

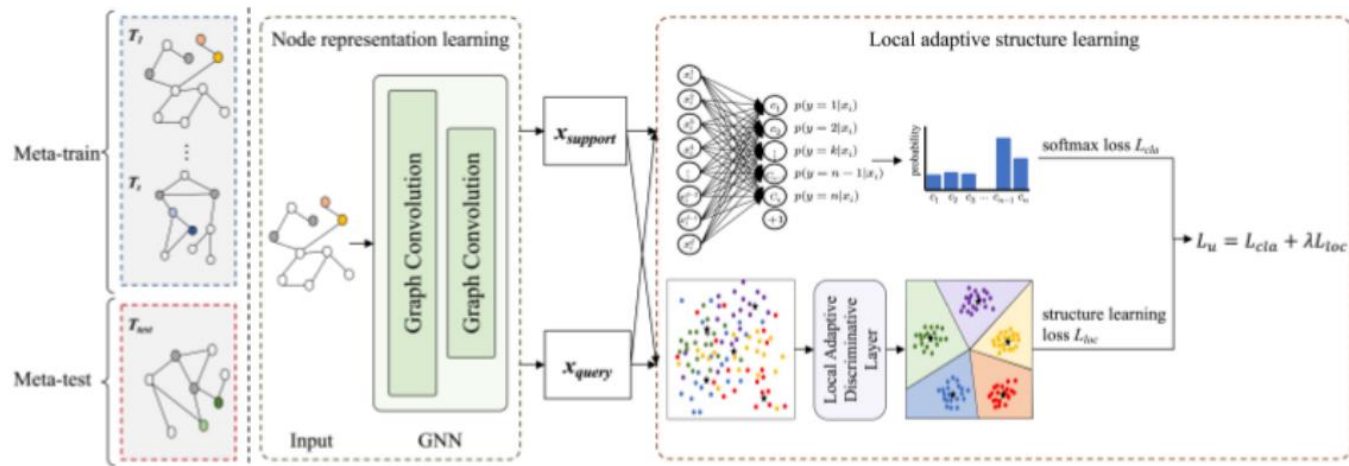
Few-Shot Node Classification via Local Adaptive Discriminant Structure Learning

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Problems & Ideas

- Problems of conventional few-shot node classification:
 - Although few-shot learning adopts episodic strategy which aims at generalizing to unseen tasks, it is difficult to train the model sufficiently with scarce labeled samples.
 - Existing few-shot learning model is vulnerable to noises since there are only limited training data.
- Ideas: Properly represent the nodes in the attributed graph and learns a new metric space which can preserve the intra-class similarity as well as achieve a strong discriminating power.



The proposed method learns node representations through a node encoder network based on the graph neural network. Then, the local adaptive discriminate structure learning strategy is introduced to extract the discriminant structure of the node representations. Moreover, by performing meta-learning across a series of node classification tasks, our method can obtain better generalization ability on the meta-test classification tasks.

Main Contributions

- Contributions:
 - Our method (LADSL) is able to improve the intra-class similarity and enlarge the inter-class differences in the process of meta learning, so that better generalization ability can be obtained;
 - We propose an attention network to evaluate the importance of different samples and suppress the influence of noises, which can improve the robustness of our method in few-shot learning tasks;
 - The abundant experimental results demonstrate that our method achieves better performance compared with the other state-of-the-art methods.

| Methods | 5-way-3-shot | | 5-way-5-shot | | 10-way-3-shot | | 10-way-5-shot | |
|--------------|--------------|-------------|--------------|-------------|---------------|-------------|---------------|-------------|
| | ACC | F1 | ACC | F1 | ACC | F1 | ACC | F1 |
| DeepWalk | 36.7 | 36.3 | 46.5 | 46.6 | 21.3 | 19.1 | 35.3 | 32.9 |
| node2vec | 36.2 | 35.8 | 41.9 | 40.7 | 17.5 | 15.1 | 32.6 | 30.2 |
| GCN | 54.3 | 51.4 | 59.3 | 56.6 | 41.3 | 37.5 | 44.8 | 40.3 |
| SGC | 56.8 | 55.2 | 62.2 | 61.5 | 43.1 | 41.6 | 46.3 | 44.7 |
| PN | 53.7 | 53.6 | 63.5 | 63.7 | 41.5 | 41.9 | 44.8 | 46.2 |
| MAML | 55.2 | 54.5 | 66.1 | 67.8 | 45.6 | 43.3 | 46.8 | 45.6 |
| Meta-GNN | 74.1 | 73.6 | 77.3 | 77.5 | 61.4 | 59.7 | 64.2 | 62.9 |
| GPN | 75.4 | 74.7 | 78.6 | 79.0 | 65.0 | 66.1 | 67.7 | 68.9 |
| LADSL | 79.0 | 78.5 | 83.3 | 83.1 | 69.2 | 68.7 | 72.2 | 71.7 |

| Methods | 5-way-3shot | | 5-way-5shot | | 10-way-3shot | | 10-way-5shot | |
|--------------|-------------|-------------|-------------|-------------|--------------|-------------|--------------|-------------|
| | ACC | F1 | ACC | F1 | ACC | F1 | ACC | F1 |
| DeepWalk | 23.5 | 22.2 | 26.1 | 25.7 | 14.7 | 12.9 | 16.0 | 14.7 |
| node2vec | 25.5 | 23.7 | 27.1 | 24.3 | 15.1 | 13.1 | 17.7 | 15.5 |
| GCN | 53.8 | 49.8 | 59.6 | 55.3 | 42.3 | 38.4 | 47.4 | 48.3 |
| SGC | 54.6 | 53.4 | 60.8 | 59.4 | 43.2 | 41.5 | 50.0 | 47.6 |
| PN | 53.5 | 55.6 | 59.7 | 61.5 | 39.9 | 40.0 | 45.0 | 44.8 |
| MAML | 53.3 | 52.1 | 59 | 58.3 | 37.4 | 36.1 | 43.4 | 41.3 |
| Meta-GNN | 63.2 | 61.5 | 67.9 | 66.8 | 58.2 | 55.8 | 60.8 | 60.1 |
| GPN | 64.6 | 62.8 | 70.9 | 70.6 | 60.3 | 60.7 | 62.4 | 63.7 |
| LADSL | 68.3 | 67.1 | 75.4 | 74.9 | 60.6 | 59.4 | 66.2 | 65.6 |

Averaged few-shot node classification results on Amazon-Clothing dataset (Left) and Amazon-Electronics dataset (Right).