In [1]:
```
!pip install supervision
!pip install ultralytics
```

```
Collecting supervision
  Downloading supervision-0.18.0-py3-none-any.whl.metadata (12 kB)
Requirement already satisfied: defusedxml<0.8.0,>=0.7.1 in /opt/conda/lib/python3.10/site-packages (from supervision) (0.7.1)
Requirement already satisfied: matplotlib>=3.6.0 in /opt/conda/lib/python3.10/site-packages (from supervision) (3.7.5)
Requirement already satisfied: numpy>=1.21.2 in /opt/conda/lib/python3.10/site-packages (from supervision) (1.26.4)
Requirement already satisfied: opencv-python-headless>=4.5.5.64 in /opt/conda/lib/python3.10/site-packages (from supervision)
(4.9.0.80)
Requirement already satisfied: pyyaml>=5.3 in /opt/conda/lib/python3.10/site-packages (from supervision) (6.0.1)
Requirement already satisfied: scipy<2.0.0,>=1.10.0 in /opt/conda/lib/python3.10/site-packages (from supervision) (1.11.4)
Requirement already satisfied: contourpy>=1.0.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.6.0->supervisio
n) (1.2.0)
Requirement already satisfied: cycler>=0.10 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.6.0->supervision)
(0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.6.0->supervisio
n) (4.47.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.6.0->supervisio
n) (1.4.5)
Requirement already satisfied: packaging>=20.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.6.0->supervision)
(21.3)
Requirement already satisfied: pillow>=6.2.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.6.0->supervision)
(9.5.0)
Requirement already satisfied: pyparsing>=2.3.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.6.0->supervisio
n) (3.1.1)
Requirement already satisfied: python-dateutil>=2.7 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.6.0->supervi
sion) (2.8.2)
Requirement already satisfied: six>=1.5 in /opt/conda/lib/python3.10/site-packages (from python-dateutil>=2.7->matplotlib>=3.6.
0->supervision) (1.16.0)
Downloading supervision-0.18.0-py3-none-any.whl (86 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 86.7/86.7 kB 2.7 MB/s eta 0:00:00
Installing collected packages: supervision
Successfully installed supervision-0.18.0
Collecting ultralytics
  Downloading ultralytics-8.1.27-py3-none-any.whl.metadata (40 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 40.3/40.3 kB 1.6 MB/s eta 0:00:00
Requirement already satisfied: matplotlib>=3.3.0 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (3.7.5)
Requirement already satisfied: opencv-python>=4.6.0 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (4.9.0.80)
Requirement already satisfied: pillow>=7.1.2 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (9.5.0)
Requirement already satisfied: pyyaml>=5.3.1 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (6.0.1)
Requirement already satisfied: requests>=2.23.0 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (2.31.0)
Requirement already satisfied: scipy>=1.4.1 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (1.11.4)
Requirement already satisfied: torch>=1.8.0 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (2.1.2)
```

```
Requirement already satisfied: torchvision>=0.9.0 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (0.16.2)
Requirement already satisfied: tqdm>=4.64.0 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (4.66.1)
Requirement already satisfied: psutil in /opt/conda/lib/python3.10/site-packages (from ultralytics) (5.9.3)
Requirement already satisfied: py-cpuinfo in /opt/conda/lib/python3.10/site-packages (from ultralytics) (9.0.0)
