THE UNIVERSITY OF CHICAGO | DEPARTMENT OF STATISTICS

MASTER'S THESIS PRESENTATION

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Simplified Framework for Contrastive Learning for Node Representations

WEDNESDAY, February 15, 2023, at 1:00 PM
Zoom Meeting

ABSTRACT

Contrastive learning has recently established itself as a powerful self-supervised learning framework for extracting rich and versatile data representations. One of the most successful instances of contrastive learning uses a data augmentation scheme to generate two views of the input, and low-dimensional representations can thereafter be obtained by maximizing a Normalized Temperature-scaled Cross Entropy loss (NT-Xent) to identify augmented samples corresponding to the same original entity. In this paper, we investigate the potential of deploying contrastive learning in combination with Graph Neural Networks for embedding nodes in a graph. Specifically, we show that the quality of the resulting embeddings and training time can be significantly improved by replacing the parameterized nonlinear neural network projection head with a simple column-wise standardization of the embeddings. This modification yields improvements in downstream classification tasks of up to 1.5\% and beats existing state-of-the-art approaches on 5 out of 7 different benchmarks. We justify our choices of projection head by revisiting alignment vs. uniformity paradigm and we show that column-wise post-processing improves both ``alignment" and ``uniformity" of the embeddings, while row-wise post-processing loses ``uniformity" in expense of improving ``alignment''.