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ROYAL UNIVERSITY OF PHNOM PENH

Recommendation System Application Development by using Association Analysis Apriori Algorithm

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Contents

Introduction

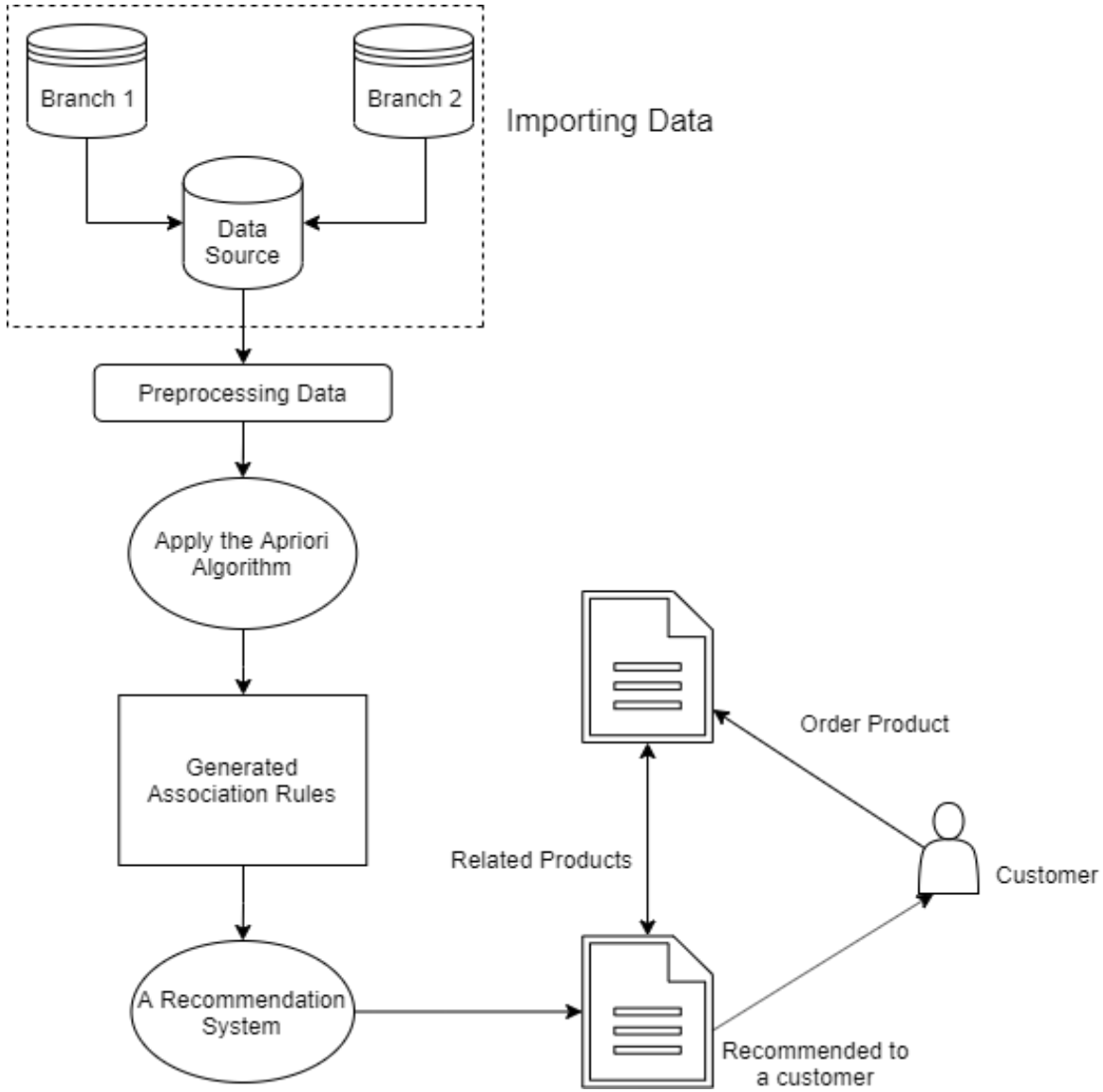
- What is recommendation system (RS)?
- What is association analysis?
- Problem Statement
  - Mining purchasing patterns allows retailers to better customize promotions and store settings.
  - The analysis of their customer data are useful for understanding the purchasing behavior of retail businesses.
- Aims and Objectives of the Study.
  - Proposed the architecture of association item analysis for the RS.
  - Developed and conducted experiments of RS by using Apriori.

