

## ▼ Setup\*\*

```
!nvidia-smi

Wed Feb 7 15:02:03 2024
+-----+
| NVIDIA-SMI 535.104.05      Driver Version: 535.104.05    CUDA Version: 12.2 |
|-----+-----+-----+-----+-----+-----+-----+
| GPU  Name Persistence-M  Bus-Id Disp.A  Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap | Memory-Usage | GPU-Util  Compute M. |
| |          |          |             |              |          | MIIG M. |
|-----+-----+-----+-----+-----+-----+-----+
| 0  Tesla T4                 Off  00000000:00:04.0 Off   0 %
| N/A  57C   P8               10W / 70W |    0MiB / 15360MiB |     0% Default |
|                               |              |                  |                N/A |
+-----+-----+-----+-----+-----+-----+-----+
+-----+
| Processes:
| GPU  GI CI      PID  Type  Process name          GPU Memory |
| ID   ID          ID   ID          Usage
|-----+-----+-----+-----+-----+-----+-----+
| No running processes found
+-----+
```

```
import os
SC = os.getcwd()
print(SC)

/content
```

## ▼ Installing YOLOv8

```
!pip install ultralytics==8.0.196

from IPython import display
display.clear_output()

import ultralytics
ultralytics.checks()

Ultralytics YOLOv8.0.196 🚀 Python-3.10.12 torch-2.1.0+cu121 CUDA:0 (Tesla T4, 15102MiB)
Setup complete ✅ (2 CPUs, 12.7 GB RAM, 26.3/78.2 GB disk)

from ultralytics import YOLO

from IPython.display import display, Image
```

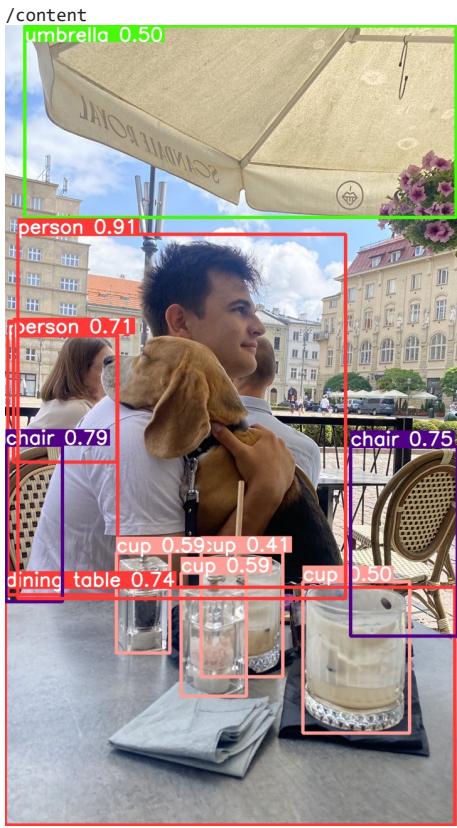
## ▼ Checking the setup

```
%cd {SC}
!yolo task=detect mode=predict model=yolov8n.pt conf=0.25 source='https://media.roboflow.com/notebooks/examples/dog-2.jpeg' save=True

/content
Downloading https://github.com/ultralytics/assets/releases/download/v0.0.0/yolov8n.pt to 'yolov8n.pt'...
100% 6.23M/6.23M [00:00<00:00, 75.0MB/s]
Ultralytics YOLOv8.0.196 🚀 Python-3.10.12 torch-2.1.0+cu121 CUDA:0 (Tesla T4, 15102MiB)
YOLOv8n summary (fused): 168 layers, 3151904 parameters, 0 gradients, 8.7 GFLOPs

Downloading https://media.roboflow.com/notebooks/examples/dog-2.jpeg to 'dog-2.jpeg'...
100% 222k/222k [00:00<00:00, 85.0MB/s]
image 1/1 /content/dog-2.jpeg: 640x384 3 persons, 1 umbrella, 4 cups, 2 chairs, 1 dining table, 163.8ms
Speed: 11.4ms preprocess, 163.8ms inference, 629.9ms postprocess per image at shape (1, 3, 640, 384)
Results saved to runs/detect/predict
💡 Learn more at https://docs.ultralytics.com/modes/predict
```

```
%cd {SC}
Image(filename='/content/runs/detect/predict/dog-2.jpeg', height=600)
```



