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Adaptive Recommender Tool using Intelligent System Technique (A.R.T.I.S.T)

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ABSTRACT: The growing prevalence of online content has led to an outbreak of newer recommender systems. These systems are used to recommend items in several categories, including books. Most of the current systems use collaborative filtering, a user-based model for recommending. In contrast, we aim to build a system that uses content-based filtering to suggest books. The system shall recommend books based on the attributes of books that have been read by the user. It shall also be adaptive – it shall adjust itself according to the user profiles.

KEYWORDS: recommenders, content-based filtering, book recommender systems

I. INTRODUCTION

Recommender systems are a subclass of information filtering system that seek to predict the 'rating' or 'preference' that a user would give to an item. Existing systems for books (such as the ones used for online books stores like Amazon) almost exclusively use either a collaborative filtering system [1, 3] or hybrid systems with a predominant collaborative component. However, these techniques are based on the assumption that preferences are similar for users of similar profiles. Collaborative systems often suffer from the cold start problem [2], where only a small number of ratings are available for some items, and hence, no valid recommendations can be made.

Content-based filtering [3] eliminates these problems by focusing solely on the attributes of items instead of users. This allows the system to uniquely characterize each user based on his/her preferences instead of trying to match users having similar preferences.

In A.R.T.I.S.T., the technique of content-based filtering has been applied to books. Using the Amazon Book-Crossing Dataset [2] as the reference data set, the database has been built to contain attributes of books such as author, publisher, genres, etc. These attributes are then used in conjunction with their respective attribute-weights to compute the weighted-sum for each user-book pair and determine the list of recommended books for each user. The recommender is self-learning, meaning that it dynamically adjusts the attribute-weights according to the user preference model built by the system for each user.

II. RELATED WORK

There have been several studies on recommender systems that examine the various techniques employed for their purpose. In *Recommendation systems: Principles, methods and evaluation*, F.O.Isinkayea, Y.O.Folajimib, and B.A.Ojokohc describe the many algorithms that have been used in measuring user similarity or item similarity in recommender systems. Initial formulations for recommender systems, as mentioned in Learning collaborative information filters by Daniel Billsus and Michael J. Pazzani, were based on straightforward correlation statistics and predictive modeling, not engaging the wider range of practices in statistics and machine learning literature.

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One can make a better personalized recommendation by knowing more about an item, such as the director and genre of a movie. This was described in *Contentboosted collaborative filtering for improved recommendations* by Prem Melville, Raymond J. Mooney, and Ramadass Nagarajan. Content-based recommenders refer to such approaches that provide recommendations by comparing representations of content describing an item to representations of content that interests the user. Much research in this area has focused on recommending items with associated textual content, such as web-pages, books, and movies; where the web-pages themselves or associated content like descriptions and user reviews are available. As such, several approaches have treated this problem as an Information Retrieval (IR) task, where the content associated with the user's preferences is treated as a query, and the unrated documents are scored with relevance/similarity to this query. This method has been expounded in *Content-based, collaborative recommendation* by Marko Balabanovic and YoavShoham.

In the domain of book recommending, Mooney et al. use text from fields such as the title, author, synopses, reviews, and subject terms, to train a multinomial naïve Bayes classifier. Ratings on a scale of 1 to k can be directly mapped to k classes. A similar method has been used to recommend books in A.R.T.I.S.T.