Literature Reviews

- Bendakir and Aimeur, 2006: *Proposed a course recommendation system based on association rules for students.*
- Chellatamilan, 2011: *Proposed an idea for building a recommendation system for the e-Learning system.*
- JinHyun, et al., 2016: *Implemented the mobile coupon recommendation system.*
- Shadi, et al., 2018: *Proposed a new recommender framework for requirements engineering.*
- Aijaz, et al., 2018: *Proposed technique for recommender system be using Opinion Based.*

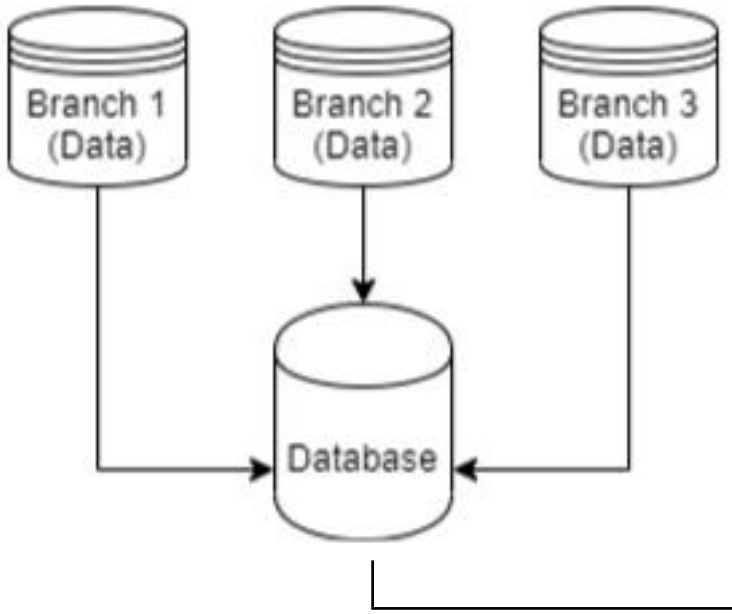
Methodology

- System Overview



Methodology – Cont.

- Importing Data



TID	Item
T1	ESPRESSO
T1	SUGAR
T1	NEWSPAPER
T2	ESPRESSO
T2	SUGAR
T2	COLA
…	…

Methodology – Cont.

- Preprocessing Data
  - Format transaction data to algorithm formation.
  - Labeled the item as a number.

TID	Items	Item Label
T1	ESPRESSO, SUGAR, NEWSPAPER	1, 2, 3
T2	ESPRESSO, SUGAR, COLA	1, 2, 4
T3	ESPRESSO, SUGAR	1, 2
T4	CAPPUCCINO, CIGARETTES	5, 6
T5	CAPPUCCINO, SUGAR	5, 2
T6	CAPPUCCINO, SUGAR, SWEETS	5, 2, 7
T7	DECAF, SUGAR, CHEWING_GUMS	8, 2, 9
T8	DECAF, SODA, VINEGAR	8, 10, 11
T9	DECAF, SUGAR, CIGARETTES	8, 2, 6

Methodology – Cont.

- Apriori Algorithm – Cont.
  - The high level of frequent itemset generation for the Apriori.

1-Itemsets

Item	Item	Count	Support
ESPRESSO	1	3	30%
SUGAR	2	7	77%
NEWSPAPER	3	1	11%
COLA	4	1	11%
CAPPUCCINO	5	3	30%
CIGARETTES	6	2	22%
SWEETS	7	1	11%
DECAF	8	3	30%
CHEWING_GUMS	9	1	11%
SODA	10	1	11%
VINEGAR	11	1	11%

Minimum Support = 20%

$$Support(A) = \frac{Number\ of\ transactions\ contraing\ A}{Total\ transaction}$$

2-Itemsets

Itemset	Itemset	Count	Support
ESPRESSO, SUGAR	1, 2	3	30%
ESPRESSO, CAPPUCCINO	1, 5	0	0%
ESPRESSO, CIGARETTES	1, 6	0	0%
ESPRESSO, DECAF	1, 8	0	0%
SUGAR, CAPPUCCINO	2, 5	2	22%
SUGAR, CIGARETTES	2, 6	0	0%
SUGAR, DECAF	2, 8	2	22%
CAPPUCCINO, CIGARETTES	2, 6	1	11%
CAPPUCCINO, DECAF	2, 8	0	0%
DECAF, CIGARETTES	8, 6	0	0%

Itemsets removed because its support count less than minimum support count.

Methodology – Cont.

- Association Rule Generation

Minimum Confidence = 60%

$$Confidence(A \Longrightarrow B) = \frac{\sum transaction\ contain\ A\ \&\ B}{\sum transactions\ contain\ A}$$

Rules	Rules	Support	Confidence
$\{ESPRESSO\} \Rightarrow \{SUGAR\}$	{1} ⇒ {2}	3/9 = 30%	3/3 = 100%
$\{DECAF\} \Rightarrow \{SUGAR\}$	{8} ⇒ {2}	2/9 = 22%	2/3 = 66%
$\{CAPPUCCINO\} \Rightarrow \{SUGAR\}$	{5} ⇒ {2}	2/9 = 22%	2/3 = 66%

Experiments

- Environmental Setup

Hardware	Software
Processor: Intel Core i5-5200U CPU @ 2.20GHz, 2 Core(s)	Windows 10 x64 Enterprise version 1809
RAM: 16GB	Python 3.7
	PyQT5 (for GUI).
	Microsoft VS Code

- Datasets

Dataset	Total Transaction	Avg. item/transaction
Dataset 1	4, 444	10
Dataset 2	16, 466	10

Experiments – Cont.

