

```
In [11]: from ultralytics import YOLO
import os
import time
import matplotlib.pyplot as plt
from collections import defaultdict
import pandas as pd
```

```
In [12]: # Load both YOLOv5 models
model_n = YOLO('yolov5n.pt') # nano
model_s = YOLO('yolov5s.pt') # small

# Set image and output folder paths
image_folder = 'images'
output_folder = 'outputs'
os.makedirs(output_folder, exist_ok=True)
```

PRO TIP Replace 'model=yolov5n.pt' with new 'model=yolov5nu.pt'.  
YOLOv5 'u' models are trained with <https://github.com/ultralytics/ultralytics> and feature improved performance vs standard YOLOv5 models trained with <https://github.com/ultralytics/yolov5>.

PRO TIP Replace 'model=yolov5s.pt' with new 'model=yolov5su.pt'.  
YOLOv5 'u' models are trained with <https://github.com/ultralytics/ultralytics> and feature improved performance vs standard YOLOv5 models trained with <https://github.com/ultralytics/yolov5>.

```
In [13]: # Prepare summary dictionary
results_summary = {
    'filename': [],
    'model': [],
    'inference_time': [],
    'detection_count': [],
    'class_diversity': []
}

models = {'yolov5n': model_n, 'yolov5s': model_s}

# Loop over both models and images
for model_name, model in models.items():
    for filename in sorted(os.listdir(image_folder)):
        if filename.lower().endswith(('.jpg', '.png')):
            img_path = os.path.join(image_folder, filename)

            # Inference + timing
            start = time.time()
            results = model(img_path)
            end = time.time()
            inference_time = round(end - start, 4)

            # Parse results
            result = results[0]
            boxes = result.boxes
            names = result.names

            classes = boxes.cls.tolist() if boxes else []
            labels = [names[int(cls)] for cls in classes]
            detection_count = len(classes)
```

```
class_diversity = len(set(labels))

# Save annotated image
result.save(filename=os.path.join(output_folder, f"{model_name}_{fil

# Add to summary
results_summary['filename'].append(filename)
results_summary['model'].append(model_name)
results_summary['inference_time'].append(inference_time)
results_summary['detection_count'].append(detection_count)
results_summary['class_diversity'].append(class_diversity)

print(f"✅ {model_name} | {filename} | Time: {inference_time}s | De
```

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img1.jpg: 448x640 16 persons, 1 bicycle, 1 dog, 1 backpack, 69.7ms

Speed: 6.1ms preprocess, 69.7ms inference, 1.3ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5n | img1.jpg | Time: 0.3041s | Detections: 19

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img10.jpg: 448x640 12 persons, 2 cars, 5 motorcycles, 1 truck, 53.7ms

Speed: 1.8ms preprocess, 53.7ms inference, 1.2ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5n | img10.jpg | Time: 0.073s | Detections: 20

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img2.jpg: 640x640 1 stop sign, 69.2ms

Speed: 7.7ms preprocess, 69.2ms inference, 1.1ms postprocess per image at shape (1, 3, 640, 640)

✅ yolov5n | img2.jpg | Time: 0.1683s | Detections: 1

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img3.jpg: 448x640 16 dogs, 3 sheeps, 54.1ms

Speed: 3.6ms preprocess, 54.1ms inference, 1.4ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5n | img3.jpg | Time: 0.2666s | Detections: 19

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img4.jpg: 448x640 8 bicycles, 51.3ms

Speed: 2.6ms preprocess, 51.3ms inference, 1.0ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5n | img4.jpg | Time: 0.0821s | Detections: 8

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img5.jpg: 384x640 1 person, 2 cars, 2 trucks, 7 cows, 43.0ms

Speed: 2.1ms preprocess, 43.0ms inference, 1.0ms postprocess per image at shape (1, 3, 384, 640)

✅ yolov5n | img5.jpg | Time: 0.0719s | Detections: 12

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img6.jpg: 448x640 15 persons, 1 train, 1 dog, 49.3ms

Speed: 1.9ms preprocess, 49.3ms inference, 1.2ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5n | img6.jpg | Time: 0.0561s | Detections: 17

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img7.jpg: 576x640 3 persons, 24 cars, 13 busses, 4 trucks, 58.8ms

Speed: 4.4ms preprocess, 58.8ms inference, 1.2ms postprocess per image at shape (1, 3, 576, 640)

✅ yolov5n | img7.jpg | Time: 0.0724s | Detections: 44

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img8.jpg: 480x640 14 persons, 2 bicycles, 52.7ms

Speed: 2.4ms preprocess, 52.7ms inference, 0.8ms postprocess per image at shape (1, 3, 480, 640)

✅ yolov5n | img8.jpg | Time: 0.0687s | Detections: 16

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img9.jpg: 448x640 16 persons, 1 car, 3 busses, 1 backpack, 45.7ms

Speed: 1.5ms preprocess, 45.7ms inference, 1.1ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5n | img9.jpg | Time: 0.0569s | Detections: 21

