DISTILL & CONTRAST: A NEW GRAPH SELF-SUPERVISED METHOD WITH APPROXIMATING NATURE DATA RELATIONSHIPS

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Abstract

Graph representation learning has become an essential technique for analyzing relational data in domains such as social networks, biological systems, and recommendation systems. However, most existing graph learning approaches rely heavily on labeled data, which is often expensive and difficult to obtain. To address this limitation, this work proposes a novel self-supervised graph representation learning framework called Distill & Contrast, which integrates contrastive learning, knowledge distillation, and nature-relationship approximation to learn meaningful node embeddings without requiring labeled data.The proposed method generates multiple augmented graph views through techniques such as edge perturbation and feature masking. A student–teacher architecture is adopted where the student model learns graph representations through contrastive learning, while a teacher model updated via Exponential Moving Average (EMA) provides stable targets for knowledge distillation. In addition, a relationship approximation module is introduced to capture intrinsic data relationships by combining feature similarity and structural proximity within the graph. This mechanism ensures that learned embeddings preserve natural relationships between nodes.