Out-of-Distribution Detection by Regaining Lost Clues (Abstract Reprint)

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Abstract

Out-of-distribution (OOD) detection identifies samples in the test phase that are drawn from distributions distinct from that of training in-distribution (ID) samples for a trained network. According to the information bottleneck, networks that classify tabular data tend to extract labeling information from features with strong associations to ground-truth labels, discarding less relevant labeling cues. This behavior leads to a predicament in which OOD samples with limited labeling information receive high-confidence predictions, rendering the network incapable of distinguishing between ID and OOD samples. Hence, exploring more labeling information from ID samples, which makes it harder for an OOD sample to obtain high-confidence predictions, can address this overconfidence issue on tabular data. Accordingly, we propose a novel transformer chain (TC), which comprises a sequence of dependent transformers that iteratively regain discarded labeling information and integrate all the labeling information to enhance OOD detection. The generalization bound theoretically reveals that TC can balance ID generalization and OOD detection capabilities. Experimental results demonstrate that TC significantly surpasses state-of-the-art methods for OOD detection in tabular data.

References

[Zhao *et al.*, 2025] Zhilin Zhao, Longbing Cao, and Philip S. Yu. Out-of-distribution detection by regaining lost clues. *Artificial Intelligence*, 339:104275, 2025.