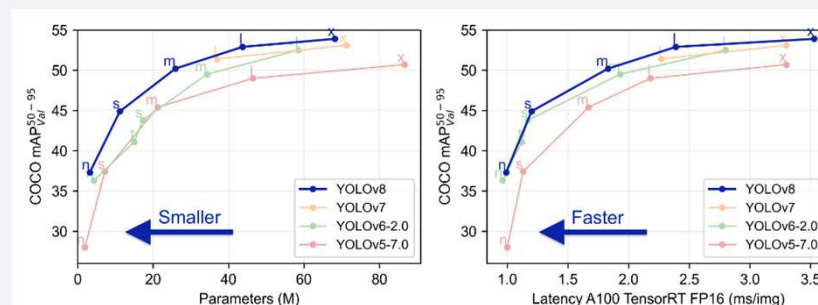


YOLOv5

YOLOv5u represents an advancement in object detection methodologies. Originating from the foundational architecture of the YOLOv5 model developed by Ultralytics, the model's architecture, leading to an improved accuracy-speed tradeoff in object detection tasks. Given the empirical results and its derived features

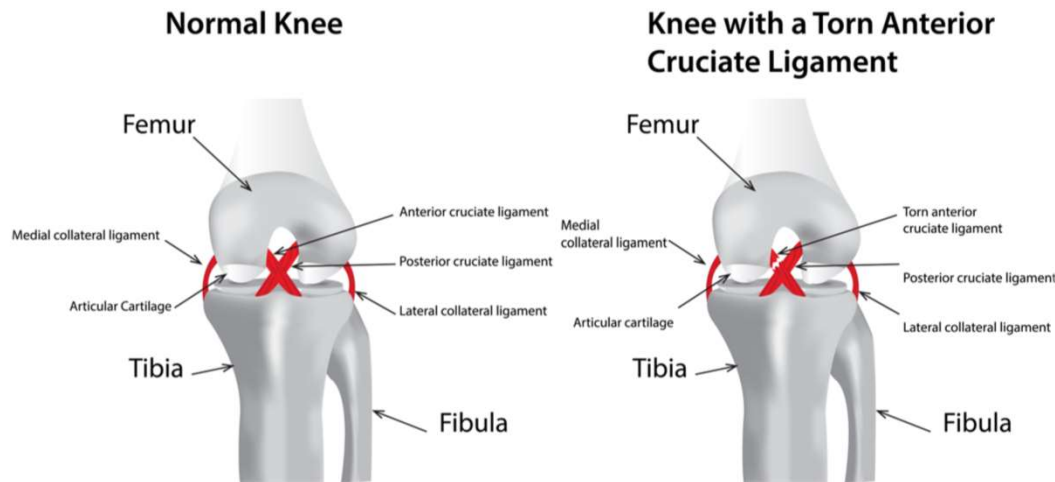
MODEL DESCRIPTION



Model	size (pixels)	mAP ^{val} 50-95	mAP ^{val} 50	Speed CPU b1 (ms)	Speed V100 b1 (ms)	Speed V100 b32 (ms)	params (M)	FLOPs @640 (B)
YOLOv5n	640	28.0	45.7	45	6.3	0.6	1.9	4.5
YOLOv5s	640	37.4	56.8	98	6.4	0.9	7.2	16.5
YOLOv5m	640	45.4	64.1	224	8.2	1.7	21.2	49.0
YOLOv5l	640	49.0	67.3	430	10.1	2.7	46.5	109.1
YOLOv5x	640	50.7	68.9	766	12.1	4.8	86.7	205.7

Knee Ligament tear detection using Yolov5

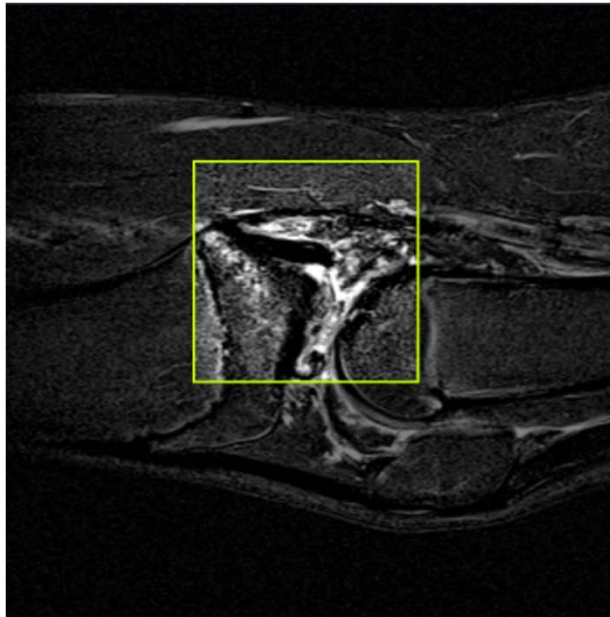
Torn Anterior Cruciate Ligament



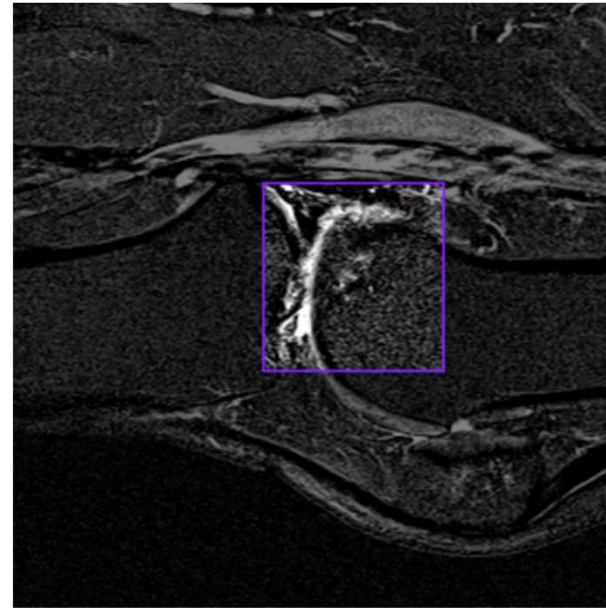
A ligament is the fibrous connective tissue that connects bones to other bones.

