iou_metric: 0.7362 - val_p_metric: 1.0000 - val_c_metric: 0.4386 - lr: 1.0000e-04
Epoch 58/100
93/93 [==============================] - ETA: 0s - loss: 91363.4062 - iou_metric: 0.6631 - p_metric: 0.9810 - c_metric: 0.3886

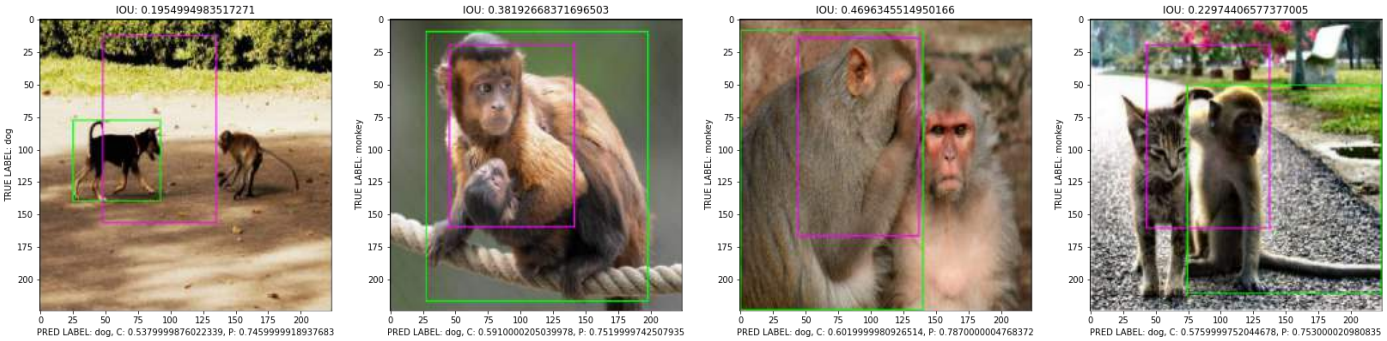
93/93 [==============================] - 20s 219ms/step - loss: 91363.4062 - iou_metric: 0.6631 - p_metric: 0.9810 - c_metric: 0.3886 - val_loss: 90960.3594 - val_iou_metric: 0.7365 - val_p_metric: 1.0000 - val_c_metric: 0.4421 - lr: 1.0000e-04
Epoch 59/100
93/93 [==============================] - ETA: 0s - loss: 90578.1641 - iou_metric: 0.6641 - p_metric: 0.9813 - c_metric: 0.3889



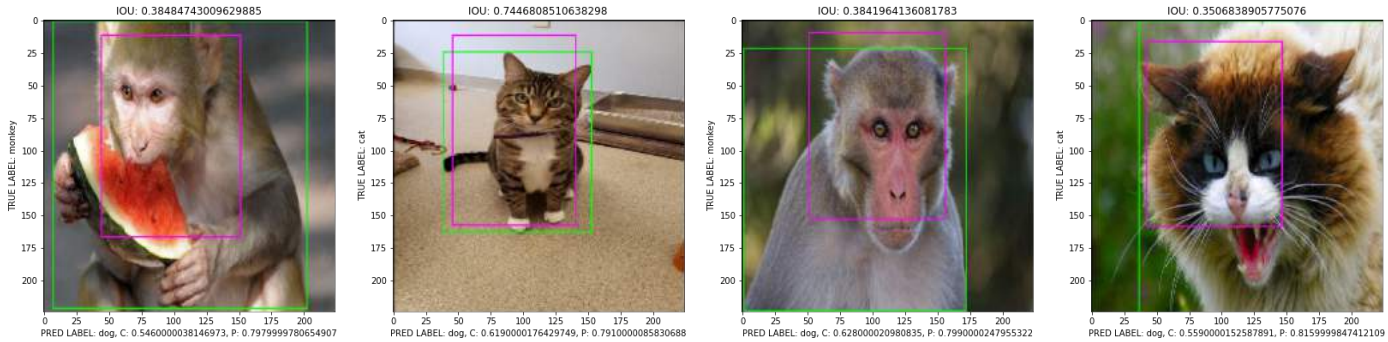
93/93 [==============================] - 21s 220ms/step - loss: 90578.1641 - iou_metric: 0.6641 - p_metric: 0.9813 - c_metric: 0.3889 - val_loss: 90192.3125 - val_iou_metric: 0.7370 - val_p_metric: 1.0000 - val_c_metric: 0.4407 - lr: 1.0000e-04
Epoch 60/100
93/93 [==============================] - ETA: 0s - loss: 89801.3047 - iou_metric: 0.6652 - p_metric: 0.9816 - c_metric: 0.3896



93/93 [==============================] - 20s 216ms/step - loss: 89801.3047 - iou_metric: 0.6652 - p_metric: 0.9816 - c_metric: 0.3896 - val_loss: 89399.6875 - val_iou_metric: 0.7374 - val_p_metric: 1.0000 - val_c_metric: 0.4400 - lr: 1.0000e-04
Epoch 61/100
93/93 [==============================] - ETA: 0s - loss: 89011.0938 - iou_metric: 0.6662 - p_metric: 0.9819 - c_metric: 0.3898



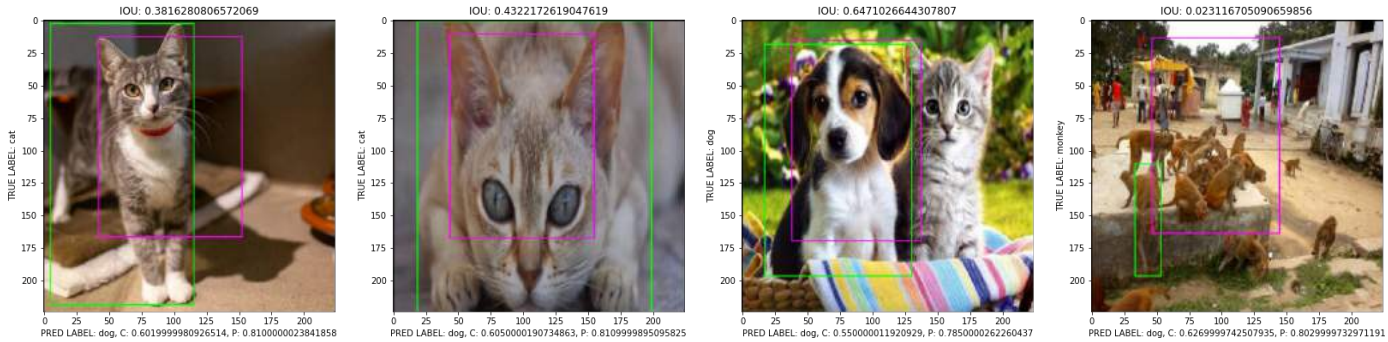
93/93 [==============================] - 21s 221ms/step - loss: 89011.0938 - iou_metric: 0.6662 - p_metric: 0.9819 - c_metric: 0.3898 - val_loss: 88615.4219 - val_iou_metric: 0.7377 - val_p_metric: 1.0000 - val_c_metric: 0.4413 - lr: 1.0000e-04
Epoch 62/100
93/93 [==============================] - ETA: 0s - loss: 88232.1719 - iou_metric: 0.6672 - p_metric: 0.9822 - c_metric: 0.3899



93/93 [==============================] - 20s 217ms/step - loss: 88232.1719 - iou_metric: 0.6672 - p_metric: 0.9822 - c_metric: 0.3899 - val_loss: 87843.5391 - val_iou_metric: 0.7381 - val_p_metric: 1.0000 - val_c_metric: 0.4419 - lr: 1.0000e-04

Epoch 63/100

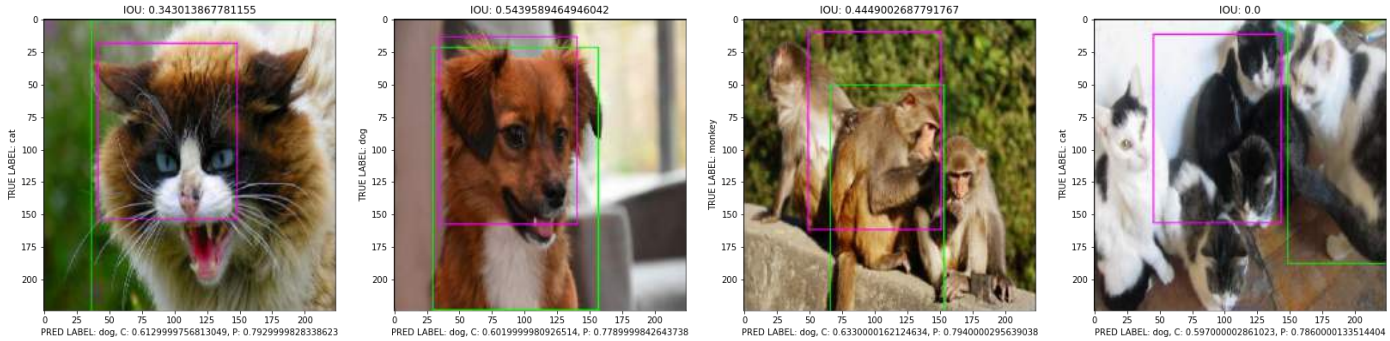
93/93 [==============================] - ETA: 0s - loss: 87463.5859 - iou_metric: 0.6682 - p_metric: 0.9825 - c_metric: 0.3907



93/93 [==============================] - 20s 219ms/step - loss: 87463.5859 - iou_metric: 0.6682 - p_metric: 0.9825 - c_metric: 0.3907 - val_loss: 87073.4688 - val_iou_metric: 0.7385 - val_p_metric: 1.0000 - val_c_metric: 0.4419 - lr: 1.0000e-04

Epoch 64/100

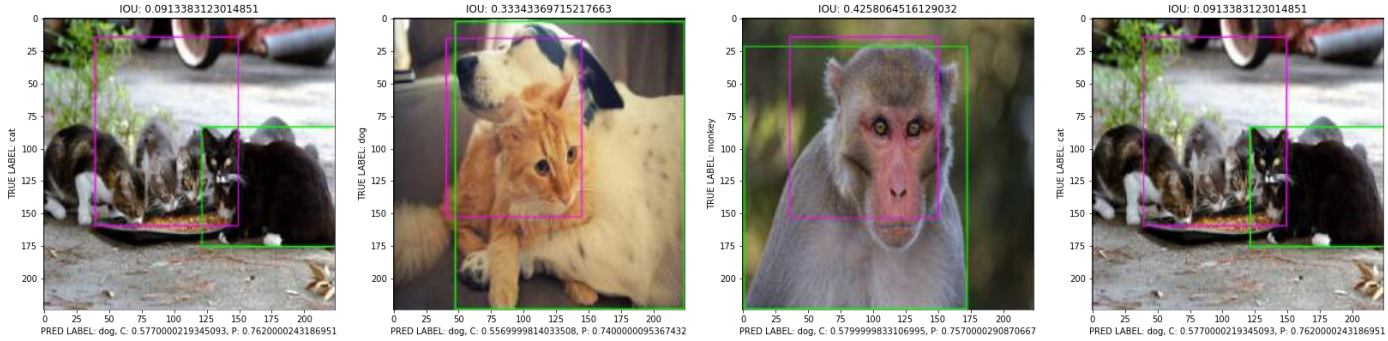
93/93 [==============================] - ETA: 0s - loss: 86688.3359 - iou_metric: 0.6691 - p_metric: 0.9828 - c_metric: 0.3911



93/93 [==============================] - 20s 216ms/step - loss: 86688.3359 - iou_metric: 0.6691 - p_metric: 0.9828 - c_metric: 0.3911 - val_loss: 86298.7266 - val_iou_metric: 0.7388 - val_p_metric: 1.0000 - val_c_metric: 0.4413 - lr: 1.0000e-04

Epoch 65/100

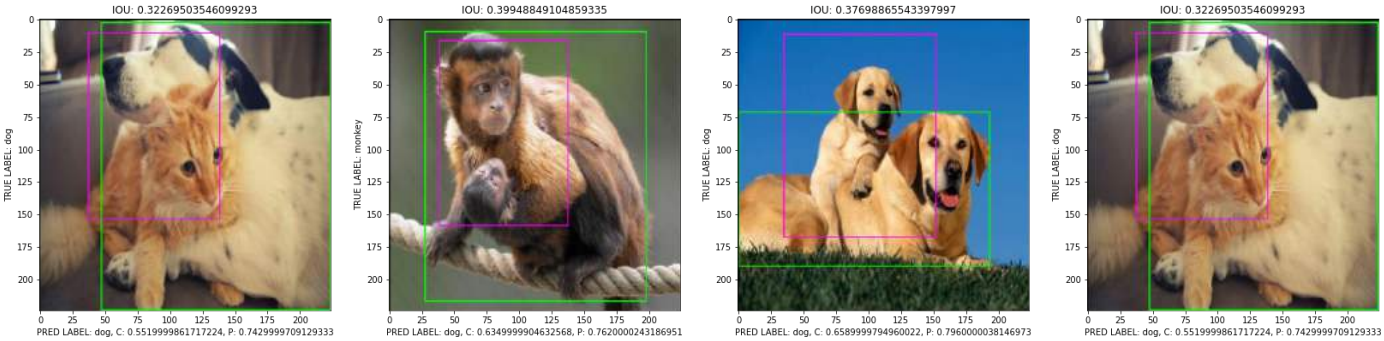
93/93 [==============================] - ETA: 0s - loss: 85925.8750 - iou_metric: 0.6701 - p_metric: 0.9831 - c_metric: 0.3919



93/93 [==============================] - 20s 217ms/step - loss: 85925.8750 - iou_metric: 0.6701 - p_metric: 0.9831 - c_metric: 0.3919 - val_loss: 85541.4375 - val_iou_metric: 0.7391 - val_p_metric: 1.0000 - val_c_metric: 0.4412 - lr: 1.0000e-04

Epoch 66/100

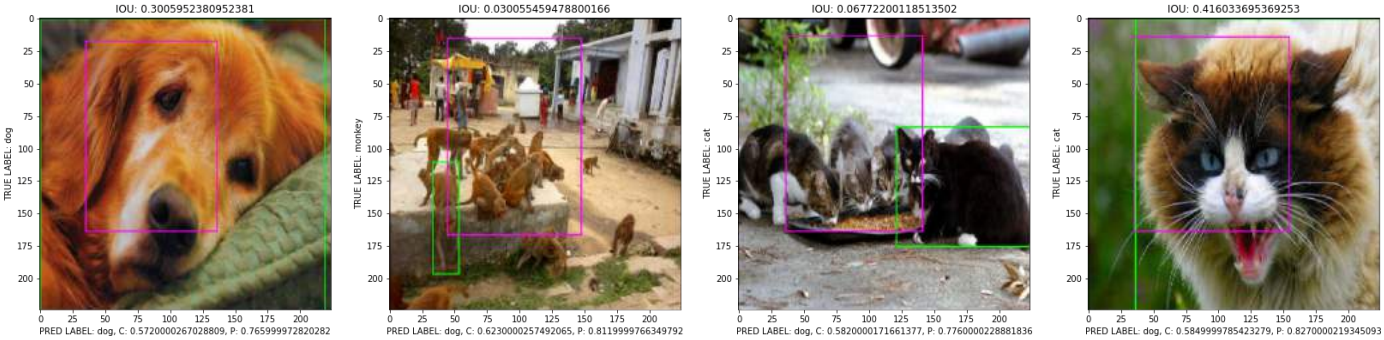
93/93 [==============================] - ETA: 0s - loss: 85166.2969 - iou_metric: 0.6710 - p_metric: 0.9833 - c_metric: 0.3921



93/93 [==============================] - 20s 217ms/step - loss: 85166.2969 - iou_metric: 0.6710 - p_metric: 0.9833 - c_metric: 0.3921 - val_loss: 84776.0625 - val_iou_metric: 0.7396 - val_p_metric: 1.0000 - val_c_metric: 0.4412 - lr: 1.0000e-04

Epoch 67/100

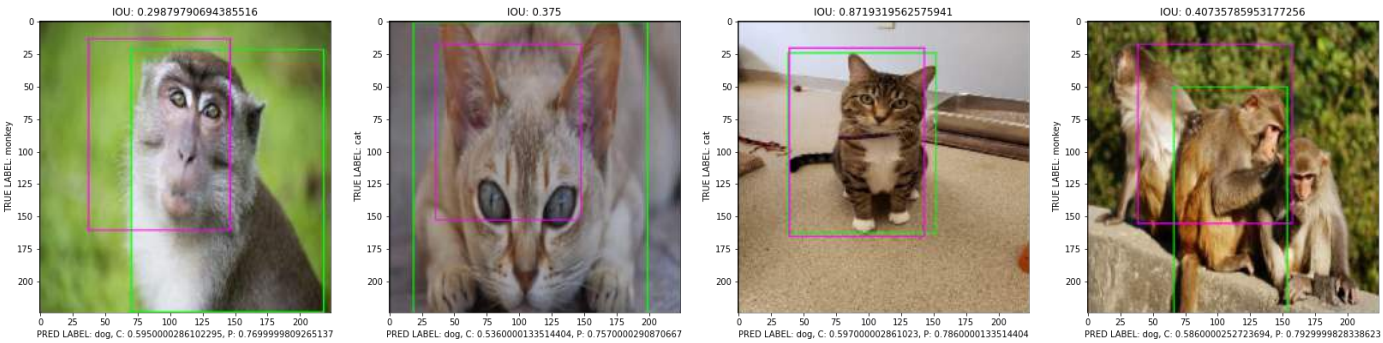
93/93 [==============================] - ETA: 0s - loss: 84403.5000 - iou_metric: 0.6719 - p_metric: 0.9836 - c_metric: 0.3925



93/93 [==============================] - 20s 216ms/step - loss: 84403.5000 - iou_metric: 0.6719 - p_metric: 0.9836 - c_metric: 0.3925 - val_loss: 84023.9375 - val_iou_metric: 0.7399 - val_p_metric: 1.0000 - val_c_metric: 0.4412 - lr: 1.0000e-04

Epoch 68/100

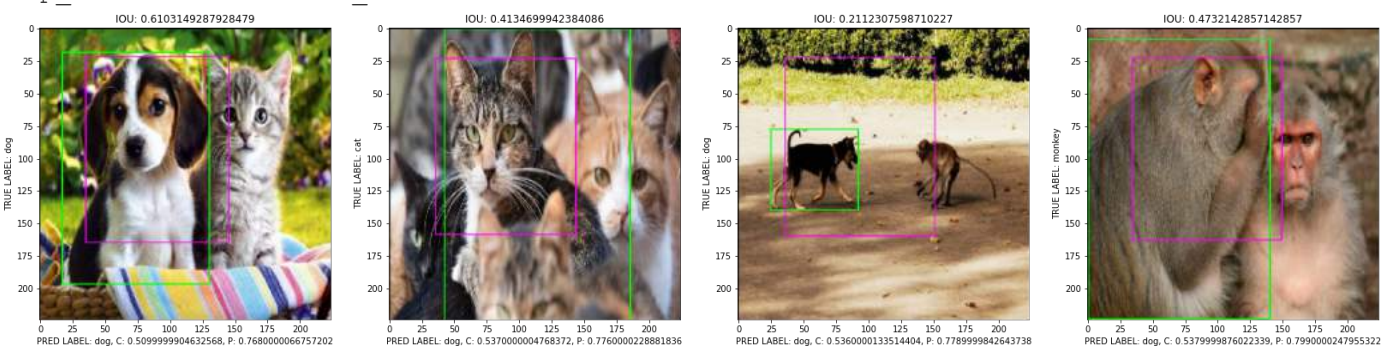
93/93 [==============================] - ETA: 0s - loss: 83659.8281 - iou_metric: 0.6728 - p_metric: 0.9838 - c_metric: 0.3934



93/93 [==============================] - 21s 222ms/step - loss: 83659.8281 - iou_metric: 0.6728 - p_metric: 0.9838 - c_metric: 0.3934 - val_loss: 83284.7031 - val_iou_metric: 0.7404 - val_p_metric: 1.0000 - val_c_metric: 0.4418 - lr: 1.0000e-04