Collecting thop>=0.1.1 (from ultralytics)
  Downloading thop-0.1.1.post2209072238-py3-none-any.whl.metadata (2.7 kB)
Requirement already satisfied: pandas>=1.1.4 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (2.1.4)
Requirement already satisfied: seaborn>=0.11.0 in /opt/conda/lib/python3.10/site-packages (from ultralytics) (0.12.2)
Requirement already satisfied: contourpy>=1.0.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralytic
s) (1.2.0)
Requirement already satisfied: cycler>=0.10 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralytics)
(0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralytic
s) (4.47.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralytic
s) (1.4.5)
Requirement already satisfied: numpy<2,>=1.20 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralytics)
(1.26.4)
Requirement already satisfied: packaging>=20.0 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralytics)
(21.3)
Requirement already satisfied: pyparsing>=2.3.1 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultralytic
s) (3.1.1)
Requirement already satisfied: python-dateutil>=2.7 in /opt/conda/lib/python3.10/site-packages (from matplotlib>=3.3.0->ultraly
tics) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in /opt/conda/lib/python3.10/site-packages (from pandas>=1.1.4->ultralytics) (2023.
3.post1)
Requirement already satisfied: tzdata>=2022.1 in /opt/conda/lib/python3.10/site-packages (from pandas>=1.1.4->ultralytics) (202
3.4)
Requirement already satisfied: charset-normalizer<4,>=2 in /opt/conda/lib/python3.10/site-packages (from requests>=2.23.0->ultr
alytics) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/lib/python3.10/site-packages (from requests>=2.23.0->ultralytics) (3.
6)
Requirement already satisfied: urllib3<3,>=1.21.1 in /opt/conda/lib/python3.10/site-packages (from requests>=2.23.0->ultralytic
s) (1.26.18)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/lib/python3.10/site-packages (from requests>=2.23.0->ultralytic
s) (2024.2.2)
Requirement already satisfied: filelock in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralytics) (3.13.1)
Requirement already satisfied: typing-extensions in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralytics)
(4.9.0)
Requirement already satisfied: sympy in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralytics) (1.12)
Requirement already satisfied: networkx in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralytics) (3.2.1)
```

```
Requirement already satisfied: jinja2 in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralytics) (3.1.2)
Requirement already satisfied: fsspec in /opt/conda/lib/python3.10/site-packages (from torch>=1.8.0->ultralytics) (2024.2.0)
Requirement already satisfied: six>=1.5 in /opt/conda/lib/python3.10/site-packages (from python-dateutil>=2.7->matplotlib>=3.3.
0->ultralytics) (1.16.0)
Requirement already satisfied: MarkupSafe>=2.0 in /opt/conda/lib/python3.10/site-packages (from jinja2->torch>=1.8.0->ultralyti
cs) (2.1.3)
Requirement already satisfied: mpmath>=0.19 in /opt/conda/lib/python3.10/site-packages (from sympy->torch>=1.8.0->ultralytics)
(1.3.0)
Downloading ultralytics-8.1.27-py3-none-any.whl (721 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 721.2/721.2 kB 17.9 MB/s eta 0:00:0000:01
Downloading thop-0.1.1.post2209072238-py3-none-any.whl (15 kB)
Installing collected packages: thop, ultralytics
Successfully installed thop-0.1.1.post2209072238 ultralytics-8.1.27
```

