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Article

Application of data mining for analyzing book borrowing patterns in SMP Negeri 2 Denpasar library using the Apriori algorithm

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***Abstract*—The library is an essential source of information that plays a vital role in supporting students' learning processes. However, the increasing number of book borrowing transactions often makes it difficult for librarians to recognize borrowing patterns and manage book collections and acquisitions effectively. This study aims to discover borrowing patterns in the library of SMP Negeri 2 Denpasar using the Knowledge Discovery in Databases (KDD) method. The research process consists of five stages: Data Selection, Preprocessing/Cleaning, Data Transformation, Data Mining, and Interpretation/ Evaluation. In the Data Mining stage, the Apriori algorithm was applied to generate association rules from 3.004 borrowing transactions. The results revealed two dominant patterns: students who borrowed the Pure Science category also tended to borrow the Social Science category with a confidence value of 53%, support of 14%, and lift of 1.87, while those who borrowed the Art category tended to borrow the Literature category with a confidence of 71%, support of 36%, and lift of 1.33. These findings demonstrate that the KDD process combined with the Apriori algorithm can effectively identify borrowing patterns and provide insights for optimizing library collections and management. Based on these patterns, this study recommends arranging the bookshelves according to categories that are frequently borrowed together and increasing the collection in categories that show high levels of student interest in the association results.**

***Keywords*—apriori algorithm; association rule; book borrowing; data mining; kdd; library.**

1. Introduction

Education plays an important role in driving Indonesia's national progress and development. One of the key factors that supports the quality of education is literacy, which includes the ability to read, write, and understand information effectively. Literacy deserves special attention because it is a fundamental skill that influences how students comprehend learning materials, develop critical thinking abilities, and communicate well. Therefore, to understand how these roles are being carried out, it is necessary to measure students' reading interest. Indicators of reading interest can be observed through one's enjoyment of reading, awareness of the benefits of reading, and the number of books they have read. Measuring these indicators is important to understand students' literacy levels and their overall reading interest (Agustina et al., 2023). One essential facility supporting these indicators is the school library.

School libraries play a crucial role in supporting the learning process and fostering students' literacy development (Nizaela F et al., 2022). However, the library management at SMP Negeri 2 Denpasar has not operated optimally. Students often struggle to find the books they need due to an unstructured arrangement of collections and a book procurement process that does not align

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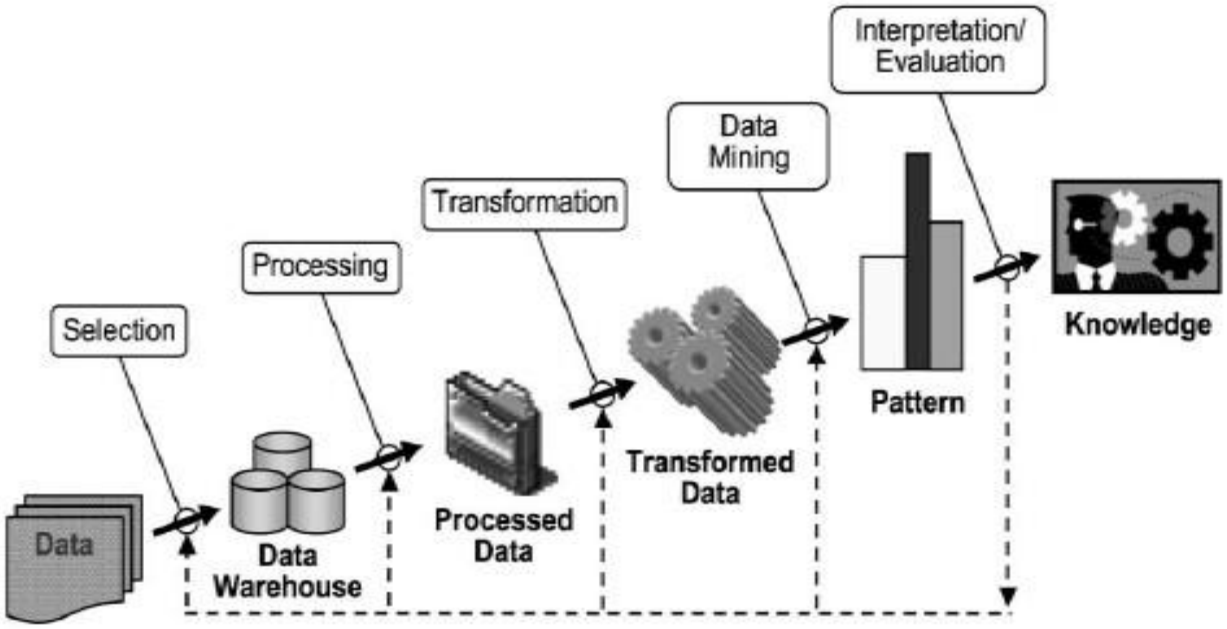