## ▼ Importing Dataset from Roboflow

```
!mkdir {SC}/datasets  
%cd {SC}/datasets  
  
!pip install roboflow  
  
from roboflow import Roboflow  
rf = Roboflow(api_key="r6085u5oVC5CYpNFcK77")  
project = rf.workspace("fseval").project("traffic-sign-guy19")  
dataset = project.version(1).download("yolov8")
```



## Model Training

```
%cd {SC}
```

```
!yolo task=detect mode=train model=yolov8s.pt data={dataset.location}/data.yaml epochs=15 imgsiz=800 plots=True
```

0	763	178	0.89	0.73	0.844	0.433
Barrier Ahead	763	15	0.91	0.933	0.98	0.873
Cattle	763	3	0.909	1	0.995	0.801
Caution	763	1	0	0	0.332	0.232
Cycle Crossing	763	11	0.781	0.818	0.884	0.577
Dangerous Dip	763	13	0.54	0.385	0.499	0.331
Eating Place	763	7	1	0.234	0.305	0.154
Falling Rocks	763	14	0.73	0.571	0.797	0.427
Ferry	763	2	1	0	0.745	0.474
First Aid Post	763	11	0.672	0.745	0.672	0.484
Give Way	763	30	0.923	0.933	0.971	0.735
Horn Prohibited	763	12	0.966	1	0.995	0.759
Hospital	763	8	0.503	0.25	0.457	0.299
Hump	763	20	0.947	0.895	0.981	0.621
Left Hair Pin Bend	763	2	0.783	1	0.995	0.746
Left Reverse Bend	763	3	0.426	0.333	0.246	0.201
Left hand curve	763	6	0.808	0.705	0.903	0.547
Light Refreshment	763	13	0.886	0.602	0.714	0.418
Men at Work	763	4	1	0.377	0.995	0.822
Narrow Bridge	763	8	0.85	0.71	0.692	0.323
Narrow road ahead	763	6	0.72	1	0.901	0.603
No Parking	763	11	0.75	0.546	0.709	0.463
No Stopping	763	5	0.77	0.6	0.735	0.522
No Thorough Road	763	8	0.728	0.75	0.688	0.35
No Thorough SideRoad	763	1	0.434	1	0.995	0.497
Parking Lot Cars	763	5	0.619	0.2	0.271	0.218
Parking Lot Cycle	763	5	0.777	0.8	0.799	0.549
Parking Lot Scooter and MotorCycle	763	15	0.823	0.8	0.84	0.471
Parking This side	763	3	0.268	0.268	0.167	0.0286
Pedestrian Crossing	763	12	0.919	1	0.995	0.824
Pedestrian Prohibited	763	5	0.94	1	0.995	0.861
Petrol Pump- Gas Station	763	16	0.936	0.812	0.841	0.589
Public Telephone	763	16	0.924	0.761	0.938	0.656
Resting Place	763	10	0.799	0.7	0.762	0.558
Right Hair Pin Bend	763	10	0.806	0.8	0.899	0.604
Right Hand Curve	763	3	0.541	0.667	0.764	0.602
Right Reverse Bend	763	13	0.757	0.958	0.937	0.635
Road Wideness Ahead	763	11	1	0.712	0.827	0.595
Round About	763	3	0.772	0.667	0.747	0.462
School Ahead	763	10	0.871	0.679	0.722	0.404
Slippery Road	763	9	0.943	0.667	0.791	0.637
Speed Limit -10-	763	12	0.811	0.917	0.917	0.605
Speed Limit -100-	763	7	0.83	1	0.995	0.652
Speed Limit -110-	763	5	0.95	1	0.995	0.553
Speed Limit -120-	763	8	0.796	1	0.995	0.571
Speed Limit -130-	763	7	0.951	1	0.995	0.739
Speed Limit -140-	763	6	1	0.287	0.995	0.515
Speed Limit -150-	763	1	0.904	1	0.995	0.317
Speed Limit -160-	763	2	1	0	0.18	0.162
Speed Limit -20-	763	14	0.867	0.929	0.938	0.718
Speed Limit -25-	763	10	0.893	0.837	0.882	0.667
Speed Limit -35-	763	8	1	0.955	0.995	0.748
Speed Limit -45-	763	5	0.764	1	0.995	0.821
Speed Limit -5-	763	14	0.599	0.534	0.731	0.34
Speed Limit -50-	763	31	0.914	0.968	0.966	0.744
Speed Limit -55-	763	7	0.961	1	0.995	0.661
Speed Limit -60-	763	27	0.803	0.963	0.906	0.653
Speed Limit -cc	763	2	0.01	0.007	0.007	0.002

