

Personalized Outfit Recommendation Mobile Application

¹Aravind Renjan, ²Bhumika Kaushik, ³Vaishnavi Gaikwad, ⁴Yash Pathak, ⁵Prof. Bailappa Bhovi & ⁶Prof. Prashant Gadakh

^{1,2,3,4} Student, Department of Computer Engineering, International Institute of Information Technology, Pune (India)

^{5,6} Professor, Department of Computer Engineering, International Institute of Information Technology, Pune (India)

ARTICLE DETAILS

Article History

Published Online: 10 December 2018

Keywords

Machine Learning, Apriori algorithm, QR Code Technology, Association Rules, Data Mining

Corresponding Author

Email: aravindrenjan[at]gmail.com

ABSTRACT

Organizing and managing a wardrobe is a tedious and time-consuming affair on a daily basis, so is keeping up with the current trends in fashion and finding the perfect outfit that suits the occasion. This mobile application envisions automating the entire process of choosing an outfit according to the weather and occasion with as minimal effort from the user as possible. The application uses Apriori algorithm to find the association rules of clothing items that can be worn together based on certain properties like fabric, color, texture, pattern, etc. These rules will be used to model a recommendation system. The properties are recognized via QR code which will be attached to the label of the clothing item generated by the vendor from the application website. The application would primarily create a virtual closet for the user and also suggest outfits according to the user preference, weather and occasion.

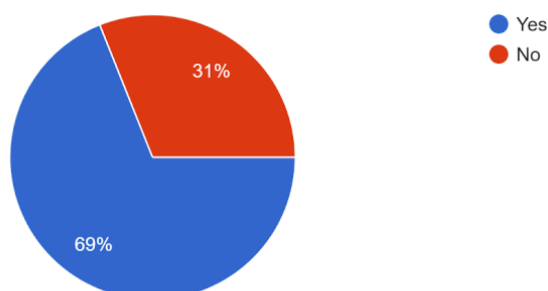
1. Introduction

Every day a great amount of time is spent in finding the outfit for the day and occasion. Choosing a set of clothes that match and also compliment the weather is a tedious task. It is almost impossible for a person to keep up with the rapid changes in trends in fashion unless they are from the fashion industry or have a keen interest in it. Physically taking out each piece of clothing that a person owns and seeing if two of them match and repeating the same to see what other choices are available is a difficult thing to do and also takes up a good amount of time on a daily basis. Moreover, while purchasing new clothes a person has to keep in mind all the clothes that he/she already has available in his/her wardrobe and envisage if the clothes available to buy match with any of those in their wardrobe.

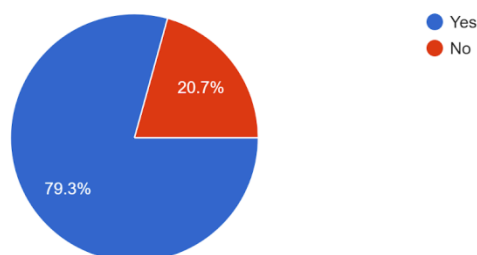
All the solutions to these difficulties and efficient use of time can be achieved by automating these everyday actions. The proposed application aims to create a virtual closet for each user which will have a repository of all the clothes owned by a person available online all the time. The application will suggest an outfit for the user from the available clothes in the closet by taking into consideration the occasion and the weather.

2. Market Survey

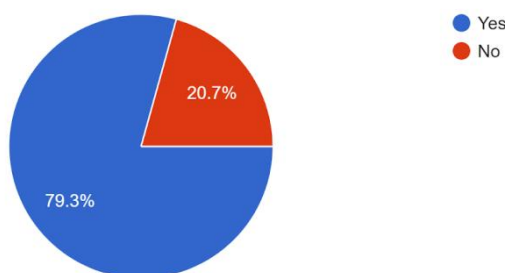
Is wardrobe management a hassle?



Is choosing an outfit for a day difficult?