- Measurements
  - Time/Size
- Results

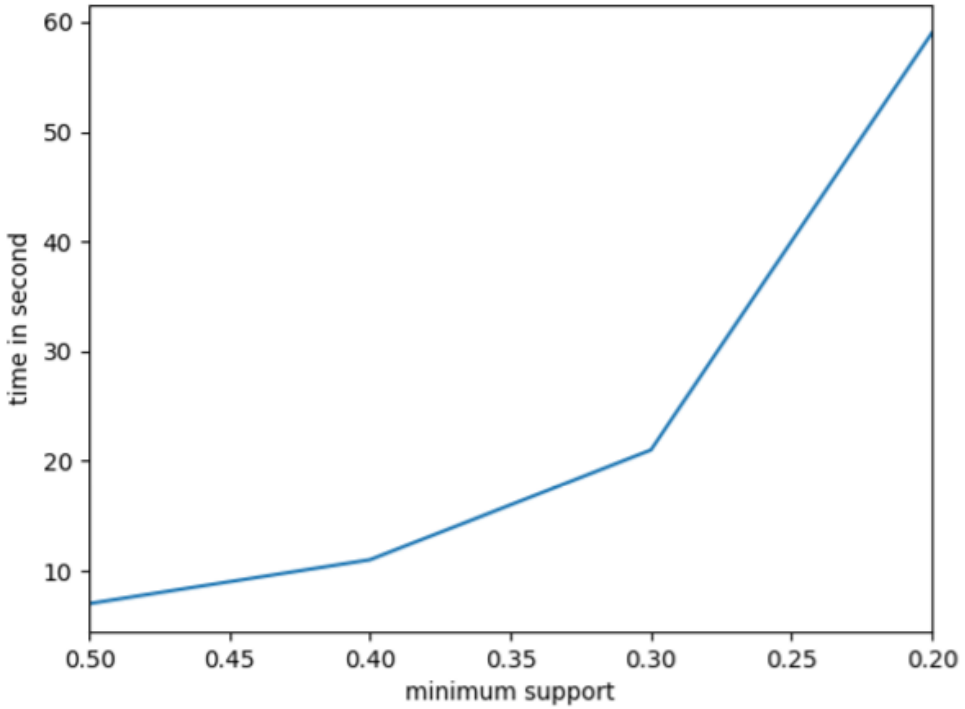


Figure 5. Response time of frequent itemset generation for Dataset1.

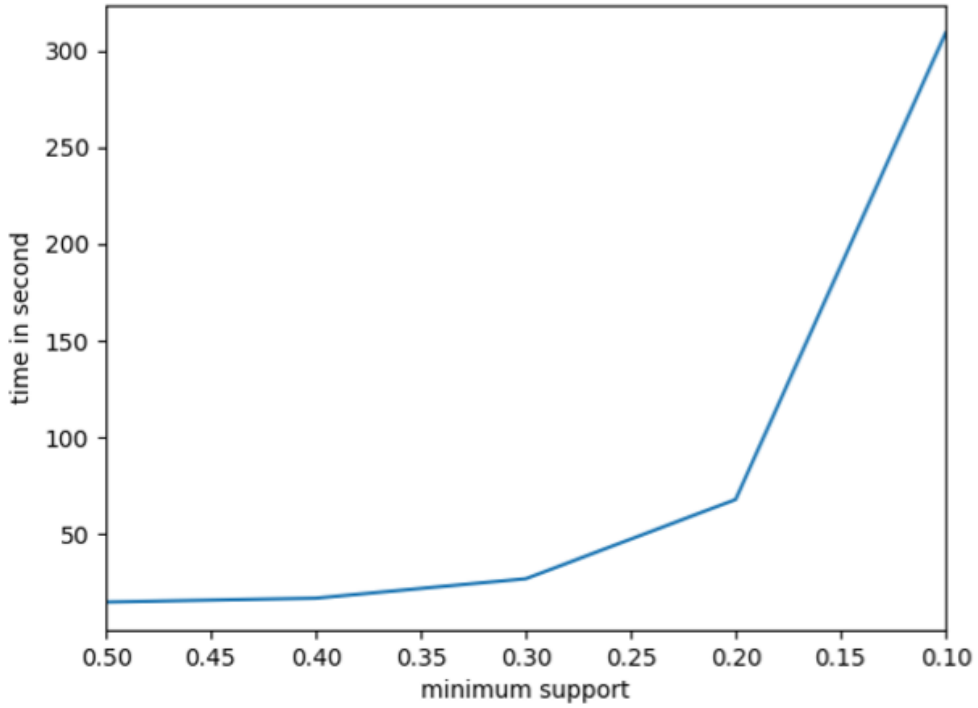


Figure 6. Response time of frequent itemset generation for Dataset2.

Conclusions & Future Works

- Conclusions
  - Proposed an architecture for association item analysis for RSs.
  - Developed and conducted experiment of RS by using Association Analysis Apriori Algorithm.
  - The results can provide recommended a new item to customers by understanding historical transaction data.
- Future Works
  - Make a library for recommend product to customers by using association items from our proposed frameworks.

Thank You

Q&A