Summary

Aiming to solve the problem of constructing knowledge graph system including communication, reconnaissance, detection and interference with restricted information and self-adaption in real scenes, this paper which could be divided into stages was constructed. A method with **SCDML** (Semi-Supervised Clustering with Deep Metric Learning) model was proposed to generates the graph, and **GCN** (Graph Convolutional Neural Network) model for self-adaption with newly input information was then established, which could adequately utilize both graph structure feature and semantic feature.

In the first part of the paper, the initial knowledge graph with sides in data set was generated. In order to construct a knowledge graph with semantic classification, our team artificially mark 28 high-degree nodes(3.8% of all) with 6 layers of labels, which could be a task for experts in real application. Then we obtain a incompletely labeled graph.

In the second part of the paper, **SCDML** was introduced to construct a complete knowledge graph. First, a model **Word2Vec** in NLP (Natural Language Processing) was applied to obtain the structure feature by node embedding, making the graph partly marked with semantic features but all marked with structure feature. Then, we introduce **deep metric learning method** to obtain a mapping neural network F from node structure feature to semantic feature. The method is semi-supervised learned from labeled nodes. Following that, we cluster all nodes with **weighted kernel KNN method** in which we calculate the distance byF. Such method could be iterated in each cluster and construct a layered semantic knowledge graph.

After the initial construction, we take consideration of self-adaption for further input of new items and introduce the state-of-art model **GCN** in **link prediction** to maintain the structure. According to the feedback data of new words or information by users, we could not only reconstruct the substructure by SCDML, but also generate predicted sides and their attributes with GCN to complete the graph.

We then apply the rules for usage in real application scenes, and provide an specific method to estimate the accuracy of the system. And we also discuss the training method of self-adaption and updating of the system with GCN model.

At the end of our paper, we test our model in small a data set and visualize the results. We present our analysis and compare our model with other methods. Our model is estimated to possess advantage in semantic accuracy and generalization, and it also demonstrates great ability to learn from insufficient information and to self-adapt with new information.

Key Words: **Knowledge Graph, Semi-Supervised Learning, Node Embedding, Deep Metric Learning, Graph Convolutional Neural Network, Link Prediction, Weighted Kernel Clustering**