25TH INTERNATIONAL CONFERENCE ON
PATTERN RECOGNITION (ICPR2020)

Unsupervised Multi-Task Domain Adaptation

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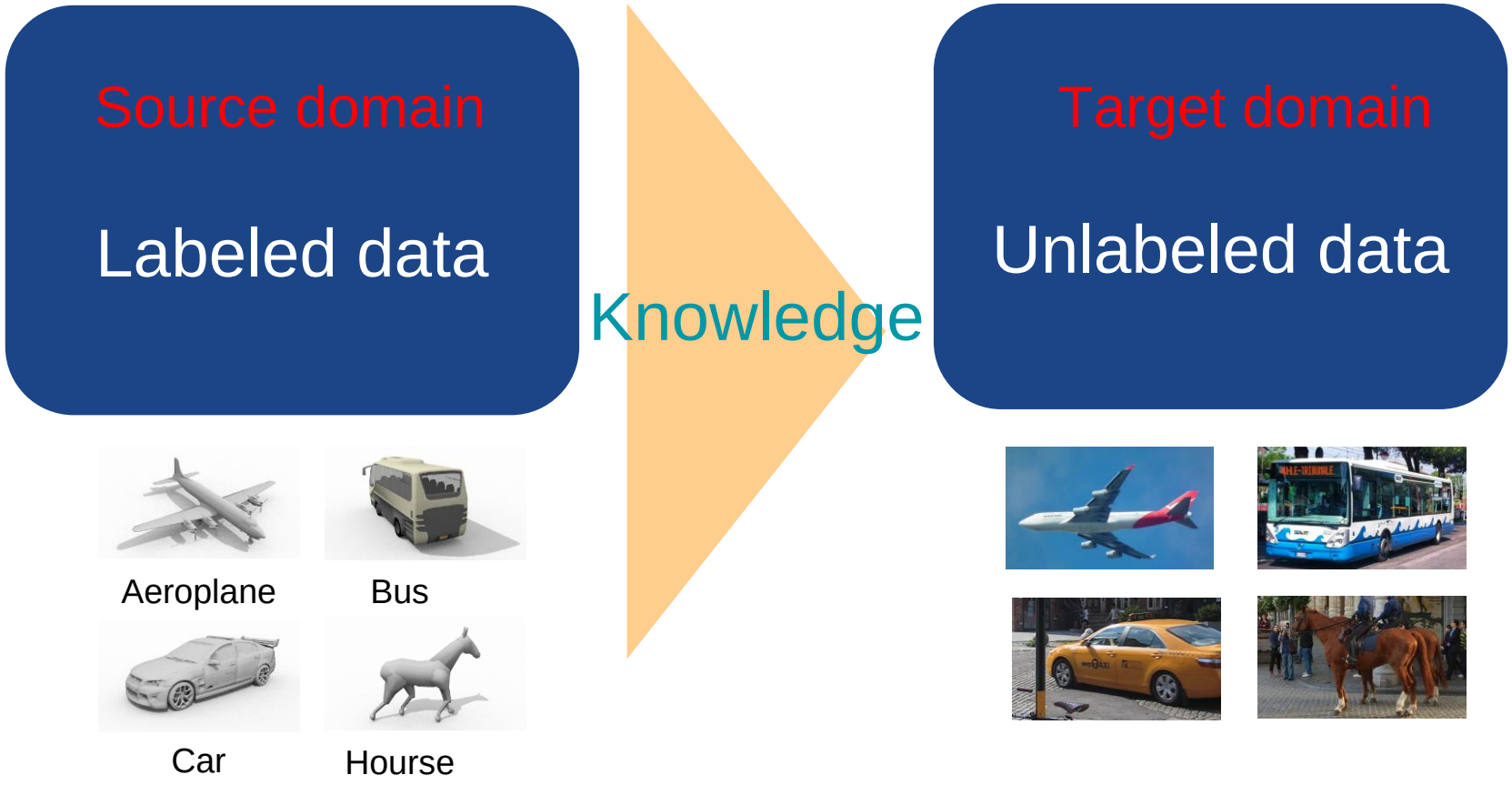
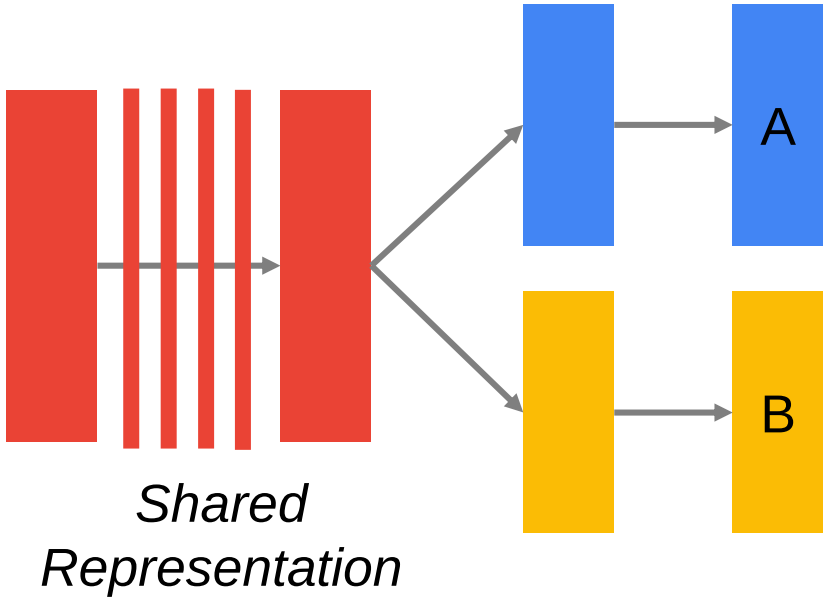
Unsupervised Domain Adaptation (UDA)

