

Taxonomy-Structured Domain Adaptation (TSDA)

Tianyi Liu*, Zihao Xu*, Hao He, Guang-Yuan Hao, Hao Wang



*These authors contributed equally to this work.

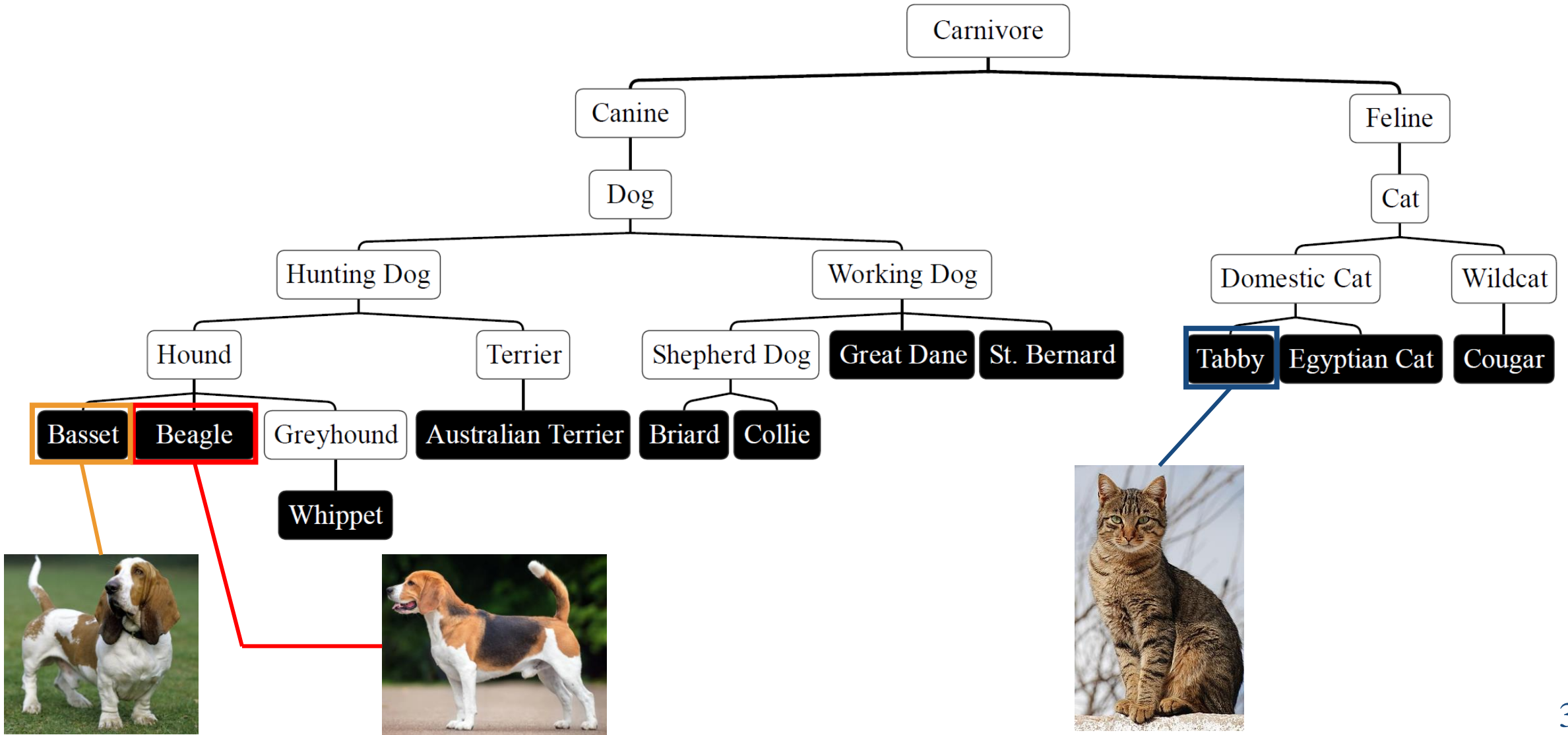
Enforcing **uniform alignment** can **harm** domain adaptation performance^[1,2,3].

[1] Zhao, Han, et al. "On learning invariant representations for domain adaptation." International conference on machine learning. PMLR, 2019.