Fig. 1. Knowledge Discovery in Database Process

with students' actual needs.

Based on observations and interviews with the librarian, it was found that the management of book collections has not taken into account the most frequently borrowed book categories. In fact, such information could serve as an important basis for arranging shelves and procuring new books. Without structured data, librarians struggle to accurately determine students' reading interests, thereby reducing the efficiency of library services.

Considering these issues, the proper arrangement of books in the library is essential to helping students easily find the materials they need. A poorly structured layout can hinder students' ability to find books, which may eventually lower their reading interest. To overcome these problems, a technology-based approach is needed to help librarians better understand borrowing patterns. One potential solution is Data Mining, which is the process of analyzing data to discover useful patterns or information for decision-making (Nurlaela et al., 2023). In this study, the Apriori algorithm is applied as an association rule technique to identify relationships among book categories based on support, confidence, and lift values (Andini et al., 2022a). This algorithm is widely used to analyze association patterns among items within a transaction, including in sales data (Utami & Artana, 2021). The Apriori algorithm works by identifying frequent itemsets, starting from smaller datasets and gradually expanding to larger ones (Falahie et al., 2022). This research follows the Knowledge Discovery in Databases (KDD) approach, which consists of several stages: Data Selection, Preprocessing/Cleaning, Data Transformation, Data Mining, and Interpretation/Evaluation.

In a study conducted by Yulia Andini, Jaya Tata Hardinata, and Yuegilion Pranayama Purba at the Sintong Bingei Library in Pematangsiantar, the Apriori algorithm was implemented to analyze book borrowing data. The study produced 17 rules with a support value of 33% and a confidence value of 80%. These results indicate that the Apriori algorithm is effective in identifying borrowing patterns, thereby facilitating book arrangement and improving students' ability to find the materials they need (Andini et al., 2022b). Meanwhile, another study carried out by Afrizal Ardiansyah, Ahmad Turmudi Zy, and Agung Nugroho at the Pratama Keluarga Kesehatan Clinic analyzed drug transaction data using the Apriori algorithm, which generated two rules with support values of 0.3 and confidence values of 0.5 (Ardiansyah et al., 2023).

The results of these previous studies show that the Apriori algorithm can effectively identify association patterns. Therefore, applying this algorithm to borrowing data in the library of SMP Negeri 2 Denpasar is expected to assist librarians in organizing book collections more efficiently and procuring appropriate books that align with students' reading interests.

2. Methods

2.1. *Knowledge discovery in databases (KDD)*

KDD is a process for identifying hidden knowledge or information in data (Sitanggang et al., 2024). This method analyses databases to uncover valuable information and uses easy-to-understand models, providing a structured analytical approach (Andi Sugiarta et al., 2023).