III. THE SYSTEM

A. Get Recommendations

Algorithm 1 Recommended Books

```
1: procedure GET-RECOMMENDED-BOOKS(MAX-RESULTS)
2:   BOOKS-READ  $\leftarrow$  Books read by User
3:   AUTHOR-WEIGHT  $\leftarrow$  User's preference for Authors
4:   GENRE-WEIGHT  $\leftarrow$  User's preference for Genres
5:   PUBLISHER-WEIGHT  $\leftarrow$  User's preference for Publishers
6:   AUTHORS-READ  $\leftarrow$  { $x$  |  $x \in$  BOOKS-READ.Author }
7:   GENRES-READ  $\leftarrow$  { $x$  |  $x \in$  BOOKS-READ.Genre }
8:   PUBLISHERS-READ  $\leftarrow$  { $x$  |  $x \in$  BOOKS-READ.Publisher }
9:   BOOKS-BY-SAME-AUTHOR  $\leftarrow$  { $x$  |  $x \in$  ALL-BOOKS,  $x.Author \in$ 
  AUTHORS-READ,  $x \notin$  BOOKS-READ }
10:  RECOMMENDED-BOOKS  $\leftarrow$  Empty Dictionary
11:  for each BOOK  $\in$  BOOKS-BY-SAME-AUTHOR do
12:    COUNT  $\leftarrow$  | { $x$  |  $x \in$  BOOKS-READ,  $x.Author =$  BOOK.Author}
13:    if BOOK.Isbn  $\in$  RECOMMENDED-BOOKS then
14:      RECOMMENDED-BOOKS[BOOK.Isbn] += COUNT * AUTHOR-
  WEIGHT
15:    else
16:      RECOMMENDED-BOOKS[BOOK.Isbn]  $\leftarrow$  COUNT * AUTHOR-
  WEIGHT
17:    end if
18:  end for
19:  BOOKS-BY-SAME-GENRE  $\leftarrow$  { $x$  |  $x \in$  ALL-BOOKS,  $x.Genre \in$ 
  GENRES-READ,  $x \notin$  BOOKS-READ }
20:  for each BOOK  $\in$  BOOKS-BY-SAME-GENRE do
21:    COUNT  $\leftarrow$  | { $x$  |  $x \in$  BOOKS-READ,  $x.Genre =$  BOOK.Genre}
22:    if BOOK.Isbn  $\in$  RECOMMENDED-BOOKS then
```

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```
23:     RECOMMENDED-BOOKS[BOOK.Isbn] += COUNT * GENRE-  
WEIGHT  
24:     else  
25:     RECOMMENDED-BOOKS[BOOK.Isbn] ← COUNT * GENRE-  
WEIGHT  
26:     end if  
27:     end for  
28:     BOOKS-BY-SAME-PUBLISHER ← {x | x ∈ ALL-BOOKS, x.Genre ∈  
PUBLISHERS-READ, x ∉ BOOKS-READ }  
29:     for each BOOK ∈ BOOKS-BY-SAME-PUBLISHER do  
30:     COUNT ← | {x | x ∈ BOOKS-READ,  
x.Publisher = BOOK.Publisher}  
31:     if BOOK.Isbn ∈ RECOMMENDED-BOOKS then  
32:     RECOMMENDED-BOOKS[BOOK.Isbn] +=  
COUNT * PUBLISHER-WEIGHT  
33:     else  
34:     RECOMMENDED-BOOKS[BOOK.Isbn] ←  
COUNT * PUBLISHER-WEIGHT  
35:     end if  
36:     end for  
37:     Sort RECOMMENDED-BOOKS1 by their respective weights in descend-  
ing order  
38:     return RECOMMENDED-BOOKS[1:MAX-RESULTS]  
39: end procedure
```

Figure 1: Recommender Algorithm

B. Adjust Attribute-Weights

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Algorithm 1 Self Learning