## Checking the results

```
!ls {SC}/runs/detect/train/
```

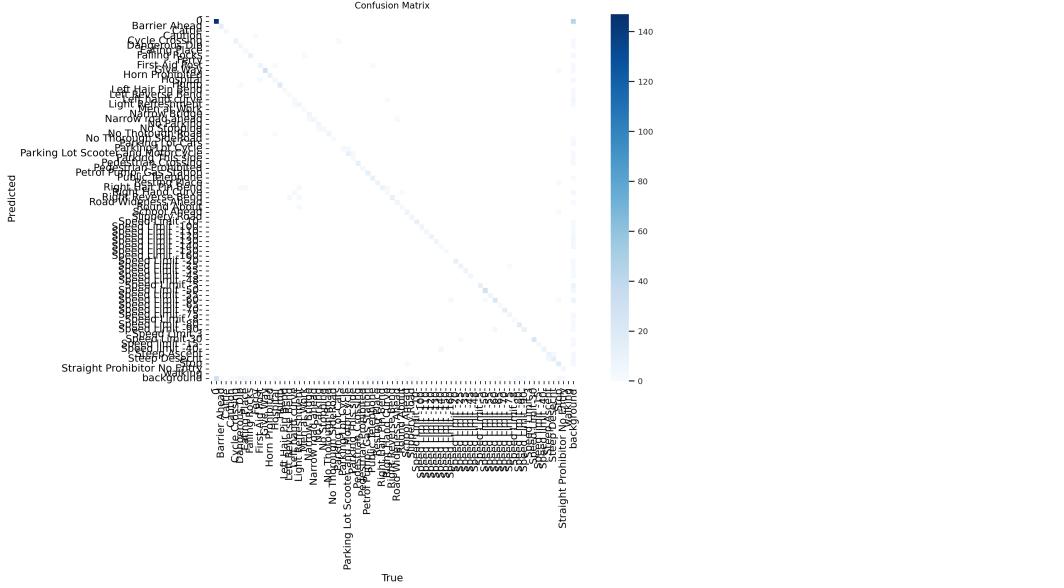
args.yaml	R_curve.png	val_batch0_labels.jpg
confusion_matrix_normalized.png	results.csv	val_batch0_pred.jpg
confusion_matrix.png	results.png	val_batch1_labels.jpg
events.out.tfevents.1707318241.59e805af5a88.939.0	train_batch0.jpg	val_batch1_pred.jpg

```
F1_curve.png
labels_correlogram.jpg
labels.jpg
P_curve.png
PR_curve.png
```

```
train_batch1.jpg      val_batch2_labels.jpg
train_batch2070.jpg   val_batch2_pred.jpg
train_batch2071.jpg   weights
train_batch2072.jpg
train_batch2.jpg
```

