Implementation of Deep Orthogonal Hypersphere Compression for Anomaly Detection

Refaldi Intri Dwi Putra (48-237411)

Department of Information and Communication Engineering
The University of Tokyo

Abstract

Will be filled later.

1 About the Picked Paper

The paper is titled "Deep Orthogonal Hypersphere Compression for Anomaly Detection" by [Zhang et al., 2024] selected as a *Spotlight* paper in The Twelfth International Conference on Learning Representations (ICLR) 2024, a top international conference in the field of artificial intelligence (AI). The team has proposed a novel deep learning method for anomaly detection that can be applicable for various data set structure such as image, tabular, and graph.

2 Reason to Pick the Paper

I pick this paper because of its high quality, the study begins with identifying problem in the existing method with clear manner and illustrative approach. Then, they analyze the discrepancy of the existing methods from the theoretical perspective. Later, they proposed two novel methods based on the analysis which can be applicable for various data set structure amplifying its impactfulness. Moreover, since its work contributes to the anomaly detection, it has many applications in various real-world problems. This is also the first time I read a paper about deep learning-based anomaly detection, so I want to challenge myself to understand it and trying to implement it by myself.

3 The Problem Setting

3.1 Basic Notation

3.2 Anomaly Detection Problem

3.3 The Gap in the Existing Methods

3.4 The Proposed Method

4 My Implementation

5 Conclusion

In this report, I reviewed the aforementioned paper to tackle the anomaly detection problem by using a deep learning approach. The study showed that the existing methods possess a discrepancy between the learned decision boundary and the hypersphere assumption that leads to the suboptimal performance. Then, they proposed two novel methods named DOHSC and DO2HSC that can overcame the identified problem. I implemented their algorithem by myself and found my implemented algorithm is similar to their performance on image data set named CIFAR-10 and graph data set named COX2.

References

[Zhang et al., 2024] Zhang, Y., Sun, Y., Cai, J., and Fan, J. (2024). Deep orthogonal hypersphere compression for anomaly detection. In *The Twelfth International Conference on Learning Representations*.