- Goal: Classify unlabeled target domain by transferring knowledge from labeled source domain with domain shift



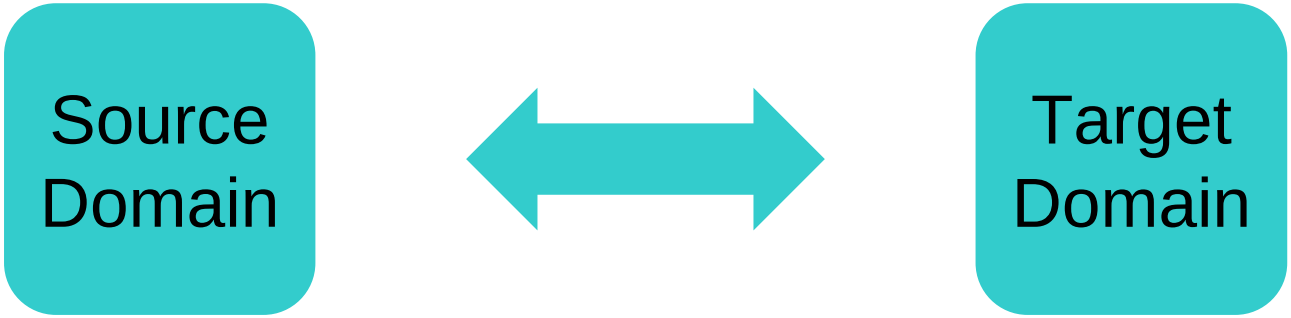
Multi-Task Learning (MTL)

- Goal: Learn multiple tasks jointly by exploiting their relatedness to improve the generalization performance for each task