The stages involved in the Knowledge Discovery in Databases process are shown in Figure 1 (Lestari et al., 2024):

The following is an explanation of the stages involved in the KDD method (Prabowo & Ramdani, 2020)

a. *Data Selection*, it is defined as the stage of analyzing or selecting data. Some data is not required in the data mining process.
b. *Data Cleaning/Preprocessing*, it is defined as the process of identifying and eliminating duplicate data before the data

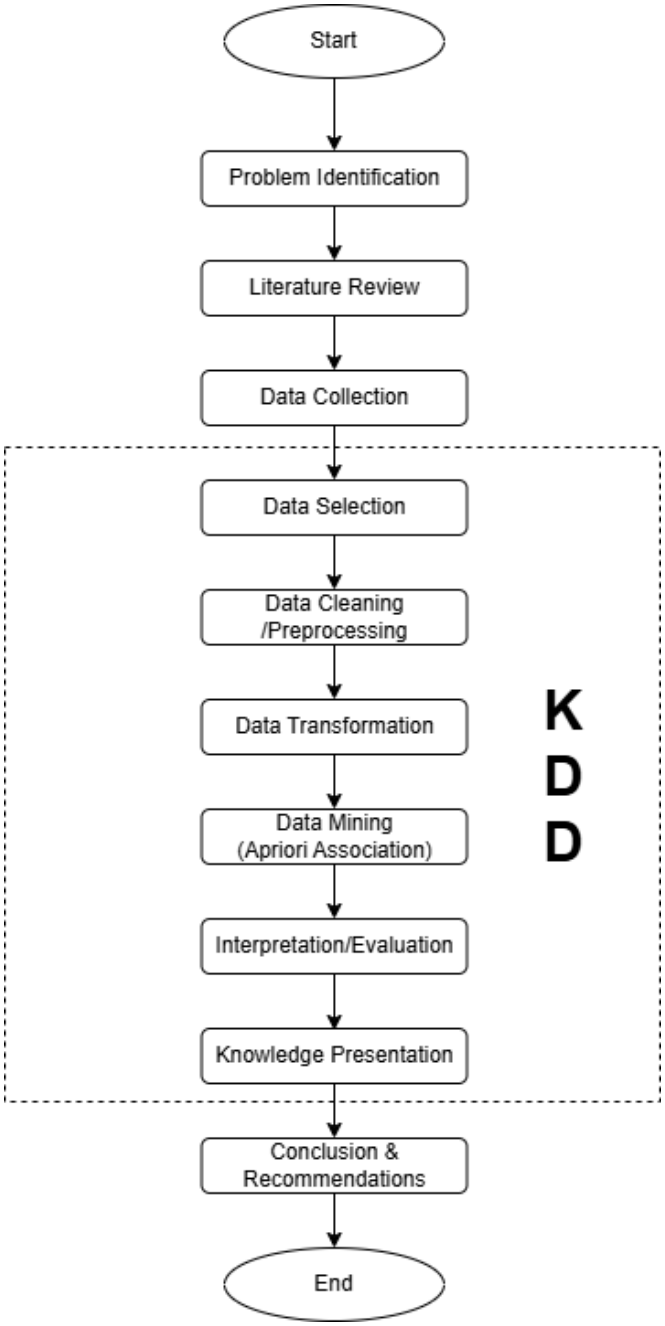

Fig. 2. Research Flow

mining process is conducted.

c. *Data Transformation*, it is defined as the stage of transforming raw data into a format suitable for the data mining process.
d. *Data Mining*, it is defined as a stage of discovering patterns using specific methods or algorithms.
e. *Interpretation/Evaluation*, it is defined as the process of evaluating the dataset to identify the discovered patterns and presenting them in a form that is easy to understand.

2.2. *Research flow*

The research procedures to be carried out consist of the following steps:

a. Problem Identification
   At this stage, the researcher conducts a problem identification process related to the research object, namely the Library of SMP Negeri 2 Denpasar. The identified problem is the suboptimal utilization of book borrowing data, resulting in book procurement and arrangement that are not yet fully aligned with students' needs and interests.
b. Literature Review
   After the problem identification stage, the researcher proceeds to a literature review, which involves examining relevant sources, such as books and scientific journals, on the research topic.
c. Data Collection
   The data used in this study were obtained through interviews and documentation. Documentation was conducted by collecting book borrowing data from the Library of SMP Negeri 2 Denpasar. The collected dataset comprises 3,047 borrowing records spanning January 2022 to December 2024. In addition, direct interviews were conducted with the librarian to obtain supporting information on the book borrowing process at the library.
d. Data Selection
   This stage focuses on determining the variables to be used in the data mining process. The study utilizes book borrowing transaction data from SMP Negeri 2 Denpasar. The collected transaction data is still in raw form. The dataset attributes include record number, borrower name, book title, book category, borrowing date, and return date.
e. Data Cleaning/Preprocessing
   At this stage, the data is cleaned to ensure quality and prevent duplicate records.
f. Data Transformation
   At the transformation stage, each category is represented by a separate column. If a transaction contains an item from a particular category, it is assigned a value of True; otherwise, it is assigned a value of *False*.
g. Data Mining
   At this stage, the researcher analyzes the processed data to identify significant patterns and relevant information. The analysis is carried out by applying the Apriori algorithm to identify association relationships among book borrowing transactions.
h. Data Interpretation/Evaluation
   After the data mining process, the resulting association patterns are interpreted and transformed into meaningful information. This information serves as the basis for providing recommendations regarding book procurement and arrangement in the Library of SMP Negeri 2 Denpasar.
i. Knowledge Presentation
   After analyzing the Apriori algorithm results, the discovered association patterns and recommendations for more appropriate book procurement and shelf arrangement based on students' needs and interests are presented to the school principal and the librarian of SMP Negeri 2 Denpasar.
j. Conclusions and Recommendations
   The conclusions and recommendations of this study are formulated based on the results of the analysis of book

Table 1. Book Borrowing Data

No	Book Title	Book Category	Loan	Return
1	Vampire Game Buku 5, Whatever After If The Shoe Fits	Arts, Literature	12/1/22	19/1/22
2	Hyper Baby VOL 2, Words of Goodbye	Arts, Literature	12/1/22	19/1/22
3	The Fairytale Hairdresser and The Sugar Plum, Gajah yang Sombong	Arts, Social Sciences	12/1/22	19/1/22
4	Drama Kelas VIII-4, Pendidikan	Literature, Social Sciences	12/1/22	19/1/22
5	Penuntun Belajar yang Sukses, Mengembangkan Bakat dan Kreativitas Anak Sekolah	Social Sciences, Philosophy	12/1/22	19/1/22
6	Doraemon Movie, Maestro Olimpiade Matematika Seri B	Arts, Pure Sciences	12/1/22	19/1/22
7	Putri Mandalika, Mimpi	Pure Sciences, Philosophy	12/1/22	19/1/22
...	...	...	...	...
3047	Pulang	Literature	19/12/24	26/12/24

Source: Book Borrowing Records of SMP Negeri 2 Denpasar from January 2022 to December 2024

Table 2. Categorical Variables

No	Book Category
1	Arts, Literature
2	Arts, Literature
3	Arts, Social Sciences
4	Literature, Social Sciences
5	Social Sciences, Philosophy

borrowing data at the Library of SMP Negeri 2 Denpasar using the Apriori algorithm. The findings are expected to assist the school in improving library collection management and to serve as a reference for future researchers interested in similar topics.

2.3. *Apriori algorithm*

This study employs the Apriori algorithm to discover association rules among book categories using students' borrowing data. The algorithm is used to identify frequent itemsets and to generate association rules, which are commonly applied in transaction pattern analysis (Utami & Artana, 2021).

Although other association rule mining algorithms, such as FP-Growth and Eclat, are more efficient for large-scale datasets, selecting the Apriori algorithm in this study aligned with the research objectives and the data characteristics. The dataset used in this research falls within a small-to-medium scale; therefore, differences in computational efficiency and memory usage among the algorithms were not a dominant factor. This research is exploratory, focusing on interpreting students' borrowing book patterns. Consequently, the Apriori algorithm was chosen because it produces transparent and easily interpretable association rules within the context of school library management

2.4. *Parameter setting and validation*

Determining the minimum support and minimum confidence parameters is a crucial step in applying the Apriori algorithm, as it directly affects the number and quality of the resulting association rules. In this study, the minimum confidence threshold was set at 50% to ensure that each association rule has sufficient reliability and can be meaningfully interpreted.