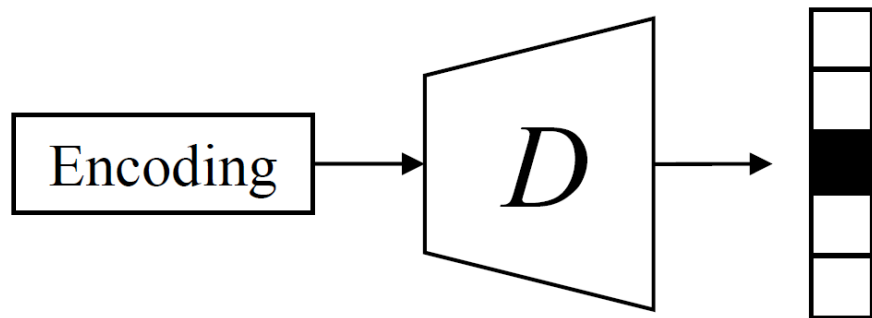
[2] Wu, Yifan, et al. "Domain adaptation with asymmetrically-relaxed distribution alignment." International Conference on Machine Learning. PMLR, 2019.

[3] Zihao Xu, Hao He, Guang-He Lee, Yuyang Wang, Hao Wang, et al. Graph-relational domain adaptation. In ICLR, 2022.

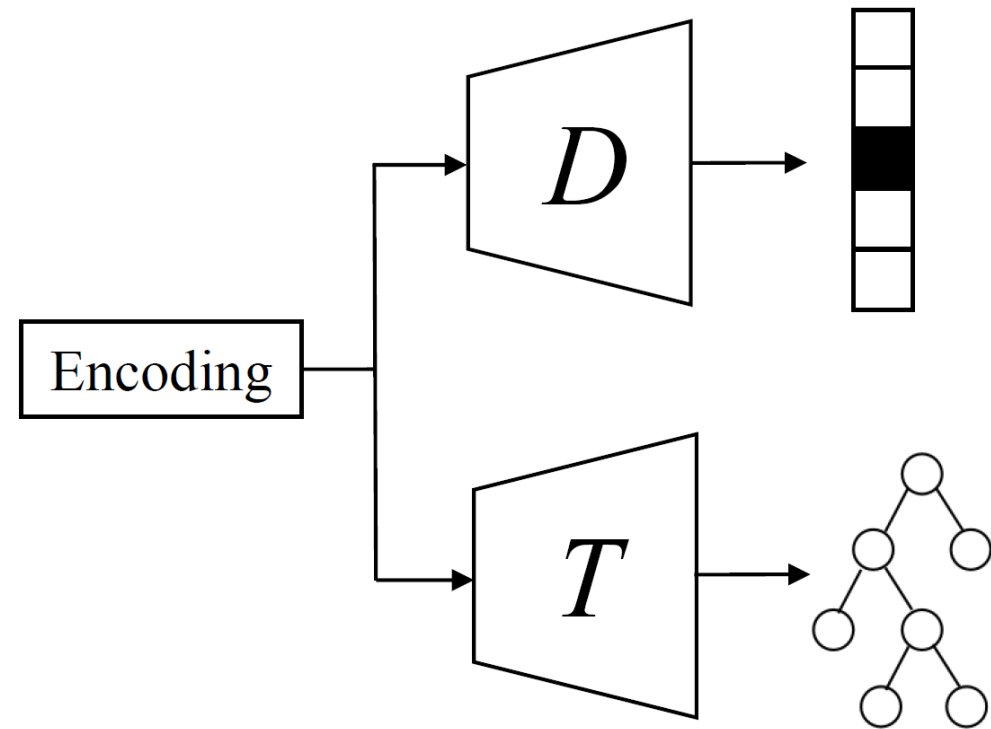
We can use **domain taxonomy** to **break**
the uniform alignment!