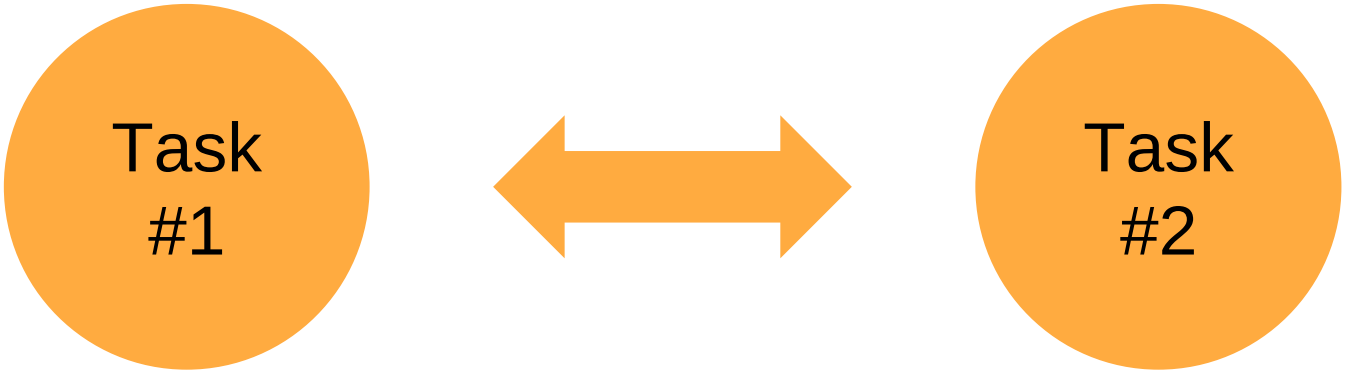


UDA vs. MTL

Unsupervised Domain Adaptation



Multi-Task Learning



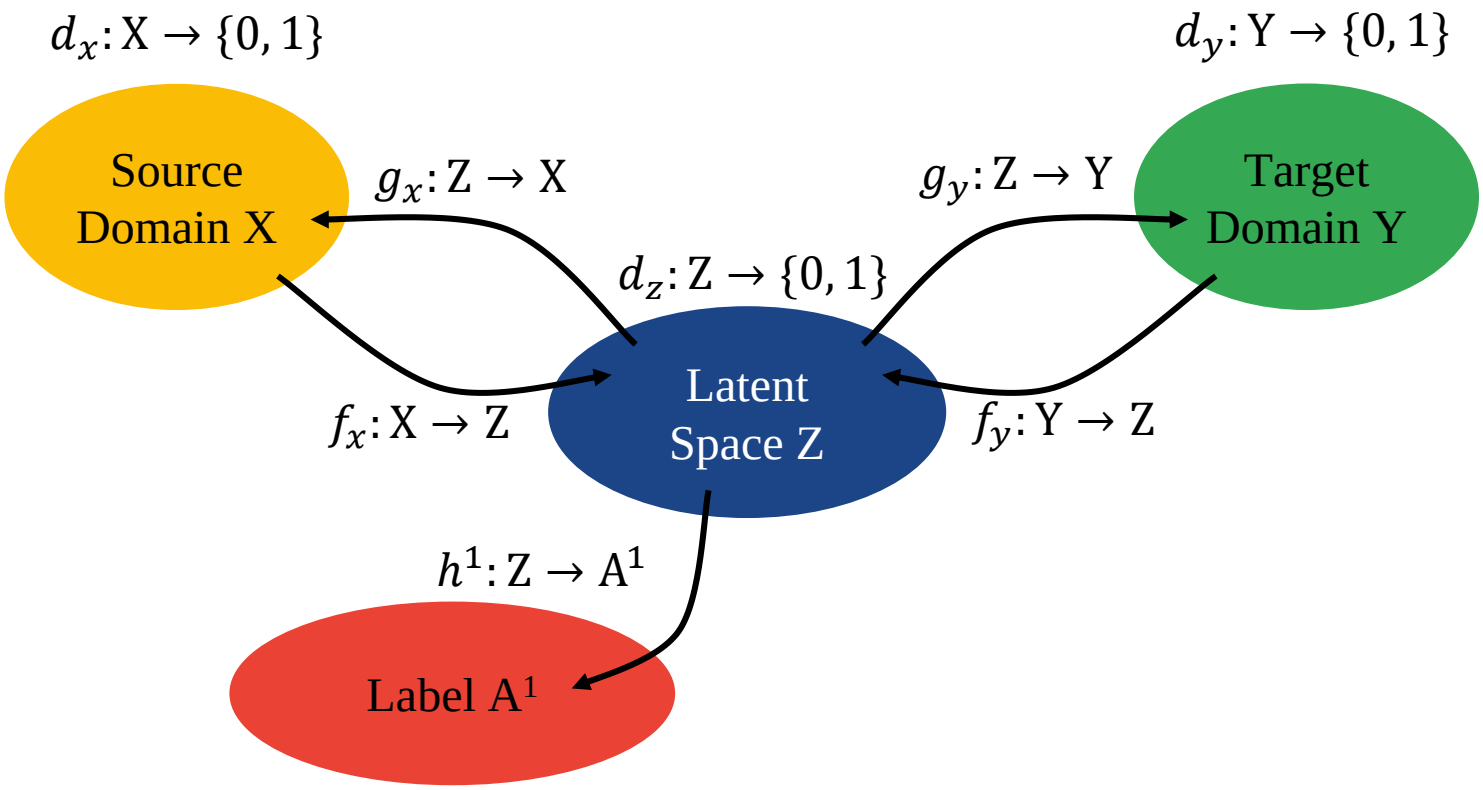
Does multi-task learning further improve the generalization ability of a model for domain adaptation?

