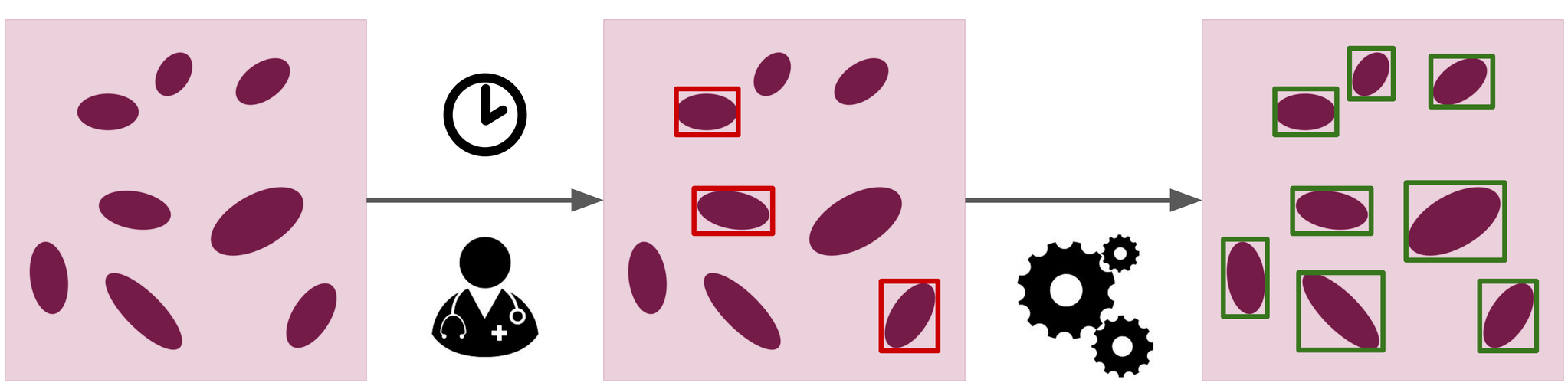
UNIVERSITY OF TARTU
Institute of Computer Science

Reducing the Effect of Incomplete Annotations in Object Detection for Histopathology

Denys Kaliuzhnyi, Dmytro Fishman, Mikhail Papkov@

Institute of Computer Science, University of Tartu

@ — mikhail.papkov@ut.ee



In histopathology, object density is very high in high-resolution images. To reduce time costs, a large part of annotations can be missing from manual analysis.

We study how incomplete annotations affect YOLO-v5s [1] detection rate and propose a *tiny* hyperparameter adjustment to improve it .

Hyperparameter	Tuned	Default
lr0	0.005	0.01
lrf	0.001	0.1
momentum	0.977	0.937
obj	1	0.7
obj_pw	0.1	1
flipud	0.5	0
batch-size	32	16
imgsz	512	640
image-weights	enabled	disabled
cos-lr	enabled	disabled

Table 1. Changed YOLO-v5 hyperparameters compared to default settings.

Results

- We achieve baseline model's performance with ~25% of annotations on MoNuSeg 2018 dataset [2].
- AP50 is improved by up to 2% in a 10% annotations scenario.

Takeaways

- YOLO-v5s can deal with missing annotations although it was designed for a dense task.
- Reducing positive object weight plays a crucial role in model's robustness for incomplete data.
- Domain-specific augmentation and hyperparameter tuning further increase performance.

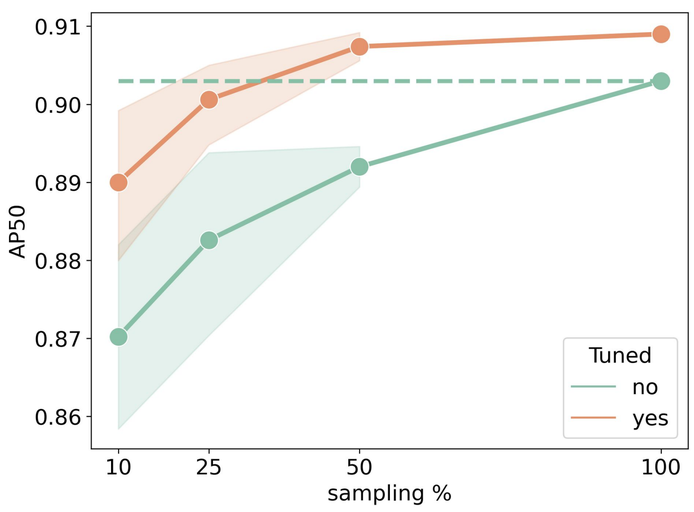


Figure 1. Annotation sub-sampling effect on detection quality over five random seeds.

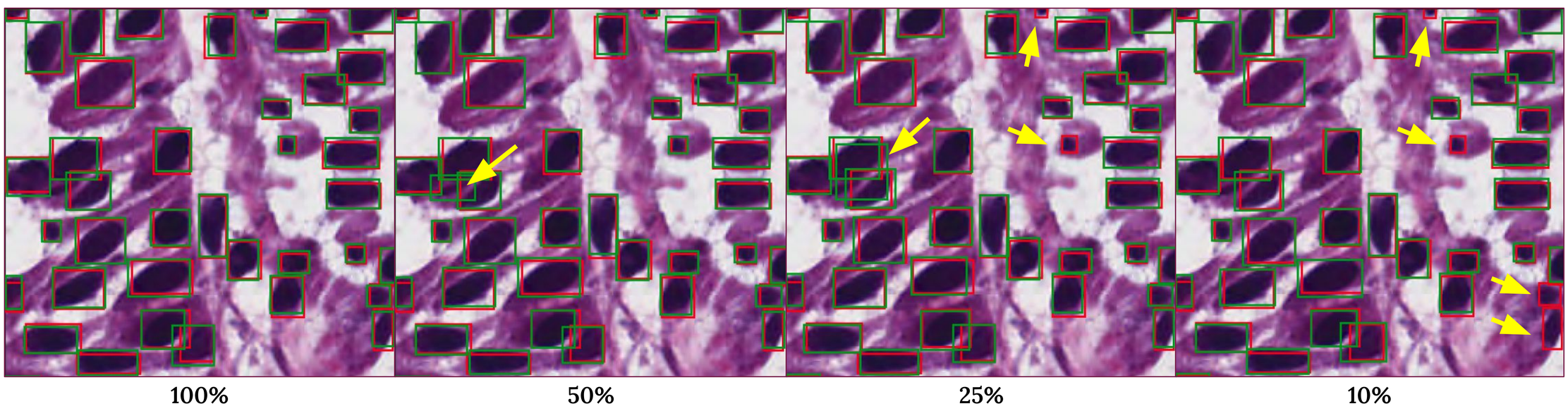


Figure 2. Example predictions of models trained on full and sub-sampled annotations.. Ground truth in red, predictions in green.

Acknowledgements

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References

[1] https://github.com/ultralytics/yolov5/tree/v6.1
[2] Neeraj Kumar et al. A multi-organ nucleus segmentation challenge. IEEE transactions on medical imaging, 39(5):1380–1391, 2019.