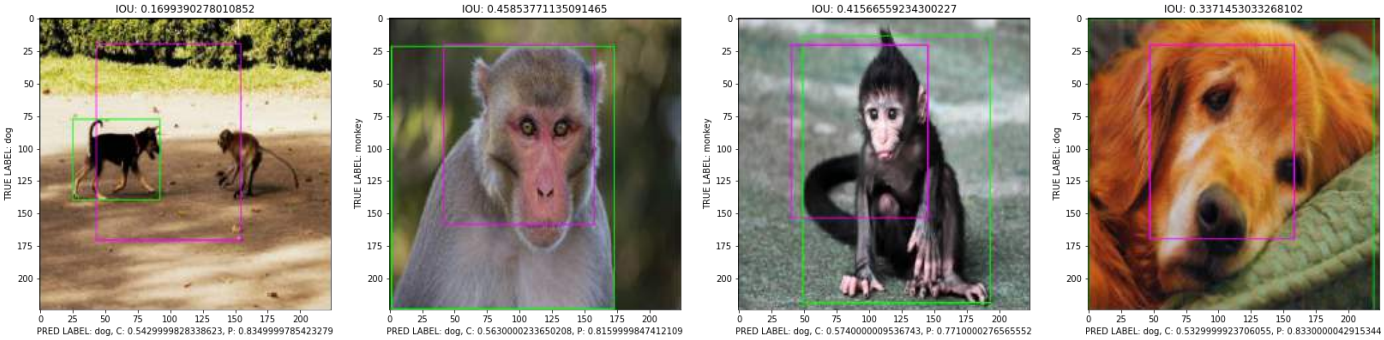
Epoch 69/100

93/93 [==============================] - ETA: 0s - loss: 82910.3750 - iou_metric: 0.6737 - p_metric: 0.9840 - c_metric: 0.3935

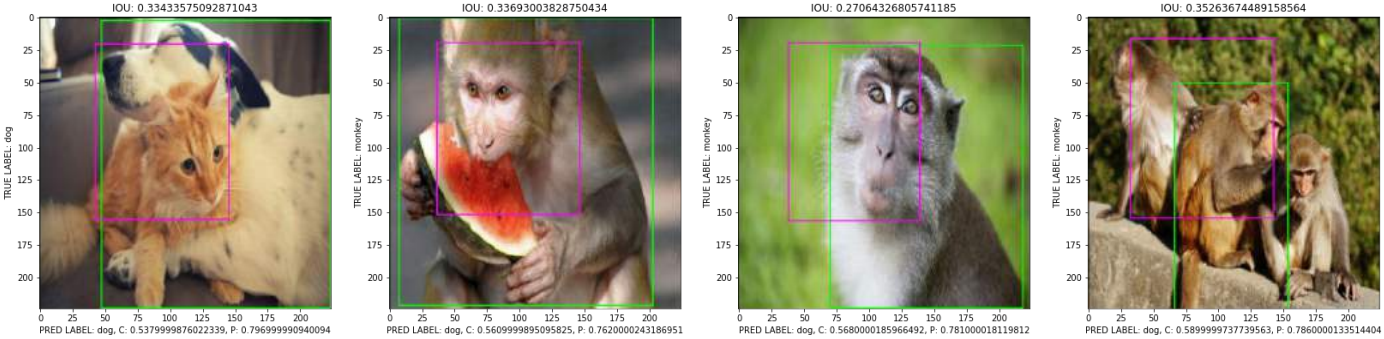


93/93 [==============================] - 19s 206ms/step - loss: 82910.3750 - iou_metric: 0.6737 - p_metric: 0.9840 - c_metric: 0.3935 - val_loss: 82530.4375 - val_iou_metric: 0.

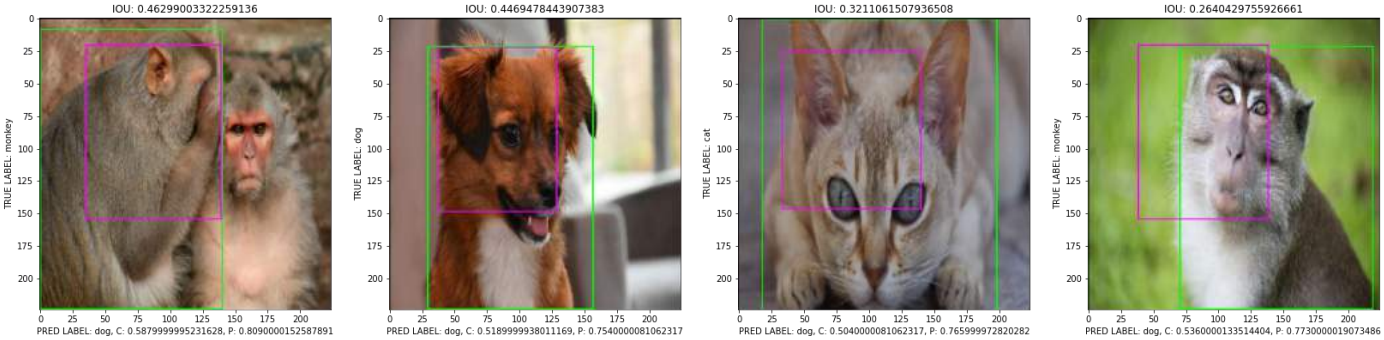
7410 - val_p_metric: 1.0000 - val_c_metric: 0.4400 - lr: 1.0000e-04
Epoch 70/100
93/93 [==============================] - ETA: 0s - loss: 82161.9766 - iou_metric: 0.6745 - p_metric: 0.9843 - c_metric: 0.3936



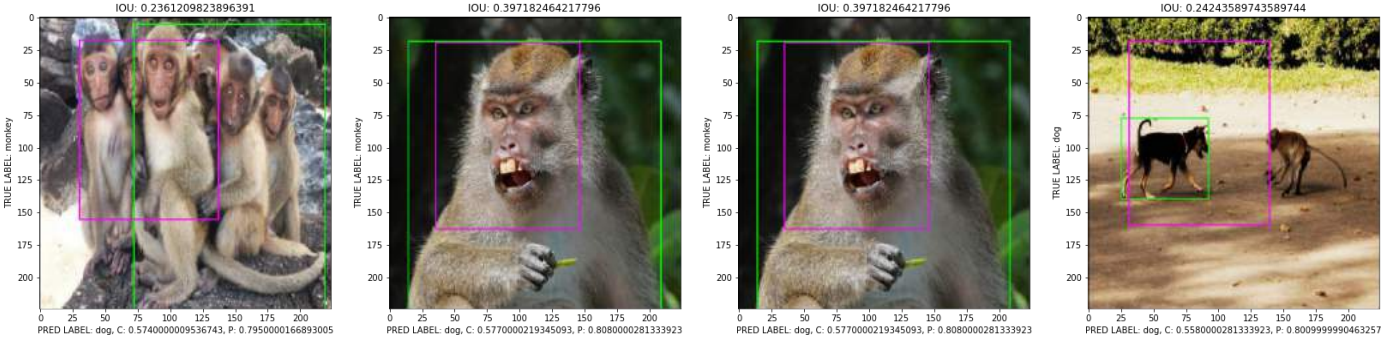
93/93 [==============================] - 19s 198ms/step - loss: 82161.9766 - iou_metric: 0.6745 - p_metric: 0.9843 - c_metric: 0.3936 - val_loss: 81788.2266 - val_iou_metric: 0.7413 - val_p_metric: 1.0000 - val_c_metric: 0.4394 - lr: 1.0000e-04
Epoch 71/100
93/93 [==============================] - ETA: 0s - loss: 81434.1250 - iou_metric: 0.6754 - p_metric: 0.9845 - c_metric: 0.3944



93/93 [==============================] - 18s 198ms/step - loss: 81434.1250 - iou_metric: 0.6754 - p_metric: 0.9845 - c_metric: 0.3944 - val_loss: 81064.9531 - val_iou_metric: 0.7416 - val_p_metric: 1.0000 - val_c_metric: 0.4394 - lr: 1.0000e-04
Epoch 72/100
93/93 [==============================] - ETA: 0s - loss: 80700.7969 - iou_metric: 0.6762 - p_metric: 0.9847 - c_metric: 0.3950

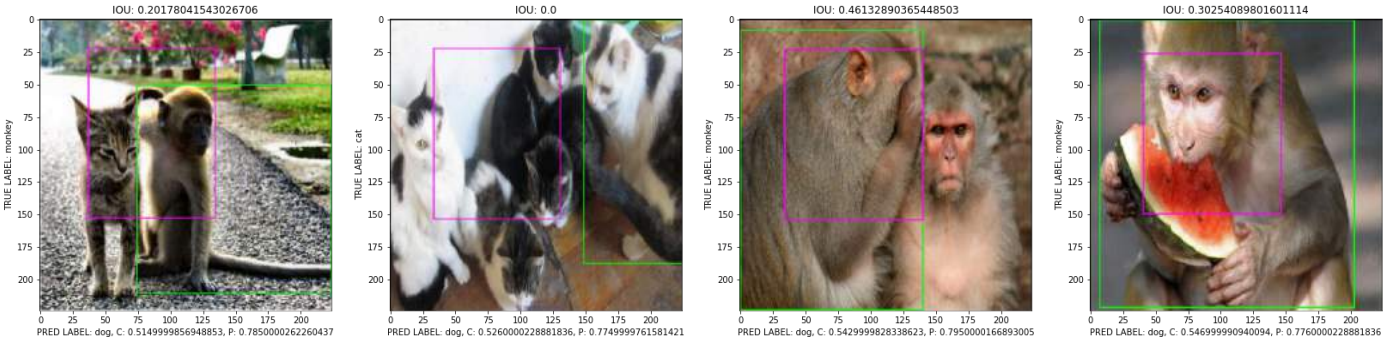


93/93 [==============================] - 18s 198ms/step - loss: 80700.7969 - iou_metric: 0.6762 - p_metric: 0.9847 - c_metric: 0.3950 - val_loss: 80335.3672 - val_iou_metric: 0.7418 - val_p_metric: 1.0000 - val_c_metric: 0.4406 - lr: 1.0000e-04
Epoch 73/100
93/93 [==============================] - ETA: 0s - loss: 79976.9219 - iou_metric: 0.6771 - p_metric: 0.9849 - c_metric: 0.3955

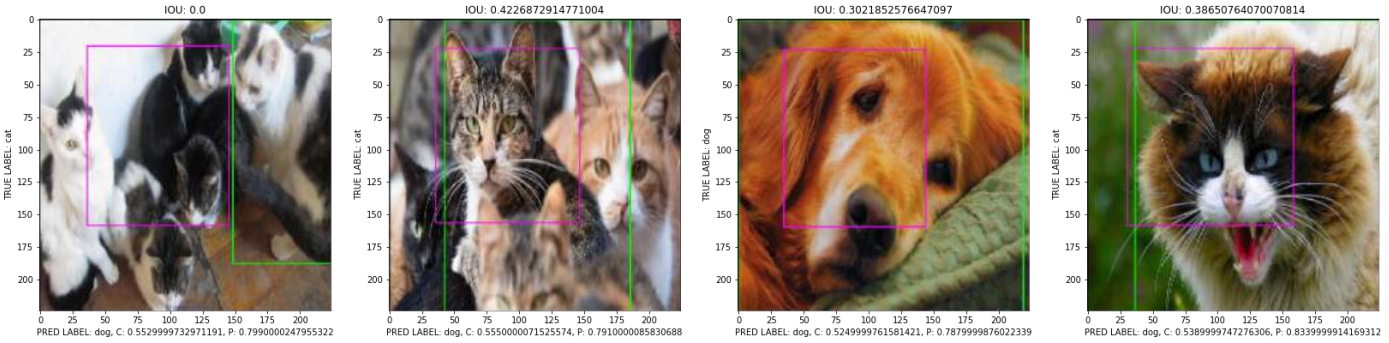


93/93 [==============================] - 18s 197ms/step - loss: 79976.9219 - iou_metric: 0.6771 - p_metric: 0.9849 - c_metric: 0.3955 - val_loss: 79606.9141 - val_iou_metric: 0.7421 - val_p_metric: 1.0000 - val_c_metric: 0.4411 - lr: 1.0000e-04
Epoch 74/100
93/93 [==============================] - ETA: 0s - loss: 79247.9141 - iou_metric: 0.6778 - p_metric: 0.9851 - c_metric: 0.3957

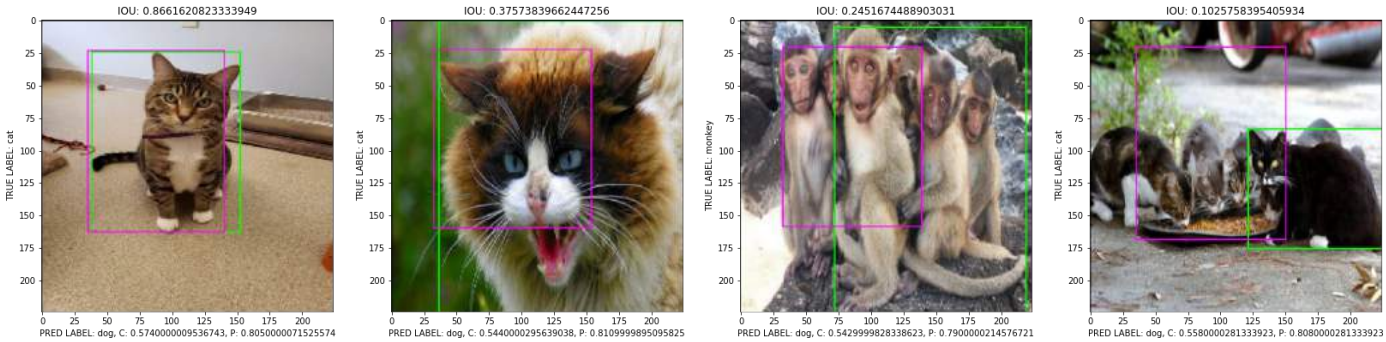
93/93 [==============================] - 18s 198ms/step - loss: 79247.9141 - iou_metric: 0.6778 - p_metric: 0.9851 - c_metric: 0.3957 - val_loss: 78880.5547 - val_iou_metric: 0.7424 - val_p_metric: 1.0000 - val_c_metric: 0.4422 - lr: 1.0000e-04
Epoch 75/100
93/93 [==============================] - ETA: 0s - loss: 78527.9531 - iou_metric: 0.6786 - p_metric: 0.9853 - c_metric: 0.3966



93/93 [==============================] - 18s 197ms/step - loss: 78527.9531 - iou_metric: 0.6786 - p_metric: 0.9853 - c_metric: 0.3966 - val_loss: 78169.0000 - val_iou_metric: 0.7426 - val_p_metric: 1.0000 - val_c_metric: 0.4421 - lr: 1.0000e-04
Epoch 76/100
93/93 [==============================] - ETA: 0s - loss: 77818.1875 - iou_metric: 0.6793 - p_metric: 0.9855 - c_metric: 0.3973



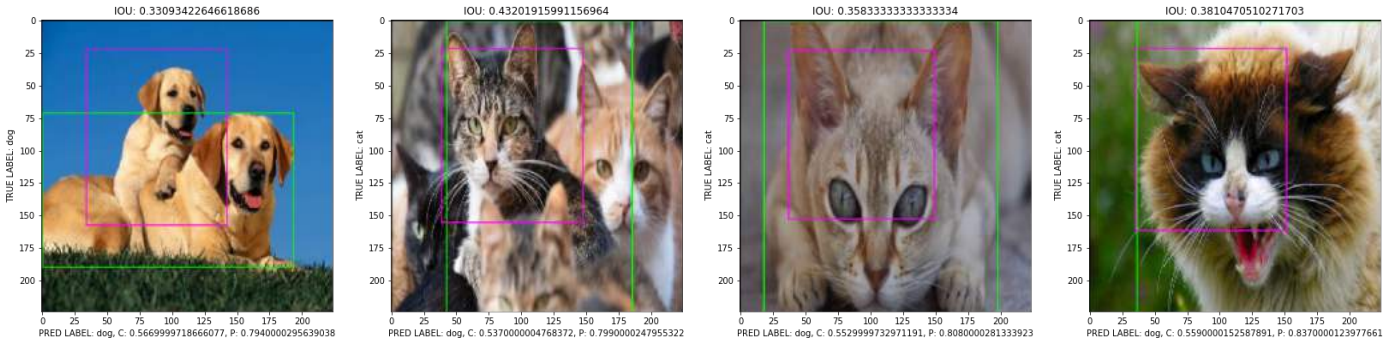
93/93 [==============================] - 19s 198ms/step - loss: 77818.1875 - iou_metric: 0.6793 - p_metric: 0.9855 - c_metric: 0.3973 - val_loss: 77459.3672 - val_iou_metric: 0.7430 - val_p_metric: 1.0000 - val_c_metric: 0.4437 - lr: 1.0000e-04
Epoch 77/100
93/93 [==============================] - ETA: 0s - loss: 77110.3672 - iou_metric: 0.6800 - p_metric: 0.9857 - c_metric: 0.3981



93/93 [==============================] - 19s 199ms/step - loss: 77110.3672 - iou_metric: 0.6800 - p_metric: 0.9857 - c_metric: 0.3981 - val_loss: 76759.6328 - val_iou_metric: 0.7433 - val_p_metric: 1.0000 - val_c_metric: 0.4447 - lr: 1.0000e-04

Epoch 78/100

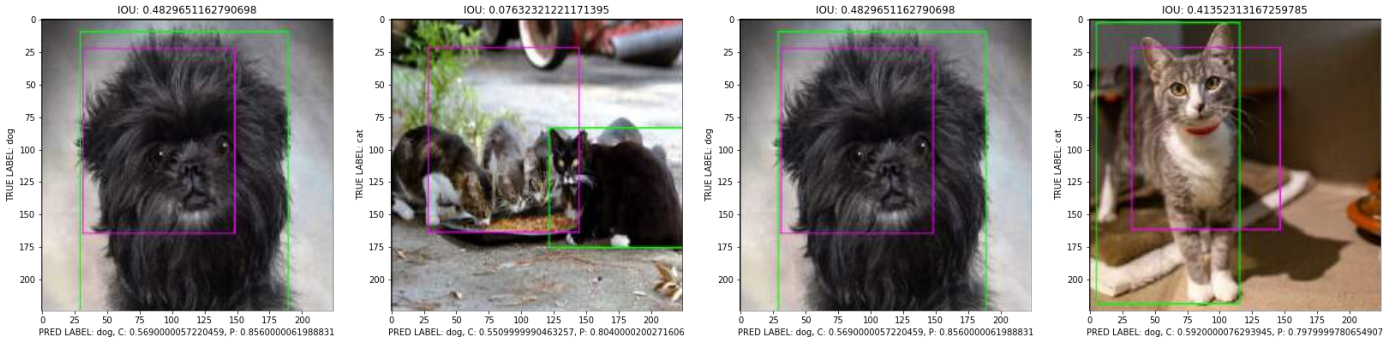
93/93 [==============================] - ETA: 0s - loss: 76407.9062 - iou_metric: 0.6806 - p_metric: 0.9859 - c_metric: 0.3986



93/93 [==============================] - 19s 199ms/step - loss: 76407.9062 - iou_metric: 0.6806 - p_metric: 0.9859 - c_metric: 0.3986 - val_loss: 76049.9609 - val_iou_metric: 0.7434 - val_p_metric: 1.0000 - val_c_metric: 0.4436 - lr: 1.0000e-04

Epoch 79/100

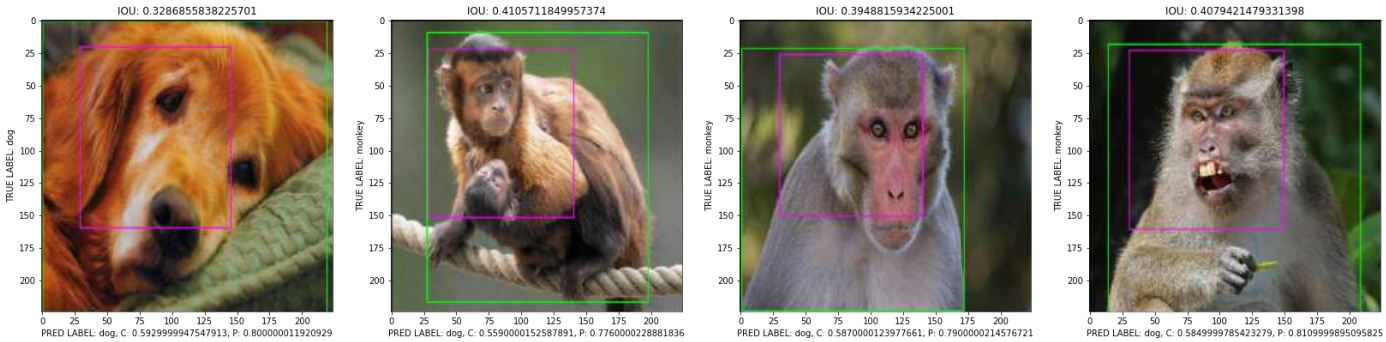
93/93 [==============================] - ETA: 0s - loss: 75704.1719 - iou_metric: 0.6814 - p_metric: 0.9861 - c_metric: 0.3992



