

## INFORMATION ON DOCTORAL DISSERTATION

Title of the thesis:

### **STUDY ON GRAPH REDUCTION ALGORITHMS AND ITS APPLICATIONS IN SOCIAL NETWORK COMMUNITY DETECTION**

Specified field of study: Information System

Code of specialty: 9.48.01.04

Name of PhD candidate: Nguyen Xuan Dung

Name of the research supervisors:

**1. Assoc. Prof. PhD. Doan Van Ban**

**2. Dr. Do Thi Bich Ngoc**

Academic Institution: Posts and Telecommunications Institute of Technology

## THE SCIENTIFIC CONTRIBUTIONS

The scientific contributions of the thesis are as follows:

- (1). Proposing the **REG (Reduce Equivalence Graph)** algorithm to reduce the graph based on the equivalence class of the peak betweenness centrality methods. Perform experiments to evaluate the efficiency and execution time of the proposed algorithm against the original algorithm dictionary using the betweenness centrality.
- (2). Proposing the **FBC (Fast algorithm for Betweenness Centrality)** algorithm to improve the time to calculate the betweenness centrality measure and proposing the **CDAB (Community Detection Algorithm based on Betweenness centrality)** algorithm to improve the time to detect communities on the graph shortened social network based on the betweenness centrality. Perform experiments to evaluate the efficiency and execution time of the proposed CDAB algorithm compared with the typical original Girvan-Newman (GN) algorithm using the betweenness centrality.
- (3). Propose the **LREN (Label based Reduce Equivalence Nodes)** algorithm to reduce the graph based on the equivalence vertex layer according to the principle of label propagation and develop the **LPAA (Label Propagation Algorithm on Abridged graph)** algorithm to improve the community detection time of the based on the principle of label propagation. Perform experiments to evaluate the efficiency and execution time of the

LPA algorithm compared with the typical original algorithms **LPA (Label Propagation Algorithm)**.

## APPLICATIONS, PRACTICAL APPLICABILITY AND FURTHER STUDIES

The research result of the thesis is the problem of graph reduction to reduce the space and time to analyze large and complex social network graphs, which is an important research direction that many people research and apply in many different fields. Apply the graph reduction problem to detect communities on social networks faster and more efficiently.

Due to the limited implementation time of the project, the topic still has many related issues that need to be further studied such as:

- Continuing to conduct research on advanced technologies for processing big data (Big Data) and applying them to analyze super large social networks.
- Continue to carry out studies to develop algorithms to find overlapping community structures on social network graphs using local betweenness centrality measures.
- Continue to develop parallel algorithms to simultaneously detect social networks to reduce computation time on large-scale social networks.

**Research supervisors**

**Ph.D candidate**

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