# Model Size

I compared three model sizes during this experiment: YOLOv8n, YOLOv8s, YOLOv8m.

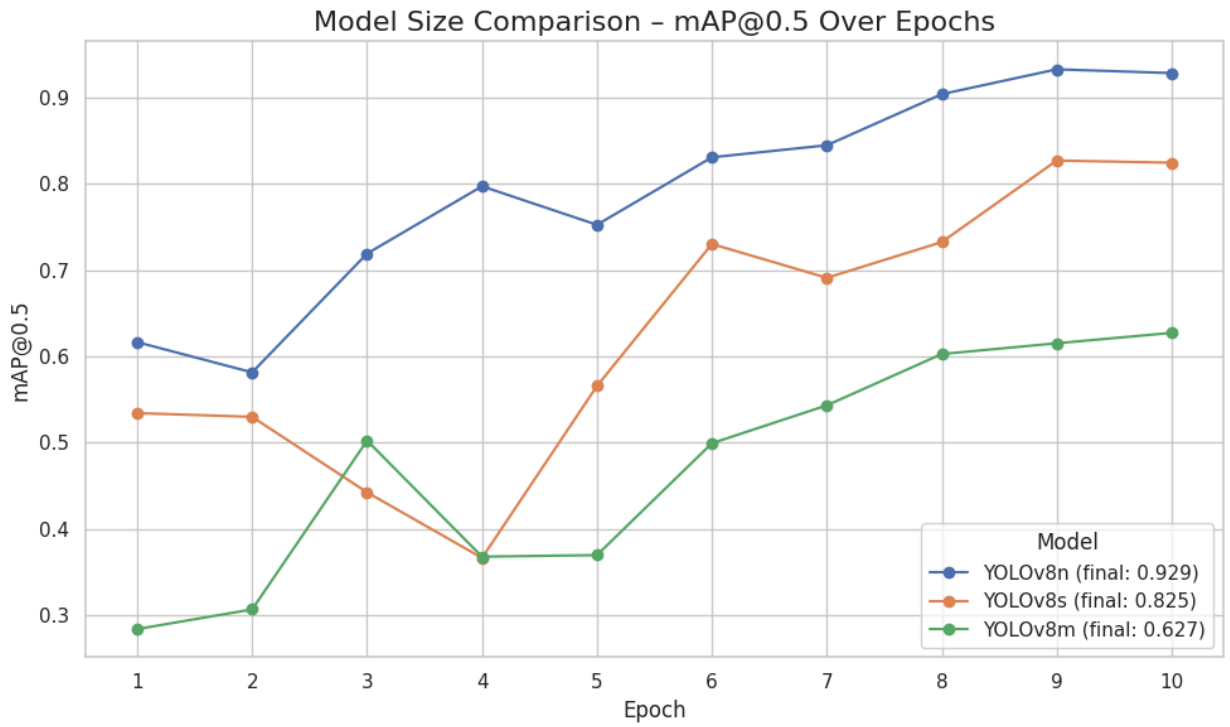
**These are the results over 10 epochs**

| Model | mAP@0.5 | mAP@0.5:0.95 | Precision | Recall |
|---|---|---|---|---|
| YOLOv8n | **0.929** | **0.926** | 0.867 | 0.862 |
| YOLOv8s | 0.825 | 0.798 | 0.725 | 0.759 |
| YOLOv8m | 0.627 | 0.591 | 0.512 | 0.707 |

Contrary to popular belief, bigger != better, the smallest model (YOLOv8n) achieved the best results across all metrics. Surprisingly, the largest model (YOLOv8m) underperformed significantly despite having more parameters.

**Conclusion**

For our current dataset and model purpose, I recommend using YOLOv8n as it offers the best balance of accuracy and efficiency.



