**VIETNAM GENERAL CONFEDERATION OF LABOR**

**TON DUC THANG UNIVERSITY**

**FACULTY OF INFORMATION TECHNOLOGY**



**REPORT**

**DESIGN AND ANALYSIS OF ALGORITHMS**

*Instructor*: **NGUYEN CHI THIEN**

*Student*: **BUI ANH PHU - 521H0508**

**BUI HAI DUONG - 521H0220**

**NGUYEN HOANG PHUC - 521H0511**

*Class*: **21H50302**

**HO CHI MINH CITY, 2023**

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ACKNOWLEDGEMENT

To complete this essay, besides our own efforts, we have received a lot of help in terms of knowledge, experience, and skills from the school and teachers. First and foremost, we would like to express my special gratitude to Nguyen Chi Thien - the lecturer of Design and Analysis of Algorithms course who has taught us valuable knowledge of the subject. That knowledge is the foundation for us to continue learning and effectively apply it to this essay. Additionally, We would like to thank the teacher for allowing us to complete this essay, which has helped us to further develop my understanding of the subject. Thank you for your guidance and support in helping us to complete this essay to the best of my ability. Moreover, we would also like to express our gratitude to the school and the teachers who have compiled the Design and Analysis of Algorithms materials, providing me with useful resources for research and essay writing. Thank you sincerely!

**COMPLETION OF THESIS**

**AT TON DUC THANG UNIVERSITY**

We here by certify that this thesis is my/our own work and was conducted under the guidance of Nguyen Chi Thien. The research and results presented in this thesis are truthful and have not been published previously in any form. The data presented in tables and figures used for analysis, comments, and evaluations were collected by the author from various sources and are clearly cited in the reference section.

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*Ho Chi Minh City, October 22, 2023*

*Author*

*(signature and full name)*

ACKNOWLEDGEMENT AND EVALUATION SECTION BY INSTRUCTOR

**Instructor's Acknowledgement Section**

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**Instructor's Evaluation Section**

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**LIST OF SYMBOLS AND ABBREVIATIONS**

**Symbols**

Uncertain dataset of size n

A set of transaction identifiers

An itemset of size m

An existential probability for item appearing in the transaction

A weight table for the itemset I. Each item has a real-valued weight

An integer between (0, n], the minimum support for expected support- based FI mining

**msup** An integer between (0, n], the minimum support for probabilistic FI mining

A real value between (0, 1], the probabilistic frequent threshold for probabilistic FI mining

A real value between [0, 1], the scale factor

**Abbreviations**

**PFI** probability frequent itemset

**w-PFI** weighted probability frequent itemset

CHAPTER 1 – EFFICIENT WEIGHTED PROBABILISTIC FREQUENT ITEMSET MINING IN UNCERTAIN DATABASES THEORY BASED ON THE STUDY DOCUMENT

1. Problem definitions

Uncertain data mining has attracted so much interest in many emerging applications

over the past decade. Several probability models are presented to measure the frequency of an itemset in the dataset, and it is noted that the frequency itself cannot identify useful or meaningful patterns in some scenarios. Therefore, weighted (importance) frequent itemset mining in uncertain databases has been done in some studies but the result is still inefficient. To overcome this issue, we introduce the new algorithms and some pruning methods for narrowing space and improve the candidate generation for the result.

1. Definitions

Definition 1 (Uncertain dataset):

An uncertain dataset DB consists of a set of transactions DB = , Each transaction contains a subset of an itemset I = {}. There is an existential probability for each item in the transaction of DB.

For example:

DB = { = {(Milk, 0.4), (Fruit, 0.9), (Video, 0.6)}

With:

DB is the uncertain database.

is the transaction identifier of DB.

In Itemset contains items Milk, Fruit, Video with the corresponding probability 0.4, 0.9, 0.6.

Definition 2 (Possible world):

A possible world is the subset of domain . With the existential probability can be calculated by the formular:

.

Definition 3 (Expected support-based frequent itemset):

An itemset is an expected support-based frequent itemset if and only if:

With:

) is the support (occurrence) of the itemset in the possible world ..

is the minimum expected support.

Definition 4 (Probabilistic frequent itemset):

An itemset is a probabilistic frequent itemset if and only if:

With:

is the probabilistic frequent threshold.

is the minimum support.

Definition 5 (Weighted probabilistic frequent itemset):

Weighted probabilistic frequent itemset is the probabilistic frequent itemset product with the weight of the itemset :

With:

is the weight of the itemset

Definition 6 (Itemset weight):

The weight of X is the average weight of the items in the itemset X:

Itemset weight calculated by the formula:

1. Theory

Theorem 1 (Equivalence between PFI and w-PFI):

Theorem 2 (Anti-monotonicity property for PFI):

Theorem 3 (Anti-monotonicity property for weighted PFI):

Corallary 1:

Theorem 4:

Theorem 5:

Theorem 6:

Corallary 2:

Corallary 3:

1. Algorithm

Algorithm 1:

Algorithm 2:

Algorithm 3:

# CHAPTER 2 – JAVA CODE IMPLIMENTATION FOR EFFICIENT WEIGHTED PROBABILISTIC FREQUENT ITEMSET MINING IN UNCERTAIN DATABASES

1. **UncertainDatabase class**

**Introduction:** The UncertainDatabase class represent for the uncertain database with existential probabilities. This class is implemented based on the definition 1.

**Detail:**

1. **wPFIItem class**

**Introduction:** The wPFIItem class is implement for the representation of the item in the uncertain database. The class is created based on the definition 1 of the definition mentioned in the chapter 1.

**Detail:**

1. **wPFIItemset class**

**Introduction:** The wPFIItemset class is implemented for the representation of the itemset which is contained in the transaction of the uncertain dataset. The class is created based on the definition 1 of the definition mentioned in the chapter 1.

**Detail:**

1. **wPFIApriori class**

**Introduction:** The wPFIApriori class is implemented for the representation of 3 algorithms mentioned in the theory in chapter 1. This also call 3 java classes definition above in the chapter 2 for the use of the algorithm function.

**Detail:**

**REFERENCES**