In [2]:
```
from warnings import filterwarnings
filterwarnings(action="ignore")

import os
import yaml
import shutil
import numpy as np
import pandas as pd

import supervision as sv
from ultralytics import YOLO

import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

In [4]:
```
test_labels = "/kaggle/input/dms-driver-monitoring-system/test/labels"
train_labels = "/kaggle/input/dms-driver-monitoring-system/train/labels"
val_labels = "/kaggle/input/dms-driver-monitoring-system/valid/labels"
```

In [6]:
```
data = {"labels":[], "split_type":[]}

for links, split_type in zip([train_labels, test_labels, val_labels], ["train", "test", "val"]):
    for labels in os.listdir(links):
        path = os.path.join(links, labels)
```

```
        data["labels"].append(path)
        data["split_type"].append(split_type)
```

In [9]:
```
df = pd.DataFrame(data)

print(df.shape)

df.head()
```

```
(9884, 2)
```

Out[9]:

	labels	split_type
0	/kaggle/input/dms-driver-monitoring-system/tra...	train
1	/kaggle/input/dms-driver-monitoring-system/tra...	train
2	/kaggle/input/dms-driver-monitoring-system/tra...	train
3	/kaggle/input/dms-driver-monitoring-system/tra...	train
4	/kaggle/input/dms-driver-monitoring-system/tra...	train

In [26]:
```
df.describe().T
```

Out[26]:

	count	unique	top	freq
labels	9884	9884	/kaggle/input/dms-driver-monitoring-system/val...	1
split_type	9884	3	train	5957

In [28]:
```
for index, labels in enumerate(df["labels"]):
    if len(np.loadtxt(labels)) != 0:
        df.loc[index, "is_annotated"] = True
    else:
        df.loc[index, "is_annotated"] = False
```

In [30]:
```
df["is_annotated"].value_counts()
```

Out[30]:
```
is_annotated
True    9884
Name: count, dtype: int64
```

Obserservation:

- The annotated label seems ok for each rows.

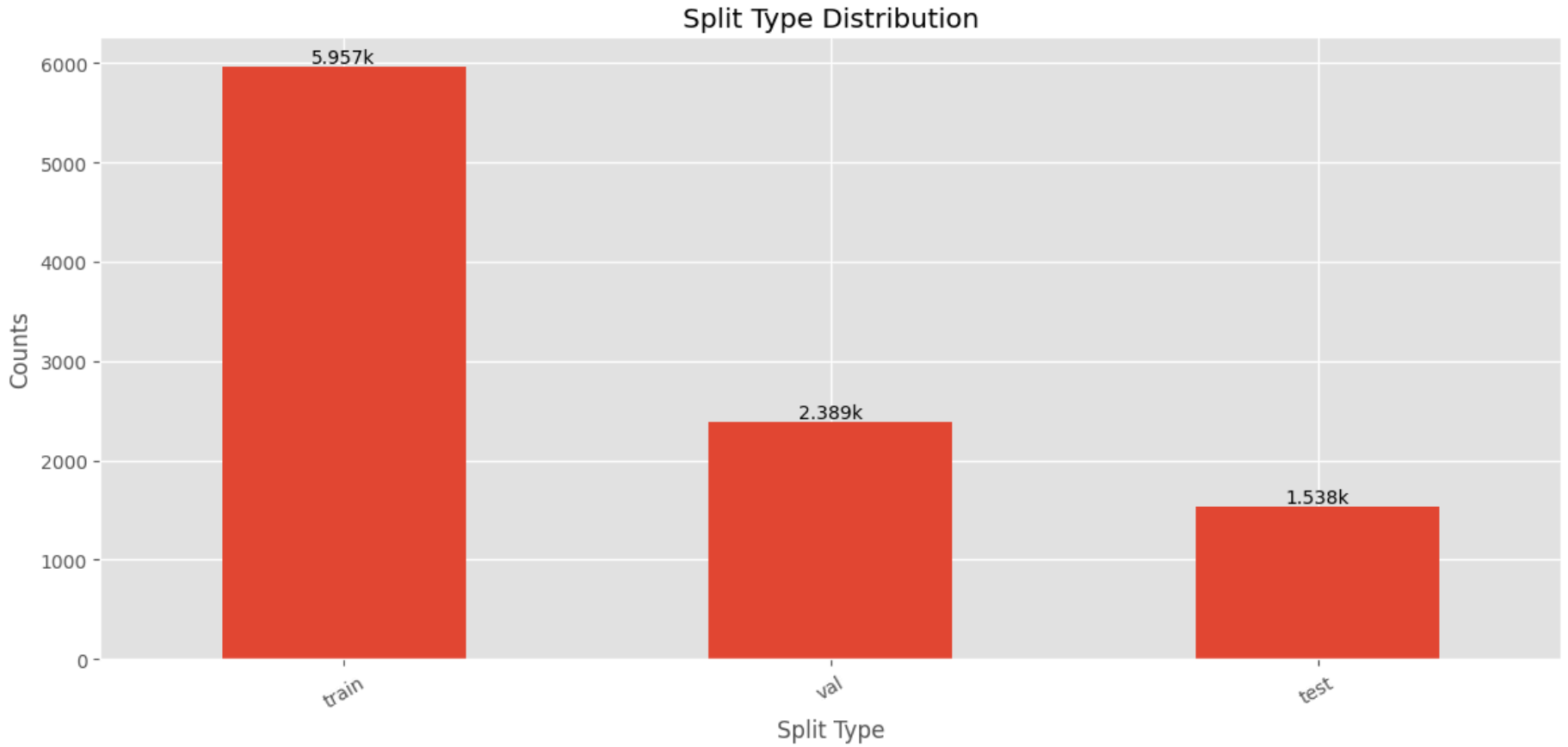
In [21]:
```
plt.style.use("ggplot")

