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Models for Efficient Utilization of Resources for Upgrading Android Mobile Technology

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ABSTRACT

The need of the customers to be connected to the network at all times has led to the evolution of mobile technology. Operating systems play a vitol role when we talk of technology. Nowadays, Android is one of the popularly used operating system in mobile phones. The authors have analysed three stable versions of Android, 6.0, 7.0, and 8.0. Incorporating a change in the version after it is released requires a lot of rework and thus huge amount of costs are incurred. In this paper, the aim is to reduce this rework by identifying certain parts of a version during early phase of development which need careful attention. Machine learning prediction models are developed to identify the parts which are more prone to changes. The accuracy of such models should be high as the developers heavily rely on them. The high dimensionality of the dataset may hamper the accuracy of the models. Thus, the authors explore four dimensionality reduction techniques, which are unexplored in the field of network and communication. The results concluded that the accuracy improves after reducing the features.

KEYWORDS

Android Operating System, Dimensionality Reduction, Feature Selection, Machine Learning, Mobile Technology, Model Prediction, Software Changes

INTRODUCTION

In today's rapidly growing industry, it is very essential to build an effective and reliable connectivity to establish an efficient communication among the clients and employees of any business organization. Communication involves sharing of critical information between the user and the organization where security plays a key role in terms of privacy (Auxilia et al., 2020). The customers want to be connected and be able to communicate with any business organization at any time and from anywhere. The demand of being connected 24/7 is only possible due to the evolution of mobile and Internet technology. The availability of newer operating systems in the competing market plays a significant role in improving the mobile technology. Among many other characteristics and applications; one of the distinguishing characteristics offered by mobile operating systems is that the users can get connected to the internet using the wireless service provider of their smart phones which is cost effective as the mobile system is completely wireless leading to benefits like saving of money and space as compared to wired sensor network (Elfouly et al., 2017). Various types of operating systems are available in the market, the most popular being Android. Android has seen various versions starting from version 1.0, then1.5, 1.6, 2.1, 2.2, 2.3, 3.0and so on. Each version has the improvements over the previous one and thus, it is always advisable to go with the latest version. The upgradation of a

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version to a higher version may be due to a number of reasons, such as identification of some bug in the previous version, change in the customers' demands, change in technology in the market, etc. We can also see that change is the need of the hour and we as humans must adapt to those changes. However, seeing from the end of developer's site, we should understand that incorporating a change due to any of the above listed reason resulting in a new version is not at all an easy task. It comes with lots of difficulty and requires huge amount of resources in terms of time, money and manpower. To elaborate on this, let us understand that the development of a software goes through certain stages before it can be deployed. Incorporating a change in any part of the software (due to any of the reasons stated above) may need widespread changes in different parts of the software and thus lots of rework is required (Sharma et al. 2014). Cost and effort of this rework significantly increases with the stages in software development lifecycle (Boehm and Basili 2001).

The authors in this paper aim to work in the direction of reducing the rework and thus, saving of cost and other resources. For this, the three stable versions of Android, viz Android 6.0 (Marshmallow), Android 7.0 (Nougat) and Android 8.0 (Oreo) are analysed. Each version is fairly large in size consisting of a large number of classes. Due to the availability of limited resources, the developers fail to pay equal attention to all the classes, leading to poor quality software. Thus, the main idea revolves around identification of those classes which are more vulnerable to changes in the next software update. The authors have constructed the prediction models which can be used by the developers/designers in the early phases of software development to identify the classes which need focussed attention. Next, we discuss about the correctness or accuracy of the constructed prediction model. Since the developers are relying on these models for identifying the classes, it is very important that the model should be as accurate as possible. The high dimensionality of the dataset is one of the hindrance which may hamper the accuracy of the models. In addition to this, the high index of features (high dimensionality) makes the computation of data an expensive and tedious task (Rattanawadee and Srivihok, 2015). Dimensionality Reduction refers to the process of reducing the number of dimensions of a given data set. This leads to a reduction in the number of variables and utilization of a group of prime variables.

In this paper, the authors have used feature selection algorithms for selecting a subset of relevant features from a given set of features such that they would yield the most optimum results while building an effective and efficient predictive model (Padmaja and Vishnuvardhan, 2016).The literature shows the wide use of traditional statistical method known as regression analysis to extract the useful features. In this study, univariate Logistic Regression (LR) is used to find the effect of each independent variable with the dependent variable. Thereafter, multivariate LR is also used for constructing the model. In addition to the regression analysis which is a statistical approach, there are much newer and popularly used feature selection techniques broadly classified under the three approaches: filter approach, wrapper approach and embedded approach (Bachu and Anuradha 2019). While filter approach focuses on the data instead of the algorithm used for mining it and gathering the relevant information by analysing the nature of the data, the wrapper approach focuses on the applicability or pertinence of each feature and the optimality of the solution thus obtained (Bolón-Canedo et al. 2014). The embedded approach, on the other hand, is more focused and aims towards optimizing the model for a particular training algorithm. In this research, the authors have analysed four sequential search techniques viz. Sequential Forward Selection (SFS), Sequential Backward Selection (SBS), Sequential Forward Floating Selection (SFFS) and Sequential Backward Floating Selection (SBFS) that are employed by wrapper methods for feature selection. The authors found that the usage of these sequential search techniques in different domains such as gene selection, big data classification, pattern recognition and image recognition (Pudil et al. 1993 and Peralta et al. 2015) have produced promising results. However, these techniques are unexplored in the field of networks and communication. Thus, this motivated the authors to explore these search techniques to reduce the features of popular mobile technology, Android.

To determine the efficiency of these sequential search techniques, the prediction models are constructed using three popularly used machine learning classifiers viz. K-Nearest Neighbor (KNN),