A SUBGRAPH-AWARE CONVOLUTIONAL FEW-SHOT CLASSIFICATION METHOD ON HETEROGENEOUS GRAPHS

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Abstract

Few-shot learning on graph-structured data has gained significant attention due to its ability to generalize from limited labeled samples. However, most existing few-shot graph classification methods are designed for homogeneous graphs and often fail to capture the rich semantic diversity present in heterogeneous graphs containing multiple node and relation types. This paper proposes a Subgraph-Aware Convolutional Few-Shot Classification Method on Heterogeneous Graphs, which integrates heterogeneous message passing with local subgraph representation learning to enhance generalization under limited supervision.The proposed framework operates in three main stages. First, a heterogeneous graph construction module models multi-typed nodes and relations, preserving semantic interactions among entities. Relation-specific transformations are employed to perform type-aware message passing across different edge types. Second, a subgraph extraction mechanism captures the k-hop local neighborhood around each target node. Instead of relying solely on immediate neighbors, the model computes a subgraph-level summary embedding that aggregates structural and semantic information from multiple node types. This subgraph-aware representation is fused with node-level embeddings through a gated mechanism, allowing the model to adaptively balance local context and relational semantics. Third, an episodic meta-learning strategy is adopted using an N-way K-shot learning paradigm. A prototype-based metric learning approach computes class centroids from support samples and classifies query instances based on distance in the learned embedding space.