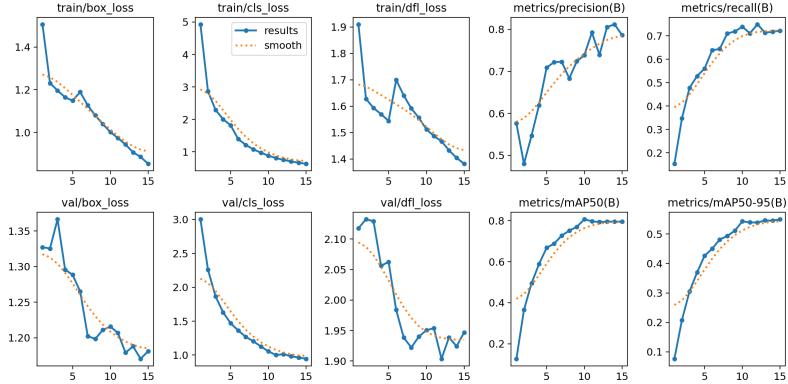
```
%cd {SC}
Image(filename=f'{SC}/runs/detect/train/confusion_matrix.png', width=600)
```

```
/content
```



```
%cd {SC}
Image(filename=f'{SC}/runs/detect/train/results.png', width=600)
```

```
/content
```



```
%cd {SC}
Image(filename=f'{SC}/runs/detect/train/val_batch0_pred.jpg', width=600)
```

/content



%cd {SC}

!yolo task=detect mode=val model={SC}/runs/detect/train/weights/best.pt data={dataset.location}/data.yaml

Hump	763	20	0.948	0.907	0.981	0.644		
Left Hair Pin Bend	763	2	0.794	1	0.995	0.746		
Left Reverse Bend	763	3	0.418	0.333	0.246	0.197		
Left hand curve	763	6	0.816	0.745	0.903	0.546		
Light Refreshment	763	13	0.888	0.611	0.723	0.441		
Men at Work	763	4	1	0.392	0.995	0.822		
Narrow Bridge	763	8	0.854	0.736	0.692	0.343		
Narrow road ahead	763	6	0.714	1	0.901	0.604		
No Parking	763	11	0.754	0.558	0.707	0.453		
No Stopping	763	5	0.74	0.6	0.735	0.522		
No Thorough Road	763	8	0.655	0.75	0.682	0.351		
No Thorough SideRoad	763	1	0.419	1	0.995	0.497		
Parking Lot Cars	763	5	0.55	0.2	0.271	0.218		
Parking Lot Cycle	763	5	0.761	0.8	0.799	0.549		
Parking Lot Scooter and MotorCycle	763	15	0.79	0.8	0.85	0.479		
Parking This side	763	3	0.331	0.333	0.167	0.0286		
Pedestrian Crossing	763	12	0.905	1	0.995	0.824		
Pedestrian Prohibited	763	5	0.93	1	0.995	0.861		
Petrol Pump- Gas Station	763	16	0.926	0.812	0.842	0.593		
Public Telephone	763	16	0.92	0.722	0.938	0.648		
Resting Place	763	10	0.792	0.7	0.772	0.58		
Right Hair Pin Bend	763	10	0.774	0.8	0.899	0.611		
Right Hand Curve	763	3	0.507	0.667	0.755	0.595		
Right Reverse Bend	763	13	0.758	0.967	0.937	0.628		
Road Wideness Ahead	763	11	0.994	0.727	0.828	0.598		
Round About	763	3	0.75	0.667	0.747	0.462		
School Ahead	763	10	0.864	0.7	0.717	0.422		
Slippery Road	763	9	0.923	0.667	0.797	0.642		
Speed Limit -10-	763	12	0.802	0.917	0.917	0.6		
Speed Limit -100-	763	7	0.814	1	0.995	0.652		
Speed Limit -110-	763	5	0.929	1	0.995	0.553		
Speed Limit -120-	763	8	0.778	1	0.995	0.571		
Speed Limit -130-	763	7	0.925	1	0.995	0.739		