93/93 [==============================] - 19s 201ms/step - loss: 75704.1719 - iou_metric: 0.6814 - p_metric: 0.9861 - c_metric: 0.3992 - val_loss: 75355.4766 - val_iou_metric: 0.7437 - val_p_metric: 1.0000 - val_c_metric: 0.4441 - lr: 1.0000e-04

Epoch 80/100

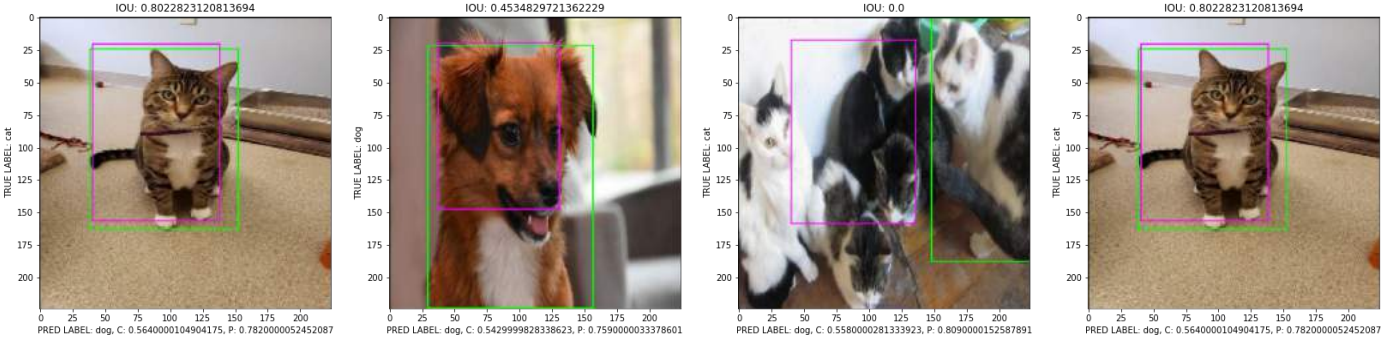
93/93 [==============================] - ETA: 0s - loss: 75012.9297 - iou_metric: 0.6820 - p_metric: 0.9862 - c_metric: 0.3994



93/93 [==============================] - 19s 198ms/step - loss: 75012.9297 - iou_metric: 0.6820 - p_metric: 0.9862 - c_metric: 0.3994 - val_loss: 74663.9844 - val_iou_metric: 0.7439 - val_p_metric: 1.0000 - val_c_metric: 0.4445 - lr: 1.0000e-04

Epoch 81/100

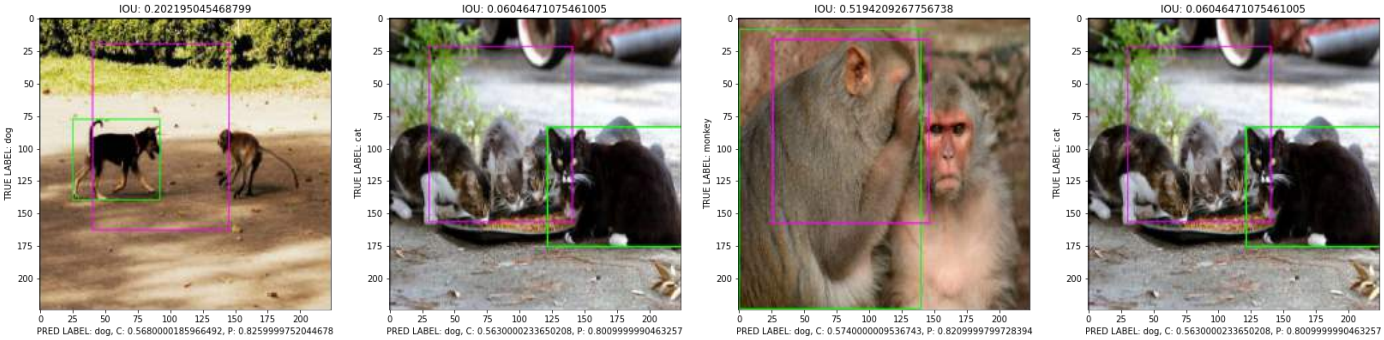
93/93 [==============================] - ETA: 0s - loss: 74321.8828 - iou_metric: 0.6827 - p_metric: 0.9864 - c_metric: 0.4000



93/93 [==============================] - 18s 198ms/step - loss: 74321.8828 - iou_metric: 0.6827 - p_metric: 0.9864 - c_metric: 0.4000 - val_loss: 73971.6719 - val_iou_metric: 0.7442 - val_p_metric: 1.0000 - val_c_metric: 0.4444 - lr: 1.0000e-04

Epoch 82/100

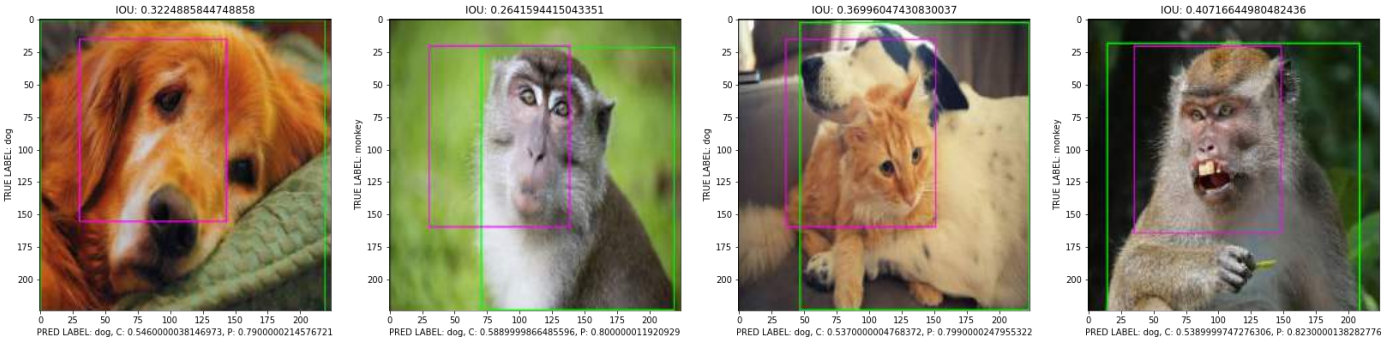
93/93 [==============================] - ETA: 0s - loss: 73630.1250 - iou_metric: 0.6833 - p_metric: 0.9866 - c_metric: 0.4005



93/93 [==============================] - 18s 198ms/step - loss: 73630.1250 - iou_metric: 0.6833 - p_metric: 0.9866 - c_metric: 0.4005 - val_loss: 73283.3125 - val_iou_metric: 0.7444 - val_p_metric: 1.0000 - val_c_metric: 0.4449 - lr: 1.0000e-04

Epoch 83/100

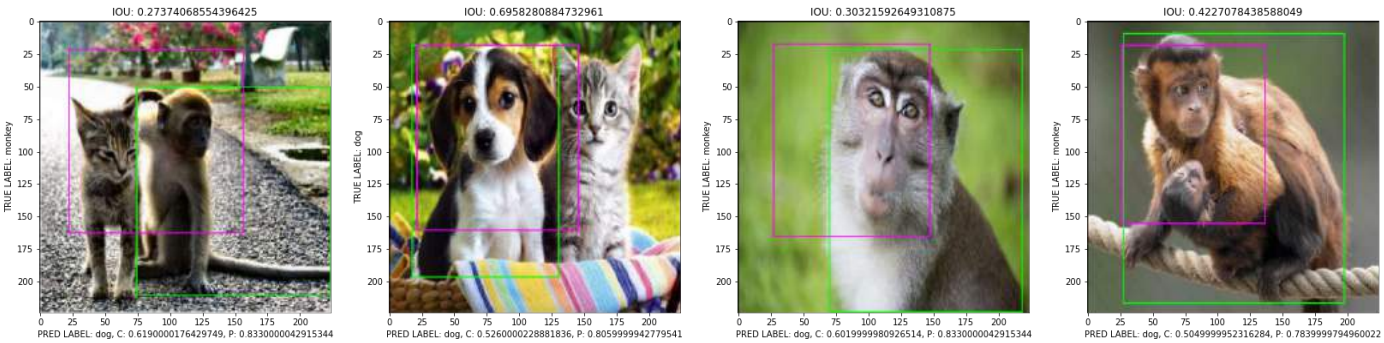
93/93 [==============================] - ETA: 0s - loss: 72947.7969 - iou_metric: 0.6839 - p_metric: 0.9867 - c_metric: 0.4010



93/93 [==============================] - 18s 198ms/step - loss: 72947.7969 - iou_metric: 0.6839 - p_metric: 0.9867 - c_metric: 0.4010 - val_loss: 72607.6406 - val_iou_metric: 0.7448 - val_p_metric: 1.0000 - val_c_metric: 0.4448 - lr: 1.0000e-04

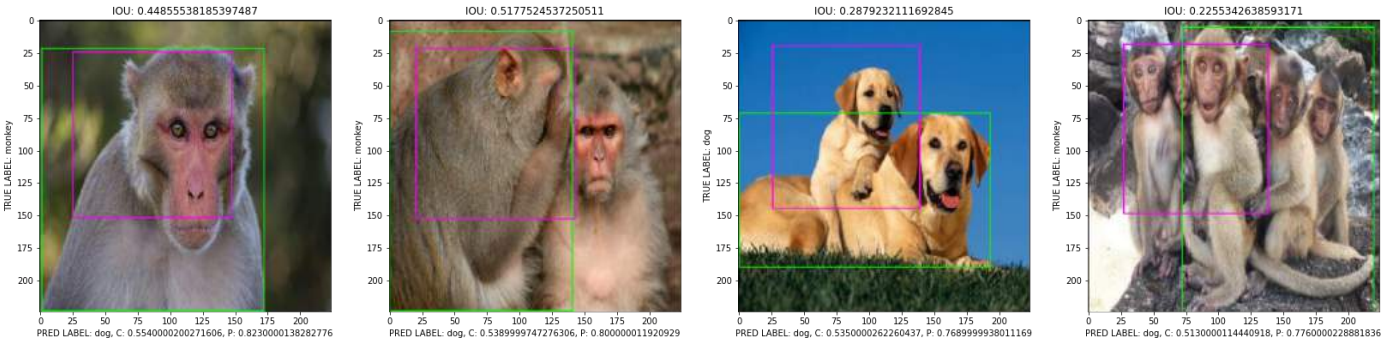
Epoch 84/100

93/93 [==============================] - ETA: 0s - loss: 72273.0078 - iou_metric: 0.6845 - p_metric: 0.9869 - c_metric: 0.4017

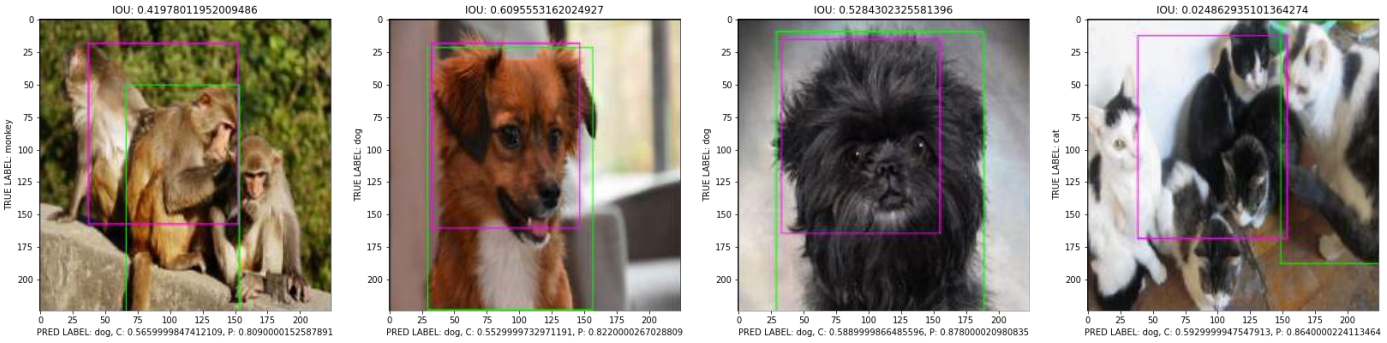


93/93 [==============================] - 18s 198ms/step - loss: 72273.0078 - iou_metric: 0.6845 - p_metric: 0.9869 - c_metric: 0.4017 - val_loss: 71931.0781 - val_iou_metric: 0.

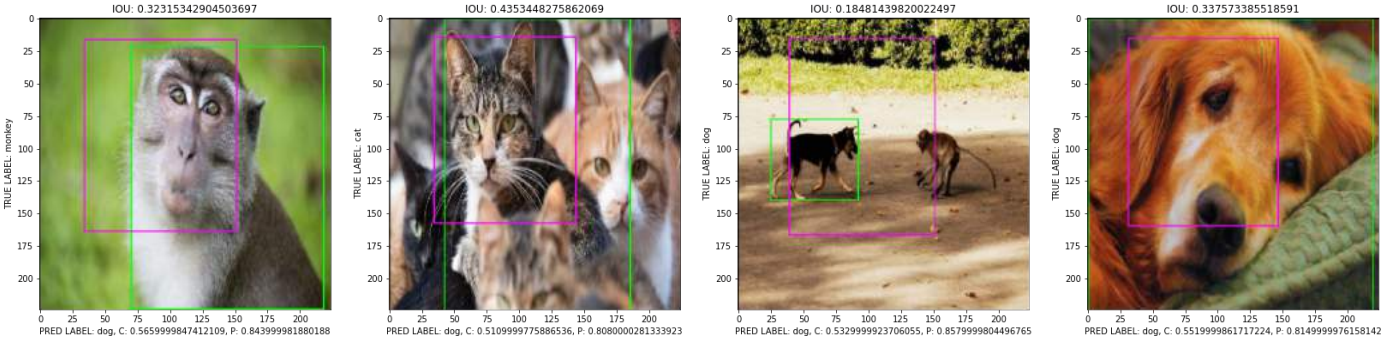
7450 - val_p_metric: 1.0000 - val_c_metric: 0.4457 - lr: 1.0000e-04
Epoch 85/100
93/93 [==============================] - ETA: 0s - loss: 71602.0156 - iou_metric: 0.6851 - p_metric: 0.9870 - c_metric: 0.4019



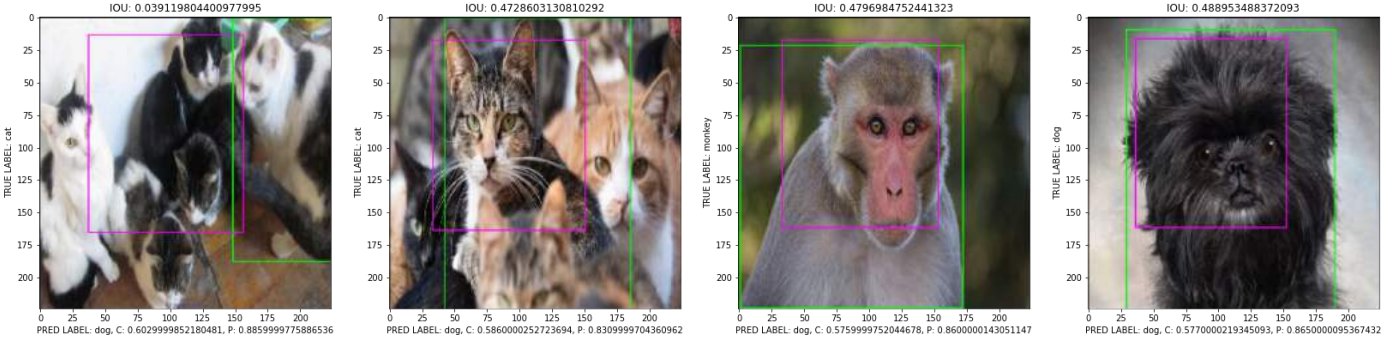
93/93 [==============================] - 19s 198ms/step - loss: 71602.0156 - iou_metric: 0.6851 - p_metric: 0.9870 - c_metric: 0.4019 - val_loss: 71260.3359 - val_iou_metric: 0.7453 - val_p_metric: 1.0000 - val_c_metric: 0.4480 - lr: 1.0000e-04
Epoch 86/100
93/93 [==============================] - ETA: 0s - loss: 70931.9531 - iou_metric: 0.6857 - p_metric: 0.9872 - c_metric: 0.4024



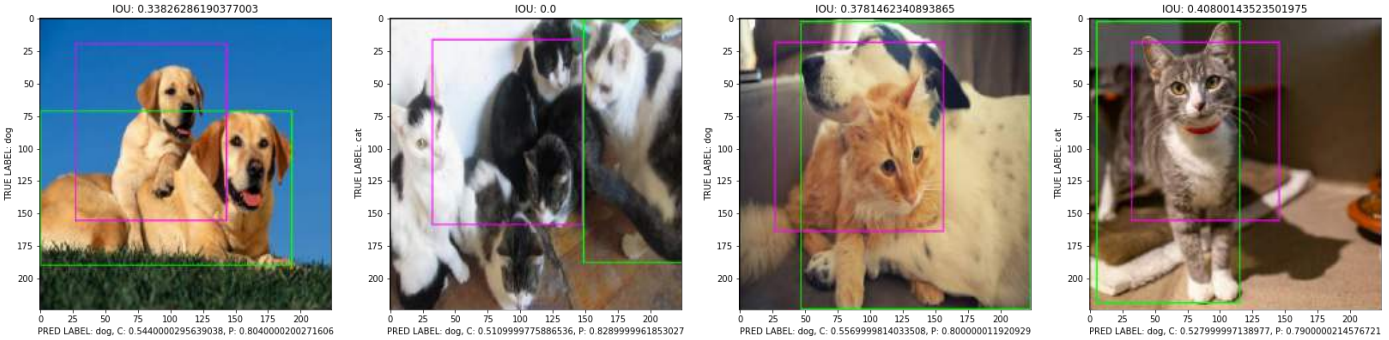
93/93 [==============================] - 18s 198ms/step - loss: 70931.9531 - iou_metric: 0.6857 - p_metric: 0.9872 - c_metric: 0.4024 - val_loss: 70596.6016 - val_iou_metric: 0.7456 - val_p_metric: 1.0000 - val_c_metric: 0.4488 - lr: 1.0000e-04
Epoch 87/100
93/93 [==============================] - ETA: 0s - loss: 70268.5703 - iou_metric: 0.6863 - p_metric: 0.9873 - c_metric: 0.4028