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img1.jpg: 448x640 14 persons, 1 bicycle, 1 dog, 1 handbag, 97.0ms  
Speed: 3.3ms preprocess, 97.0ms inference, 1.0ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5s | img1.jpg | Time: 0.3552s | Detections: 17

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img10.jpg: 448x640 10 persons, 1 car, 7 motorcycles, 1 bus, 2 trucks, 91.4ms

Speed: 1.8ms preprocess, 91.4ms inference, 1.2ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5s | img10.jpg | Time: 0.1006s | Detections: 21

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img2.jpg: 640x640 (no detections), 138.2ms

Speed: 5.8ms preprocess, 138.2ms inference, 0.6ms postprocess per image at shape (1, 3, 640, 640)

✅ yolov5s | img2.jpg | Time: 0.2442s | Detections: 0

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img3.jpg: 448x640 17 dogs, 105.1ms

Speed: 3.9ms preprocess, 105.1ms inference, 0.8ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5s | img3.jpg | Time: 0.3148s | Detections: 17

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img4.jpg: 448x640 8 bicycles, 103.6ms

Speed: 2.4ms preprocess, 103.6ms inference, 1.0ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5s | img4.jpg | Time: 0.1443s | Detections: 8

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img5.jpg: 384x640 2 persons, 2 cars, 2 trucks, 11 cows, 88.0ms

Speed: 2.1ms preprocess, 88.0ms inference, 1.0ms postprocess per image at shape (1, 3, 384, 640)

✅ yolov5s | img5.jpg | Time: 0.1111s | Detections: 17

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img6.jpg: 448x640 14 persons, 1 train, 1 backpack, 1 handbag, 98.7ms

Speed: 2.3ms preprocess, 98.7ms inference, 0.8ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5s | img6.jpg | Time: 0.1168s | Detections: 17

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img7.jpg: 576x640 7 persons, 1 bicycle, 30 cars, 1 motorcycle, 16 busses, 1 truck, 124.3ms

Speed: 4.7ms preprocess, 124.3ms inference, 1.2ms postprocess per image at shape (1, 3, 576, 640)

✅ yolov5s | img7.jpg | Time: 0.1447s | Detections: 56

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelComparison\images\img8.jpg: 480x640 15 persons, 3 bicycles, 1 banana, 113.5ms

Speed: 3.4ms preprocess, 113.5ms inference, 1.1ms postprocess per image at shape (1, 3, 480, 640)

✅ yolov5s | img8.jpg | Time: 0.1295s | Detections: 19

image 1/1 c:\github projects\GauravJha\_Phase2\_Assignment\_TechAtPlay\Task3\_ModelCo

mparison\images\img9.jpg: 448x640 14 persons, 1 car, 2 buss, 4 backpacks, 2 handbags, 89.8ms

Speed: 1.5ms preprocess, 89.8ms inference, 0.8ms postprocess per image at shape (1, 3, 448, 640)

✅ yolov5s | img9.jpg | Time: 0.1116s | Detections: 23

```
In [14]: df = pd.DataFrame(results_summary)

# Pivot to compare models side-by-side
df_pivot = df.pivot(index='filename', columns='model', values=['inference_time',
df_pivot.columns = ['_'.join(col) for col in df_pivot.columns]
df_pivot.reset_index(inplace=True)

print("📊 Model Comparison Table:")
display(df_pivot)

# Optional: Save table to CSV
df_pivot.to_csv('model_comparison_results.csv', index=False)
```

📊 Model Comparison Table:

	filename	inference_time_yolov5n	inference_time_yolov5s	detection_count_yolov5n	detection_count_yolov5s
0	img1.jpg	0.3041	0.3552	19.0	19.0
1	img10.jpg	0.0730	0.1006	20.0	20.0
2	img2.jpg	0.1683	0.2442	1.0	1.0
3	img3.jpg	0.2666	0.3148	19.0	19.0
4	img4.jpg	0.0821	0.1443	8.0	8.0
5	img5.jpg	0.0719	0.1111	12.0	12.0
6	img6.jpg	0.0561	0.1168	17.0	17.0
7	img7.jpg	0.0724	0.1447	44.0	44.0
8	img8.jpg	0.0687	0.1295	16.0	16.0
9	img9.jpg	0.0569	0.1116	21.0	21.0

```
In [15]: plt.figure(figsize=(10,6))
plt.plot(df[df['model'] == 'yolov5n']['filename'], df[df['model'] == 'yolov5n']['inference_time'], label='yolov5n')
plt.plot(df[df['model'] == 'yolov5s']['filename'], df[df['model'] == 'yolov5s']['inference_time'], label='yolov5s')
plt.title("Inference Time Comparison")
plt.xlabel("Image")
plt.ylabel("Time (seconds)")
plt.xticks(rotation=45)
plt.legend()
plt.tight_layout()
plt.show()
```