Contributions of the paper

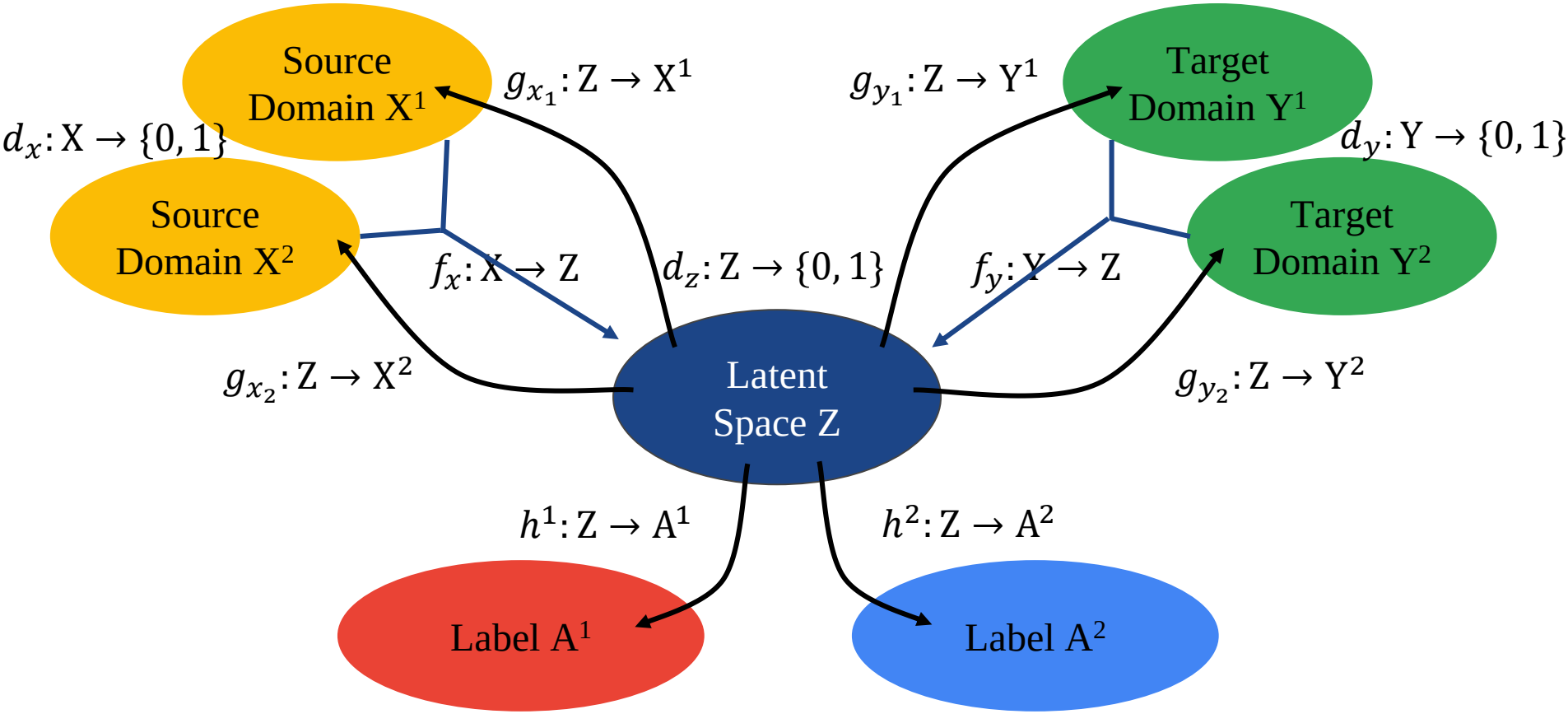
1. We extend the I2I Adapt Framework (a STOA single-task domain adaptation method) to a multi-task setting.
2. We explore whether multi-task learning can help domain adaptation.

[I2I] Zak Murez, Soheil Kolouri, David Kriegman, Ravi Ramamoorthi, and Kyungnam Kim. Image to image translation for domain adaptation. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, 2018.