Novel Taxonomist

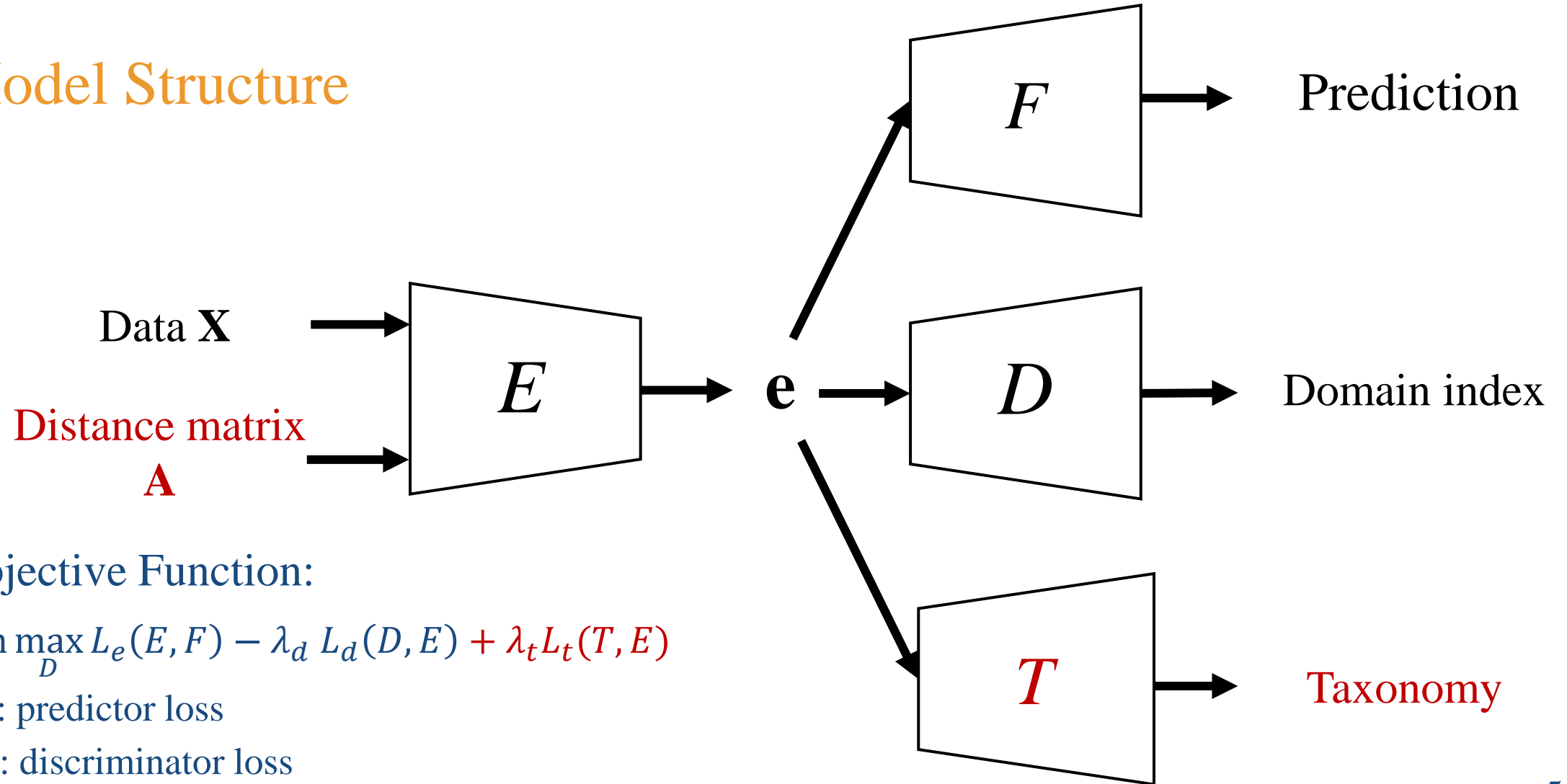


Traditional Domain Adaptation
methods



Ours
+ Reconstruct taxonomy

Model Structure



Objective Function:

$$\min_{E,F} \max_D L_e(E, F) - \lambda_d L_d(D, E) + \lambda_t L_t(T, E)$$

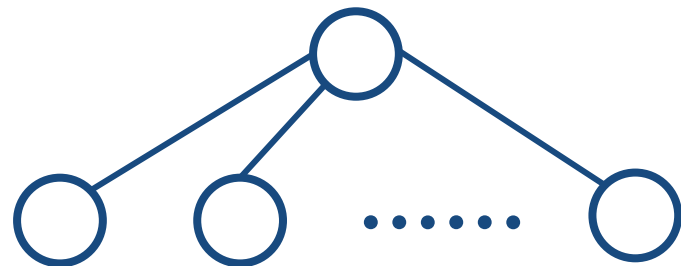
L_e : predictor loss

L_d : discriminator loss

L_t : taxonomist loss

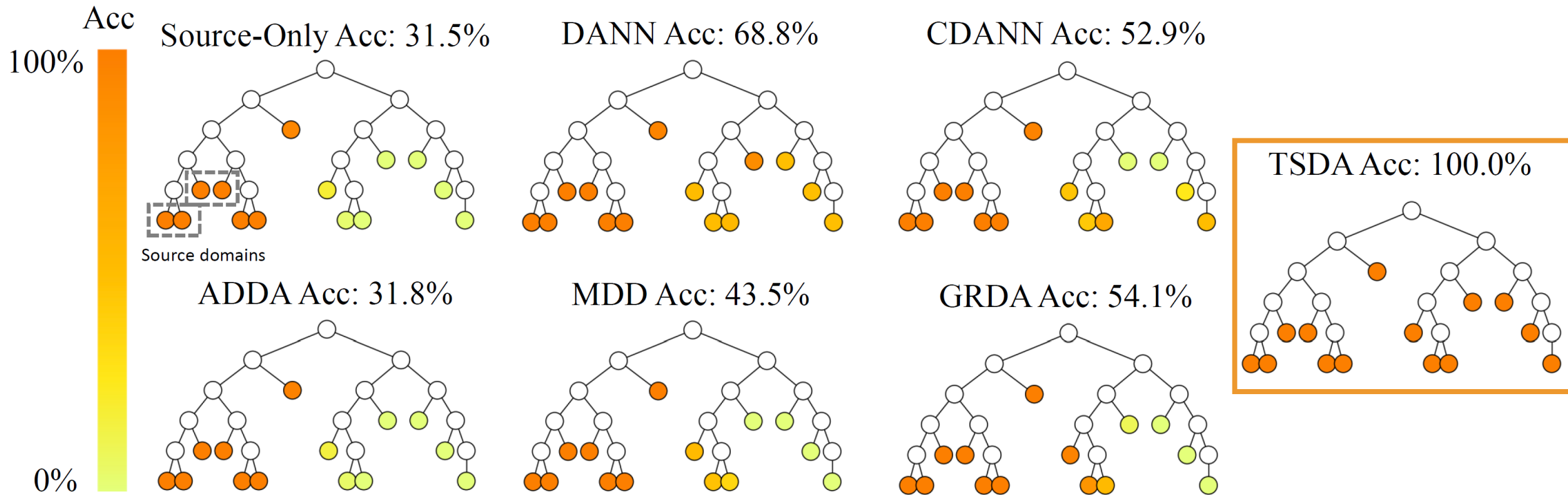
Theorem (informal)

- The introduction of the taxonomist prevents the discriminator from enforcing uniform alignment.
- TSDA can **recover DANN** with a non-informative taxonomy.
- DANN with weighted pairwise discriminators can only produce uniform alignment.



A non-informative taxonomy

Experiment on DT-14



Experiment on ImageNet-Attribute-DT

Target Domain	Source-Only	DANN	CDANN	ADDA	MDD	GRDA	TSDA
Basset	84.0	84.0	72.0	88.0	88.0	84.0	92.0
Beagle	68.0	64.0	68.0	44.0	68.0	76.0	76.0
Whippet	68.0	64.0	68.0	68.0	76.0	72.0	76.0
Australian Terrier	80.0	80.0	72.0	84.0	84.0	84.0	84.0
Briard	80.0	80.0	80.0	80.0	72.0	68.0	72.0
Collie	84.0	80.0	88.0	84.0	84.0	84.0	84.0
Average	77.3	75.3	74.7	74.7	78.7	78.0	80.7



Code

<https://github.com/Wang-ML-Lab/TSDA>



Paper

<https://arxiv.org/abs/2306.07874>

Thank you!
Q & A