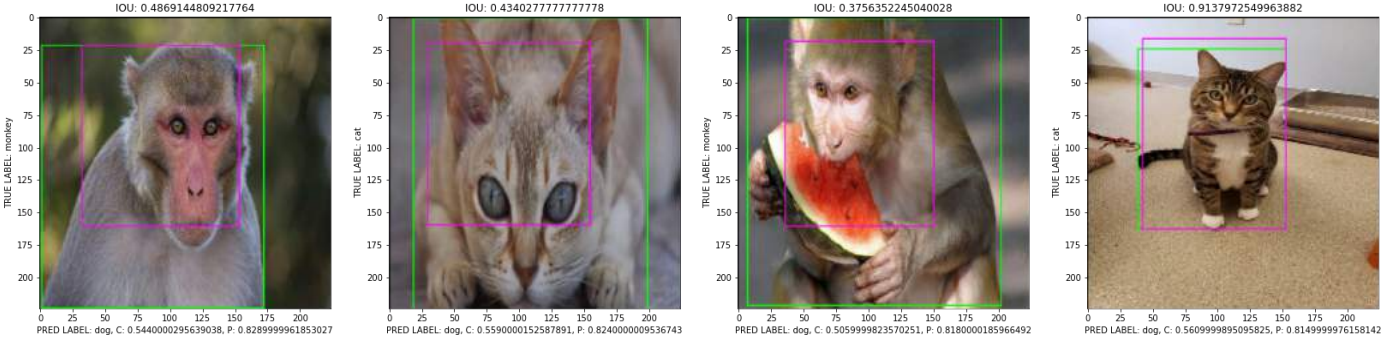
93/93 [==============================] - 18s 198ms/step - loss: 70268.5703 - iou_metric: 0.6863 - p_metric: 0.9873 - c_metric: 0.4028 - val_loss: 69933.6406 - val_iou_metric: 0.7457 - val_p_metric: 1.0000 - val_c_metric: 0.4497 - lr: 1.0000e-04
Epoch 88/100
93/93 [==============================] - ETA: 0s - loss: 69610.2578 - iou_metric: 0.6868 - p_metric: 0.9875 - c_metric: 0.4033



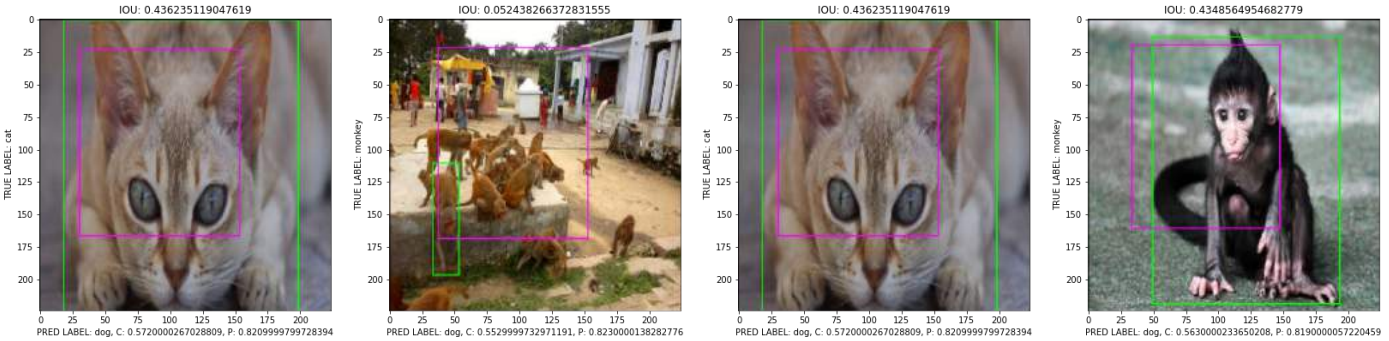
93/93 [==============================] - 18s 197ms/step - loss: 69610.2578 - iou_metric: 0.6868 - p_metric: 0.9875 - c_metric: 0.4033 - val_loss: 69282.5938 - val_iou_metric: 0.7461 - val_p_metric: 1.0000 - val_c_metric: 0.4505 - lr: 1.0000e-04
Epoch 89/100
93/93 [==============================] - ETA: 0s - loss: 68954.8359 - iou_metric: 0.6874 - p_metric: 0.9876 - c_metric: 0.4033



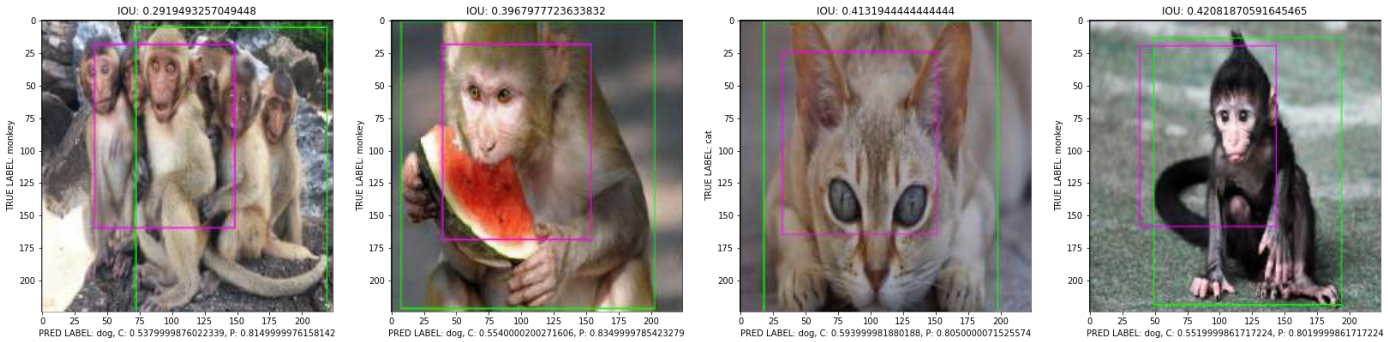
93/93 [==============================] - 18s 197ms/step - loss: 68954.8359 - iou_metric: 0.6874 - p_metric: 0.9876 - c_metric: 0.4033 - val_loss: 68625.0391 - val_iou_metric: 0.7464 - val_p_metric: 1.0000 - val_c_metric: 0.4508 - lr: 1.0000e-04
Epoch 90/100
93/93 [==============================] - ETA: 0s - loss: 68303.5469 - iou_metric: 0.6880 - p_metric: 0.9878 - c_metric: 0.4032



93/93 [==============================] - 19s 201ms/step - loss: 68303.5469 - iou_metric: 0.6880 - p_metric: 0.9878 - c_metric: 0.4032 - val_loss: 67970.7500 - val_iou_metric: 0.7467 - val_p_metric: 1.0000 - val_c_metric: 0.4516 - lr: 1.0000e-04
Epoch 91/100
93/93 [==============================] - ETA: 0s - loss: 67653.4141 - iou_metric: 0.6885 - p_metric: 0.9879 - c_metric: 0.4036



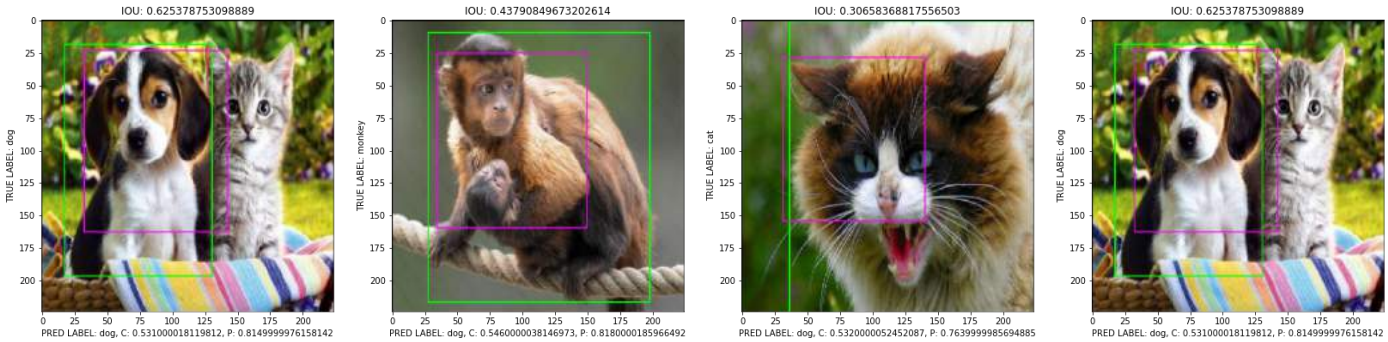
93/93 [==============================] - 18s 197ms/step - loss: 67653.4141 - iou_metric: 0.6885 - p_metric: 0.9879 - c_metric: 0.4036 - val_loss: 67329.0938 - val_iou_metric: 0.7469 - val_p_metric: 1.0000 - val_c_metric: 0.4519 - lr: 1.0000e-04
Epoch 92/100
93/93 [==============================] - ETA: 0s - loss: 67010.4453 - iou_metric: 0.6891 - p_metric: 0.9880 - c_metric: 0.4039



93/93 [==============================] - 18s 198ms/step - loss: 67010.4453 - iou_metric: 0.6891 - p_metric: 0.9880 - c_metric: 0.4039 - val_loss: 66683.8359 - val_iou_metric: 0.7471 - val_p_metric: 1.0000 - val_c_metric: 0.4526 - lr: 1.0000e-04

Epoch 93/100

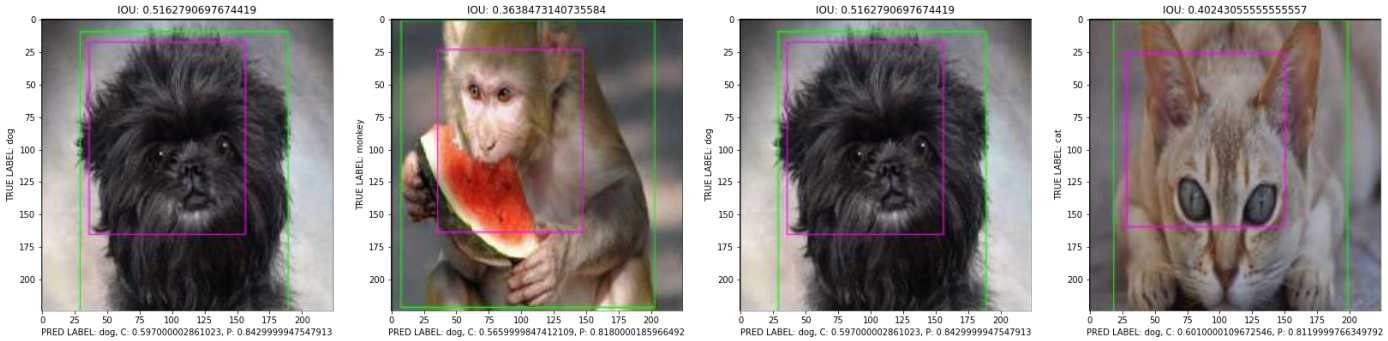
93/93 [==============================] - ETA: 0s - loss: 66363.7969 - iou_metric: 0.6895 - p_metric: 0.9882 - c_metric: 0.4039



93/93 [==============================] - 18s 197ms/step - loss: 66363.7969 - iou_metric: 0.6895 - p_metric: 0.9882 - c_metric: 0.4039 - val_loss: 66037.7734 - val_iou_metric: 0.7473 - val_p_metric: 1.0000 - val_c_metric: 0.4529 - lr: 1.0000e-04

Epoch 94/100

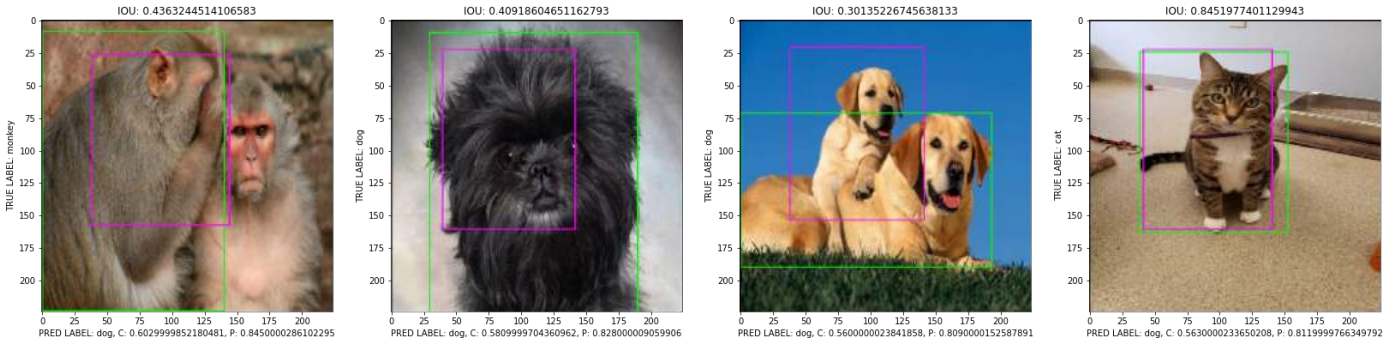
93/93 [==============================] - ETA: 0s - loss: 65730.6719 - iou_metric: 0.6900 - p_metric: 0.9883 - c_metric: 0.4043



93/93 [==============================] - 18s 197ms/step - loss: 65730.6719 - iou_metric: 0.6900 - p_metric: 0.9883 - c_metric: 0.4043 - val_loss: 65415.1914 - val_iou_metric: 0.7475 - val_p_metric: 1.0000 - val_c_metric: 0.4536 - lr: 1.0000e-04

Epoch 95/100

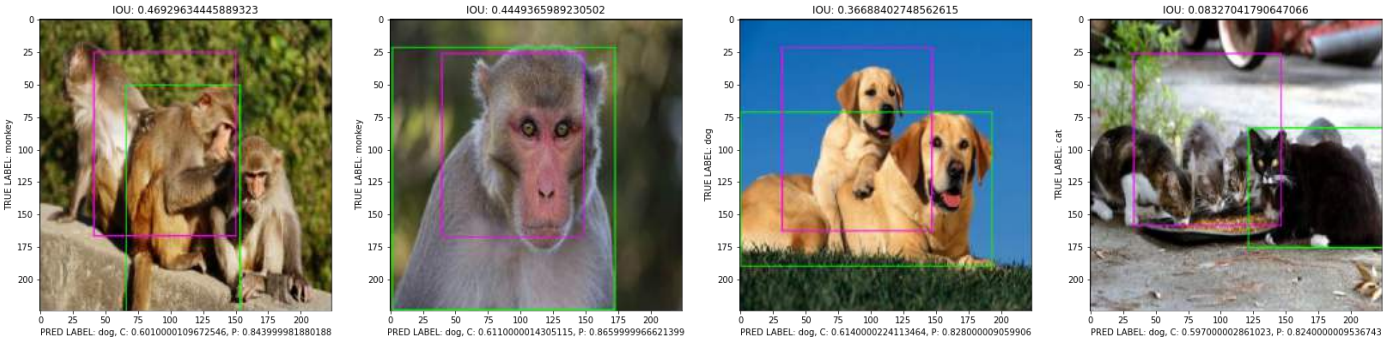
93/93 [==============================] - ETA: 0s - loss: 65109.8125 - iou_metric: 0.6904 - p_metric: 0.9884 - c_metric: 0.4045



93/93 [==============================] - 18s 198ms/step - loss: 65109.8125 - iou_metric: 0.6904 - p_metric: 0.9884 - c_metric: 0.4045 - val_loss: 64794.3047 - val_iou_metric: 0.7478 - val_p_metric: 1.0000 - val_c_metric: 0.4552 - lr: 1.0000e-04

Epoch 96/100

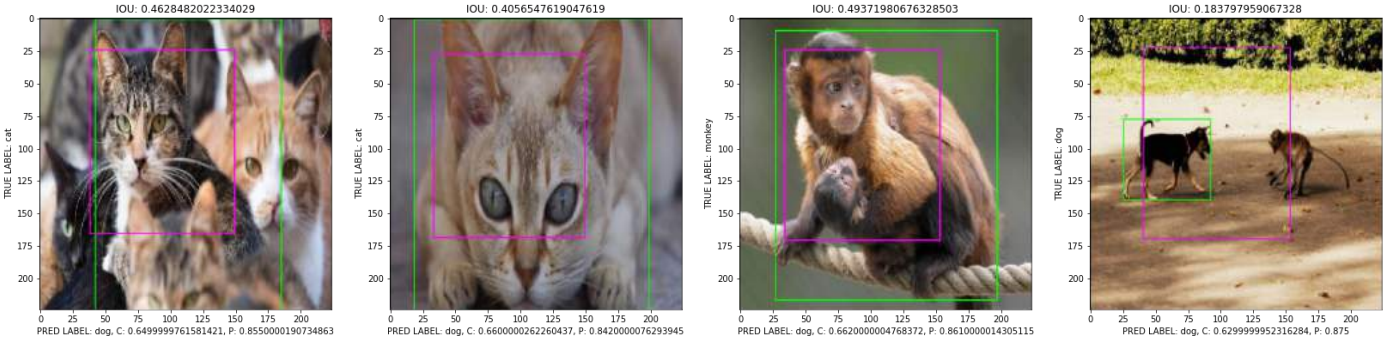
93/93 [==============================] - ETA: 0s - loss: 64486.6523 - iou_metric: 0.6909 - p_metric: 0.9885 - c_metric: 0.4050



93/93 [==============================] - 18s 198ms/step - loss: 64486.6523 - iou_metric: 0.6909 - p_metric: 0.9885 - c_metric: 0.4050 - val_loss: 64172.2109 - val_iou_metric: 0.7480 - val_p_metric: 1.0000 - val_c_metric: 0.4546 - lr: 1.0000e-04

Epoch 97/100

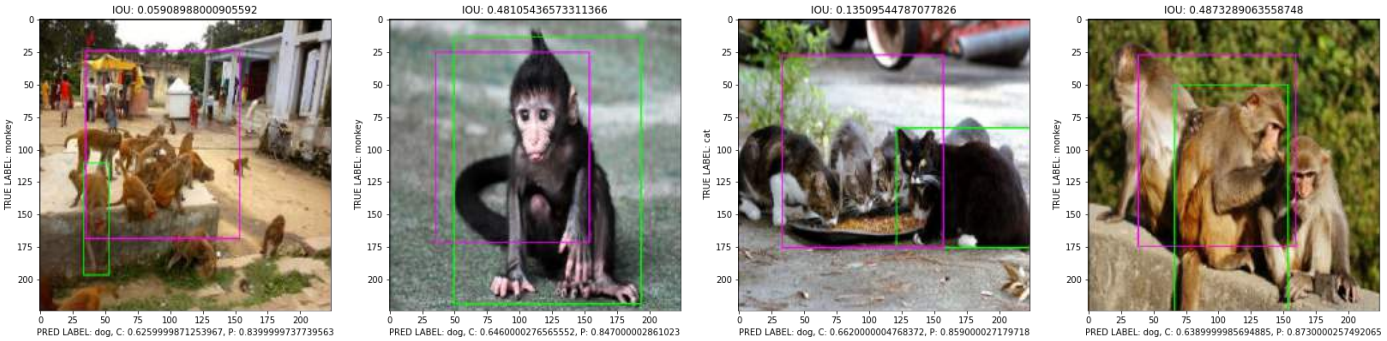
93/93 [==============================] - ETA: 0s - loss: 63869.2578 - iou_metric: 0.6914 - p_metric: 0.9886 - c_metric: 0.4050



93/93 [==============================] - 18s 198ms/step - loss: 63869.2578 - iou_metric: 0.6914 - p_metric: 0.9886 - c_metric: 0.4050 - val_loss: 63564.5469 - val_iou_metric: 0.7483 - val_p_metric: 1.0000 - val_c_metric: 0.4557 - lr: 1.0000e-04

Epoch 98/100

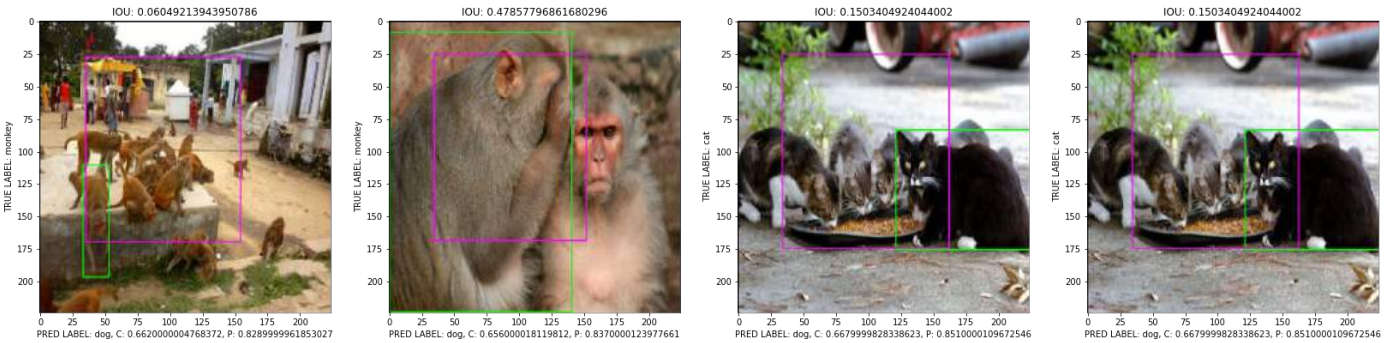
93/93 [==============================] - ETA: 0s - loss: 63267.1484 - iou_metric: 0.6919 - p_metric: 0.9888 - c_metric: 0.4053