Single-task domain adaptation



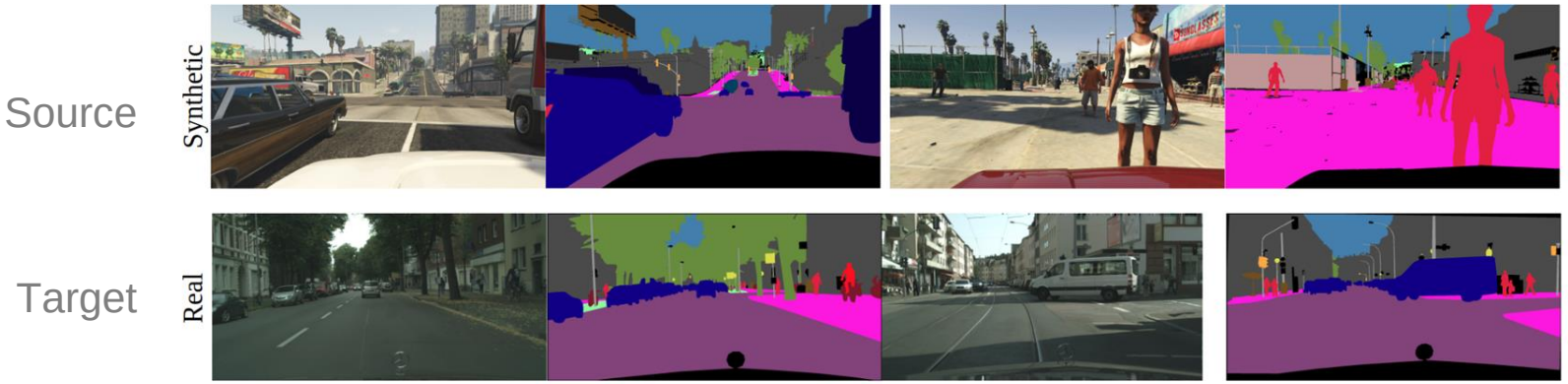
Multi-task domain adaptation



VisDA Dataset

Classification

Semantic Segmentation



X. Peng, B. Usman, N. Kaushik, J. Hoffman, D. Wang and K. Saenko, “VisDA: The Visual Domain Adaptation Challenge,” 2017.

Setup	No Adaptation (Single-Task)	No Adaptation (Multi-Task)	Single-Task Adaptation	Multi-Task Adaptation
aeroplane	70.39	65.32	69.71	**71.21**
bicycle	26.91	26.91	**80.79**	69.71
bus	52.51	43.07	65.03	**75.75**
car	**69.40**	60.43	65.72	66.47
horse	77.67	75.64	83.26	**87.10**
knife	4.22	5.18	28.19	**39.88**
motorcycle	82.06	**84.69**	74.99	81.16
person	38.31	46.69	55.19	**64.56**
plant	77.25	71.10	79.34	**82.25**
skateboard	21.60	**26.10**	25.77	22.59
train	83.24	**86.37**	78.47	75.52
truck	9.10	13.83	**16.53**	15.45
average	51.05	50.44	60.25	**62.64**

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road	23.42	20.06	71.26	**79.17**
sidewalk	22.32	20.68	27.76	**34.69**
building	40.54	53.89	70.82	**78.40**
wall	2.88	5.39	9.75	**20.30**
fence	4.99	8.55	11.07	**14.08**
pole	10.50	19.36	19.29	**30.69**
traffic light	12.79	16.14	8.01	**20.21**
traffic sign	0.26	0.16	0.34	**1.14**
vegetation	73.40	**77.95**	77.09	75.95
terrain	**26.91**	21.62	24.23	19.91
sky	35.01	72.04	67.13	**76.45**
person	43.88	30.94	37.91	**52.95**
rider	**0.08**	0.07	0.02	0.07
car	68.44	31.59	65.84	**75.26**
truck	9.83	5.41	7.35	**13.99**
bus	3.86	6.51	9.10	**17.64**
train	0.00	0.06	0.15	**0.53**
motorcycle	0.18	0.41	0.07	**1.14**
bicycle	0.00	0.00	0.00	0.00
mIOU	19.96	20.57	26.69	**32.24**

Semantic Segmentation

Conclusions

1. We explore multi-task learning for unsupervised domain adaptation.
2. We extend the I2I Adapt Framework (a STOA single-task domain adaptation method) to a multi-task setting.
3. Multi-task learning can enhance domain adaptation.

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More information:
http://www2.csie.ntnu.edu.tw/~myeh