```
1: procedure LEARN-FROM-HISTORY(USER)
2:   BOOKS-READ ← Books read by USER
3:   NUMBER-OF-BOOKS-READ-BY-SAME-AUTHOR ← [
   | {x | x ∈ BOOKS-READ, x.Author = BOOKS-READ.Author} | author ∈
   | BOOKS-READ.Author
   ]
4:   Sort NUMBER-OF-BOOKS-READ-BY-SAME-AUTHOR in descending
   order
5:   USER.AUTHOR-WEIGHT = MAX(
   1, 0.35 * NUMBER-OF-BOOKS-READ-BY-SAME-AUTHOR[0]
   )
6:   NUMBER-OF-BOOKS-READ-BY-SAME-GENRE ← [
   | {x | x ∈ BOOKS-READ, x.Genre = BOOKS-READ.Genre} | genre ∈
   | BOOKS-READ.Genre
   ]
7:   Sort NUMBER-OF-BOOKS-READ-BY-SAME-GENRE in descending
   order
8:   USER.GENRE-WEIGHT = MAX(
   1, 0.25 * NUMBER-OF-BOOKS-READ-BY-SAME-GENRE[0]
   )
9:   NUMBER-OF-BOOKS-READ-BY-SAME-PUBLISHER ← [
   | {x | x ∈ BOOKS-READ, x.Publisher = BOOKS-READ.Publisher} | pub-
   | lisher ∈ BOOKS-READ.Publisher
   ]
10:  Sort NUMBER-OF-BOOKS-READ-BY-SAME-PUBLISHER in descend-
   ing order
11:  USER.PUBLISHER-WEIGHT = MAX(
   1, 0.2 * NUMBER-OF-BOOKS-READ-BY-SAME-PUBLISHER[0]
   )
12: end procedure
```

Figure 2: Self-learning Algorithm

The input to the algorithm is user data gathered:

1. Books read by user
2. Dynamic weights for individual user
 - Author weight
 - Genre weight
 - Publisher weight, etc

A dictionary of recommended books is maintained, which is empty for a new user. We assign default weights to author, genre and publisher based on the assumption of books read by an average reader. We maintain three sets, namely the books by the same author, genre and publisher. We begin by iterating over the book collection and analyzing book metadata. If the current book's author matches any of the authors already read by the user, we add it to the same-author set. Similarly we populate the same-genre and same-publisher set. Note that there may be an overlap of some books. This is done intentionally to improve the accuracy of the recommendation. Next we iterate through the same-author set. For each book, we get the count of the books having the same author as that book. With this, we know the users preference for that author. We add it to the recommended dictionary if it was not already added, having a weight equal to the users author-weight and a multiplying factor given by the count. If book is already present in the dictionary, we increment its weight by the author-weight and the multiplying factor - count. We repeat this process for the same-genre and same-publisher set.

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After the computation is complete, the algorithm outputs a dictionary with the key as isbn number and the value as the weight. We sort this dictionary based on the weight in descending order. The book having the highest weight is recommended.

IV. OBSERVATIONS

The system was able to recommend books based on the content attributes – author, genre and publisher. Using pre-assigned weights, the system provided accurate recommendations for the new user. The system was sufficiently dynamic such that the recommendations reflected the change in inputs.

We compared how recommendations differed for Static and Dynamic recommender systems:

STATIC SYSTEM:

- 3 different users
- All users read different genre books
- The recommendations are noted

DYNAMIC SYSTEM:

- Only 1 user
- The user reads different genres one after the other
- The recommendations are noted

