User Preference Based Mobile Application Recommendation

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Abstract: Application recommendation is one of the larger scales and sophisticated recommendation system currently exists. In this research work, we devised an approach which will deal with suggesting application based on users click on a particular application. The approach described in this paper is efficient and with less memory requirement than other traditional methods. This paper also includes the details about the implementation of the approach with User Interface. The paper also provides the details that how it can be implemented on a large scale. The approach is implemented in a mobile-based platform with react native support. The main objective of this paper is to describe an approach, which will be efficient and completely based on users data. The main objective of an Application Recommendation to recommend applications to increase user experience and recommend application based on their needs. Companies like Google, Apple, Samsung etc. are implementing it also.

Keywords: Mobile application, User preference, Recommender Systems

I. INTRODUCTION

Mobile devices have permeated daily life of human beings in a seamless manner. These have become like a personal advisor or like a personal assistant and contain greater user information than even a close friend. The reason for this standard change is mainly due to the capability of these devices to support an ever-increasing number of mobile applications. Mobile applications or the mobile apps, as these are commonly referred, keep the user experience in which. These mobile apps have a number of properties or advantages such that a user uses them even without having any technical information about them.

The most commonly used apps are categorized into messaging like WhatsApp or entertainment like Netflix [22], [23]. A lot of hours go in the designing of these apps so that a user can keep using them in a faster and easier manner, that too for long hours without getting tired. Furthermore, if a user uses an app repeatedly then this can be a sign of his/her affinity for that app. In the nutshell, authors of this paper believe that every user has a different preference for a different type of apps thus whenever a user unlocks his/her mobile device then he/she should be presented with the plethora of installed apps based on the app ranking.

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The app ranking is generally employed by the app stores also. For example, the Apple Application Store recommends application based on the user's previous data and the same thing is done by Google Play Store but based on different algorithms. It is important to learn the way these app stores rank the mobile apps using the different ranking algorithm. This knowledge is also necessary because a large amount of research is currently going on for the design of algorithms that optimize mobile app rankings. The major part of the research consists of enhancing the previous method of recommendation engine and developing new and better recommendation engine algorithms [4], [5].

There are number of techniques employed for ranking these mobile apps such as collaborative filtering, content-based recommendation and Hybrid Recommendation.

However, these approaches suffer from the number of limitation. These methods ignore the relationship between data values. Therefore in this research work, we proposed graph-based methodology for app ranking.

Our novel graph-based mobile app ranking method captures the user's preferences and builds a graph by forming a connection between different nodes. Initially, the user preferences are captured by an app numbered 0 and as the user browses through the app, weighted connection are developed from this app to the other apps. Greater the weight of the link greater is the number of times a user browses the app (we will discuss the details in section 3).

The biggest advantage of our proposed novel algorithm is that no time is wasted in learning user preferences and aligning the apps [1-3]. User preferences are learned on the fly as the user continue to browse the apps. We strongly feel that our approach is novel because no one has used the graph-based algorithm for learning the user preferences and ranking the mobile apps till day.

The organization of the rest of the paper is as follows; section 2 discusses the mathematical preliminary that forms the base of the present work, section 3 discusses our proposed user preference aware novel graph-based mobile app ranking algorithm, section 4 discusses the result and finally, section 5 concludes the present work.

II. MATHEMATICAL PRELIMINARIES

In this section, we will discuss the mathematical details of the algorithm used to optimize the memory usage of the program [6-10].

In our previous method, we have added a constant (for example 1) in every case when the user has clicked on 1 and based on that we have ranked the applications.

In our new approach, we have selected a normalization method to prevent from going out of memory. This will prevent more memory usage at the cost of computation.
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\[ z = \frac{x - \text{min}(x)}{\text{max}(x) - \text{min}(x)} \]  
(1)

Where \text{min} and \text{max} are the minimum value in x and maximum value in x given its range. \( X \) is current value at which value is to be normalize [12-15].

Min-max normalization or equation (1) is often refer as feature scaling where the values of a integer range of a feature of data, i.e. a property, which normalize to a scale in range of 0 and 1. Therefore, in order to calculate \( z \), i.e. the normalized value of a member of the observed values of \( x \).

III. DESIGN

To suggest application based on similar kind of users previous choice, an algorithm can be suggested which connect all the applications by link or virtual link and contain score how frequently it had been visited irrespective of the user. One of the approach to do this is by following techniques.

A. Use weight graph [16], [17]

Connect all the application by assuming its one application as initial vertex and other as final vertex and one edge connecting them. A Edge should have initial weight as minimum as possible or it can be 0. To render suggestion of application, all the neighbors of current vertex need to be copied in dictionary with key being end vertex and value being the weight. That dictionary then sorted in decreasing order based on values and then it should be rendered sequentially.

B. Update [18]

It is necessary to update the data based on which the application user has clicked. This is done by adding a constant \( c' \) to the value of the key that the user has select and then normalize it with using min max normalized equations.

C. Adding back to graph[19-21]

It is required to add back all the updates that happened in the dictionary. After adding back graph will contain the values which as per the user's data.

The pseudo code for above implementation is stated below /* this pseudo-code will will increase the rank of the particular applications and display them based on their rank */
Implementation of above implementation is done by using JavaScript based framework react native. Screenshot of the implementation are shown in Fig. 4.

IV. RESULTS AND DISCUSSION

This algorithm will suggest application based on user’s data with less access time and memory than other classic recommendation algorithms like basket analysis. This algorithm will work best with user-user collaborative filtering in which users have the same kind of interest in the products. Not only this application can be used in recommendation system in other recommendation algorithm will work best.

This method can also be implemented with item-item collaborative filtering by changing the vertex to applications. This method is most effective with integration in collaborative filtering. This method consumes less memory and computation power than most of the recommendation model, which makes it more efficient and fast than the others.

To overcome the high memory usage to store the frequency of the users preference, we have use normalization technique from data mining i.e. Min max Normalization. Which let the value of the frequency between 0 and 1, which in turn decrease memory usage and prevent the memory overflow.

V. CONCLUSION

Application recommendation is a subpart of the Recommendation system, so, it is very important to suggest applications to users, which will they like. So, as a developer, it is necessary to develop an algorithm with the utmost possible accuracy with less processing power and memory. So that each and every company can easily use it without dealing with cost overhead. We have developed a recommendation algorithm which takes much less power and good accuracy with less difficulty in implementation and with good accuracy if users are of the same mindset or behavior. This algorithm can be implemented as a part of a recommendation engine as a same group of users, which has the same taste in the application. As a part of the recommendation engine algorithm, this algorithm can greatly increase the accuracy of the recommendation engine as a whole.

REFERENCES

[5] Fig 2 Update when app1 is selected on app9 pagehttp://www.google.com/corporate/history.html, Google Corporate Information; Google Milestones.
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