The minimum support value was determined based on the characteristics of the analyzed book borrowing data. To obtain the most appropriate support threshold, several minimum support values were tested, namely 1%, 5%, and 10%. At a minimum support value of 1%, a very large number of association rules were generated; however, most were difficult to analyze due to their low significance. Conversely, at a minimum support value of 10%, only a very limited number of rules were produced, causing several potentially important book borrowing patterns to remain unidentified.

Based on these experimental results, a minimum support value of 5% was selected, as it yielded a relatively limited yet relevant and easily interpretable set of association rules. The rules produced at this threshold also exhibited consistent confidence and lift values, thereby providing a balanced and reliable representation of students' book borrowing patterns.

The use of relatively selective minimum support and minimum confidence thresholds in this study represents a deliberate methodological decision aligned with the research objectives. Rather than aiming to produce as many rules as possible, this study focuses on identifying dominant and consistent borrowing patterns that reflect students' general borrowing behavior. By filtering out patterns that occur in only a small number of transactions, the resulting rules are more relevant for addressing practical library management issues, particularly in supporting more targeted book procurement and more effective bookshelf arrangement.

3. Results

3.1. *Data collection results*

The data used in this study are secondary data obtained from

Table 3. Data Transformation

No	AGM	BHS	FLT	GEO	PM	S	J	KN	KS	F	KL
0	False	False	False	False	alse	alse	ılse	True	True	alse	alse
1	False	False	False	False	alse	alse	ılse	True	True	alse	alse
2	False	False	False	False	alse	rue	ılse	True	False	alse	alse
3	False	False	False	False	alse	rue	ılse	False	True	alse	alse
4	False	False	True	False	alse	rue	ılse	False	False	alse	alse
...	...	...	..	..	.	.		..	..	.	.
2999	False	False	False	False	alse	rue	ılse	True	False	alse	alse
3000	False	False	False	True	rue	alse	ılse	False	False	alse	alse
3001	False	False	False	False	alse	rue	ılse	False	True	alse	alse
3002	False	False	False	False	alse	rue	ılse	False	True	alse	alse
3003	False	False	False	False	alse	alse	ılse	False	True	alse	alse

book borrowing records at the Library of SMP Negeri 2 Denpasar. The data includes all book borrowing transactions conducted by students during the period from 12 January 2022 to 19 December 2024. Each transaction represents a book borrowing activity carried out by a student at a specific time, with the primary information consisting of the categories of books borrowed.

The initial dataset consisted of 3,047 borrowing transactions. The data were then cleaned to ensure the quality of the analysis. During this stage, several duplicate records and incomplete data were identified and subsequently removed from the research dataset. After data cleaning, the 3,004 borrowing transactions were deemed valid and suitable for use as the final dataset in this study.

3.2. *KDD process*

At the data selection stage, the selected variable is the book *category* for each borrowing transaction. By selecting this variable, the analysis focuses on relevant data, enabling the resulting borrowing patterns to reflect students' reading habits in the library.

After the variables were determined, the data-cleaning or preprocessing stage was performed to ensure data quality and avoid errors caused by duplication or incomplete data. This process involved thoroughly examining each transaction and removing duplicate records. From the initial total of 3,047 transactions, 43 records were removed during cleaning, leaving a final dataset of 3,004 for analysis.

The next step is data transformation. In this process, the filtered and cleaned data are converted into a format that is suitable for and readable by the data mining algorithms and tools used. During the transformation stage, each category is represented by a separate column. If a transaction contains an item from a particular category, it is assigned a value of *True;* otherwise, it is assigned a value of *False*.

After the data transformation stage was completed, this study proceeded to the data mining phase by applying the Apriori algorithm to discover association rules among book categories using student borrowing data.

3.3. *Application of the Apriori algorithm*

The application of the Apriori algorithm in this study aims to identify patterns of student book borrowing based on the relationships among book categories. The Apriori algorithm was selected for its ability to discover frequent itemsets and generate association rules based on support and confidence values.

Table 4. Results of Book Category Combinations with Minimum Support of 5%

Support	Itemsets
0.058	(Geography)
0.267	(Pure Sciences)
0.284	(Social Sciences)
0.504	(Arts)
0.632	(Literature)
0.062	(Technology)
0.142	(Social Sciences, Pure Sciences)
0.067	(Literature, Pure Sciences)
0.076	(Literature, Social Sciences)
0.361	(Literature, Arts)

The initial stage of implementing the Apriori algorithm began with determining the variables used in the analysis. The selected variable was the book category, as it represents the type of books borrowed by students in each borrowing transaction.