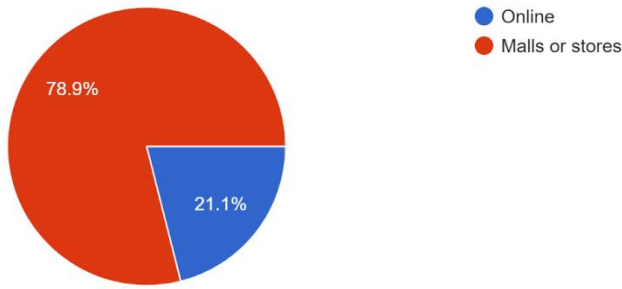


Would you like to have an app that can choose an outfit out of your own closet?

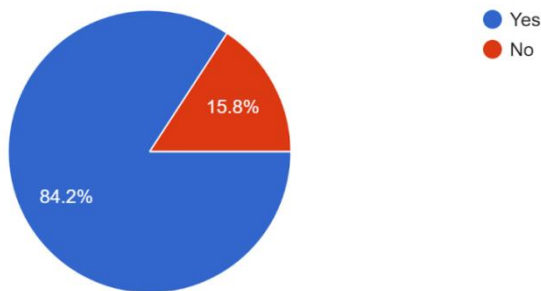


The surveys conducted shows that wardrobe management is a big hassle for many. Choosing what to wear every day when the wardrobe is not properly managed is a time-consuming activity. Having an app that would help choose an outfit from already available clothes in the wardrobe is also preferred highly. It can be fairly assumed app that would create and manage wardrobe virtually all on its own and help recommend outfits for everyday wear and also depending on the occasion and weather would be highly appreciated by the survey demographic.

Where do you shop usually?



Would you prefer buying from malls/store if you got recommendations based on what you bought previously and based on your personal choice?



And it is also seen in the result of the surveys that most consumers still prefer going to malls and stores to buy clothes. Even though going to malls and stores have many advantages a major disadvantage that can be seen is that while buying clothes from a mall or a store a consumer has to imagine whether the clothing item would make a complete outfit with the already available clothes in their wardrobe. This can be solved by our app as it can put together the outfit using both the new and the available clothing units in the wardrobe. A consumer can see an image of the selected clothes as a whole outfit and decide on buying the clothes.

3. Existing System

Initially a survey to find similar existing systems was conducted where in two different already existing apps were found and studied upon. One was a styling application that gives outfit ideas for a user. The application provides the user with an outfit that goes well together but does not take into consideration the preferences of the user. Also, the application suggests only outfits that the user can buy, not an outfit constructed out of the user's closet. Basically, this application suggests a user outfits to buy rather than wear.

The second system is another styling application that recommends outfits from user's clothes which the user has to add to the repository by taking pictures and entering necessary information along with it. The suggestions are made from the outfit ideas created by the user which has to be done manually. The user need not have the enough knowledge or time to create outfit ideas. And there are no suggestions for buying clothes that help create an outfit.

4. Proposed System

Our application would suggest a user outfits from the set of clothes available with the user to reduce the everyday hassle of finding an outfit. This suggestion model would take into consideration the preference of the user, weather and also the occasion. In the initial stage of use by any user the clothes that are already available with the user need to be manually entered into the virtual closet by the user. But with time the need for user entry of data will not be necessary as vendors can print the QR code with the tag on the cloth. And a user would simply need to scan the QR code to add the cloth to the private closet. As the application is a virtual closet organizer the user will be able to delete a cloth from the closet too. The application will also suggest users with clothes that can be bought that make an outfit with the clothes that are already present in the closet of the user.