93/93 [==============================] - 18s 198ms/step - loss: 63267.1484 - iou_metric: 0.6919 - p_metric: 0.9888 - c_metric: 0.4053 - val_loss: 62955.3398 - val_iou_metric: 0.7486 - val_p_metric: 1.0000 - val_c_metric: 0.4559 - lr: 1.0000e-04

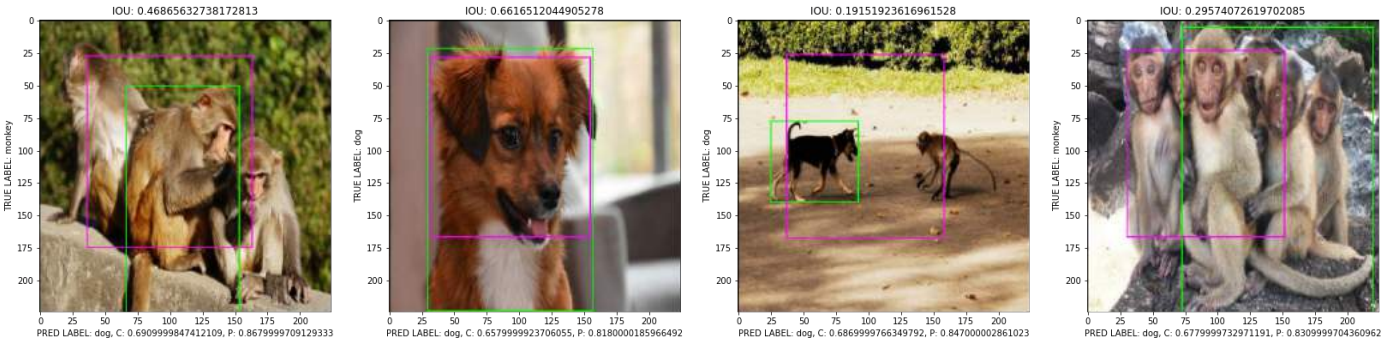
Epoch 99/100

93/93 [==============================] - ETA: 0s - loss: 62652.5781 - iou_metric: 0.6923 - p_metric: 0.9889 - c_metric: 0.4055



93/93 [==============================] - 18s 198ms/step - loss: 62652.5781 - iou_metric: 0.6923 - p_metric: 0.9889 - c_metric: 0.4055 - val_loss: 62348.8008 - val_iou_metric: 0.

```
7487 - val_p_metric: 1.0000 - val_c_metric: 0.4566 - lr: 1.0000e-04
Epoch 100/100
93/93 [==============================] - ETA: 0s - loss: 62044.0508 - iou_metric: 0.6927
- p_metric: 0.9890 - c_metric: 0.4060
```




```
93/93 [==============================] - 18s 198ms/step - loss: 62044.0508 - iou_metric:
0.6927 - p_metric: 0.9890 - c_metric: 0.4060 - val_loss: 61727.8906 - val_iou_metric: 0.
7489 - val_p_metric: 1.0000 - val_c_metric: 0.4568 - lr: 1.0000e-04
```

EVALUATE MODEL ON TESTING DATA

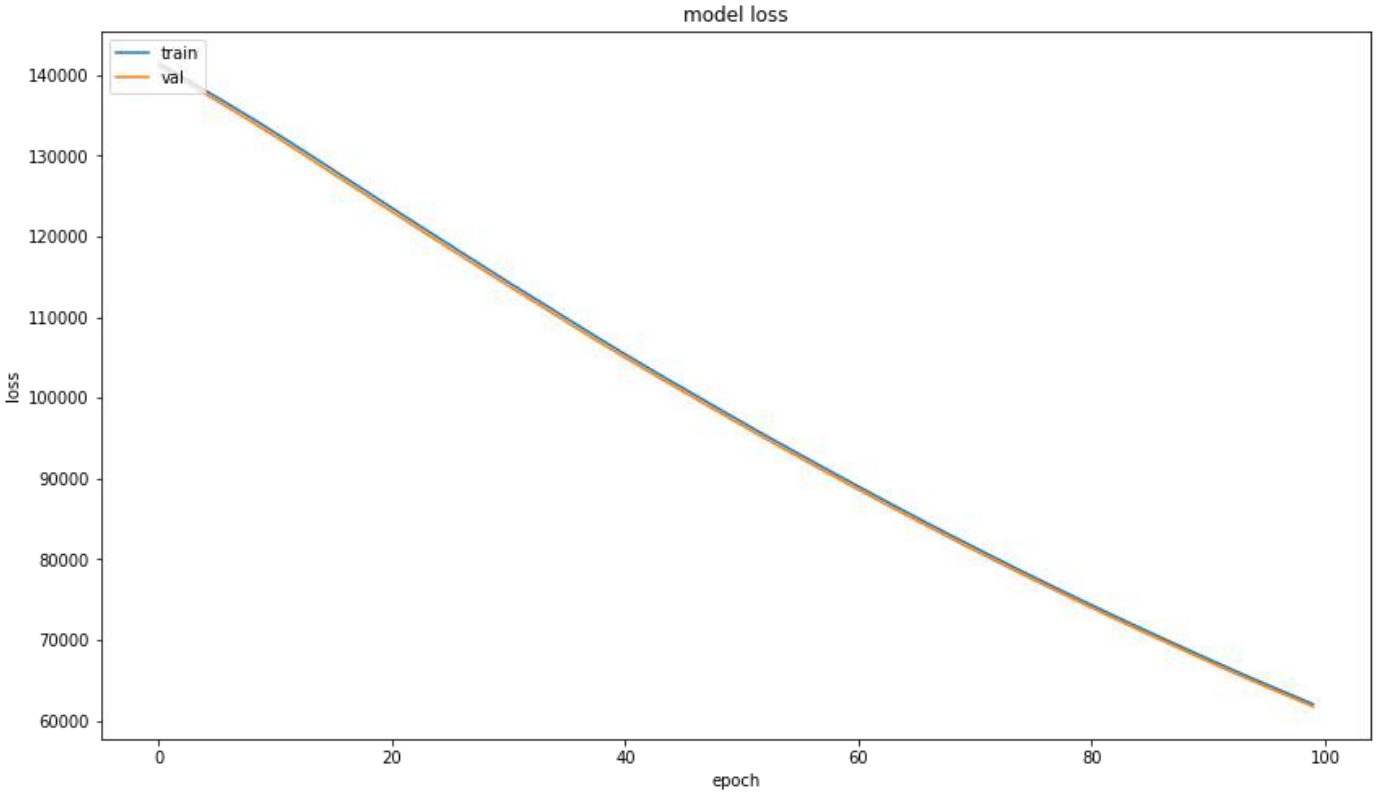
In [ ]:
```
model1.save_weights('model1_full.tf')
model1.evaluate(test_gen)
```

```
5/5 [==============================] - 0s 76ms/step - loss: 61727.8906 - iou_metric: 0.7
493 - p_metric: 1.0000 - c_metric: 0.4580
```

Out[ ]:
```
[61727.890625, 0.7493180632591248, 1.0, 0.45803919434547424]
```

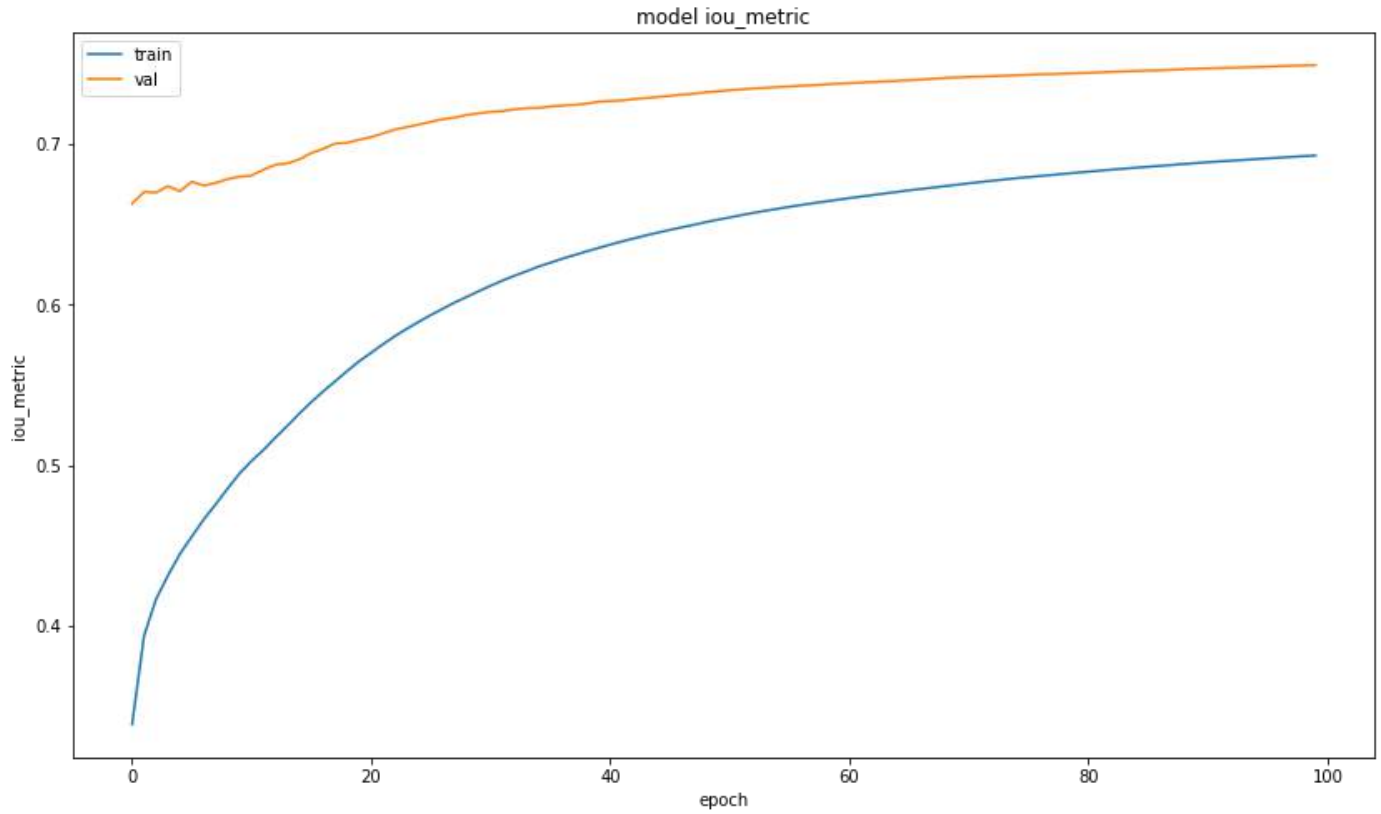
PLOT TRAINING AND VALIDATION LOSS

In [ ]:
```
plot_metric(fit1, 'loss')
```

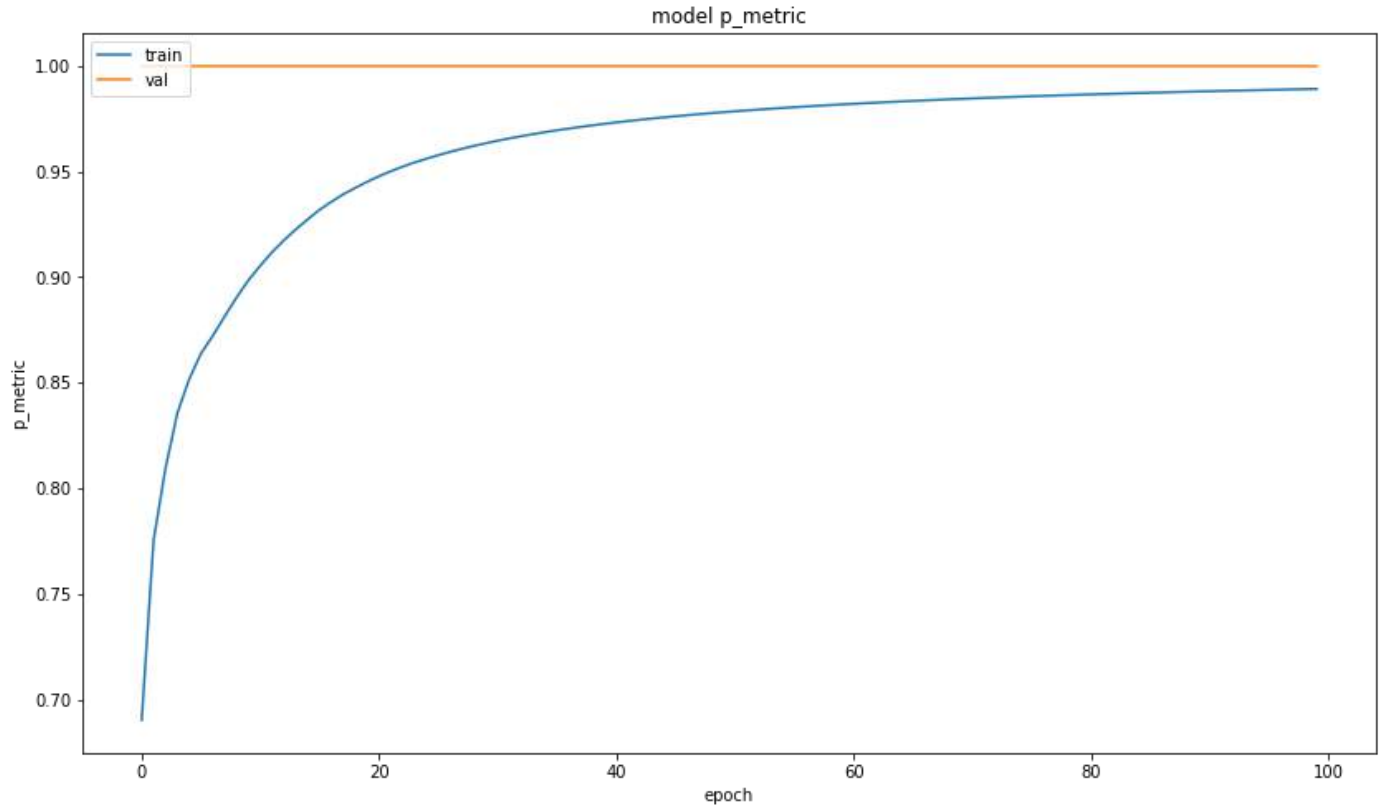


PLOT TRAINING AND VALIDATION METRICS

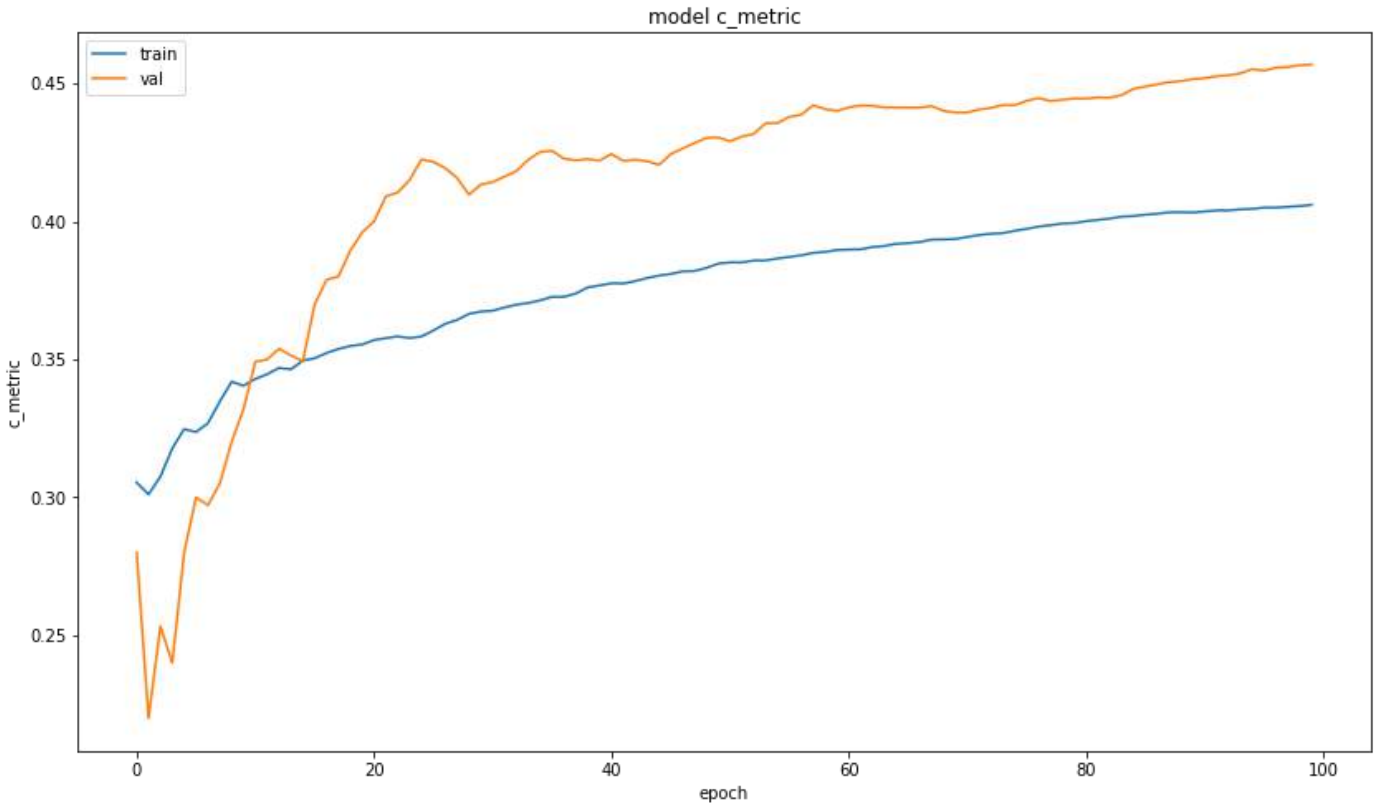
In [ ]:
```
plot_metric(fit1, 'iou_metric')
```



In [ ]:
```
plot_metric(fit1, 'p_metric')
```



In [ ]:
```
plot_metric(fit1, 'c_metric')
```



CREATE MODEL 2 USING TRANSFER LEARNING

In [ ]:
```
X_inp = tf.keras.layers.Input(shape=(H, W, C), batch_size=B)
base = tf.keras.applications.vgg19.VGG19(include_top=False, weights='imagenet', input_te
X = tf.keras.layers.Flatten()(base.output)
X = tf.keras.layers.Dense(2048, activation='sigmoid')(X)
X = tf.keras.layers.Dropout(0.3)(X)
X = tf.keras.layers.Dense(1024, activation='tanh')(X)
X = tf.keras.layers.Dropout(0.2)(X)
X = tf.keras.layers.Dense(512, activation='relu')(X)
X = tf.keras.layers.Dropout(0.1)(X)
X = tf.keras.layers.Dense(len(N)+5)(X)
model2 = tf.keras.Model(inputs=X_inp, outputs=X, name='VGG-BasedNet')
model2.summary()
```

```
Model: "VGG-BasedNet"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 input_2 (InputLayer)        [(5, 224, 224, 3)]        0

 block1_conv1 (Conv2D)       (5, 224, 224, 64)         1792

 block1_conv2 (Conv2D)       (5, 224, 224, 64)         36928

 block1_pool (MaxPooling2D)  (5, 112, 112, 64)         0

 block2_conv1 (Conv2D)       (5, 112, 112, 128)        73856

 block2_conv2 (Conv2D)       (5, 112, 112, 128)        147584

 block2_pool (MaxPooling2D)  (5, 56, 56, 128)          0

 block3_conv1 (Conv2D)       (5, 56, 56, 256)          295168

 block3_conv2 (Conv2D)       (5, 56, 56, 256)          590080
```

