

Learnable Instance-Adaptive Thresholds for Semi-Supervised Multi-Label Learning

**Shuxian Xiong, Mingkun Xie, Jiahao Xiao,
Shengjun Huang**

Frontiers of Computer Science, DOI: [10.1007/s11704-025-51185-3](https://doi.org/10.1007/s11704-025-51185-3)

Problems & Ideas

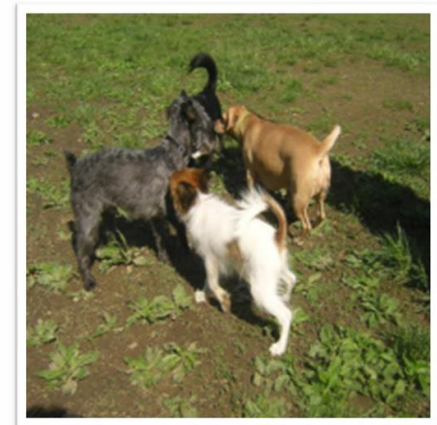
- Problems of Existing SSMLL Pseudo-labeling:
 - Class-wise pseudo-labeling assumes prediction scores of the same class are comparable across instances.
 - This assumption is violated by contextual bias: scores are heavily influenced by the contextual information (e.g., scene/background cues or co-occurring objects).
- Ideas: A learnable instance-adaptive thresholding strategy to mitigate contextual bias in pseudo-labeling.



CAP: person, car, bus
Ours: person, car, bus



CAP: person, skateboard
Ours: person, skateboard

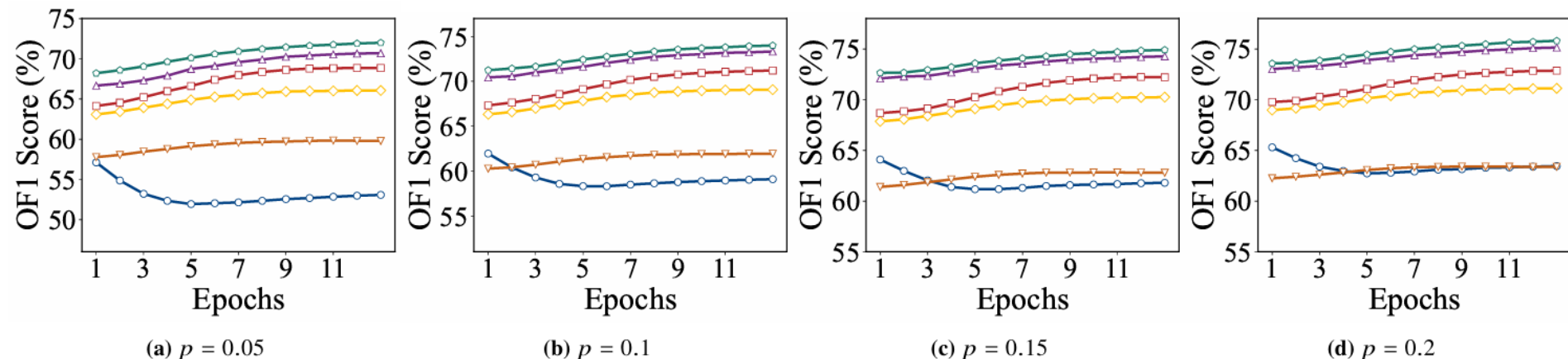


CAP: dog, Frisbee
Ours: dog

Left / Middle / Right: typical failure cases of existing pseudo-labeling methods due to tiny objects, occlusion, and contextual bias.

Main Contributions

- Contributions:
 - Instance-adaptive thresholding mechanism
 - Learns a dynamic threshold for each instance, enabling reliable separation of positive and negative labels within the same context.
 - Improved Pairwise Ranking (IPR) loss
 - Efficiently enforces positive labels above the threshold and negative labels below it, reducing the complexity of traditional ranking loss from quadratic to linear in the number of classes.



Pseudo-labeling performance in terms of Overall F1 (OF1) scores on COCO for different values of labeled proportions p . Our method consistently improves pseudo-label quality across different labeled proportions.