Voting with Their Feet: Inferring User Preferences from App Management Activities

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ABSTRACT

Smartphone users have adopted an explosive number of mobile applications (a.k.a., apps) in the recent years. App marketplaces for iOS, Android and Windows Phone platforms host millions of apps which have been downloaded for more than 100 billion times. Investigating how people manage mobile apps in their everyday lives creates a unique opportunity to understand the behavior and preferences of mobile users, to infer the quality of apps, and to improve the user experience. Existing literature provides very limited knowledge about app management activities, due to the lack of user behavioral data at scale. This paper takes the initiative to analyze a very large app management log collected through a leading Android app marketplace. The data set covers five months of detailed downloading, updating, and uninstallation activities, involving 17 million anonymized users and one million apps. We present a surprising finding that the metrics commonly used by app stores to rank apps do not truly reflect the users' real attitudes towards the apps. We then identify useful patterns from the app management activities that much more accurately predict the user preferences of an app even when no user rating is available.

General Terms

Experimentation

Keywords

Mobile apps, App management activities, Behavior analysis

1. INTRODUCTION

The prevalence of smartphone applications (a.k.a., apps) has introduced an evolutionary change to people's everyday lives. By 2014, the Apple App Store and the Google Play have hosted more than a million apps and have collected over 100 billion downloads [4, 5]. Many apps are also hosted through other marketplaces such as the Amazon App Store, the Samsung App Store, the F-Droid [1], and the Fetch [2]. In regions where the native app marketplaces are inaccessible, these third party marketplaces play a major role in facilitating users to find, download, and manage mobile apps.

To help users find and explore high-quality apps, most app marketplaces gather user-input ratings of apps, either in the format of like/dislike votes, numerical ratings, or free-text comments. Much work has been done to analyze these ratings [26]. However, among the hundreds of millions of users who downloaded and used these apps, only a small proportion have left reviews [25]. While popular apps are rated heavily, the majority of apps, especially new apps receive very few or even no ratings, making them invisible from the users even if the quality is high. Biased, fake, paid off, and malicious reviews also commonly exist, which compromises the credibility of user-input ratings [29].

In this paper we study a different signal, the signal of users voting an app using their feet. We hypothesize that users who like an app manage it differently from those who don't. Users' preference towards an app can be revealed by the way they manage the app. These actions are just like votes made by the users. Indeed, it is reported that 80 to 90 percent of mobile apps were downloaded, used only once, and then deleted by a user*. These users, although few of them bother to leave a review, are clearly not in favor of the app. Instead, other users are much more engaged, who download an app, keep to date with the updates, and immediately install it back after they get a new device or update the operation system.

More generally, these app-managing activities can include searching, downloading, installing, updating, uninstalling, and rating an app. They provide much richer, and arguably less biased indicators of the actual preferences of the users about the apps. In other words, if one can infer user preferences from behavioral patterns in these app management activities, one could provide an accurate and unbiased indicator of the user preferences and the quality of apps *even if they are not rated by any users.* Indeed, many marketplaces count how many times an app has been downloaded (or how many users have downloaded the app), hoping to provide an evidence of the quality of the app when the ratings are rare. These simple counts, however, may not really reflect the users' preferences when they are interpreted apart from the context: the actual sequences of activities of the users (e.g.,

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*http://www.digitaltrends.com/mobile/16-percent-of-mobile\-userstry-out-a-buggy-app-more-than-twice/