Politecnico di Torino
Data Analysis and Artificial Intelligence

OPEN SET DOMAIN ADAPTATION

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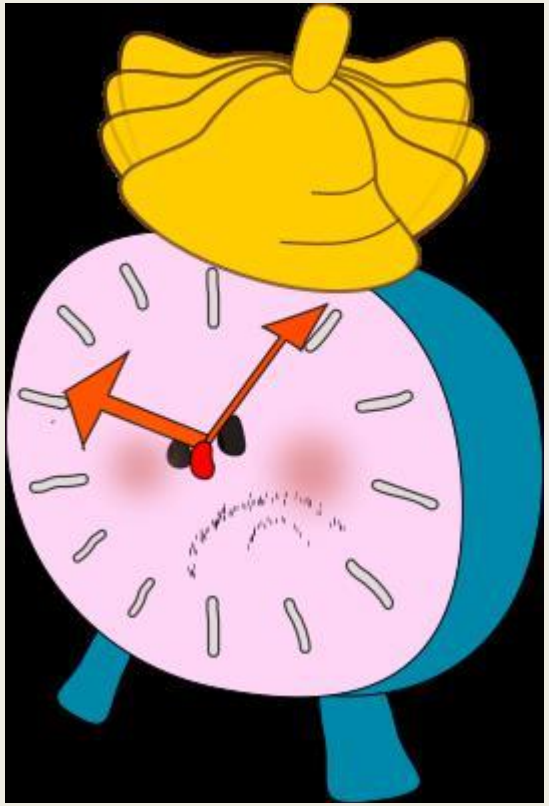
Introduction of the problem



Knowing the unknown

Joint Supervision Training

$$L = L_{C_1} + \alpha_1 L_{R_1} + \lambda \text{ Center\_Loss}$$

Chair

Candle

Fork

Normality score

$$N = \max\{E_s, R_s\}$$

- E_s is the entropy score
- R_s is the rotation score

Known and Unknown separation

N >= th

clock

N < th

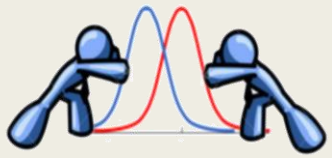
?

Domain Alignment

Here, in simple words, we try to get a label for the known objects using a combination of two losses, while not forcing the same distribution of objects :

$$L = L_{C_2} + \alpha_2 L_{R_2}$$

The classifier is trained either to label the known object or to reject it as unknown

Domain Alignment  & Unknown Detection 

Metric Evaluation

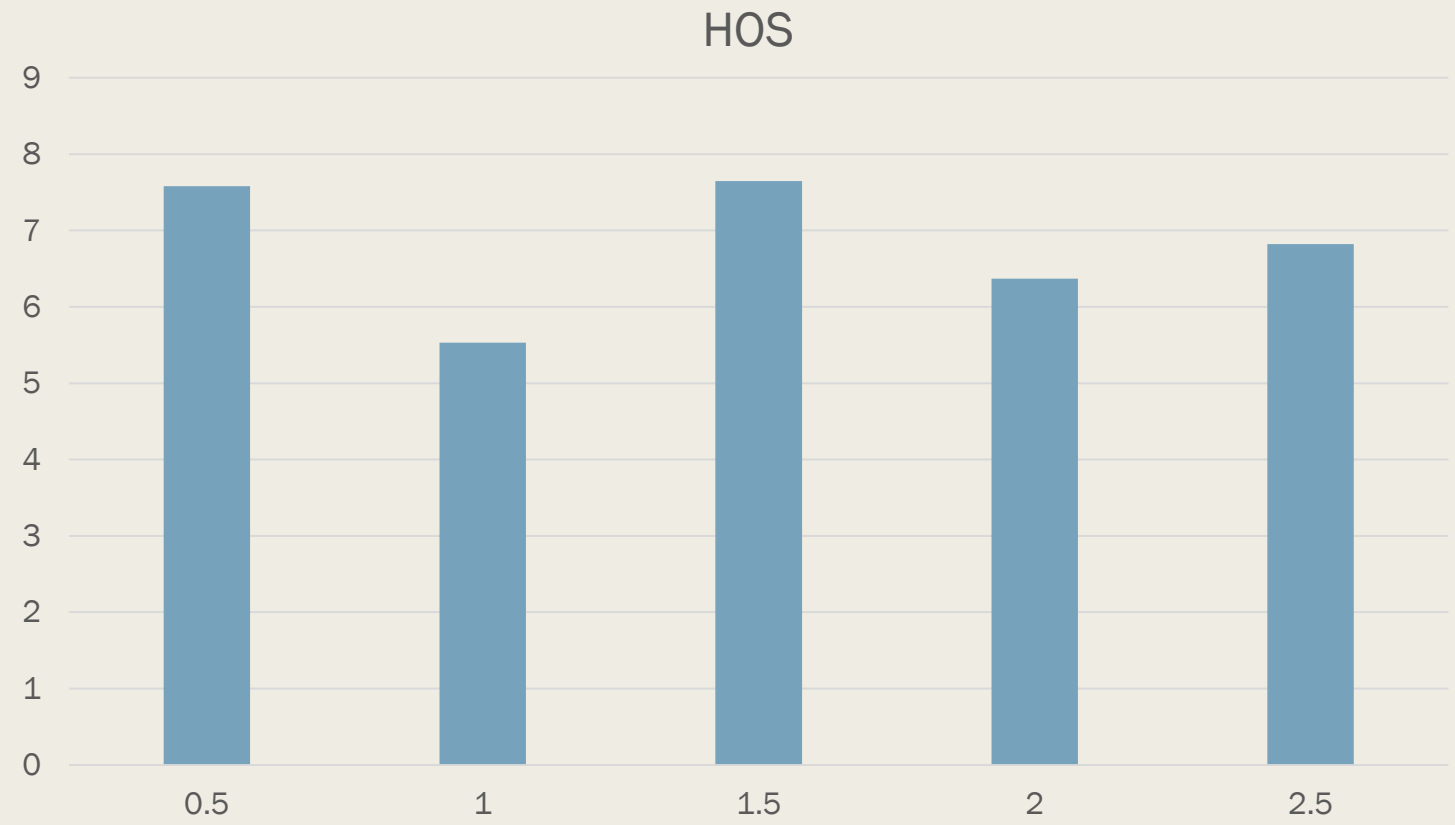
- OS*: Accuracy of the known classes.
- UNK: Accuracy of the unknown classes.
- HOS: Harmonic mean of the 2 accuracies.

