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| **APCS.jpg** | UNIVERSITY OF SCIENCE  **ADVANCED PROGRAM IN COMPUTER SCIENCE** |

# Thesis Proposal

**Thesis title:**

**INCREMENTAL SVD++ RECOMMENDER SYSTEMS**

**Thesis advisor:** Le Mai Tung, PhD – Le Ngoc Thanh, Msc

**Students: Cao Dung Anh** (1151003) – **Hoang Phuong Anh** (1151004)

**Type of thesis:** *Research with demo application*

**Duration:** From January 2016 to August 2016

**Contents of thesis:**

**Introduction**

Recommender systems were developed to help users deal with information. These systems has become an important part of e-commerce. With the tremendous growth of e-commerce, scalability is one of biggest challenges for recommender systems. To addressing the scalability problem, we propose the Incremental SVD++ method which is based on a state-of-the-art recommendation algorithm SVD++.

**Motivation**

The introduction of recommender system is a highlight in the development of E-Commerce. Recommender system can now be found in many successful e-commerce applications likes amazon.com, Netflix, Levi’s, eBay, etc. Various approaches have been suggested for building recommender systems.

Singular Value Decomposition with Implicit Feedback (SVD++) is a state-of-the-art recommendation algorithm. With the implicit feedback of users, this algorithm improves prediction accuracy. However, the computation complexity of SVD++ is higher than other algorithms.

To deal with performance problem, many e-commerce systems prefer to pre-compute model offline and update database periodically. In this way, they can provide quick recommendations to users, however these recommendations are not based on the newest data.

**Goal**

This thesis proposes an incremental SVD++ method which extends SVD++ with incremental updates. Our method improves performance of classic SVD++, while maintaining the recommendation quality. The pre-computed model is updated incrementally at the time of rating activity and recommended items are modified based on newest data.

**Project details**

*The project has two parts: Research and Application*

The Research part focuses on investigate Singular Value Decomposition with Implicit Feedback (SVD++) algorithm and how to extend SVD++ with incremental updates.

The Application part is a simple movie database website where users can get recommendation based on their references.

**Tools**

Programming language: R, Java

IDE: R Studio, Eclipse

Source control: Github

**Challenges**

The most challenging problem we have to deal with is how to reduce the pre-computed time of SVD++ model and maintain the accuracy.

On the application side, we also have to face the problem of scaling. When the number of users and movies become too big, the system may be overloaded and stop functioning.

**Research timelines:**

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| Task | Date |
| Study background in recommender system | 1/2016 – 3/2016 |
| Investigate Singular Value Decomposition with Implicit Feedback (SVD++) algorithm | 3/2016 – 4/2016 |
| Learn how to extend SVD++ with incremental updates. | 4/2016 – 5/2016 |
| Design and develop an Incremental SVD++ recommender engine.  Improve source code. Test application. | 5/2016 – 7/2016 |
| Finalize the thesis document. | 7/2016 – 8/2016 |

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| **Approved by the advisor** | **Ho Chi Minh city, 13/06/2016** |
| ***Signature of advisor*** | ***Signature(s) of student(s)*** |