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004	Classification-Reconstruction Learning for Open-Set Recognition:
005	058
006	Supplementary Material
007	059
008	060
009	Anonymous CVPR submission
010	061
011	Paper ID 1789
012	062
013	063
014	064
015	1. Visualizing learned representations
016	We additionally visualize the learned representations by using t-distributed stochastic neighbor embedding (t-SNE) [3].
017	Figure 1 shows distributions of the representations extracted from known- and unknown-class images in the test sets, em-
018	bedded into two-dimensional planes. Here we compare the distributions of the prediction y from the supervised net and that
019	of the concatenation of the prediction and the latent variable $[y, z]$ from our DHRNet. Their usages are shown in Eqns. (4)
020	and (6) of the main text. While the existing deep open-set classifiers [1, 2, 4] exploit only y , our CROSR exploits $[y, z]$.
021	With the latent representation, the clusters of knowns and unknowns are more clearly separated, and this suggests that the
022	representations learned by our DHRNet are preferable for open-set classification.
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1. Visualizing learned representations

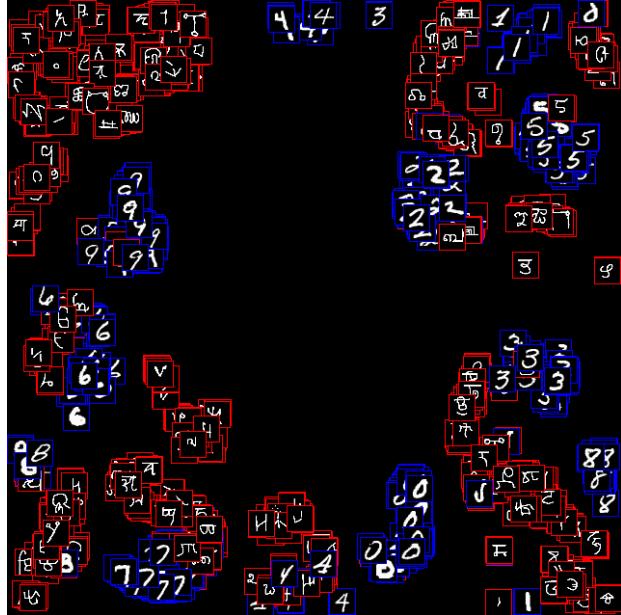
We additionally visualize the learned representations by using t-distributed stochastic neighbor embedding (t-SNE) [3]. Figure 1 shows distributions of the representations extracted from known- and unknown-class images in the test sets, embedded into two-dimensional planes. Here we compare the distributions of the prediction y from the supervised net and that of the concatenation of the prediction and the latent variable $[y, z]$ from our DHRNet. Their usages are shown in Eqns. (4) and (6) of the main text. While the existing deep open-set classifiers [1, 2, 4] exploit only y , our CROSR exploits $[y, z]$. With the latent representation, the clusters of knowns and unknowns are more clearly separated, and this suggests that the representations learned by our DHRNet are preferable for open-set classification.

References

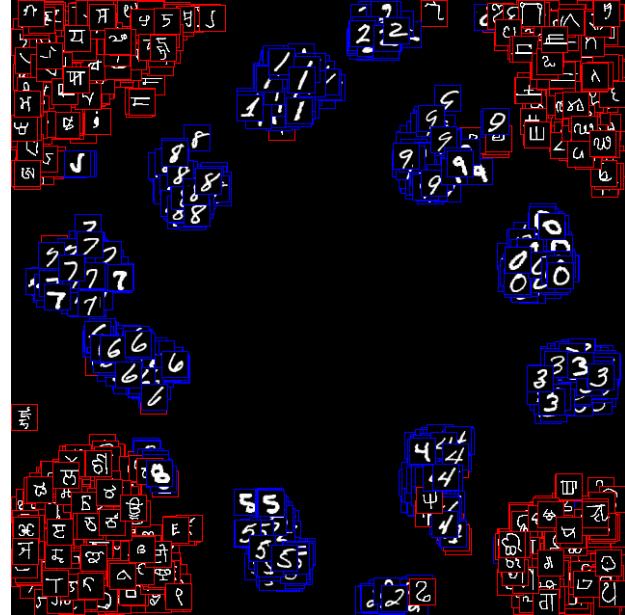
- [1] A. Bendale and T. Boult. Towards open world recognition. In *CVPR*, pages 1893–1902, 2015. 1
- [2] Z. Ge, S. Demyanov, Z. Chen, and R. Garnavi. Generative OpenMax for multi-class open set classification. *BMVC*, 2017. 1
- [3] L. v. d. Maaten and G. Hinton. Visualizing data using t-SNE. *JMLR*, 9(Nov):2579–2605, 2008. 1
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A) MNIST-Omniglot



a) Supervised net

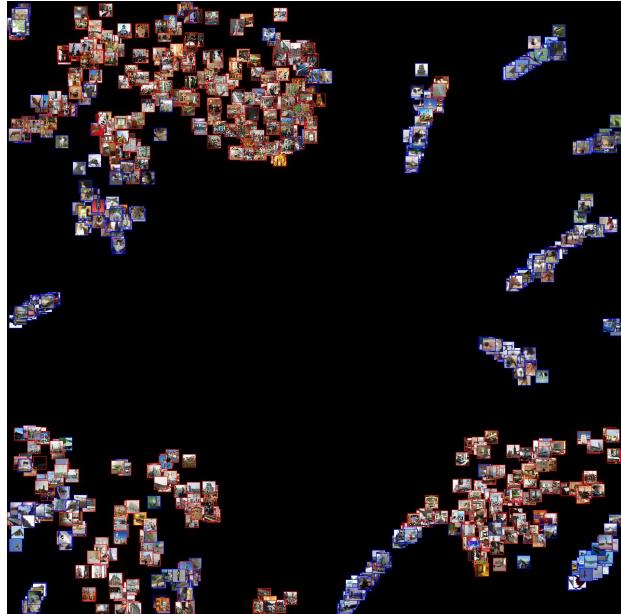


b) DHRNet (ours)

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B) CIFAR10-LSUN



a) Supervised net



b) DHRNet (ours)

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