$$HOS = \frac{2\ OS^*\ UNK}{OS^* + UNK}$$

The adoption of HOS, as the criterion for performance, allowed to consider both tasks of identifying known and unknown samples.

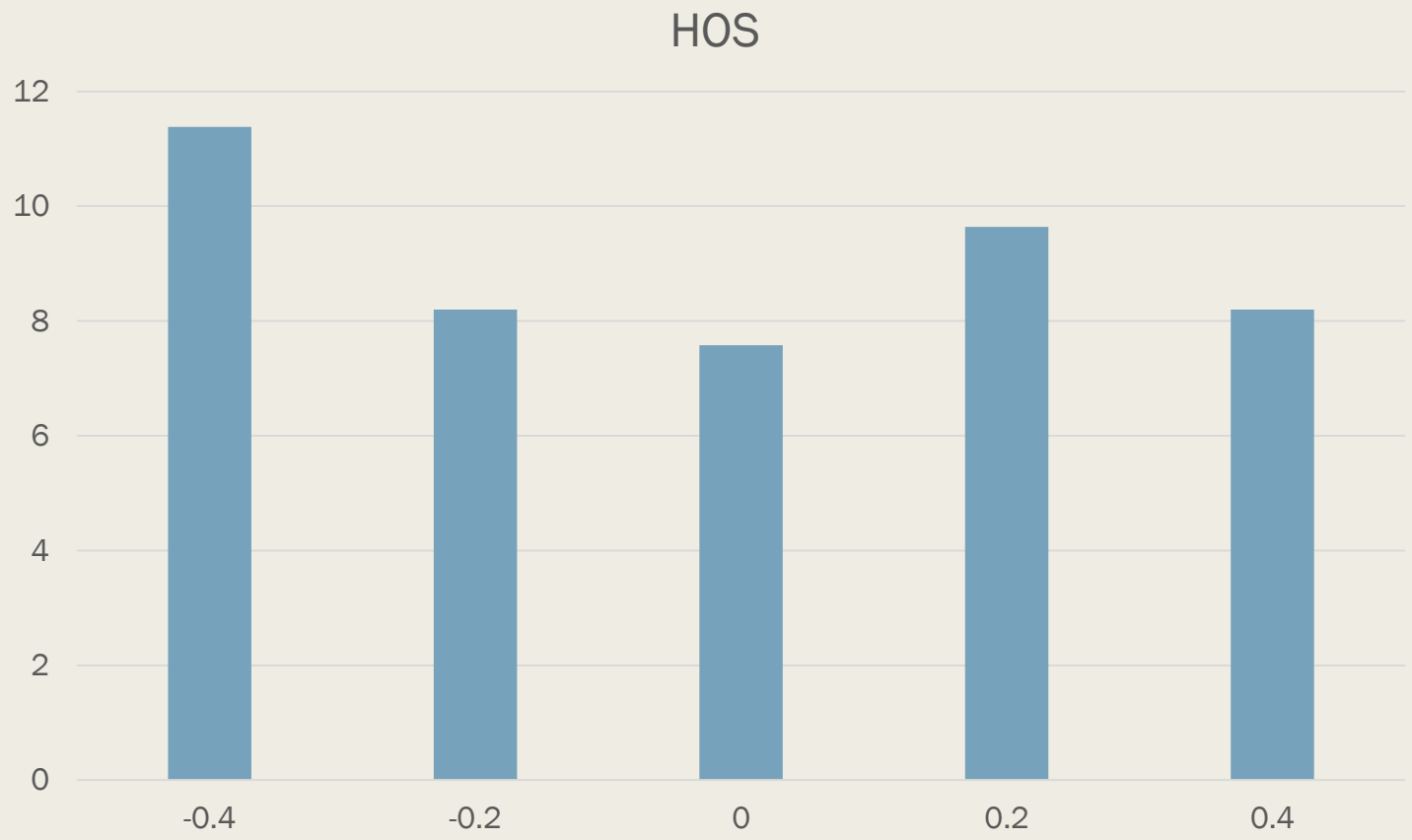
Ablation for α_1 and α_2

Threshold=0
Centerloss=0



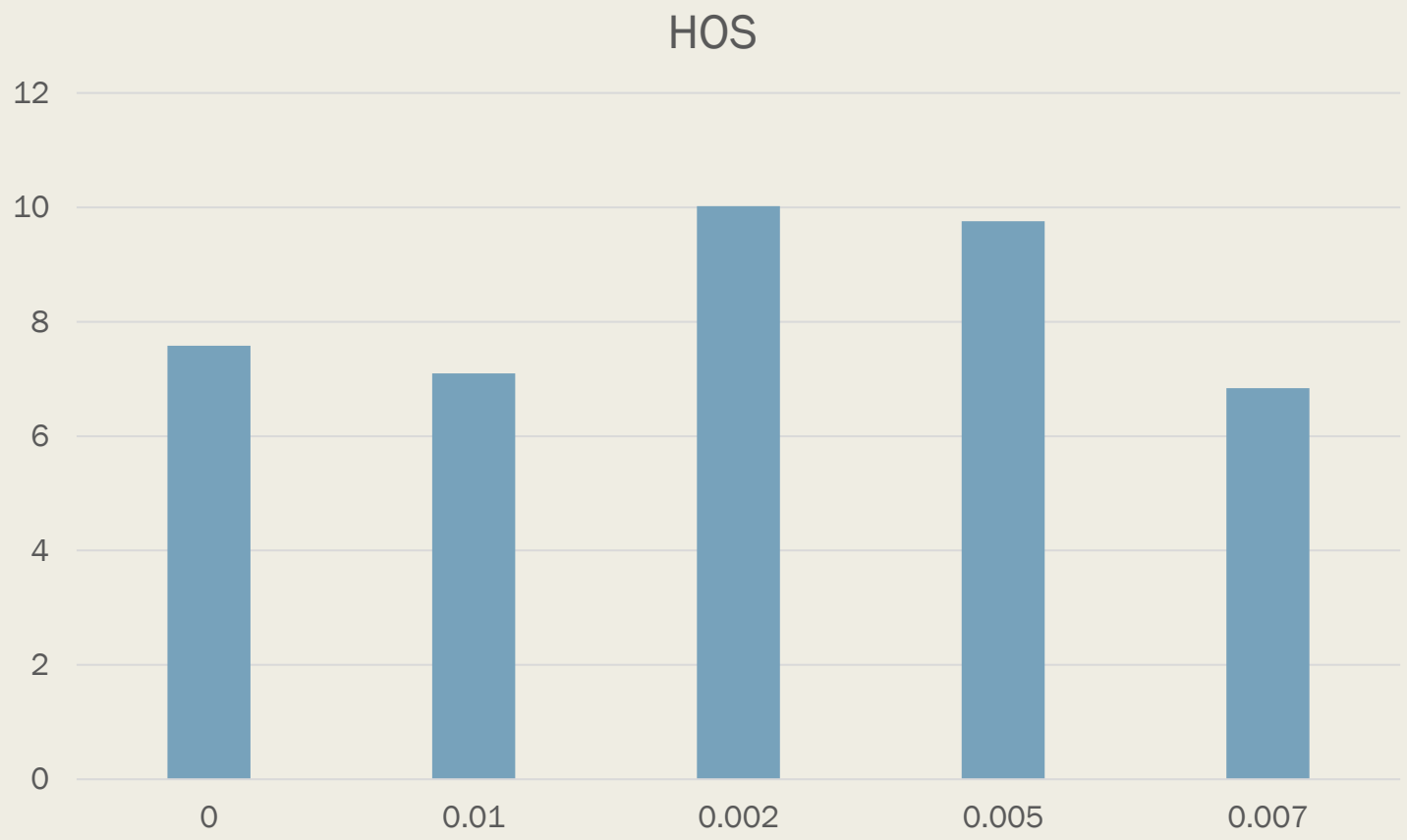