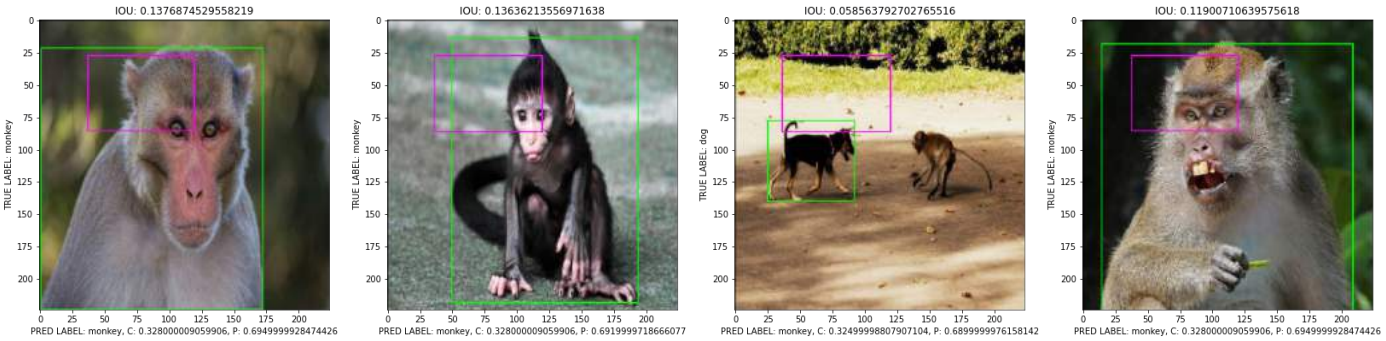
```
 block3_conv3 (Conv2D)       (5, 56, 56, 256)          590080

 block3_conv4 (Conv2D)       (5, 56, 56, 256)          590080

 block3_pool (MaxPooling2D)  (5, 28, 28, 256)          0

 block4_conv1 (Conv2D)       (5, 28, 28, 512)          1180160

 block4_conv2 (Conv2D)       (5, 28, 28, 512)          2359808

 block4_conv3 (Conv2D)       (5, 28, 28, 512)          2359808

 block4_conv4 (Conv2D)       (5, 28, 28, 512)          2359808

 block4_pool (MaxPooling2D)  (5, 14, 14, 512)          0

 block5_conv1 (Conv2D)       (5, 14, 14, 512)          2359808

 block5_conv2 (Conv2D)       (5, 14, 14, 512)          2359808

 block5_conv3 (Conv2D)       (5, 14, 14, 512)          2359808

 block5_conv4 (Conv2D)       (5, 14, 14, 512)          2359808

 block5_pool (MaxPooling2D)  (5, 7, 7, 512)            0

 flatten (Flatten)           (5, 25088)                0

 dense (Dense)               (5, 2048)                 51382272

 dropout (Dropout)           (5, 2048)                 0

 dense_1 (Dense)             (5, 1024)                 2098176

 dropout_1 (Dropout)         (5, 1024)                 0

 dense_2 (Dense)             (5, 512)                  524800

 dropout_2 (Dropout)         (5, 512)                  0

 dense_3 (Dense)             (5, 8)                    4104

=================================================================
Total params: 74,033,736
Trainable params: 74,033,736
Non-trainable params: 0
_________________________________________________________________
```

TRAIN MODEL 2 USING PREVIOUS LOSS AND METRIC

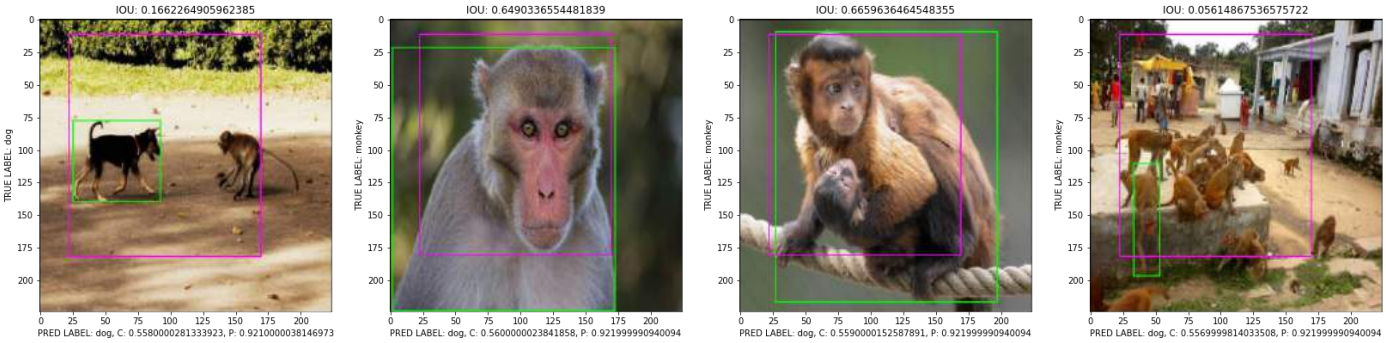
In [ ]:
```
model2.compile(optimizer=tf.keras.optimizers.RMSprop(learning_rate=1e-4),
               loss=loss,
               metrics=metric)
fit2 = model2.fit(train_gen,
                  epochs=e,
                  batch_size=B,
                  callbacks=callback,
                  validation_data=val_gen,
                  validation_batch_size=B)
```

```
Epoch 1/100
 6/93 [>.............................] - ETA: 13s - loss: 11.3693 - iou_metric: 0.1753 -
p_metric: 0.7333 - c_metric: 0.3667
```

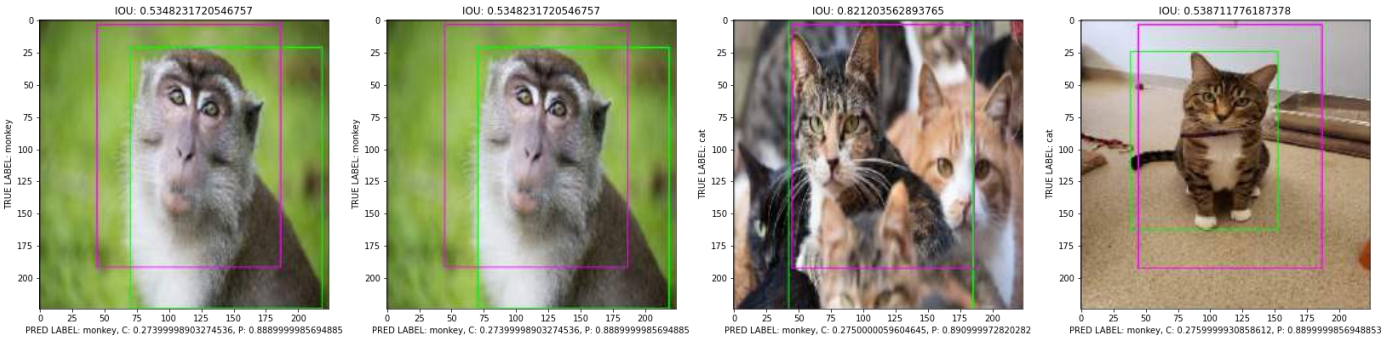
```
WARNING:tensorflow:Callback method `on_train_batch_end` is slow compared to the batch ti
me (batch time: 0.0434s vs `on_train_batch_end` time: 0.0920s). Check your callbacks.
93/93 [==============================] - ETA: 0s - loss: 1.6559 - iou_metric: 0.5032 - p
_metric: 0.9290 - c_metric: 0.3441
```



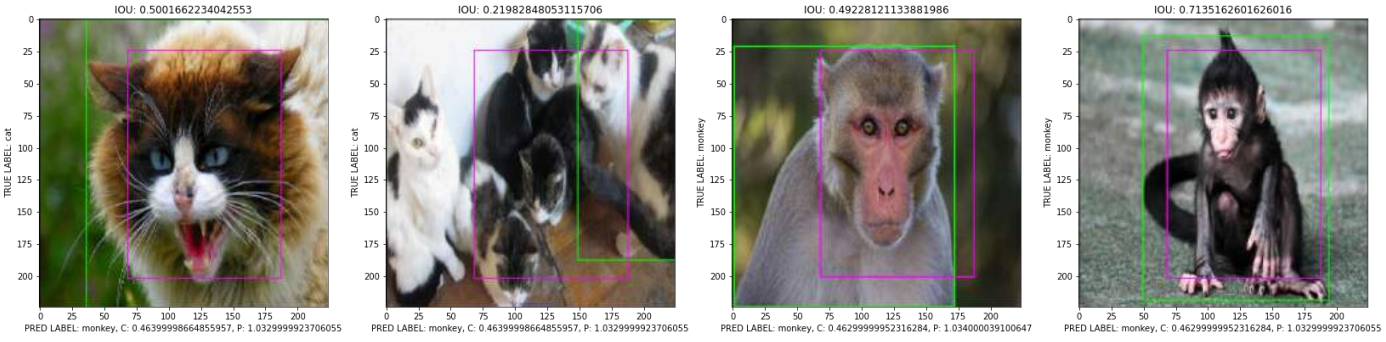

```
93/93 [==============================] - 22s 191ms/step - loss: 1.6559 - iou_metric: 0.5
032 - p_metric: 0.9290 - c_metric: 0.3441 - val_loss: 0.8047 - val_iou_metric: 0.4901 -
val_p_metric: 1.0000 - val_c_metric: 0.4400 - lr: 1.0000e-04
Epoch 2/100
93/93 [==============================] - ETA: 0s - loss: 0.5604 - iou_metric: 0.5730 - p
_metric: 0.9602 - c_metric: 0.3548
```



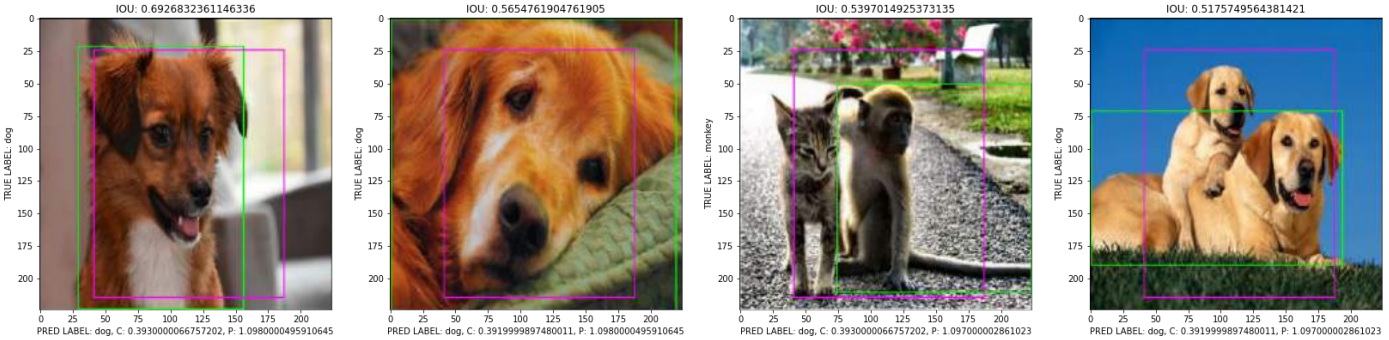

```
93/93 [==============================] - 17s 180ms/step - loss: 0.5604 - iou_metric: 0.5
730 - p_metric: 0.9602 - c_metric: 0.3548 - val_loss: 0.3971 - val_iou_metric: 0.6108 -
val_p_metric: 1.0000 - val_c_metric: 0.3600 - lr: 1.0000e-04
Epoch 3/100
93/93 [==============================] - ETA: 0s - loss: 0.4962 - iou_metric: 0.6072 - p
_metric: 0.9706 - c_metric: 0.3434
```



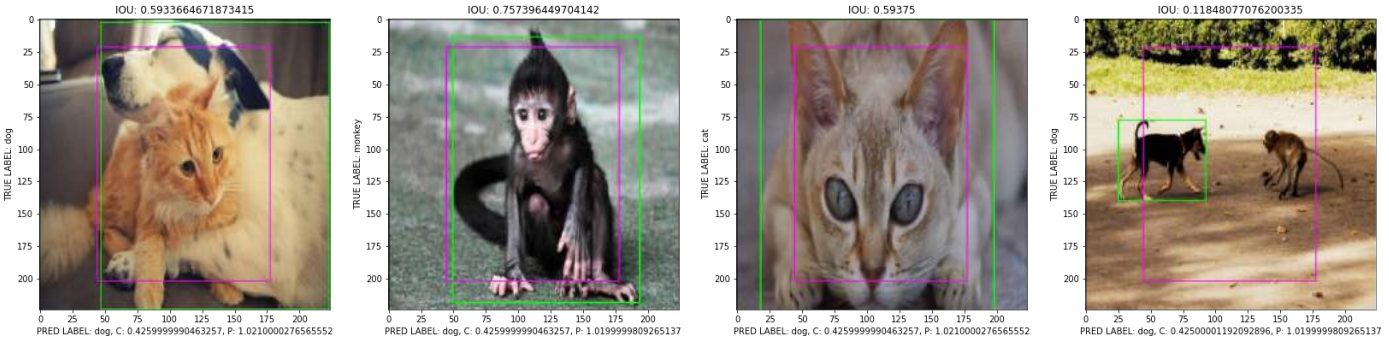

```
93/93 [==============================] - 17s 181ms/step - loss: 0.4962 - iou_metric: 0.6
072 - p_metric: 0.9706 - c_metric: 0.3434 - val_loss: 0.3517 - val_iou_metric: 0.6569 -
val_p_metric: 1.0000 - val_c_metric: 0.3867 - lr: 1.0000e-04
Epoch 4/100
93/93 [==============================] - ETA: 0s - loss: 0.4666 - iou_metric: 0.6259 - p
_metric: 0.9763 - c_metric: 0.3398
```



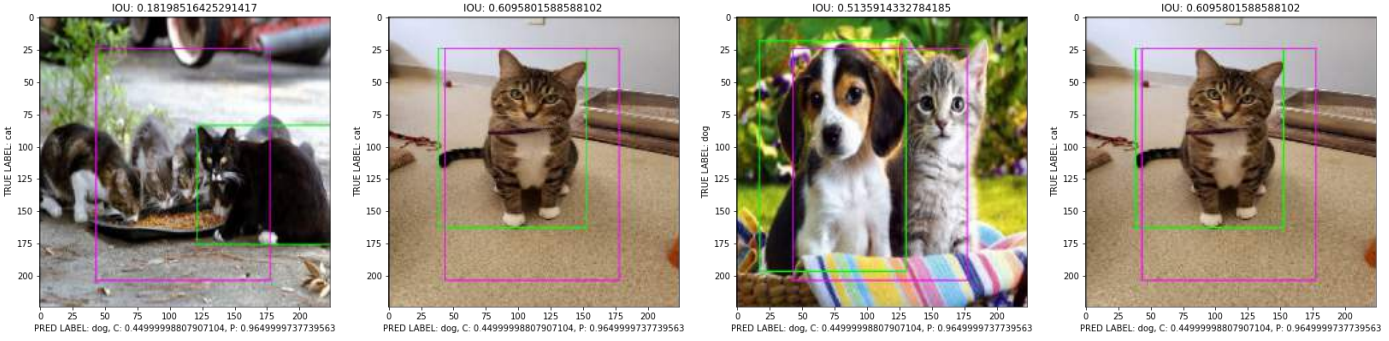
93/93 [==============================] - 17s 183ms/step - loss: 0.4666 - iou_metric: 0.6259 - p_metric: 0.9763 - c_metric: 0.3398 - val_loss: 0.3339 - val_iou_metric: 0.6753 - val_p_metric: 1.0000 - val_c_metric: 0.4000 - lr: 1.0000e-04
Epoch 5/100
93/93 [==============================] - ETA: 0s - loss: 0.4620 - iou_metric: 0.6378 - p_metric: 0.9802 - c_metric: 0.3376



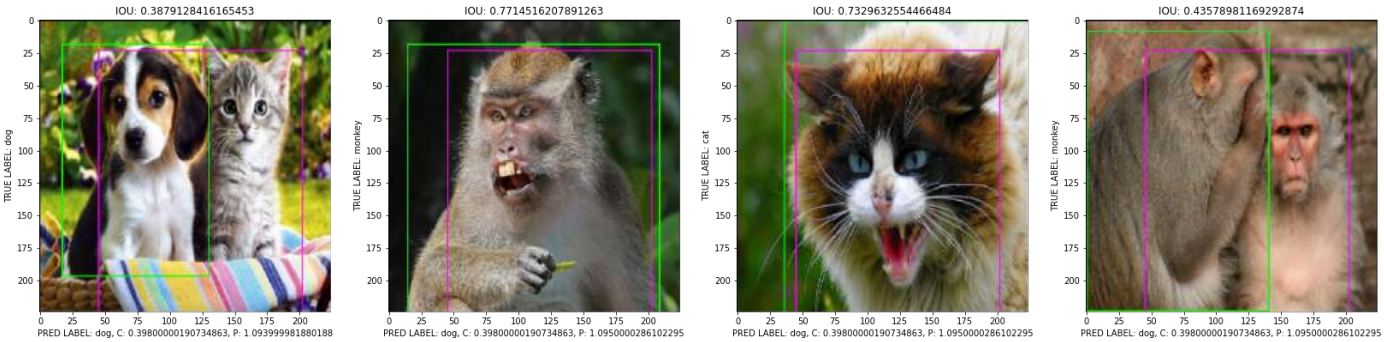
93/93 [==============================] - 17s 182ms/step - loss: 0.4620 - iou_metric: 0.6378 - p_metric: 0.9802 - c_metric: 0.3376 - val_loss: 0.3351 - val_iou_metric: 0.6950 - val_p_metric: 1.0000 - val_c_metric: 0.3760 - lr: 1.0000e-04
Epoch 6/100
93/93 [==============================] - ETA: 0s - loss: 0.4399 - iou_metric: 0.6472 - p_metric: 0.9835 - c_metric: 0.3355



93/93 [==============================] - 17s 185ms/step - loss: 0.4399 - iou_metric: 0.6472 - p_metric: 0.9835 - c_metric: 0.3355 - val_loss: 0.3259 - val_iou_metric: 0.7051 - val_p_metric: 1.0000 - val_c_metric: 0.3600 - lr: 1.0000e-04
Epoch 7/100
93/93 [==============================] - ETA: 0s - loss: 0.4431 - iou_metric: 0.6544 - p_metric: 0.9853 - c_metric: 0.3367



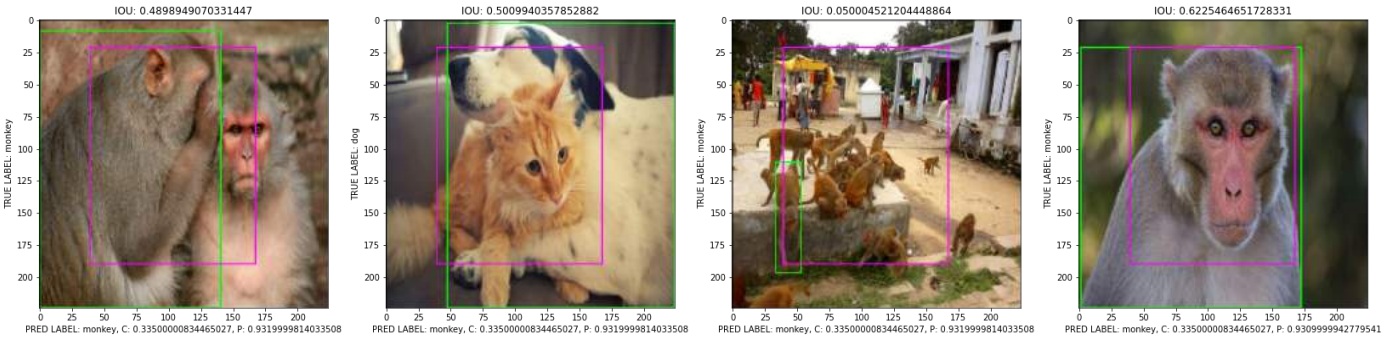
93/93 [==============================] - 17s 186ms/step - loss: 0.4431 - iou_metric: 0.6544 - p_metric: 0.9853 - c_metric: 0.3367 - val_loss: 0.3291 - val_iou_metric: 0.7121 - val_p_metric: 1.0000 - val_c_metric: 0.3486 - lr: 1.0000e-04
Epoch 8/100
93/93 [==============================] - ETA: 0s - loss: 0.4267 - iou_metric: 0.6607 - p_metric: 0.9868 - c_metric: 0.3333