Steep Ascent	763	14	0.827	0.685	0.848	0.736
Steep Descent	763	16	0.72	0.966	0.805	0.621
Stop	763	25	0.785	0.72	0.695	0.462
Straight Prohibitor No Entry	763	4	1	0.882	0.995	0.803

```
%cd {SC}
!yolo task=detect mode=predict model={SC}/runs/detect/train/weights/best.pt conf=0.25 source={dataset.location}/test/images save=True
image 677/807 /content/datasets/traffic-sign-1/test/images/Tlight-706_.png_jpg.rf.918a08fab7855fac929dc7783f041c39.jpg: 800x800 3 0s,
image 678/807 /content/datasets/traffic-sign-1/test/images/Tlight-714_.png_jpg.rf.bd4c7118daf339c85fa46411c4e70059.jpg: 800x800 2 0s,
image 679/807 /content/datasets/traffic-sign-1/test/images/Tlight-716_.png_jpg.rf.02bc368cad3c5a414b603ad5a6a27c47.jpg: 800x800 1 0,
image 680/807 /content/datasets/traffic-sign-1/test/images/Tlight-733_.png_jpg.rf.ca92387ca58adb08a88890c7c1aa5c5b.jpg: 800x800 3 0s,
image 681/807 /content/datasets/traffic-sign-1/test/images/Tlight-740_.png_jpg.rf.2ecf154cfc6fb95bf5e50abb00f9115.jpg: 800x800 1 0,
image 682/807 /content/datasets/traffic-sign-1/test/images/Tlight-765_.png_jpg.rf.a54b4bd442d78192851f2eb7c80c050c.jpg: 800x800 2 0s,
image 683/807 /content/datasets/traffic-sign-1/test/images/Tlight-768_.png_jpg.rf.7865f742dd168a71236618750105e084.jpg: 800x800 1 0,
image 684/807 /content/datasets/traffic-sign-1/test/images/Tlight-781_.png_jpg.rf.15f7fcabbe94e46374413d61a2ba53ab.jpg: 800x800 1 0,
image 685/807 /content/datasets/traffic-sign-1/test/images/Tlight-784_.png_jpg.rf.c8943272ea4d4838331faae9690cf8e8d.jpg: 800x800 1 0,
image 686/807 /content/datasets/traffic-sign-1/test/images/Tlight-800_.png_jpg.rf.ec2eda539c48e4224158472c6626845.jpg: 800x800 2 0s,
image 687/807 /content/datasets/traffic-sign-1/test/images/Tlight-811_.png_jpg.rf.85165930814969a6c2b38a5ef8df88d.jpg: 800x800 2 0s,
image 688/807 /content/datasets/traffic-sign-1/test/images/Tlight-83_.png_jpg.rf.741a504791284f455c59086c8e72b0c4.jpg: 800x800 3 0s,
image 689/807 /content/datasets/traffic-sign-1/test/images/Tlight-89_.png_jpg.rf.f5d8ecf30cc18d638c22a9c04f6c31a2.jpg: 800x800 1 0,
image 690/807 /content/datasets/traffic-sign-1/test/images/Tlight-90_.png_jpg.rf.204f688bb14c98881efa4e06d53fa3be.jpg: 800x800 3 0s,
image 691/807 /content/datasets/traffic-sign-1/test/images/Tlight-91_.png_jpg.rf.b05078fdcafef2d85811e801a9e1646c.jpg: 800x800 1 0,
image 692/807 /content/datasets/traffic-sign-1/test/images/Tlight-95_.png_jpg.rf.7981ec810d3f47283f3f988fd91038da.jpg: 800x800 1 0,
image 693/807 /content/datasets/traffic-sign-1/test/images/download.jpg.rf.655c941a0839e428e61de9b3bb5aea7d.jpg: 800x800 4 0s, 16.4ms
image 694/807 /content/datasets/traffic-sign-1/test/images/images-10_.jpg.rf.7abea0b3a981b0bea1b63d3da659c0bf93.jpg: 800x800 3 0s, 17.7