plt.figure(figsize=(14, 6))

barplot = df["split_type"].value_counts().plot(kind="bar")

for p in barplot.patches:
    h = p.get_height()
    barplot.text(p.get_x()+(p.get_width()/2), h, f"{h/1000:}k", va="bottom", ha="center")

barplot.set_title("Split Type Distribution")
barplot.set_xlabel("Split Type")
barplot.set_ylabel("Counts")
barplot.set_xticklabels(labels=barplot.get_xticklabels(), rotation=30)
plt.show()
```



In [3]:
```
model = YOLO(model='yolov8n.pt')

model.train(data="/kaggle/input/dms-driver-monitoring-system/data.yaml", epochs=20)
```

```
Downloading https://github.com/ultralytics/assets/releases/download/v8.1.0/yolov8n.pt to 'yolov8n.pt'...
100%|██████████| 6.23M/6.23M [00:00<00:00, 130MB/s]
```

```
Ultralytics YOLOv8.1.27 🚀 Python-3.10.13 torch-2.1.2 CUDA:0 (Tesla P100-PCIE-16GB, 16276MiB)
engine/trainer: task=detect, mode=train, model=yolov8n.pt, data=/kaggle/input/dms-driver-monitoring-system/data.yaml, epochs=2
0, time=None, patience=100, batch=16, imgsz=640, save=True, save_period=-1, cache=False, device=None, workers=8, project=None,
name=train, exist_ok=False, pretrained=True, optimizer=auto, verbose=True, seed=0, deterministic=True, single_cls=False, rect=F
alse, cos_lr=False, close_mosaic=10, resume=False, amp=True, fraction=1.0, profile=False, freeze=None, multi_scale=False, overl
ap_mask=True, mask_ratio=4, dropout=0.0, val=True, split=val, save_json=False, save_hybrid=False, conf=None, iou=0.7, max_det=3
00, half=False, dnn=False, plots=True, source=None, vid_stride=1, stream_buffer=False, visualize=False, augment=False, agnostic
_nms=False, classes=None, retina_masks=False, embed=None, show=False, save_frames=False, save_txt=False, save_conf=False, save_
crop=False, show_labels=True, show_conf=True, show_boxes=True, line_width=None, format=torchscript, keras=False, optimize=Fals
e, int8=False, dynamic=False, simplify=False, opset=None, workspace=4, nms=False, lr0=0.01, lrf=0.01, momentum=0.937, weight_de
cay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8, warmup_bias_lr=0.1, box=7.5, cls=0.5, dfl=1.5, pose=12.0, kobj=1.0, label_s
moothing=0.0, nbs=64, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0.1, scale=0.5, shear=0.0, perspective=0.0, fli
pud=0.0, fliplr=0.5, mosaic=1.0, mixup=0.0, copy_paste=0.0, auto_augment=randaugment, erasing=0.4, crop_fraction=1.0, cfg=None,
tracker=botsort.yaml, save_dir=runs/detect/train
Downloading https://ultralytics.com/assets/Arial.ttf to '/root/.config/Ultralytics/Arial.ttf'...
100%|██████████| 755k/755k [00:00<00:00, 18.9MB/s]
2024-03-12 09:29:15,599 INFO util.py:124 -- Outdated packages:
  ipywidgets==7.7.1 found, needs ipywidgets>=8
Run `pip install -U ipywidgets`, then restart the notebook server for rich notebook output.
2024-03-12 09:29:16,454 INFO util.py:124 -- Outdated packages:
  ipywidgets==7.7.1 found, needs ipywidgets>=8
Run `pip install -U ipywidgets`, then restart the notebook server for rich notebook output.
2024-03-12 09:29:18.923259: E external/local_xla/xla/stream_executor/cuda/cuda_dnn.cc:9261] Unable to register cuDNN factory: A
ttempting to register factory for plugin cuDNN when one has already been registered
2024-03-12 09:29:18.923359: E external/local_xla/xla/stream_executor/cuda/cuda_fft.cc:607] Unable to register cuFFT factory: At
tempting to register factory for plugin cuFFT when one has already been registered
2024-03-12 09:29:19.052716: E external/local_xla/xla/stream_executor/cuda/cuda_blas.cc:1515] Unable to register cuBLAS factory:
Attempting to register factory for plugin cuBLAS when one has already been registered
```