The categories shown in the table above are described as follows:

KN = Arts
KS = Literature
IIS = Social Sciences
IPM = Pure Sciences
RF = Reference
FLT = Philosophy
AGM = Religion
BHS = Language
TKL = Technology
GEO = Geography
KU = General Works

The next stage involved generating frequent itemsets using the Apriori algorithm. At this stage, the transformed data were

analyzed using a minimum support threshold of 5% to identify combinations of book categories that frequently co-occurred in borrowing transactions. Combinations of book categories that met the minimum support threshold were considered frequent itemsets.

After the frequent itemsets were obtained, the analysis continued by identifying itemset combinations containing more than one book category. This stage aimed to examine the relationships among book categories that appeared together within a single borrowing transaction. Combinations of two book categories that met the minimum support value of 5% were selected for further analysis.

The final stage of the Apriori algorithm is the generation of association rules. At this stage, the previously obtained frequent itemsets were used to generate association rules by calculating support and confidence values. Only rules that met the minimum support value of 5% and the minimum confidence value of 50% were retained. The resulting association rules capture the relationships among book categories that students frequently borrow together.

3.4. *Interpretation of association rules*

The first association rule indicates that students who borrow books in the Pure Sciences category tend also to borrow books in the Social Sciences category. This rule has a support value of 14%, meaning that 14% of all borrowing transactions contain both book categories simultaneously. A confidence value of 53% indicates that more than half of the students who borrow books in the Pure Sciences category also borrow books in the Social Sciences category. In addition, a lift value of 1.87 indicates a positive relationship between the two book categories.

The second association rule shows that students who borrow books in the Arts category also tend to borrow books in the Literature category. This rule has a support value of 36%, indicating that the combination of these two book categories appears frequently in borrowing transactions. A confidence value of 71% indicates a high level of reliability for this rule. The lift value of 1.33 suggests that the relationship between the Arts and Literature categories is positive and mutually associated.

3.5. *Summary of research findings*

Based on the results of applying the Apriori algorithm to the book borrowing data at the Library of SMP Negeri 2 Denpasar, two association rules were obtained that met the defined minimum support and confidence thresholds. These results indicate the presence of dominant book-borrowing patterns within specific categories, with students frequently borrowing together.

Although the number of association rules generated in this study is limited, the results reflect the application of selective parameter settings designed to focus on dominant and consistent borrowing patterns. The two identified rules represent recurring borrowing relationships across a large number of transactions and are therefore considered reliable indicators of students' general borrowing behavior.

These findings provide a focused and practical basis for further discussion of students' borrowing behavior. They can be directly used to support decision-making on book procurement and bookshelf arrangement in the library of SMP Negeri 2 Denpasar.

4. Discussion

4.1. *Analysis of student borrowing behavior*

The generated association patterns indicate that students' book borrowing behavior is not random, but rather related to their learning needs and personal interests. The relationship between the Pure Sciences and Social Sciences categories suggests that students often draw on more than one book category to complete school assignments or deepen their understanding of subject matter. This finding indicates that students utilize the library collection as a complementary learning resource in their academic activities.

Furthermore, the association between the Arts and Literature categories reflects a tendency among students with an interest in the arts also to borrow literary books. Arts and literature books are often used together in learning activities and for interest-based reading, leading students who borrow one category to also borrow the other. These findings demonstrate that similarities influence book borrowing behavior in reading themes and students' interests, rather than solely by the availability of the library collection.

4.2. *Managerial implications for the library*

The findings of this study can be utilized by the Library of SMP Negeri 2 Denpasar as a basis for improving collection management and library services. The association patterns identified indicate that several book categories are frequently borrowed together by students, suggesting that collection management should be adjusted accordingly. One practical implication is the arrangement of book collections by placing related categories in close proximity. Positioning the Pure Sciences category near Social Sciences, as well as the Arts category near Literature, can help students find books relevant to their learning needs and reading interests.