Torn or stretched ligaments are also called sprains. They usually occur due to extreme force to a joint, such as with a fall or another high-impact event. Common ligament tears happen in the ankle, knee, wrist, thumb, neck, or back.

Knee Ligament tear detection using Yolov5



Tear



No Tear

Knee Ligament tear detection using YOLOv5

```
1) !git clone https://github.com/ultralytics/yolov5 # clone
   %cd yolov5
   %pip install -qr requirements.txt roboflow

Cloning into 'yolov5'...
remote: Enumerating objects: 16562, done.
remote: Counting objects: 100% (40/40), done.
remote: Compressing objects: 100% (27/27), done.
remote: Total 16562 (delta 20), reused 29 (delta 13), pack-reused 16522
Receiving objects: 100% (16562/16562), 15.08 MiB | 25.27 MiB/s, done.
Resolving deltas: 100% (11377/11377), done.
/content/yolov5
74.1/74.1 kB 2.1 MB/s eta 0:00:00
207.3/207.3 kB 8.8 MB/s eta 0:00:00
4.5/4.5 MB 27.8 MB/s eta 0:00:00
750.8/750.8 kB 26.3 MB/s eta 0:00:00
158.3/158.3 kB 17.1 MB/s eta 0:00:00
178.7/178.7 kB 16.5 MB/s eta 0:00:00
58.8/58.8 kB 7.8 MB/s eta 0:00:00
49.1/49.1 MB 13.0 MB/s eta 0:00:00
54.5/54.5 kB 7.0 MB/s eta 0:00:00
62.7/62.7 kB 3.1 MB/s eta 0:00:00

ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source of the following dependency conflicts.
imageio 2.31.6 requires pillow<10.1.0,>=8.3.2, but you have pillow 10.3.0 which is incompatible.

2) import torch
   import os
   from IPython.display import Image, clear_output

3) from roboflow import Roboflow
   os.environ["DATASET_DIRECTORY"] = '/content/datasets'
```

Connected to Python 3 Google Compute Engine backend (GPU)

Battery saver: Your battery is low. You should plug in your device.

```
4) Downloading Dataset Version Zip in /content/datasets/biocliq-knee-project-1 to yolov5pytorch:: 100% [49104/49104 [00:02:00:00, 22229.10it/s]
   Extracting Dataset Version Zip to /content/datasets/biocliq-knee-project-1 in yolov5pytorch:: 100% [3512/3512 [00:00:00:00, 8274.66it/s]

5) !python train.py --img 416 --batch 30 --epochs 50 --data (dataset.location)/data.yaml --weights yolov5s.pt --cache

train: New cache created: /content/datasets/biocliq-knee-project-1/train/labels.cache
train: Caching images (0.7GB ram): 100% 1494/1494 [00:04:00:00, 306.86it/s]
val: Scanning /content/datasets/biocliq-knee-project-1/valid/labels... 81 images, 0 backgrounds, 0 corrupt: 100% 81/81 [00:00:00:00, 656.27it/s]
val: New cache created: /content/datasets/biocliq-knee-project-1/valid/labels.cache
val: Caching images (0.6GB ram): 100% 81/81 [00:00:00:00, 143.82it/s]

AutoAnchor: 5.54 anchors/target, 1.000 Best Possible Recall (BPR). Current anchors are a good fit to dataset
Plotting labels to runs/train/exp/labels.jpg...
Image sizes 416 train, 416 val
Using 2 dataloader workers
Logging results to runs/train/exp
Starting training for 50 epochs...

Epoch 0/49
GPU_mem 2.65G box_loss 0.08791 obj_loss 0.02804 cls_loss 0.02804 Instances 48 Size 416: 100% 50/50 [00:17:00:00, 2.86it/s]
Class Images Instances P R mAP50 mAP50-95 100% 2/2 [00:03:00:00, 1.61it/s]
all 81 81 0.153 0.69 0.235 0.0652

Epoch 1/49
GPU_mem 3.33G box_loss 0.05637 obj_loss 0.02601 cls_loss 0.02601 Instances 40 Size 416: 100% 50/50 [00:12:00:00, 4.10it/s]
Class Images Instances P R mAP50 mAP50-95 100% 2/2 [00:00:00:00, 2.73it/s]
all 81 81 0.298 0.721 0.389 0.133

Epoch 2/49
GPU_mem 3.33G box_loss 0.05393 obj_loss 0.02552 cls_loss 0.02552 Instances 39 Size 416: 100% 50/50 [00:11:00:00, 4.21it/s]
Class Images Instances P R mAP50 mAP50-95 100% 2/2 [00:00:00:00, 2.66it/s]
all 81 81 0.186 0.567 0.233 0.0597
```

Connected to Python 3 Google Compute Engine backend (GPU)

Battery saver: Your battery is low. You should plug in your device.

Knee Ligament tear detection using YOLOv5