Ablation for the threshold

$\alpha_1 = \alpha_2 = 0$
Centerloss=0



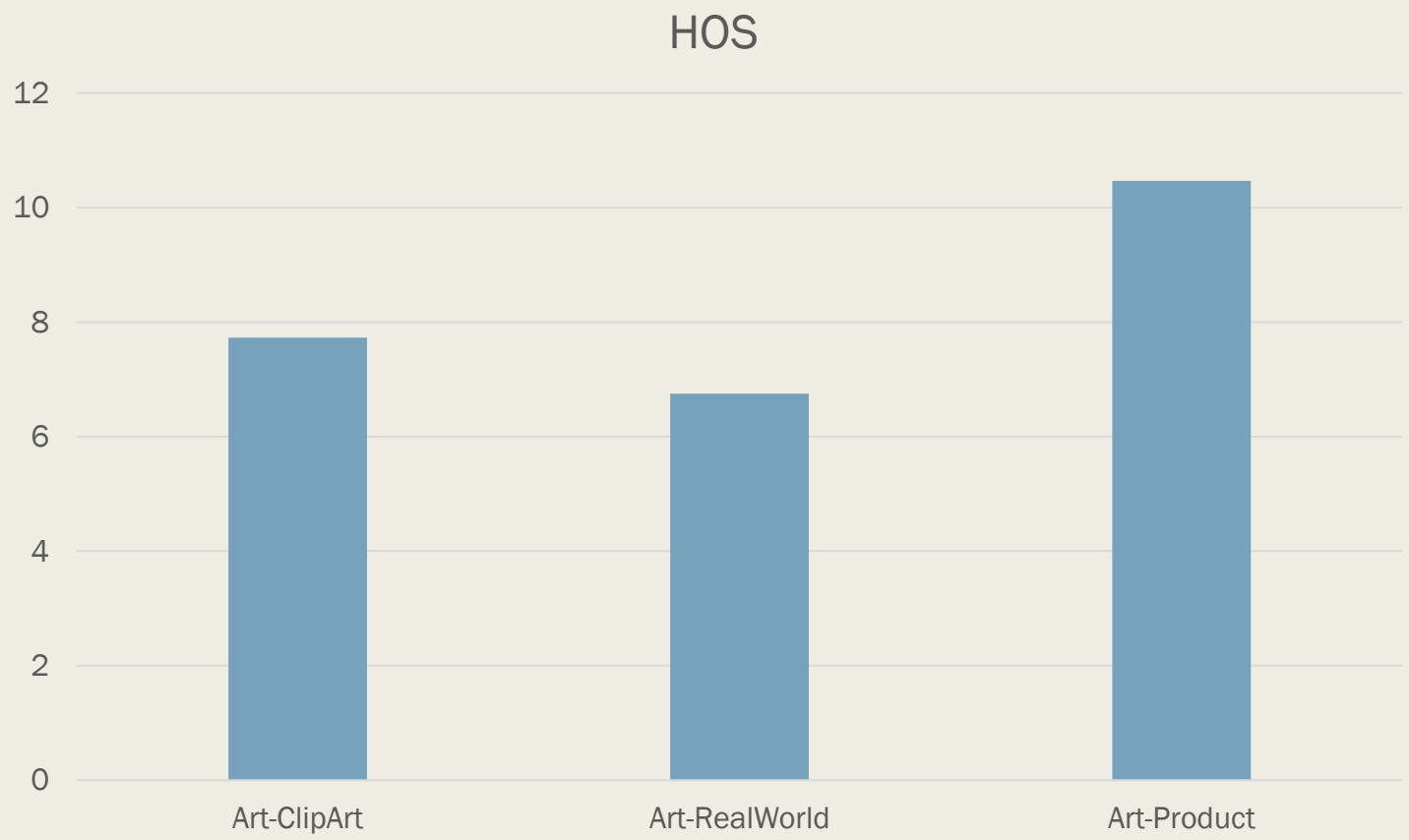
Ablation for Centerloss

$\alpha_1 = \alpha_2 = 0$
Threshold$=0$



Domain Shift

$\alpha_1 = \alpha_2 = 1.5$, Threshold=-0.4, Centerloss=0.



Improvements

Problems:

- Low Performance: AUROC & HOS
- Domain Shift(real world)
- Limited resources
- Centerloss implementation

Possible Solutions:

- More exhaustive training
- Improved database
- Early stopping

THANK YOU FOR YOUR ATTENTION!

GitHub Repository:
https://github.com/FelipeCorredor73/DAAI_OPEN_SET_ROS.git