image 695/807 /content/datasets/traffic-sign-1/test/images/images-13_.jpg.rf.909740060dc135b99b6595ba152198a8.jpg: 800x800 2 0s, 17.8
image 696/807 /content/datasets/traffic-sign-1/test/images/images-16_.jpg.rf.76ad06f2c1bb23121f3292aae777a2c3.jpg: 800x800 4 0s, 55.7
image 697/807 /content/datasets/traffic-sign-1/test/images/images-24_.jpg.rf.be69e32cbce8f9c625229e7ff89fd0cd.jpg: 800x800 2 0s, 57.3
image 698/807 /content/datasets/traffic-sign-1/test/images/images-4_.jpg.rf.908d934a619c5b309c9480f71ec46fba.jpg: 800x800 1 0, 17.3ms
image 699/807 /content/datasets/traffic-sign-1/test/images/temporary-traffic-lights-street-england-34609671.jpg.rf.213e4c4c24036e4ac2
image 700/807 /content/datasets/traffic-sign-1/test/images/traffic-light-112_.jpg.rf.44416544d05e11f21fdeaea934ebbbef.jpg: 800x800 1
image 701/807 /content/datasets/traffic-sign-1/test/images/traffic-light-12_.jpg.rf.1d9630f1e2f53c0c1ba83d5fd3df1515.jpg: 800x800 1 0
image 702/807 /content/datasets/traffic-sign-1/test/images/traffic-light-121_.jpg.rf.1a141f721598f26aa22c16ad2c036c24.jpg: 800x800 4
image 703/807 /content/datasets/traffic-sign-1/test/images/traffic-light-131_.jpg.rf.a98aa5b3bf9d3e7b8c89659ac3666725.jpg: 800x800 4
image 704/807 /content/datasets/traffic-sign-1/test/images/traffic-light-135_.jpg.rf.1b9fa1069ca3a874fc47df7b4ac0f1ac.jpg: 800x800 1
image 705/807 /content/datasets/traffic-sign-1/test/images/traffic-light-135_.jpg.rf.34e5031dae59d2a95854bc6a71eee68a.jpg: 800x800 2
image 706/807 /content/datasets/traffic-sign-1/test/images/traffic-light-143_.jpg.rf.1b35632ffdb6b94b321004b6d84d3607.jpg: 800x800 4
image 707/807 /content/datasets/traffic-sign-1/test/images/traffic-light-157_.jpg.rf.0c59a45f93f04d2884ac259a12a344a1.jpg: 800x800 2
image 708/807 /content/datasets/traffic-sign-1/test/images/traffic-light-173_.jpg.rf.0579f8a7f5d0e18f36e27bcd3d27b3de.jpg: 800x800 2
image 709/807 /content/datasets/traffic-sign-1/test/images/traffic-light-175_.jpg.rf.b88839ec3f2b7d7f1918c857736c84e.jpg: 800x800 1
image 710/807 /content/datasets/traffic-sign-1/test/images/traffic-light-186_.jpg.rf.1c1ee766c08cf2943e9d0d5194eb9536.jpg: 800x800 1
image 711/807 /content/datasets/traffic-sign-1/test/images/traffic-light-2_.jpg.rf.82a2a47a9903ec71e482682bd5abf418.jpg: 800x800 2 0s
image 712/807 /content/datasets/traffic-sign-1/test/images/traffic-light-251_.jpg.rf.354836cb84a5d521531b665330c5ae1d.jpg: 800x800 1
image 713/807 /content/datasets/traffic-sign-1/test/images/traffic-light-260_.jpg.rf.e87972a25aaa4612c4ade741abb9224a.jpg: 800x800 1
image 714/807 /content/datasets/traffic-sign-1/test/images/traffic-light-27_.jpg.rf.241a27818761e2450838291c51c7aa57.jpg: 800x800 1 0