```
Overriding model.yaml nc=80 with nc=5

                   from  n    params  module                                       arguments
  0                  -1  1       464  ultralytics.nn.modules.conv.Conv             [3, 16, 3, 2]
  1                  -1  1      4672  ultralytics.nn.modules.conv.Conv             [16, 32, 3, 2]
  2                  -1  1      7360  ultralytics.nn.modules.block.C2f             [32, 32, 1, True]
  3                  -1  1     18560  ultralytics.nn.modules.conv.Conv             [32, 64, 3, 2]
  4                  -1  2     49664  ultralytics.nn.modules.block.C2f             [64, 64, 2, True]
  5                  -1  1     73984  ultralytics.nn.modules.conv.Conv             [64, 128, 3, 2]
  6                  -1  2    197632  ultralytics.nn.modules.block.C2f             [128, 128, 2, True]
  7                  -1  1    295424  ultralytics.nn.modules.conv.Conv             [128, 256, 3, 2]
  8                  -1  1    460288  ultralytics.nn.modules.block.C2f             [256, 256, 1, True]
  9                  -1  1    164608  ultralytics.nn.modules.block.SPPF            [256, 256, 5]
 10                  -1  1         0  torch.nn.modules.upsampling.Upsample         [None, 2, 'nearest']
 11             [-1, 6]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 12                  -1  1    148224  ultralytics.nn.modules.block.C2f             [384, 128, 1]
 13                  -1  1         0  torch.nn.modules.upsampling.Upsample         [None, 2, 'nearest']
 14             [-1, 4]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 15                  -1  1     37248  ultralytics.nn.modules.block.C2f             [192, 64, 1]
 16                  -1  1     36992  ultralytics.nn.modules.conv.Conv             [64, 64, 3, 2]
 17            [-1, 12]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 18                  -1  1    123648  ultralytics.nn.modules.block.C2f             [192, 128, 1]
 19                  -1  1    147712  ultralytics.nn.modules.conv.Conv             [128, 128, 3, 2]
 20             [-1, 9]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 21                  -1  1    493056  ultralytics.nn.modules.block.C2f             [384, 256, 1]
 22        [15, 18, 21]  1    752287  ultralytics.nn.modules.head.Detect           [5, [64, 128, 256]]
Model summary: 225 layers, 3011823 parameters, 3011807 gradients, 8.2 GFLOPs

Transferred 319/355 items from pretrained weights
TensorBoard: Start with 'tensorboard --logdir runs/detect/train', view at http://localhost:6006/
wandb: Logging into wandb.ai. (Learn how to deploy a W&B server locally: https://wandb.me/wandb-server)
wandb: You can find your API key in your browser here: https://wandb.ai/authorize
wandb: Paste an API key from your profile and hit enter, or press ctrl+c to quit:
wandb: ERROR API key must be 40 characters long, yours was 41
wandb: Logging into wandb.ai. (Learn how to deploy a W&B server locally: https://wandb.me/wandb-server)
wandb: You can find your API key in your browser here: https://wandb.ai/authorize
wandb: Paste an API key from your profile and hit enter, or press ctrl+c to quit:
wandb: Appending key for api.wandb.ai to your netrc file: /root/.netrc
```

wandb version 0.16.4 is available! To upgrade, please run: $ pip install wandb --upgrade