In addition to the collection arrangement, the results of this study may also serve as a reference for library collection development. Increasing the number of books in frequently borrowed categories is expected to better accommodate students' needs and reduce limitations in collection availability. Furthermore, the identified borrowing patterns can be used to develop reading recommendations for students. By providing book recommendations based on categories that are frequently borrowed together, the library can help students discover reading materials that align with their interests and learning needs. Overall, implementing these implications is expected to enhance the library's role in supporting learning activities and to encourage the growth of a literacy culture within the school environment.

4.3. *Research limitations*

This study has several limitations. The analysis was based solely on book categories without considering individual borrower characteristics, such as grade level or borrowing purpose. In addition, this study applied only the Apriori algorithm, without comparing it with other association rule mining algorithms. Therefore, future research may extend the analysis by incorporating additional variables and comparing

Table 5. Results of Two Category Book Combinations with Minimum Support of 5%

No	support	itemsets
6	0.142	(Social Sciences, Pure Sciences)
7	0.067	(Literature, Pure Sciences)
8	0.076	(Literature, Social Sciences)
9	0.361	(Literature, Arts)

Table 6. Association Rules Result

No	antecedents	consequents	support	confidence	lift
1	(Pure Sciences)	(Social Sciences)	0.142	0.53	1.87
2	(Arts)	(Literature)	0.361	0.71	1.13

the performance of different algorithms to obtain more comprehensive results.

5. Conclusion

Based on the results of applying Data Mining to book borrowing data at the Library of SMP Negeri 2 Denpasar using the Apriori algorithm, two main rules were obtained. First, students who borrow books in the Pure Sciences category also tend to borrow books in the Social Sciences, with confidence of 53%, support of 14%, and a lift of 1.87. Second, students who borrow books in the Arts category also borrow books in the Literature category, with confidence of 71%, support of 36%, and a lift of 1.33. Based on these patterns, the library can consider rearranging the collection's layout so that frequently borrowed book categories are placed nearby. In addition, book categories with high borrowing rates can have their copy counts increased to ensure they are always available to students who need them. The findings of this study are expected to serve as a reference for the library in planning the arrangement and procurement of book collections to suit students' needs and reading interests better. The library can also develop a reading recommendation program based on borrowing patterns to help students find books relevant to their interests.

For future researchers, it is recommended to use other Data Mining algorithms, such as FP-Growth, to compare the results of the association patterns obtained. Future studies can also utilize a larger dataset or cover a longer time period to generate more comprehensive and varied association rules.

Data availability

Some of the supporting data for this study are presented in this article, while the raw book borrowing data is available from the authors upon reasonable request.

Declaration of competing interest

All authors declare that there are no conflicts of interest, either financial or non-financial, that could have influenced the results of this study.

Authors' Contributions

All authors participated in the study design, data collection, analysis, and manuscript revision. Ni Putu Wanda Cahya Wicandi drafted the initial manuscript, implemented the Apriori algorithm, and conducted the data analysis. Nengah Widya Utami contributed to the conceptualization of the research, supervision of the methodology, and validation of the results. Putri Anugrah Cahya Dewi contributed to the literature review, interpretation of findings, and manuscript revision. All authors have reviewed and approved the final manuscript.

References

Afdal, M., Rosadi, M., Studi Sistem Informasi, P., Sains dan Teknologi UIN Suska Riau Jl Soebrantas KM, F. H., & Pekanbaru -Riau, P. (2019). Penerapan Association Rule Mining untuk Analisis Penempatan Tata Letak Buku di Perpustakaan Menggunakan Algoritma Apriori. *Jurnal Ilmiah Rekayasa Dan Manajemen Sistem Informasi*, *5*(1).

Andi Sugiarta, I. K., Cahya Dewi, P. A., & Utami, N. W. (2023). Analisa Sentimen Mahasiswa Terhadap Layanan STMIK Primakara Menggunakan Algoritma Naive Bayes dan K-Nearest Neighbor. In *JINTEKS* (Vol. 5, Issue 3).