We represented it graphically and checked for the accuracy. We conclude that the Dynamic system gave a better and accurate set of recommendations based on the recency of the books read. The data input, the recommendations and the graphs are as follows:

1. STATIC

USER 1: BOOKS READ OF ‘HUMOR’ AND THE RECOMMENDATIONS THAT FOLLOWED

Sr. No.	Name	Author	Genre	Publisher	Isbn
1	The Jeopardy book	Alex Trebek	Humor	HarperCollins	60965118
2	Me talk pretty one day	David Sedaris		Back Bay Books	316776963
3	A supposedly fun thing I'll never do again	David Foster Wallace		Little, Brown and Co	316919896
4	The Cat Who Came in from the Cold	Deric Longden		Acacia Press, Inc	552138223
5	The root of all evil	Bob Herbstman		O'Reilly	596001932
RECOMMENDATIONS					
Sr. No.	Name	Author	Genre	Publisher	Isbn
1	User Friendly	Illiad	entertainment,essays,humor	O'Reilly	1565926730
2	Evil Geniuses in a Nutshell	Illiad	entertainment,essays,humor	O'Reilly	156592861X
3	Sand in My Bra and Other Misadventures: Funny Women Write from the Road	Jennifer Leo	entertainment,essays,humor	Travelers' Tales Guides	1885211929
4	Couplehood	Paul Reiser	entertainment,essays,humor	Bantam	553573136
5	I Haven't Understood Anything Since 1962	Lewis Grizzard	entertainment,essays,humor	Ballantine Books	345385977
6	Bumper Sticker Wisdom	Carol Brooks Gardner	entertainment,essays,humor	Beyond Words Publishing	188523117X
7	Brain droppings	George Carlin	entertainment,essays,humor	Hyperion	786883219
8	Taxi driver wisdom	Risa Mickenberg	entertainment,essays,humor	Chronicle Books	811811654
9	The Darwin awards II	Wendy Northcutt	entertainment,essays,humor	Dutton	525946233
10	The Bad Girl's Guide to the Party Life	Cameron Tuttle	entertainment,essays,humor	Chronicle Books	811833615

All recommendations have humor as one of their listed genres, which is the common genre for all input data

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USER 2: BOOKS READ OF 'MYSTERY' AND THE RECOMMENDATIONS THAT FOLLOWED

shweta.kutty@yahoo.com					
Sr. No.	Name	Author	Genre	Publisher	isbn
1	Death Row	William Bernhardt	Mystery	Fawcett	0345441761
2	The surgeon	Tess Gerritsen		Ballantine Books	0345447840
3	When Darkness Falls	Taniht Lee		Silhouette	0373218222
4	Unmarked man	Darlene Scalera		Harlequin	0373227396
5	The Kalahari typing school for men	Alexander McCall Smith		Pantheon Books	037542217X
RECOMMENDATIONS					
Sr. No.	Name	Author	Genre	Publisher	isbn
1	Timeline	Michael Crichton	mystery,suspense,thrillers	Ballantine Books	0345417623
2	Monster : A Novel	Jonathan Kellerman	mystery,psychological,suspense,thrillers	Ballantine Books	0345413873
3	Wanted woman	B.J. Daniels	mystery,suspense,thrillers	Harlequin	0373227787
4	A Cry In the Dark : Family Secrets: The Next Generation	Jenna Mills	mystery,suspense,thrillers	Silhouette	037327369X
5	Criminal Intent	William Bernhardt	legal,mystery,thrillers	Fawcett	0345441753
6	Deadly Justice	William Bernhardt	general,mystery,thrillers	Ballantine Books	0345380274
7	Perfect justice	William Bernhardt	general,mystery,thrillers	Ballantine Books	0345391330
8	Babylon rising	TIM LAHAYE	mystery,suspense,thrillers	Bantam Books	0553803220
9	River road	JoAnn Ross	mystery,suspense,thrillers	Pocket Books	0743436830
10	Last Lover	Laura Van Wormer	mystery,suspense,thrillers	Mira	155166836X

All recommendations have mystery as one of their listed genres, which is the common genre for all input data

USER 3: BOOKS READ OF 'EDUCATION' AND THE RECOMMENDATIONS THAT FOLLOWED

pooja.hegde@gmail.com					
Sr. No.	Name	Author	Genre	Publisher	isbn