93/93 [==============================] - 17s 184ms/step - loss: 0.4267 - iou_metric: 0.6607 - p_metric: 0.9868 - c_metric: 0.3333 - val_loss: 0.3508 - val_iou_metric: 0.7189 - val_p_metric: 1.0000 - val_c_metric: 0.3400 - lr: 1.0000e-04

Epoch 9/100

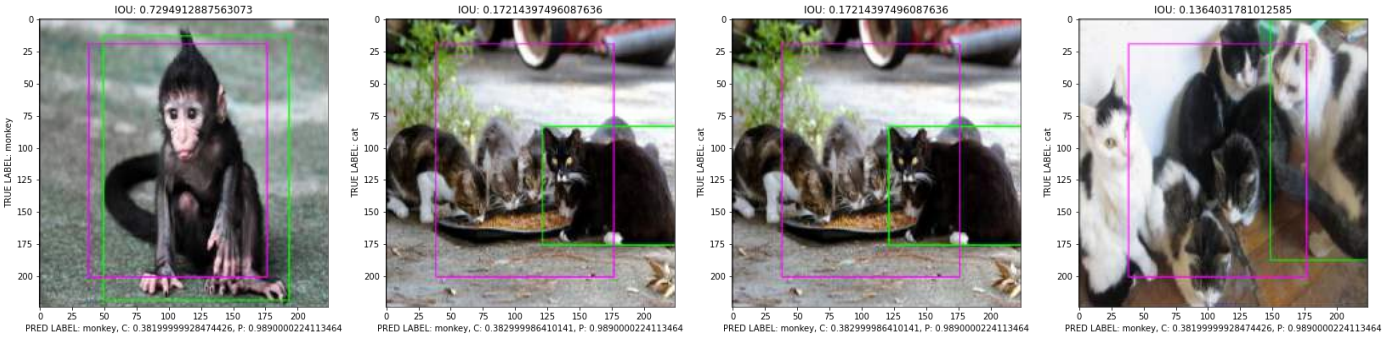
93/93 [==============================] - ETA: 0s - loss: 0.4351 - iou_metric: 0.6649 - p_metric: 0.9878 - c_metric: 0.3357



93/93 [==============================] - 17s 183ms/step - loss: 0.4351 - iou_metric: 0.6649 - p_metric: 0.9878 - c_metric: 0.3357 - val_loss: 0.3324 - val_iou_metric: 0.7210 - val_p_metric: 1.0000 - val_c_metric: 0.3511 - lr: 1.0000e-04

Epoch 10/100

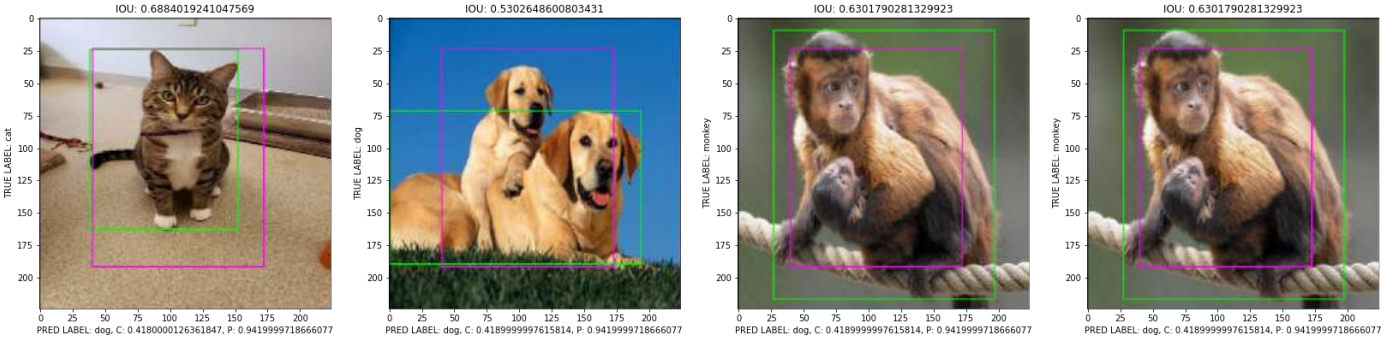
93/93 [==============================] - ETA: 0s - loss: 0.3986 - iou_metric: 0.6698 - p_metric: 0.9890 - c_metric: 0.3400



93/93 [==============================] - 17s 185ms/step - loss: 0.3986 - iou_metric: 0.6698 - p_metric: 0.9890 - c_metric: 0.3400 - val_loss: 0.3195 - val_iou_metric: 0.7247 - val_p_metric: 1.0000 - val_c_metric: 0.3600 - lr: 3.0000e-05

Epoch 11/100

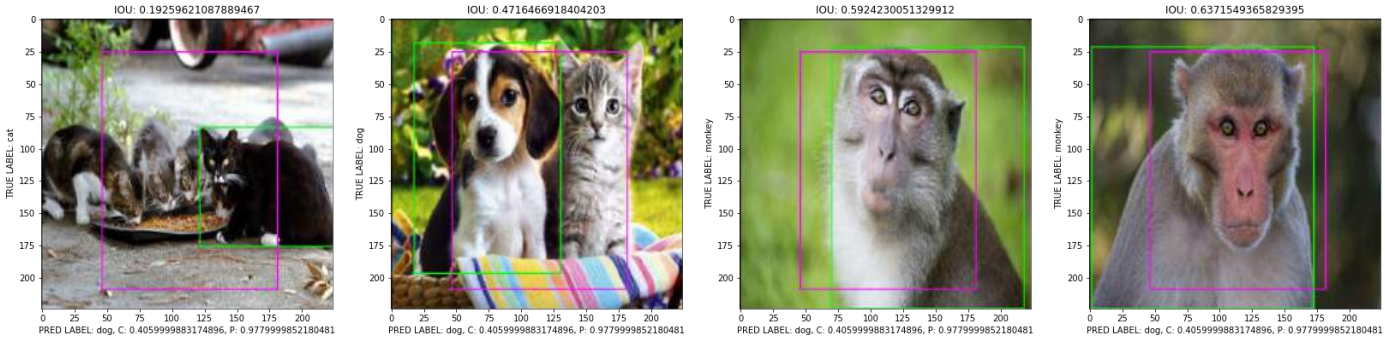
93/93 [==============================] - ETA: 0s - loss: 0.4104 - iou_metric: 0.6730 - p_metric: 0.9900 - c_metric: 0.3410



93/93 [==============================] - 17s 183ms/step - loss: 0.4104 - iou_metric: 0.6730 - p_metric: 0.9900 - c_metric: 0.3410 - val_loss: 0.3370 - val_iou_metric: 0.7263 - val_p_metric: 1.0000 - val_c_metric: 0.3527 - lr: 3.0000e-05

Epoch 12/100

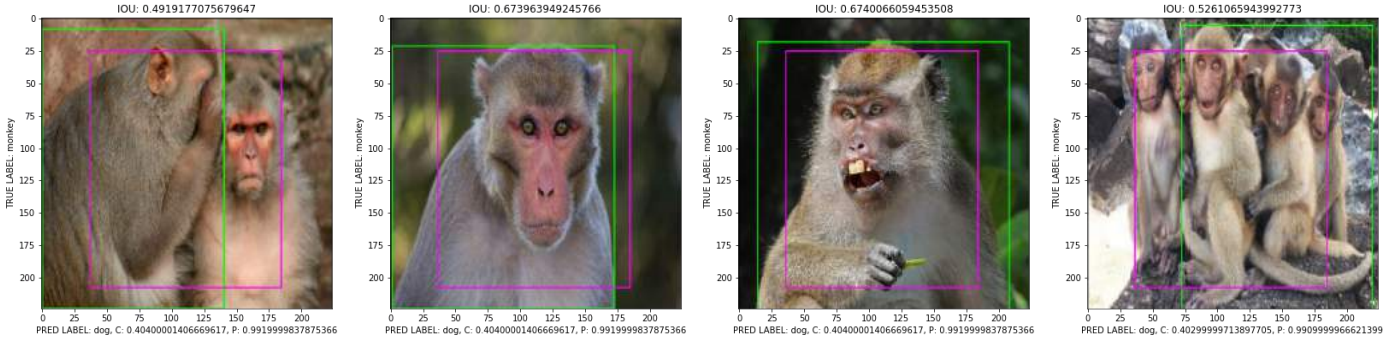
93/93 [==============================] - ETA: 0s - loss: 0.4081 - iou_metric: 0.6761 - p_metric: 0.9909 - c_metric: 0.3400



93/93 [==============================] - 17s 183ms/step - loss: 0.4081 - iou_metric: 0.6761 - p_metric: 0.9909 - c_metric: 0.3400 - val_loss: 0.3232 - val_iou_metric: 0.7290 - val_p_metric: 1.0000 - val_c_metric: 0.3467 - lr: 3.0000e-05

Epoch 13/100

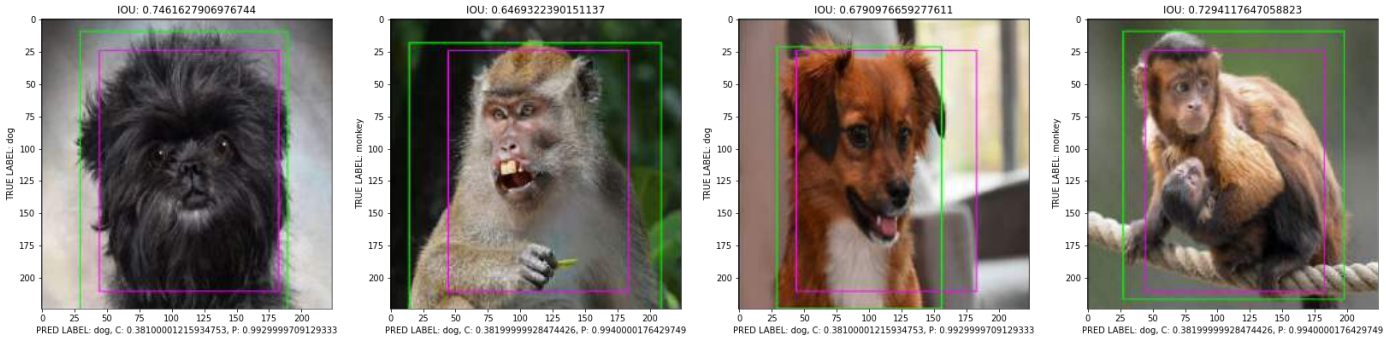
93/93 [==============================] - ETA: 0s - loss: 0.4183 - iou_metric: 0.6784 - p_metric: 0.9912 - c_metric: 0.3385



93/93 [==============================] - 17s 183ms/step - loss: 0.4183 - iou_metric: 0.6784 - p_metric: 0.9912 - c_metric: 0.3385 - val_loss: 0.3209 - val_iou_metric: 0.7320 - val_p_metric: 1.0000 - val_c_metric: 0.3415 - lr: 3.0000e-05

Epoch 14/100

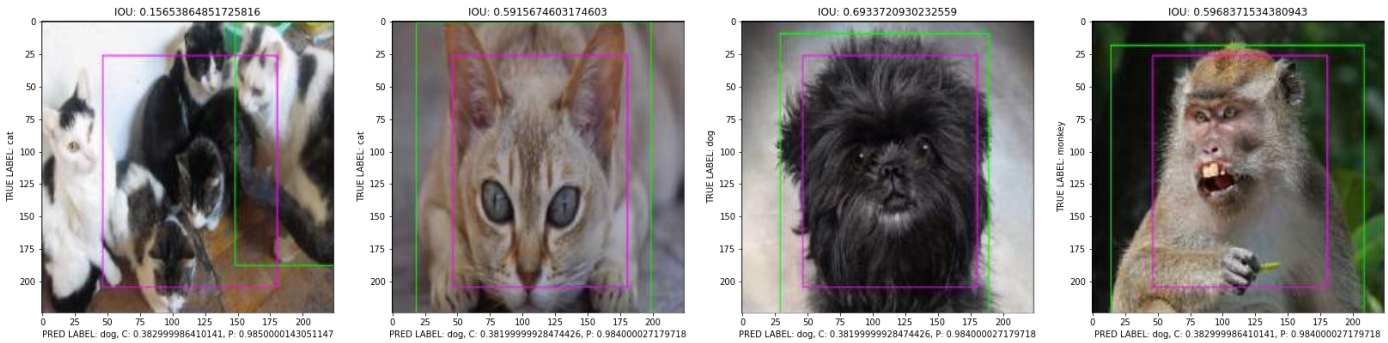
93/93 [==============================] - ETA: 0s - loss: 0.3899 - iou_metric: 0.6813 - p_metric: 0.9919 - c_metric: 0.3390



93/93 [==============================] - 17s 183ms/step - loss: 0.3899 - iou_metric: 0.6813 - p_metric: 0.9919 - c_metric: 0.3390 - val_loss: 0.3190 - val_iou_metric: 0.7343 - val_p_metric: 1.0000 - val_c_metric: 0.3371 - lr: 9.0000e-06

Epoch 15/100

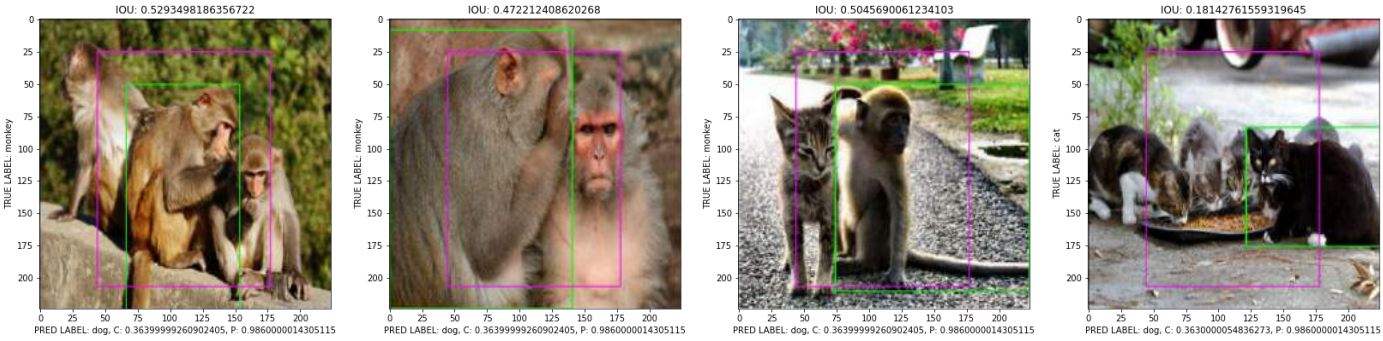
93/93 [==============================] - ETA: 0s - loss: 0.3925 - iou_metric: 0.6837 - p_metric: 0.9921 - c_metric: 0.3418



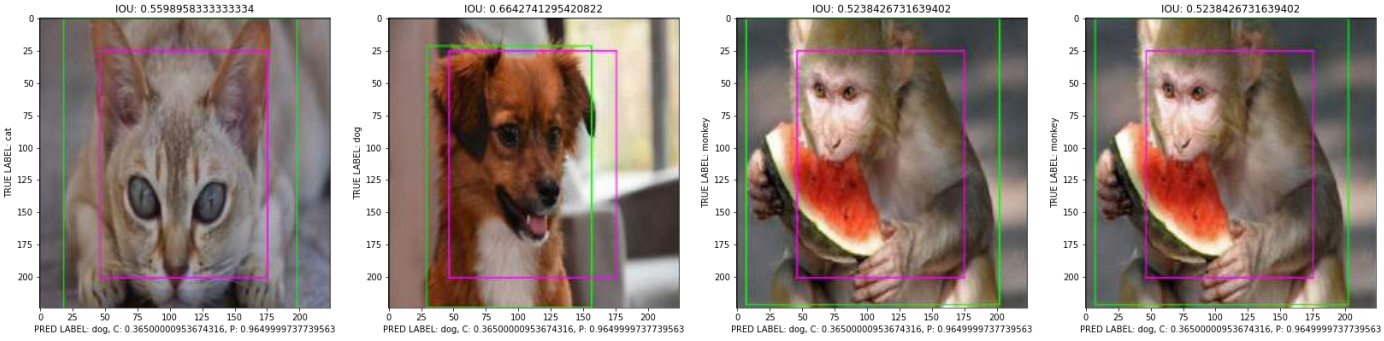
93/93 [==============================] - 17s 185ms/step - loss: 0.3925 - iou_metric: 0.6837 - p_metric: 0.9921 - c_metric: 0.3418 - val_loss: 0.3205 - val_iou_metric: 0.7355 -

val_p_metric: 1.0000 - val_c_metric: 0.3333 - lr: 9.0000e-06
Epoch 16/100
93/93 [==============================] - ETA: 0s - loss: 0.4046 - iou_metric: 0.6857 - p_metric: 0.9926 - c_metric: 0.3395

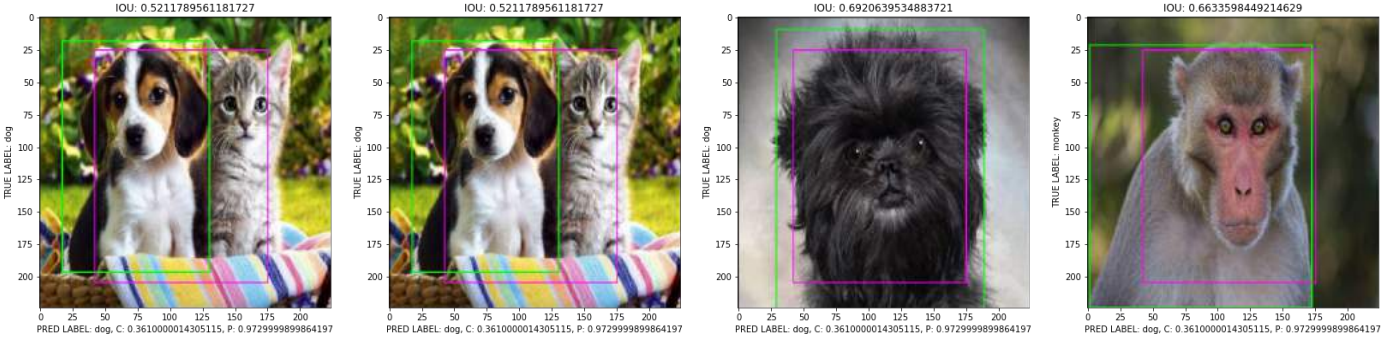
93/93 [==============================] - 18s 188ms/step - loss: 0.4046 - iou_metric: 0.6857 - p_metric: 0.9926 - c_metric: 0.3395 - val_loss: 0.3190 - val_iou_metric: 0.7370 - val_p_metric: 1.0000 - val_c_metric: 0.3300 - lr: 9.0000e-06
Epoch 17/100
93/93 [==============================] - ETA: 0s - loss: 0.4014 - iou_metric: 0.6874 - p_metric: 0.9929 - c_metric: 0.3394



93/93 [==============================] - 18s 193ms/step - loss: 0.4014 - iou_metric: 0.6874 - p_metric: 0.9929 - c_metric: 0.3394 - val_loss: 0.3183 - val_iou_metric: 0.7381 - val_p_metric: 1.0000 - val_c_metric: 0.3271 - lr: 9.0000e-06
Epoch 18/100
93/93 [==============================] - ETA: 0s - loss: 0.3957 - iou_metric: 0.6890 - p_metric: 0.9933 - c_metric: 0.3388