Andini, Y., Hardinata, J. T., & Purba, Y. P. (2022a). *Penerapan Data Mining Terhadap Tata Letak Buku di Perpustakaan Sintong Bingei Pematangsiantar Menggunakan Metode Apriori: Vol. XI* (Issue 1). http://ejournal.stmik-time.ac.id

Andini, Y., Hardinata, J. T., & Purba, Y. P. (2022b). *Penerapan Data Mining Terhadap Tata Letak Buku di Perpustakaan Sintong Bingei Pematangsiantar Menggunakan Metode Apriori: Vol. XI* (Issue 1). http://ejournal.stmik-time.ac.id

Ardiansyah, A., Zy, A. T., & Nugroho, A. (2023). Implementasi Data Mining Algoritma Apriori pada Sistem Persediaan Obat (Studi Kasus Klinik Pratama Keluarga Kesehatan). *Journal of Information System, Applied, Management, Accounting and Research*, *7*(3), 777–788. https://doi.org/10.52362/jisamar.v7i3.1163

Falahie, A. F. N., Susyanto, T., & Vulandari, R. T. (2022). Implementasi Algoritma Apriori pada Tata Letak Kategori Buku di Perpustakaan. *Jurnal Ilmiah SINUS*, *20*(1), 23–34. https://doi.org/10.30646/sinus.v20i1.566

Gorunescu, F. (2011). *Data Mining: Concepts, Models and Techniques* (Vol. 12). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-19721-5

Han, J., & Kamber, M. (2006). *Data Mining: Concepts and Techniques*.

Lestari, H., Purnamasari, A. I., & Suprapti, T. (2024). Penerapan Data Mining Menggunakan Algoritma C4.5 untuk Prediksi Prestasi Belajar Siswa di MTS Yamuallim Panongan. In *Jurnal Mahasiswa Teknik Informatika* (Vol. 8, Issue 2).

Nizaela F, A. F., Susyanto, T., & Vulandari, R. T. (2022). Implementasi Algoritma Apriori pada Tata Letak Kategori Buku di Perpustakaan. *Jurnal Ilmiah SINUS*, *20*(1), 23. https://doi.org/10.30646/sinus.v20i1.566

Nurlaela, D., Utami, L. D., & Widiastuti, L. (2023a). *Implementasi Algoritma Apriori dan FP-Growth Untuk Penempatan Buku pada Perpustakaan (Studi Kasus : UBSI - Bogor)*. *8*, 103–110.

Nurlaela, D., Utami, L. D., & Widiastuti, L. (2023b). *Implementasi*

Algoritma Apriori dan FP-Growth Untuk Penempatan Buku pada Perpustakaan (Studi Kasus : UBSI - Bogor). *8*, 103–110.

Prabowo, D., & Ramdani, F. (2020a). Penerapan Algoritma Apriori Untuk Rekomendasi Buku Pada Amikom Resource Center. In *Information System Journal (INFOS)* | (Vol. 3, Issue 1).

Prabowo, D., & Ramdani, F. (2020b). Penerapan Algoritma Apriori Untuk Rekomendasi Buku Pada Amikom Resource Center. In *Information System Journal (INFOS)* | (Vol. 3, Issue 1).

Saputra, R., & Sibrani, A. J. P. (2020). *Implementasi Data Mining Menggunakan Algoritma Apriori Untuk Meningkatkan Pola Penjualan Obat* (Vol. 7, Issue 2). http://jurnal.mdp.ac.id

Sitanggang, A., Umaidah, Y., & Adam, R. I. (2024). Analisis Sentimen Masyarakat Terhadap Program Makan Siang Gratis Pada Media Sosial X Menggunakan Algoritma Naive Bayes. *Jurnal Informatika Dan Teknik Elektro Terapan*, *12*, 2757–2762. https://doi.org/10.23960/jitet.v12i3.4902

Utami, N. W., & Artana, I. M. (2021). *Analisis Asosiasi Untuk Menentukan Strategi Promosi Perguruan Tinggi Menggunakan Algoritma Apriori (Studi Kasus: STMIK PRIMAKARA)*.

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