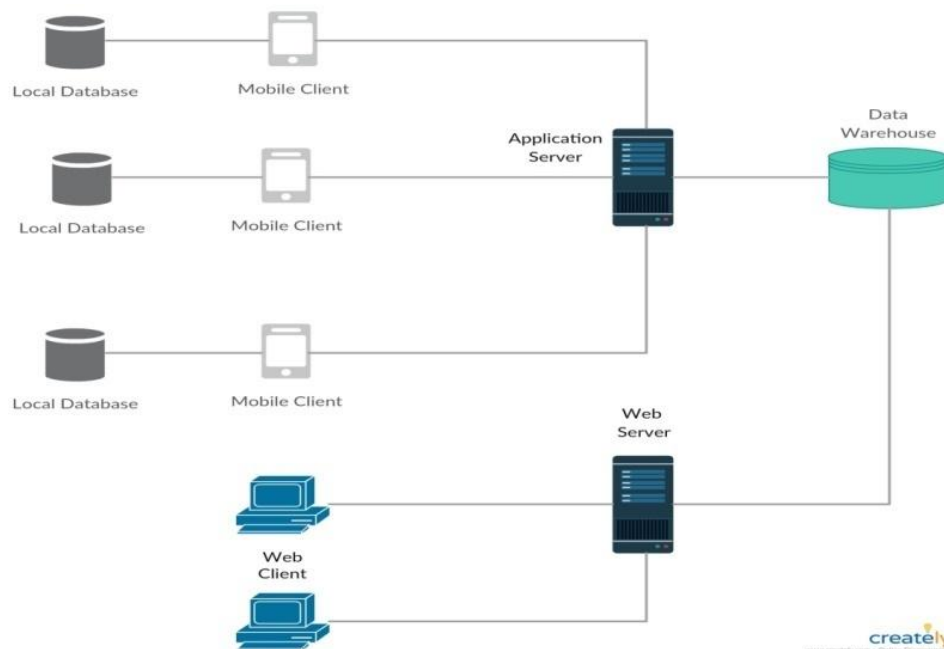


Fig.1 Architecture Diagram

The proposed system will be making use of the following:

Apriori Algorithm:

Association rule mining is the technique of finding frequent rules that define relations between seemingly unrelated items in a dataset. The two main measurements used for association rule mining are confidence and support. Association rule mining generally works in two steps. The first is to find all item sets with pre-decided minimum support and the second is generating association rules by combining these frequent items.

Apriori algorithm is one of the most popular data mining approach to find frequent patterns in a dataset and to mine association rules from it. These rules can be used to find relations from user preferences and can be used to recommend outfits to a user^[1]. For example a relation like:

{(cotton, white, shirt) → (blue, jeans) → (sunny)}

Tells us that a cotton white shirt is preferred with blue jeans on a sunny day.

Similarly, many relations like the one above can be used to recommend an outfit to a user. Most of the rules will be general and can be used for many users and then can be bettered according to their personal preferences.

Apriori uses breadth first search and a tree structure to count the candidate item sets efficiently. The algorithm generates candidate item sets of length n from item sets of length n-1. The candidate item set is pruned to remove item sets that are not frequent. According to the downward closure lemma, the candidate set contains all frequent n-length term sets. It is an iterative process that repeats until the most frequent item set that are above the minimum support threshold are mined. The result is then used to generate association rules which are above the minimum confidence threshold.

Limitations of Apriori algorithm:

1. Slow and candidate generation bottleneck.
2. Repeated scans of the database increasing time complexity.
3. Large number of non-frequent item set generation increasing the space complexity.

References

1. Jugendra Dongre, Gend Lal Prajapati, S.V. Tokekar, "The Role of Apriori Algorithm for Finding the Association Rules in Data Mining", 2014 IEEE.
2. Chanchal Yadav, Shuliang Wang, Manoj Kumar, "An Approach to Improve Apriori Algorithm Based in Association Mining", 2013 IEEE.
3. Sumit Tiwari, "An Introduction to QR Technology", 2016 IEEE.
4. Berry, M. J. A. and Linoff, G. Data mining techniques for marketing,
5. sales and customer support, USA: John Wiley and Sons, 1997
6. Andre Bergmann, "Data Mining for Manufacturing: Preventive Maintenance, Failure Prediction, and Quality Control".
7. Fayyad, U. M.; Piatetsky-Shapiro, G.; Smyth, P.; and Uthurusamy, R. 1996. Advances in Knowledge Discovery and Data Mining. Menlo Park, Calif.: AAAI Press.
9. Dr. Gary Parker, vol 7, 2004, Data Mining: Modules in emerging fields, CD-ROM.
10. Jiawei Han and Micheline Kamber (2006), Data Mining

There are multiple solutions to solve these limitations of apriori algorithm like FP Growth (Frequent Pattern Growth) method which generates an FP tree using with frequent patterns are generated thus reducing the database scans to only two times. And also, methods like partitioning which partitions the data into various partitions to find local frequent items sets which can then be used to find the global frequent item sets and sampling can implemented to increase the efficiency of the apriori algorithm^[2].