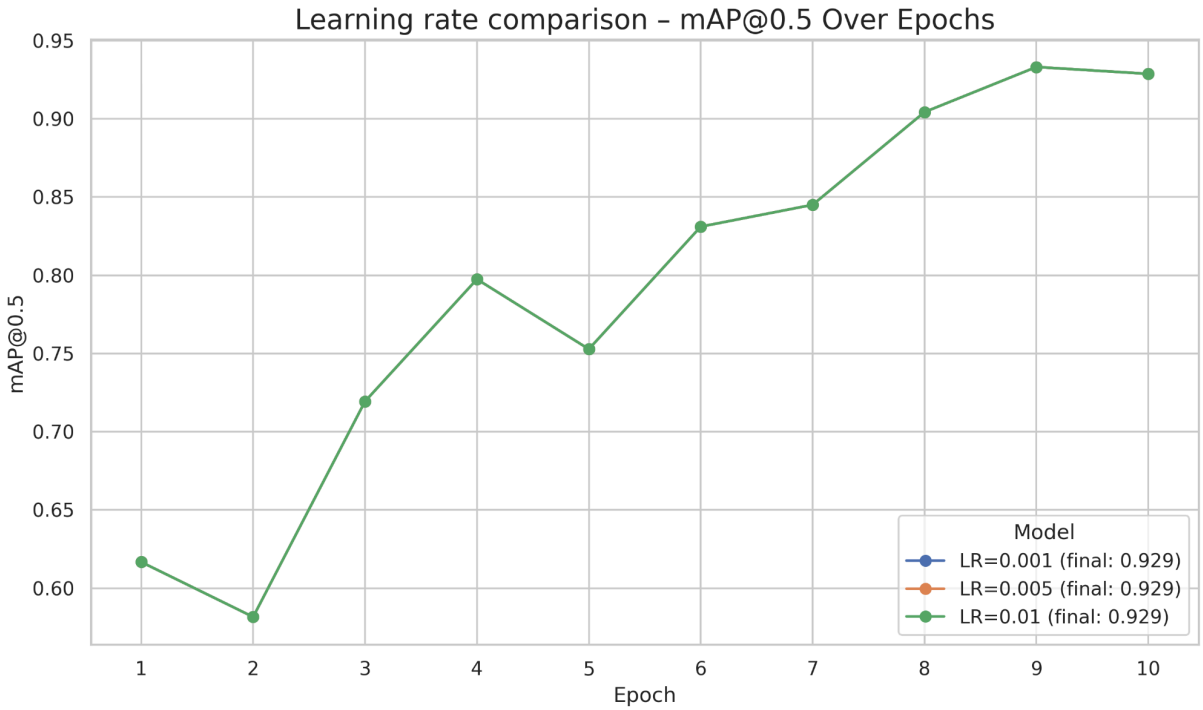
# Continuation of my experiments, learning rate:

**These are the results over 10 epochs**
MODEL USED: **YOLOv8n**

| Learning Rate | mAP@0.5 | mAP@0.5:0.95 | Precision | Recall |
|---|---|---|---|---|
| 0.001 | **0.929** | **0.926** | 0.867 | 0.862 |
| 0.005 | **0.929** | **0.926** | 0.867 | 0.862 |
| 0.01 | **0.929** | **0.926** | 0.867 | 0.862 |

Based on these results I've reached a conclusion that learning rate has no significant effect on model performance in this 10-epoch window.