1	Beautiful Child	Torey L. Hayden	Education	Avon Books	0060508876
2	Comprehensive school health education	Linda Brower Meeks		McGraw-Hill	0072521309
3	Including students with special needs	Marilyn Penovich Friend		Allyn and Bacon	0205280854
4	The morning after	Katie Roiphe		Little, Brown and Co	0316754315
5	Among schoolchildren	Tracy Kidder			0380710897
RECOMMENDATIONS					
Sr. No.	Name	Author	Genre	Publisher	isbn
1	Technical writing	John M. Lannon	education,general,nonfiction	HarperCollins	0673522946
2	What your kindergartener needs to know	John P. Holdren	education,general,nonfiction	Doubleday	0385318413
3	El Hombre Anumerico	John Allen Paulos	education,general,nonfiction	Tusquets	8472231496
4	Big Book of Everything, Preschool	Kathy Douglas	education,general,nonfiction,school	Instructional Fair	1568222033
5	Cultural literacy	Joseph F. Kett	education,general,nonfiction	Vintage Books	0394758439
6	Kaleidoscope	Kevin Ryan	education,general,nonfiction	Houghton Mifflin Co	0395874653
7	Homeschooling	CAFI COHEN	education,general,nonfiction	Prima Pub	0761520937
8	Ich, Prinzessin Viola: Ein altes Haus und seine Besetzer	Claudia von Zglinicki	education,foreign,german,language,nonfiction,reference	Aufbau Taschenbuch Verlag	3746670144
9	Great eastern RV trips	Janet Groene	general,states,travel,united	Ragged Mountain Press	0071349294
10	Graveyard of the Atlantic	David Stick	americas,general,history,states,united	University of North Carolina Press	0807842613

All recommendations have education listed genre, which is the common genre for all input data

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2. DYNAMIC

SAME USER

STEP 1. BOOKS READ OF 'HUMOR' AND THE RECOMMENDATIONS THAT FOLLOWED

Sr. No.	Name	Author	Genre	Publisher	isbn
1	The Jeopardy book	Alex Trebek	Humor	HarperCollins	60965118
2	Me talk pretty one day	David Sedaris		Back Bay Books	316776963
3	A supposedly fun thing I'll never do again	David Foster Wallace		Little, Brown and Co	316919896
4	The Cat Who Came in from the Cold	Deric Longden		Acacia Press, Inc	552138223
5	The root of all evil	Bob Herbstman		O'Reilly	596001932
RECOMMENDATIONS					
Sr. No.	Name	Author	Genre	Publisher	isbn
1	User Friendly	Illiad	entertainment,essays,humor	O'Reilly	1565926730
2	Evil Geniuses in a Nutshell	Illiad	entertainment,essays,humor	O'Reilly	156592861X
3	Sand in My Bra and Other Misadventures: Funny Women Write from the Road	Jennifer Leo	entertainment,essays,humor	Travelers' Tales Guides	1885211929
4	Couplehood	Paul Reiser	entertainment,essays,humor	Bantam	553573136
5	I Haven't Understood Anything Since 1962	Lewis Grizzard	entertainment,essays,humor	Ballantine Books	345385977
6	Bumper Sticker Wisdom	Carol Brooks Gardner	entertainment,essays,humor	Beyond Words Publishing	188522317X
7	Brain droppings	George Carlin	entertainment,essays,humor	Hyperion	786883219
8	Taxi driver wisdom	Risa Mickenberg	entertainment,essays,humor	Chronicle Books	811811654
9	The Darwin awards II	Wendy Northcutt	entertainment,essays,humor	Dutton	525946233
10	The Bad Girl's Guide to the Party Life	Cameron Tuttle	entertainment,essays,humor	Chronicle Books	811833615

All recommendations have humor as one of their listed genres, which is the common genre for all input data

STEP 2. BOOKS READ OF 'MYSTERY' AND THE RECOMMENDATIONS THAT FOLLOWED

Sr. No.	Name	Author	Genre	Publisher	isbn
1	Death Row	William Bernhardt	Mystery	Fawcett	345441761
2	The surgeon	Tess Gerritsen		Ballantine Books	345447840