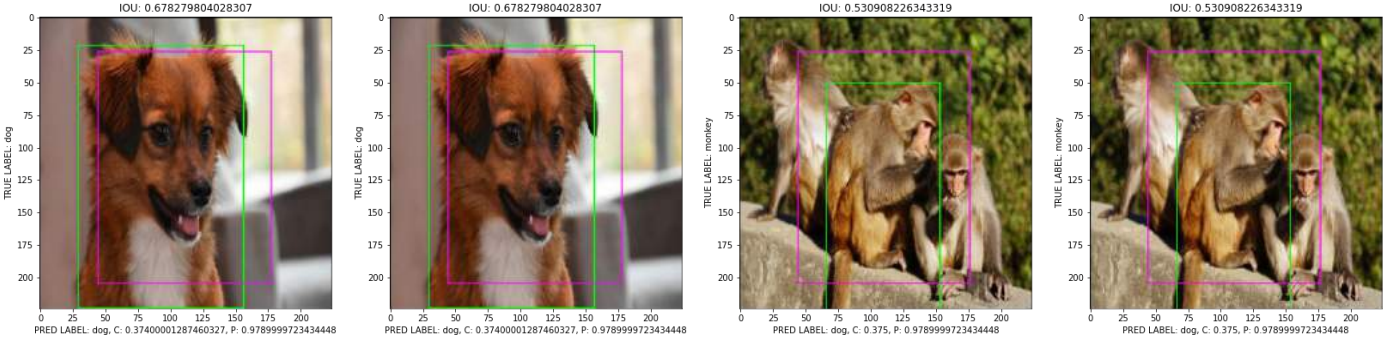


93/93 [==============================] - 18s 195ms/step - loss: 0.3957 - iou_metric: 0.6890 - p_metric: 0.9933 - c_metric: 0.3388 - val_loss: 0.3230 - val_iou_metric: 0.7386 - val_p_metric: 1.0000 - val_c_metric: 0.3244 - lr: 9.0000e-06
Epoch 19/100
93/93 [==============================] - ETA: 0s - loss: 0.4010 - iou_metric: 0.6907 - p_metric: 0.9937 - c_metric: 0.3372

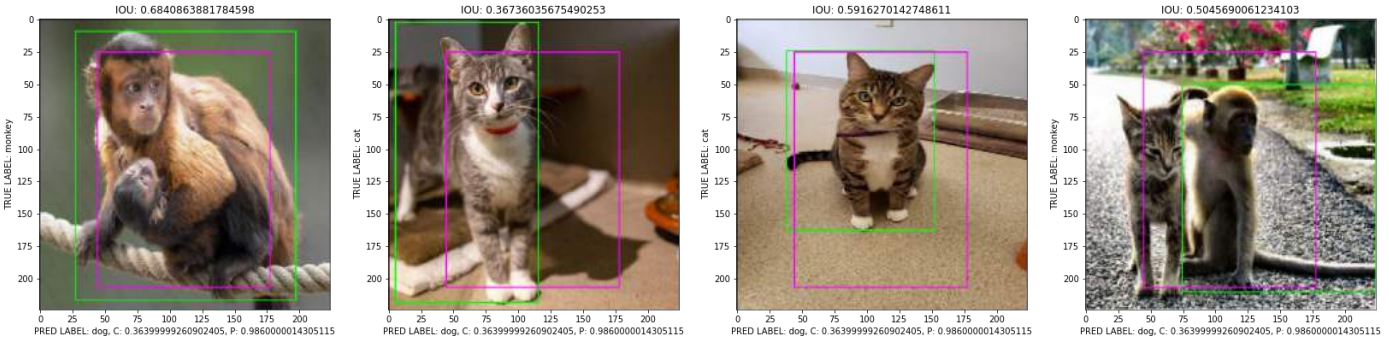


```
93/93 [==============================] - 18s 189ms/step - loss: 0.4010 - iou_metric: 0.6
907 - p_metric: 0.9937 - c_metric: 0.3372 - val_loss: 0.3190 - val_iou_metric: 0.7394 -
val_p_metric: 1.0000 - val_c_metric: 0.3221 - lr: 9.0000e-06
Epoch 20/100
93/93 [==============================] - ETA: 0s - loss: 0.3912 - iou_metric: 0.6922 - p
_metric: 0.9940 - c_metric: 0.3362
```


```
93/93 [==============================] - 18s 190ms/step - loss: 0.3912 - iou_metric: 0.6
922 - p_metric: 0.9940 - c_metric: 0.3362 - val_loss: 0.3225 - val_iou_metric: 0.7400 -
val_p_metric: 1.0000 - val_c_metric: 0.3200 - lr: 9.0000e-06
Epoch 21/100
93/93 [==============================] - ETA: 0s - loss: 0.3981 - iou_metric: 0.6932 - p
_metric: 0.9942 - c_metric: 0.3367
```




```
93/93 [==============================] - 18s 189ms/step - loss: 0.3981 - iou_metric: 0.6
932 - p_metric: 0.9942 - c_metric: 0.3367 - val_loss: 0.3203 - val_iou_metric: 0.7406 -
val_p_metric: 1.0000 - val_c_metric: 0.3181 - lr: 2.7000e-06
Epoch 22/100
93/93 [==============================] - ETA: 0s - loss: 0.3864 - iou_metric: 0.6945 - p
_metric: 0.9943 - c_metric: 0.3383
```




```
93/93 [==============================] - 18s 193ms/step - loss: 0.3864 - iou_metric: 0.6
945 - p_metric: 0.9943 - c_metric: 0.3383 - val_loss: 0.3205 - val_iou_metric: 0.7412 -
val_p_metric: 1.0000 - val_c_metric: 0.3164 - lr: 2.7000e-06
```

SAVE AND EVALUATE MODEL ON TESTING DATA

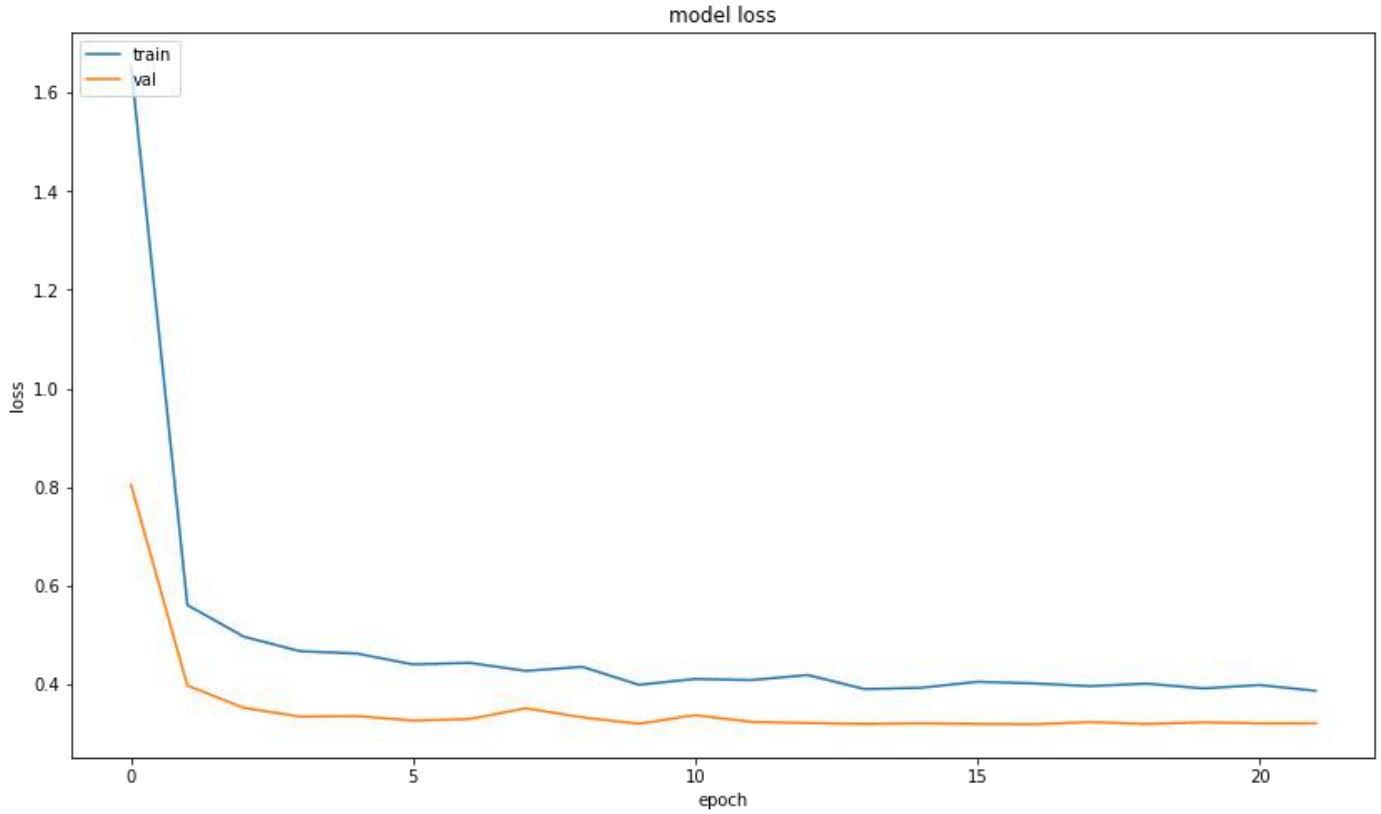
In [ ]:
```
model2.save('model2__full.tf')
model2.evaluate(test_gen)
```

```
5/5 [==============================] - 1s 91ms/step - loss: 0.3059 - iou_metric: 0.7421
- p_metric: 1.0000 - c_metric: 0.3235
```

Out[ ]:
```
[0.30592295552745819, 0.7421384453773499, 1.0, 0.32347837090492251]
```

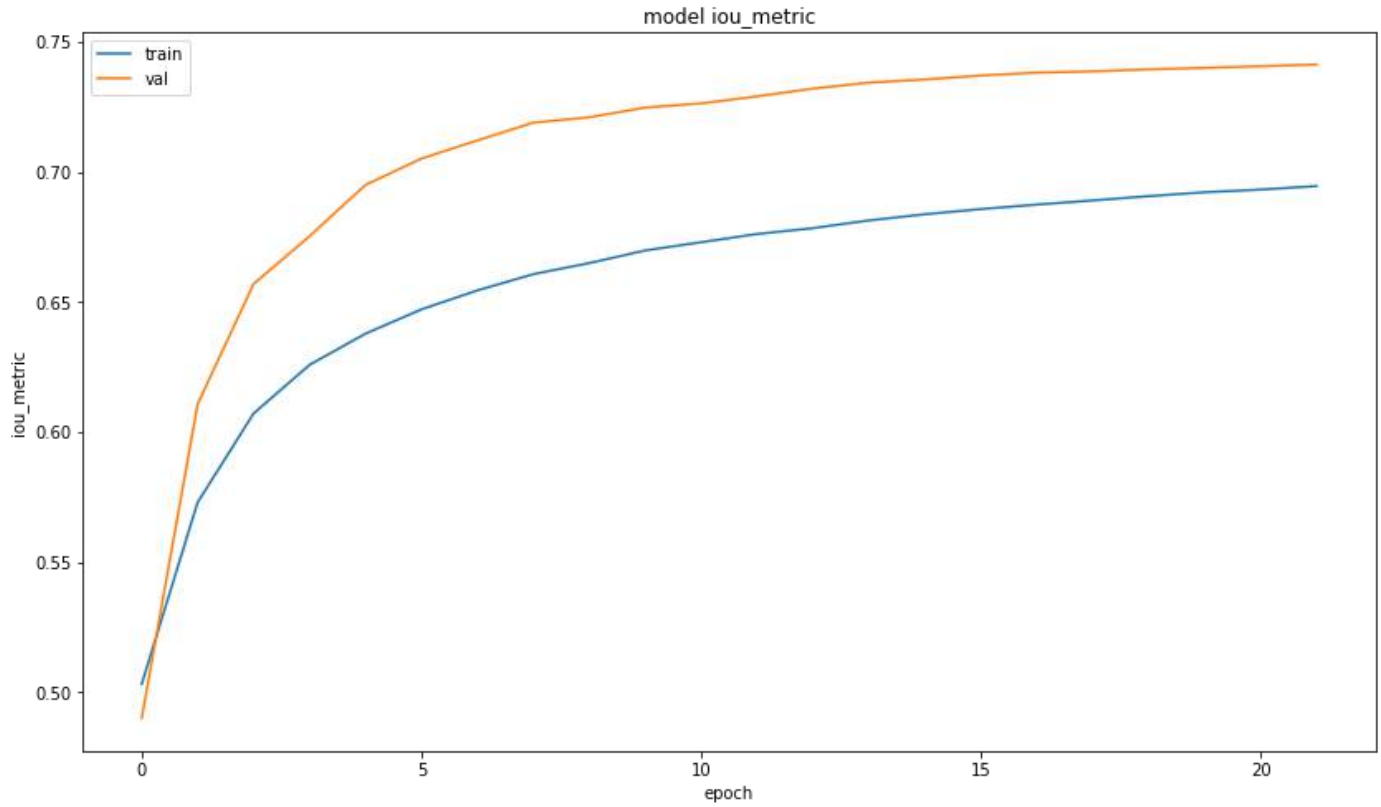
PLOT MODEL LOSS

In [ ]:
```
plot_metric(fit2, 'loss')
```

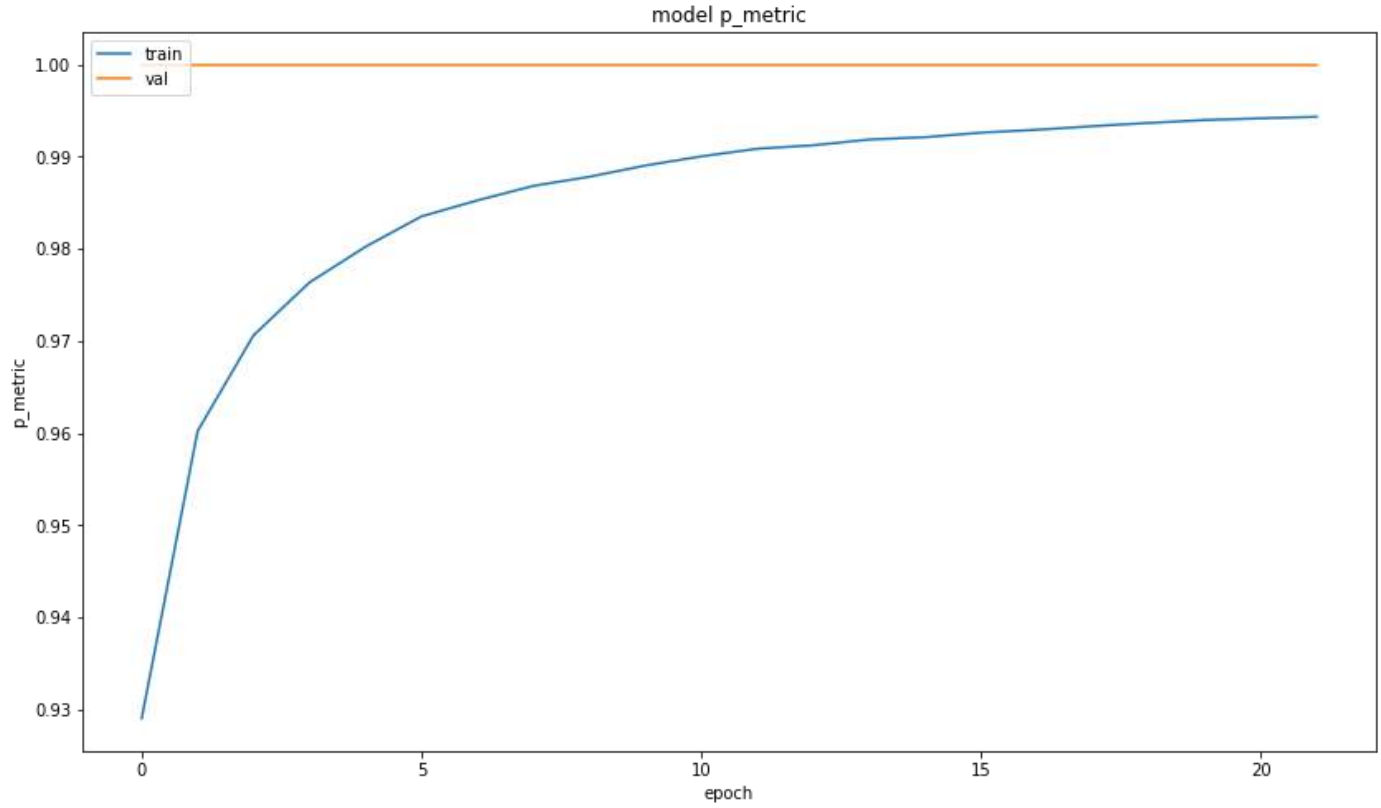


PLOT MODEL METRIC

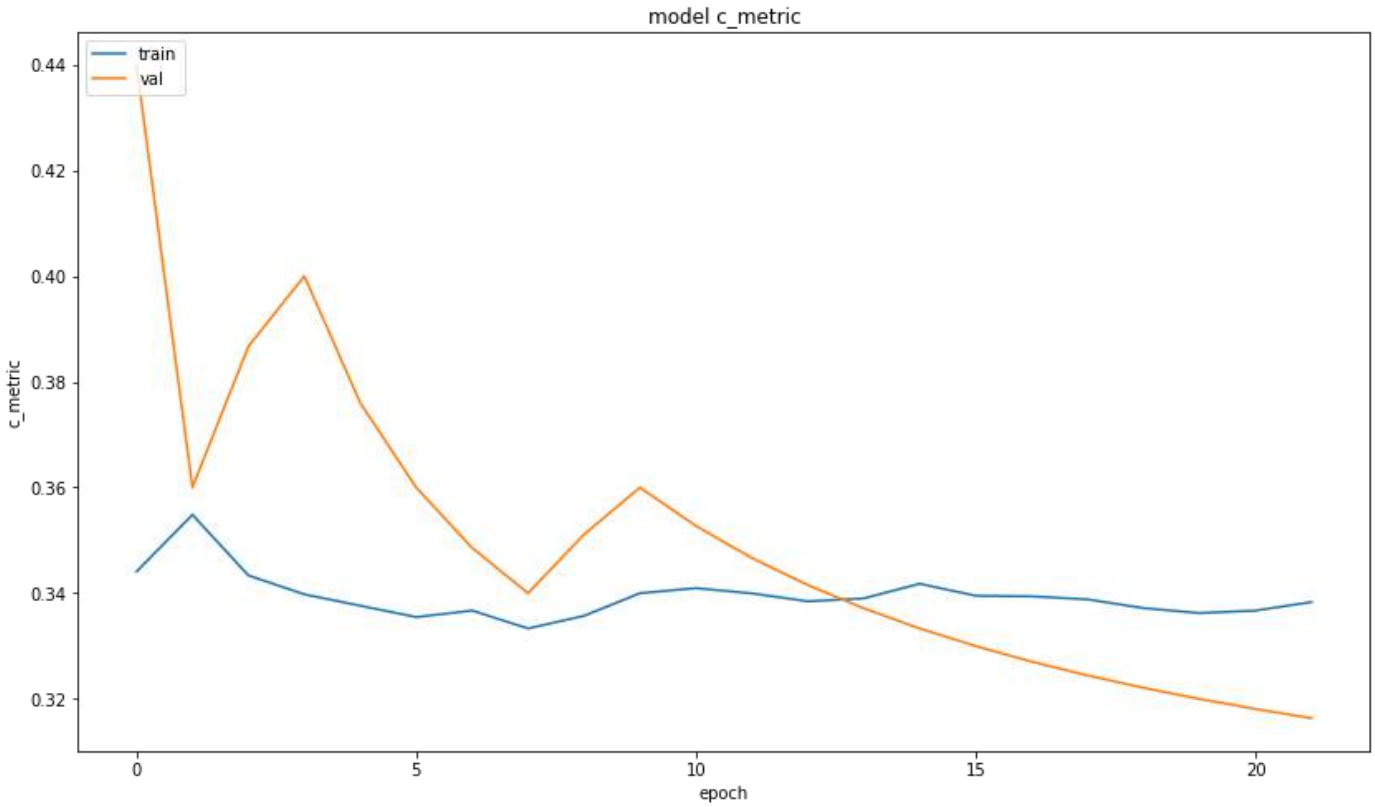
In [ ]:
```
plot_metric(fit2, 'iou_metric')
```



In [ ]:
```
plot_metric(fit2, 'p_metric')
```



In [ ]:
```
plot_metric(fit2, 'c_metric')
```


model c_metric
train
val
0.44
0.42
0.40
0.38
0.36
0.34
0.32
c_metric
0
5
10
15
20
epoch