image 715/807 /content/datasets/traffic-sign-1/test/images/traffic-light-305_.jpg.rf.caafcb5050330fd2614d60b2e57e81b4.jpg: 800x800 2
image 716/807 /content/datasets/traffic-sign-1/test/images/traffic-light-310_.jpg.rf.c709c6feef2ad09888bd2a3bcfbd1edf5.jpg: 800x800 2
image 717/807 /content/datasets/traffic-sign-1/test/images/traffic-light-312_.jpg.rf.9dd4f5933914e2d1a26faf1cd48efd69.jpg: 800x800 2
image 718/807 /content/datasets/traffic-sign-1/test/images/traffic-light-314_.jpg.rf.b65b94d6f160dfd57ccb3679424419af.jpg: 800x800 2
image 719/807 /content/datasets/traffic-sign-1/test/images/traffic-light-317_.jpg.rf.f025c14bb94edfa0089593d38171b9c.jpg: 800x800 2
image 720/807 /content/datasets/traffic-sign-1/test/images/traffic-light-322_.jpg.rf.739d537606cf239dac686b2be71d3fbcc.jpg: 800x800 2
image 721/807 /content/datasets/traffic-sign-1/test/images/traffic-light-333_.jpg.rf.3e625586fb55972782ed0291de6d0e1f.jpg: 800x800 2
image 722/807 /content/datasets/traffic-sign-1/test/images/traffic-light-343_.jpg.rf.b4867f6d0384c2048fa6d496f0837f26.jpg: 800x800 1
image 723/807 /content/datasets/traffic-sign-1/test/images/traffic-light-343_.jpg.rf.bee702394f2507a29562e4722375c548.jpg: 800x800 1
image 724/807 /content/datasets/traffic-sign-1/test/images/traffic-light-346_.jpg.rf.f2dd81b755f20f0a4e943fdbbf1b839.jpg: 800x800 1
image 725/807 /content/datasets/traffic-sign-1/test/images/traffic-light-349_.jpg.rf.afcb73f716bc1aa4d5dc9e2bdc1a6e97.jpg: 800x800 1
image 726/807 /content/datasets/traffic-sign-1/test/images/traffic-light-356_.jpg.rf.bf895c102de20b233b344f050b3a21ee.jpg: 800x800 1
image 727/807 /content/datasets/traffic-sign-1/test/images/traffic-light-357_.jpg.rf.603f82b28b5a74d4f93e839a138c5be7.jpg: 800x800 3
image 728/807 /content/datasets/traffic-sign-1/test/images/traffic-light-37_.jpg.rf.2bb49dedda2d3f37a6b681c95046800c.jpg: 800x800 1 0
image 729/807 /content/datasets/traffic-sign-1/test/images/traffic-light-38_.jpg.rf.e8697d07ad59edcd1cf90bd4b40491e.jpg: 800x800 1 P
image 730/807 /content/datasets/traffic-sign-1/test/images/traffic-light-382_.jpg.rf.e1526d896df0b24932286fd6c54b34d3.jpg: 800x800 1
image 731/807 /content/datasets/traffic-sign-1/test/images/traffic-light-387_.jpg.rf.88f97e37e0740db0c96c32d330595210.jpg: 800x800 1
image 732/807 /content/datasets/traffic-sign-1/test/images/traffic-light-387_.jpg.rf.e458886d6855378f4a597358dbda03f7.jpg: 800x800 1
image 733/807 /content/datasets/traffic-sign-1/test/images/traffic-light-391_.jpg.rf.f2d5e648d2c8ba3f7a450bb90a9c49c.jpg: 800x800 6
```

```
import glob
from IPython.display import Image, display

for image_path in glob.glob(f'{SC}/runs/detect/predict2/*.jpg')[3:]:
    display(Image(filename=image_path, width=600))
    print("\n")
```