3	When Darkness Falls	Tanith Lee		Silhouette	373218222
4	Unmarked man	Darlene Scalera		Harlequin	373227396
5	The Kalahari typing school for men	Alexander McCall Smith		Pantheon Books	037542217X
RECOMMENDATIONS					
Sr. No.	Name	Author	Genre	Publisher	isbn
1	Trap Line	Carl Hiaasen	general,mystery,thrillers	Vintage	375700692
2	Small Town	Lawrence Sanders	general,mystery,thrillers	HarperTorch	60011912
3	Deadly Justice	William Bernhardt	general,mystery,thrillers	Ballantine Books	345380274
4	Perfect justice	William Bernhardt	general,mystery,thrillers	Ballantine Books	345391330
5	Hell's Kitchen	Jeffery Deaver	general,mystery,thrillers	Pocket Books	671047515
6	User Friendly	Illiad	entertainment,essays,humor	O'Reilly	1565926730
7	Evil Geniuses in a Nutshell	Illiad	entertainment,essays,humor	O'Reilly	156592861X
8	Sand in My Bra and Other Misadventures: Funny Women Write from the Road	Jennifer Leo	entertainment,essays,humor	Travelers' Tales Guides	1885211929
9	I Haven't Understood Anything Since 1962	Lewis Grizzard	entertainment,essays,humor	Ballantine Books	345385977
10	Bumper Sticker Wisdom	Carol Brooks Gardner	entertainment,essays,humor	Beyond Words Publishing	188522317X

The recommendations are a mix of humor and mystery, which are the two input genres

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STEP 3. BOOKS READ OF 'EDUCATION' AND THE RECOMMENDATIONS THAT FOLLOWED

Sr. No.	Name	Author	Genre	Publisher	isbn
1	Beautiful Child	Torey L. Hayden	Education	Avon Books	60508876
2	Comprehensive school health education	Linda Brower Meeks		McGraw-Hill	72521309
3	Including students with special needs	Marilyn Penovich Friend		Allyn and Bacon	205280854
4	The morning after	Katie Roiphe		Little, Brown and Co	316754315
5	Among schoolchildren	Tracy Kidder			380710897
RECOMMENDATIONS					
Sr. No.	Name	Author	Genre	Publisher	isbn
1	What your kindergartener needs to know	John P. Holdren	Education	Doubleday	385318413
2	The hot zone	Richard Preston	Education	Anchor Books	385479565
3	Cultural literacy	Joseph F. Kett	Education	Vintage Books	394758439
4	Kaleidoscope	Kevin Ryan	Education	Houghton Mifflin Co	395874653
5	Technical writing	John M. Lannon	Education	HarperCollins	673522946
6	Trap Line	Carl Hiaasen	general,mystery,thrillers	Vintage	375700692
7	Small Town	Lawrence Block	general,mystery,thrillers	HarperTorch	60011912
8	Deadly Justice	William Bernhardt	general,mystery,thrillers	Ballantine Books	345380274
9	Perfect justice	William Bernhardt	general,mystery,thrillers	Ballantine Books	345391330
10	User Friendly	Illiad	entertainment,essays,humor	O'Reilly	1565926730

All three input genres are present in the recommendations, reflecting the entire user read history

STEP 4. BOOKS READ OF 'HISTORY' AND THE RECOMMENDATIONS THAT FOLLOWED

Sr. No.	Name	Author	Genre	Publisher	isbn
1	Required reading	Andrew Delbanco	History	Farrar, Straus and Giroux	374230072
2	Waiting	Ha Jin		Pantheon Books	375406530
3	American pastoral	Phillip Roth		Vintage Books	375701427
4	One More River	Lynne Reid Banks		HarperTrophy	380715635
5	The night lives on	Walter Lord		Avon Books	380732033
RECOMMENDATIONS					
Sr. No.	Name	Author	Genre	Publisher	isbn
1	Ghost soldiers	Hampton Sides	history,philosophy	Doubleday	385495641
2	Hidden in plain view	Jacqueline Tobin	history,philosophy	Anchor Books	385497679
3	The dream of reason	Anthony Gottlieb	history,philosophy	W.W. Norton	393049515
4	Texas	James A. Michener	history,philosophy	Random House	394541545