QR code:

Sumit Tiwari^[3] gives a brief about QR code technology in his paper. A QR code is a type of matrix bar code or two-dimensional code that can store data information and designed to be read by smart phones. QR stands for "Quick Response" and hence implying that the contents are to be decoded rapidly. The code consists of black modules arranged in a square pattern on a white background. It has many advantages which include omnidirectional and fast scanning, small size, more storage space compared to a barcode, error correction, varied types of data support and so on. Increased use of smart phone in everyday life and QR scanners in smart phones have made this technique more accessible to public in recent times. The clothes will be added by scanning a QR code attached to the tag of the clothing item, which a manufacturer can obtain via the website of the application. It can be used to add clothes or match up with other clothes available in the virtual wardrobe of the application.

5. Conclusion and Future Works

In this paper, we develop a novel application to help people with the everyday hassle of choosing an outfit; Creating and easy organization of a virtual closet. Providing personalised suggestions to users with regards to various parameters like occasion, weather and preference. The system also provides the manufacturers with a website from which they can procure a QR code to be attached to the cloth tag that the user can use to easily add the item to their closet or be used by the system to suggest the clothing item to any user that has another that goes with it and completes the outfit. In future we plan to add existing clothes to the closet with only the click of an image of the clothing and recognizing the necessary data (tags associated with the item) from the image. Also expand the closet horizon by adding accessories to the closet; And also providing a platform for purchase of clothes and other items by connecting the manufacturers and customers directly to each other.

- Concepts and Techniques, published by Morgan Kaufman, 2nd ed.
11. Literature Review: Data mining, <http://nccur.lib.nccu.edu.tw/bitstream/140.119/35231/S/35603IOS.pdf>, retrieved on June 2012.
 12. H. Mahgoub, "Mining association rules from unstructured documents" in Proc. 3rd Int. Conf. on Knowledge Mining, ICKM, Prague, Czech Republic, Aug. 25- 27, 2006, pp. 167-172.
 13. S. Kannan, and R. Bhaskaran "Association rule pruning based on interestingness measures with clustering". International Journal of Computer Science Issues, IJCSI, 6(1), 2009, pp. 35-43.
 14. M. Ashrafi, D. Taniar, and K. Smith "A New Approach of Eliminating Redundant Association Rules". Lecture Notes in Computer Science, Volume 3150, 2004, pp. 465 -474.
 15. P. Tang, M. Turkia "Parallelizing frequent itemset mining with FPtrees".
 16. Technical Report titus.compsci.ualr.edu/~ptang/papers/parfi.pdf, Department of Computer Science, University of Arkansas at Little Rock, 2005.
 17. M. Ashrafi, D. Taniar, and K. Smith "Redundant Association Rules Reduction Techniques". Lecture Notes in Computer Science, Volume 3509, 2005, pp. 254 -263.
 18. M. Dimitrijevic, and Z. Bosnjak "Discovering interesting association rules in the web log usage data". Interdisciplinary Journal of Information, Knowledge, and Management, 5, 2010, pp.191 -207.
 19. R. Agrawal, H. Mannila, R. Srikant, H. Toivonen, and A. I. Verkamo.: Fast discovery of association rules- In Advances in Knowledge Discovery and Data Mining (1996).
 20. Z. HONG-ZHEN, C. DIAN-HUI, and, Z. DE-CHEN "Association Rule Algorithm Based on Bitmap and Granular Computing". AIML Journal, Volume (5), Issue (3), September, 2005.
 21. K. Yun Sing "Mining Non-coincidental Rules without a User Defined Support Threshold". 2009.
 22. C. Yin-Ling and F. Ada Wai-Chee "Mining Frequent Itemsets without Support Threshold: With and without Item Constraints". 2004.
 23. Agrawal R, Srikant R (1994) Fast algorithms for mining association rules. In: Proceedings of the 20th VLDB conference, pp 487-499.