```
Tracking run with wandb version 0.16.3
Run data is saved locally in /kaggle/working/wandb/run-20240312_093058-16dlt3l1
Syncing run train to Weights & Biases (docs)
View project at https://wandb.ai/eddyblizzy14/YOLOv8
View run at https://wandb.ai/eddyblizzy14/YOLOv8/runs/16dlt3l1
Freezing layer 'model.22.dfl.conv.weight'
AMP: running Automatic Mixed Precision (AMP) checks with YOLOv8n...
AMP: checks passed ✅
train: Scanning /kaggle/input/dms-driver-monitoring-system/train/labels... 5957 images, 0 backgrounds, 0 corrupt: 100%|██████████| 5957/5957 [00:15<00:00, 387.28it/s]
train: WARNING ⚠️ Cache directory /kaggle/input/dms-driver-monitoring-system/train is not writeable, cache not saved.
albumentations: Blur(p=0.01, blur_limit=(3, 7)), MedianBlur(p=0.01, blur_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01, clip_limit=(1, 4.0), tile_grid_size=(8, 8))
val: Scanning /kaggle/input/dms-driver-monitoring-system/valid/labels... 2389 images, 0 backgrounds, 0 corrupt: 100%|██████████| 2389/2389 [00:06<00:00, 376.09it/s]
val: WARNING ⚠️ Cache directory /kaggle/input/dms-driver-monitoring-system/valid is not writeable, cache not saved.
Plotting labels to runs/detect/train/labels.jpg...
optimizer: 'optimizer=auto' found, ignoring 'lr0=0.01' and 'momentum=0.937' and determining best 'optimizer', 'lr0' and 'momentum' automatically...
optimizer: AdamW(lr=0.001111, momentum=0.9) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)
TensorBoard: model graph visualization added ✅
Image sizes 640 train, 640 val
Using 4 dataloader workers
Logging results to runs/detect/train
Starting training for 20 epochs...

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       1/20      2.43G      1.462      2.133      1.249         27        640: 100%|██████████| 373/373 [01:17<00:00,  4.81it/s]
       7/20      2.46G      1.113     0.8174      1.073         18        640: 100%|██████████| 373/373 [01:10<00:00,  5.29it/s]5.71it/s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00, 5.74it/s]
                   all       2389       5773      0.848      0.763      0.834      0.535

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
```

```
       8/20      2.45G      1.086     0.7903      1.059         14        640: 100%|██████████| 373/373 [01:09<00:00,  5.33it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:12<00:00,
5.81it/s]
                   all       2389       5773      0.853      0.789      0.862      0.554

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       9/20      2.46G      1.065     0.7646      1.053         23        640: 100%|██████████| 373/373 [01:09<00:00,  5.37it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:12<00:00,
5.94it/s]
                   all       2389       5773      0.829        0.8       0.85      0.549

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
      10/20      2.46G      1.047     0.7466      1.047         25        640: 100%|██████████| 373/373 [01:09<00:00,  5.36it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:12<00:00,
5.81it/s]
                   all       2389       5773      0.831      0.795       0.85      0.564

Closing dataloader mosaic
albumentations: Blur(p=0.01, blur_limit=(3, 7)), MedianBlur(p=0.01, blur_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01, clip_limi
t=(1, 4.0), tile_grid_size=(8, 8))

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
      11/20      2.46G      1.005     0.6669       1.05          9        640: 100%|██████████| 373/373 [01:10<00:00,  5.30it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.61it/s]
                   all       2389       5773      0.809      0.783      0.855      0.545

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
      12/20      2.45G       0.98     0.6435      1.037         10        640: 100%|██████████| 373/373 [01:08<00:00,  5.41it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.66it/s]
                   all       2389       5773      0.867      0.812      0.885      0.589