5	Citizens	Simon Schama	history,philosophy	Knopf	394559487
6	What your kindergartener needs to know	John P. Holdren	Education	Doubleday	385318413
7	The hot zone	Richard Preston	Education	Anchor Books	385479565
8	Cultural literacy	Joseph F. Kett	Education	Vintage Books	394758439
9	Trap Line	Carl Hiaasen	general,mystery,thrillers	Vintage	375700692
10	Small Town	Lawrence Block	general,mystery,thrillers	HarperTorch	60011912

The recommendations are a mix of history, education and mystery, reflecting the last 15 read books

In the following graph, the attribute 'genre' has been chosen as the defining variable for the input. Books of five genres – 'Humor', 'Mystery', 'Education', 'History' and 'Fiction' have been selected as the input, and the top ten resulting recommendations has been plotted for each genre.

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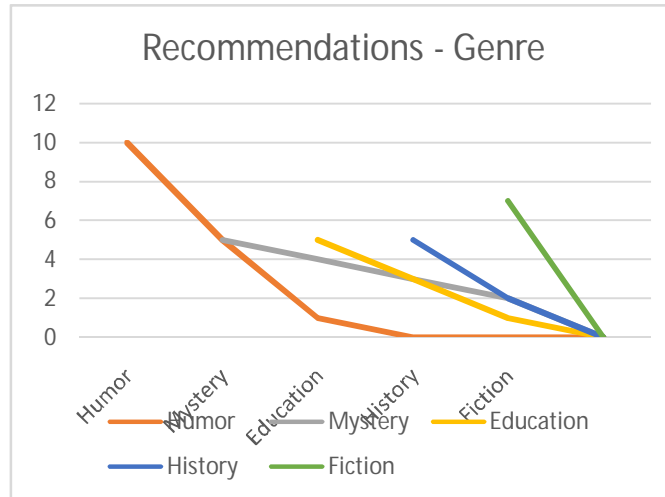


Figure 5: Graph to show recency and retention of user history

As can be inferred from the graph, in the first five inputs, only books of the ‘Humor’ genre have been read, and hence, all ten recommendations are of that genre. As the input genres keep varying, the output recommendations also vary accordingly. The same inferences can be made using author or publisher as the varying attribute. The recommendation system thus adapts itself to the user’s preferences, placing greater emphasis on a particular attribute if it believes the user has a greater preference of books of that given attribute.

The below graph provides another representation of the same input data. Here, the top five recommendations for each set of inputs are selected, and a graph of the input v. output has been plotted. It is observed that the output depends not only on the user input and preferences, but also on the existing dataset. For example, due to a much higher number of existing fiction books (1747) as compared to books having education in their genre (17), the number of recommendations for fiction are also greater than those for education. Once again, the adaptive nature of the system has been proven by the prevalence of the user’s preference history in determining the output recommendations.

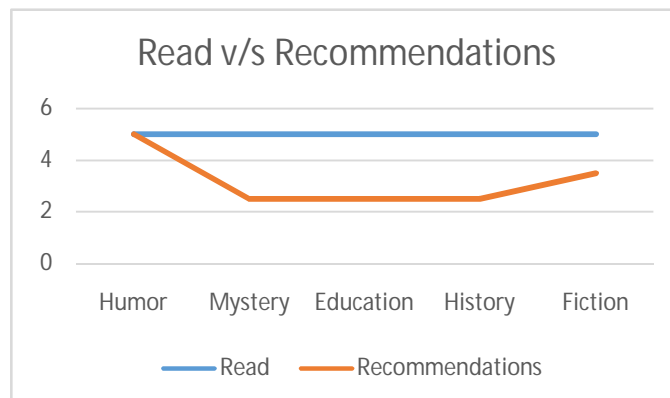


Figure 6: Graph to show count of recommendations per genre

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III. FUTURE WORK

Several improvements can be made to the existing system. The data gathered from the Amazon data-set and mining can still be cleansed further to improve accuracy of recommendation and remove redundant results. Further mining may be required to gather data on more attributes. User review can be added to the recommendations themselves, which would help in users having a greater say in the books recommended to them. Lastly, user profiles and connections could be used as influencing factors to make the system a hybrid recommender tool.

IV. CONCLUSION

Thus, in this paper, we have proposed and implemented an adaptive recommender system for books. The system adjusts itself according to the user preferences by refining its model each time the user reads a book. Content-based filtering is used for this purpose. In this model, the last fifteen books read by the user determine the recommendations output. Thus, the recency of user preferences, along with the preferences themselves, is used to recommend books.

REFERENCES

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