**Conclusion**
For our current dataset it doesn't matter what learning rate we use.



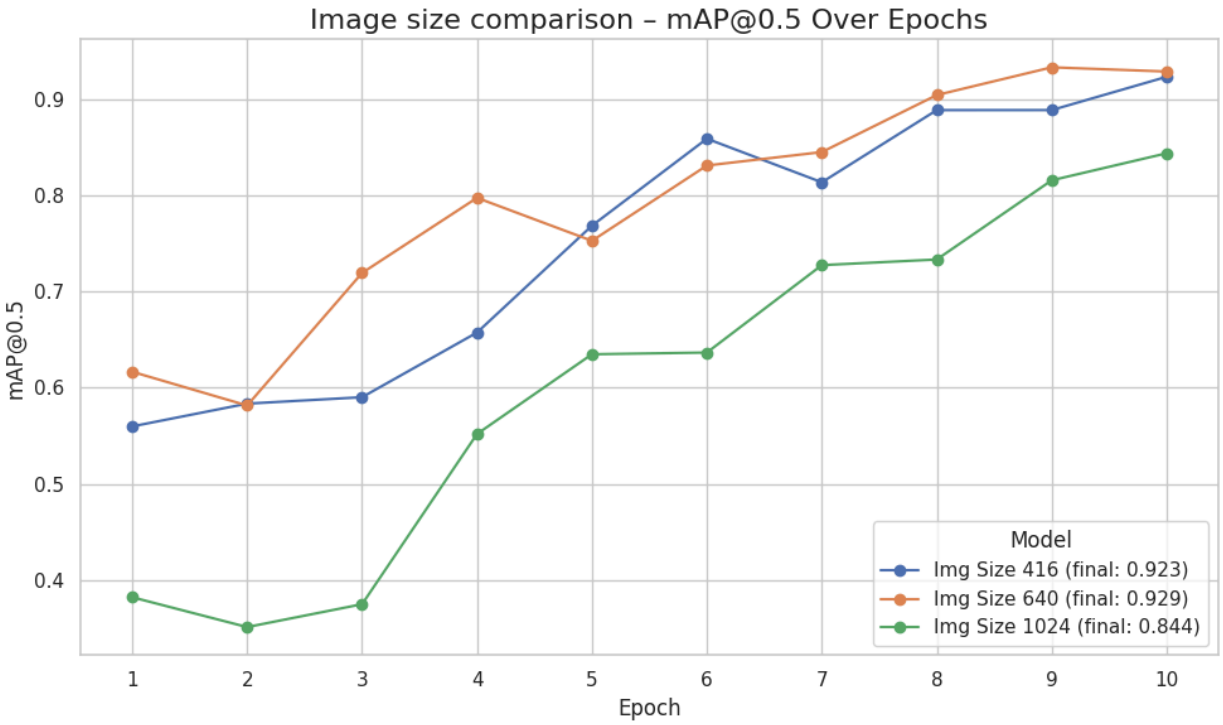

# Final experiment, image size:

**These are the results over 10 epochs**
MODEL USED: **YOLOv8n**

| Image Size | mAP@0.5 | mAP@0.5:0.95 | Precision | Recall |
|---|---|---|---|---|
| 416 | 0.923 | 0.918 | 0.864 | 0.843 |
| 640 | **0.929** | **0.926** | 0.867 | 0.862 |
| 1024 | 0.844 | 0.827 | 0.789 | 0.757 |

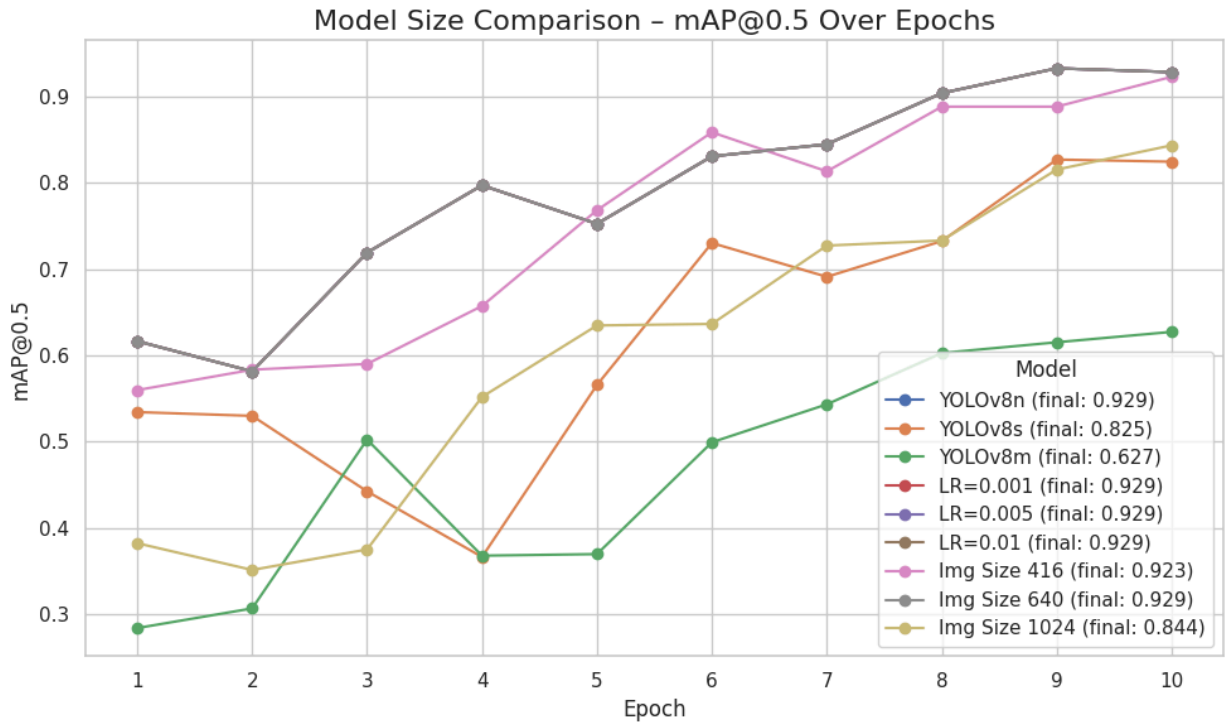
Based on these results the sweet spot is 640x640. Going larger actually hurts performance, probably due to overfitting or inefficient learning.

**Conclusion**
For our current dataset and model purpose, I recommend using 640x640 image size.




# Final conclusion

I recommend using **YOLOv8n,** learning rate of 0.005 and image size 640x640, as this is the most balanced combo out of all possible combinations.


Model Size Comparison – mAP@0.5 Over Epochs
mAP@0.5
Epoch
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
2
3
4
5
6
7
8
9
10
Model
YOLOv8n (final: 0.929)
YOLOv8s (final: 0.825)
YOLOv8m (final: 0.627)
LR=0.001 (final: 0.929)
LR=0.005 (final: 0.929)
LR=0.01 (final: 0.929)
Img Size 416 (final: 0.923)
Img Size 640 (final: 0.929)
Img Size 1024 (final: 0.844)