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
```

```
      13/20      2.46G     0.9611     0.6164      1.027         14        640: 100%|██████████| 373/373 [01:09<00:00,  5.40it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.70it/s]
                   all       2389       5773      0.853      0.818       0.88      0.594

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size

      14/20      2.49G      0.948     0.6033      1.023         15        640: 100%|██████████| 373/373 [01:08<00:00,  5.43it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.70it/s]
                   all       2389       5773      0.863      0.821       0.887      0.603

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size

      15/20      2.46G     0.9219     0.5766      1.011         11        640: 100%|██████████| 373/373 [01:08<00:00,  5.42it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.75it/s]
                   all       2389       5773      0.873      0.825       0.894      0.618

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size

      16/20      2.45G      0.905     0.5607      1.001         15        640: 100%|██████████| 373/373 [01:08<00:00,  5.45it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.76it/s]
                   all       2389       5773      0.875      0.829       0.892      0.605

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size

      17/20      2.46G     0.8925     0.5422     0.9958         12        640: 100%|██████████| 373/373 [01:08<00:00,  5.43it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.75it/s]
                   all       2389       5773      0.883      0.847       0.906      0.627

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size

      18/20      2.46G     0.8683     0.5231     0.9838         14        640: 100%|██████████| 373/373 [01:08<00:00,  5.42it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.70it/s]
                   all       2389       5773      0.878      0.849       0.907      0.631

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
```

```
      19/20      2.46G     0.8515     0.5074     0.9757         13        640: 100%|██████████| 373/373 [01:08<00:00,  5.42it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.70it/s]
                   all       2389       5773      0.898      0.842      0.913      0.646

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
      20/20      2.45G      0.838     0.4929     0.9686         12        640: 100%|██████████| 373/373 [01:09<00:00,  5.38it/
s]
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:13<00:00,
5.71it/s]
                   all       2389       5773      0.899      0.845      0.916      0.649

20 epochs completed in 0.470 hours.
Optimizer stripped from runs/detect/train/weights/last.pt, 6.2MB
Optimizer stripped from runs/detect/train/weights/best.pt, 6.2MB

Validating runs/detect/train/weights/best.pt...
Ultralytics YOLOv8.1.27 🚀 Python-3.10.13 torch-2.1.2 CUDA:0 (Tesla P100-PCIE-16GB, 16276MiB)
Model summary (fused): 168 layers, 3006623 parameters, 0 gradients, 8.1 GFLOPs
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100%|██████████| 75/75 [00:17<00:00,
4.30it/s]
                   all       2389       5773      0.898      0.845      0.916      0.649
              Open Eye       2389       2710       0.92      0.951      0.979      0.781
            Closed Eye       2389        530      0.852      0.713      0.873      0.666
             Cigarette       2389        453      0.849      0.722      0.817      0.448
                 Phone       2389        588      0.955      0.952      0.975      0.702
              Seatbelt       2389       1492      0.916      0.887      0.934      0.647
Speed: 0.1ms preprocess, 1.5ms inference, 0.0ms loss, 0.9ms postprocess per image
Results saved to runs/detect/train
VBox(children=(Label(value='12.247 MB of 12.247 MB uploaded\r'), FloatProgress(value=1.0, max=1.0)))
```

Run history:

lr/pg0	
lr/pg1	
lr/pg2	
metrics/mAP50(B)	
metrics/mAP50-95(B)	
metrics/precision(B)	
metrics/recall(B)	
model/GFLOPs	
model/parameters	
model/speed_PyTorch(ms)	
train/box_loss	
train/cls_loss	
train/dfl_loss	
val/box_loss	
val/cls_loss	
val/dfl_loss	

Run summary:

lr/pg0	0.00012
lr/pg1	0.00012
lr/pg2	0.00012
metrics/mAP50(B)	0.91565
metrics/mAP50-95(B)	0.64872
metrics/precision(B)	0.8985
metrics/recall(B)	0.84511
model/GFLOPs	8.198
model/parameters	3011823
model/speed_PyTorch(ms)	1.645
train/box_loss	0.83799
train/cls_loss	0.49291
train/dfl_loss	0.96859
val/box_loss	0.94691
val/cls_loss	0.55473
val/dfl_loss	1.05781

View run **train** at: https://wandb.ai/eddyblizzy14/YOLOv8/runs/16dlt3l1
Synced 6 W&B file(s), 24 media file(s), 5 artifact file(s) and 0 other file(s)
Find logs at: `./wandb/run-20240312_093058-16dlt3l1/logs`

Out[3]: ultralytics.utils.metrics.DetMetrics object with attributes:

```
ap_class_index: array([0, 1, 2, 3, 4])
box: ultralytics.utils.metrics.Metric object
confusion_matrix: <ultralytics.utils.metrics.ConfusionMatrix object at 0x78b4630fdc60>
curves: ['Precision-Recall(B)', 'F1-Confidence(B)', 'Precision-Confidence(B)', 'Recall-Confidence(B)']
curves_results: [[array([          0,    0.001001,    0.002002,    0.003003,    0.004004,    0.005005,    0.006006,    0.0070
07,    0.008008,    0.009009,     0.01001,    0.011011,    0.012012,    0.013013,    0.014014,    0.015015,    0.016016,
0.017017,    0.018018,    0.019019,     0.02002,    0.021021,    0.022022,    0.023023,
          0.024024,    0.025025,    0.026026,    0.027027,    0.028028,    0.029029,     0.03003,    0.031031,    0.032032,
0.033033,    0.034034,    0.035035,    0.036036,    0.037037,    0.038038,    0.039039,     0.04004,    0.041041,    0.04204
2,    0.043043,    0.044044,    0.045045,    0.046046,    0.047047,
          0.048048,    0.049049,     0.05005,    0.051051,    0.052052,    0.053053,    0.054054,    0.055055,    0.056056,
0.057057,    0.058058,    0.059059,     0.06006,    0.061061,    0.062062,    0.063063,    0.064064,    0.065065,    0.06606
6,    0.067067,    0.068068,    0.069069,     0.07007,    0.071071,
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0.081081,    0.082082,    0.083083,    0.084084,    0.085085,    0.086086,    0.087087,    0.088088,    0.089089,     0.0900
9,    0.091091,    0.092092,    0.093093,    0.094094,    0.095095,
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           0.12012,     0.12112,     0.12212,     0.12312,     0.12412,     0.12513,     0.12613,     0.12713,     0.12813,
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```

```
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```

```
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0.68168,    0.68268,    0.68368,    0.68468,    0.68569,    0.68669,    0.68769,    0.68869,    0.68969,    0.69069,
0.69169,    0.69269,    0.69369,    0.69469,     0.6957,
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0.99399,     0.99499,       0.996,       0.997,       0.998,       0.999,           1]), array([[    0.99446,     0.99446,
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fitness: 0.6754164396458071
keys: ['metrics/precision(B)', 'metrics/recall(B)', 'metrics/mAP50(B)', 'metrics/mAP50-95(B)']
maps: array([    0.78062,     0.66612,     0.44801,      0.7023,     0.64657])
names: {0: 'Open Eye', 1: 'Closed Eye', 2: 'Cigarette', 3: 'Phone', 4: 'Seatbelt'}
plot: True
results_dict: {'metrics/precision(B)': 0.8984985997827405, 'metrics/recall(B)': 0.8451070395992005, 'metrics/mAP50(B)': 0.915
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6467185023756, 'metrics/mAP50-95(B)': 0.6487241864395217, 'fitness': 0.6754164396458071}
save_dir: PosixPath('runs/detect/train')
speed: {'preprocess': 0.12427146787072585, 'inference': 1.4714868361104627, 'loss': 0.0005749390683148185, 'postprocess': 0.9
222796094023368}
task: 'detect'
```

Eddy