Detecting Mobile App Fraud Review and Fake Ranking

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Abstract. Image Mobile Applications are hugely installed in various mobile phones now a days as mobile application developments are overwhelmingly increasing. As per survey huge number of mobiles apps is developed for performing fraud activities in recent years. Many application developers are indulging in shady means utilization, imposter postings and also in positioning distortion. To get fame and usage of mobile Applications, in various app stores generating leader boards in apps every day in order to specify the graph rankings of trendy applications. Efforts to promote their Apps are put in such App leader boards using various advertisements in order to have high ranking for their apps. Shady App designers are indulging in shady means activities to defame others genuine apps and boost their Apps and generate the fake rankings in their mobile application store. Web positioning spam acknowledgment (WPSA) and portable app recommendation systems are used in recent years. As per the research survey, the issue of fake reviews and defaming activities for mobile Apps is still unresolved. The issue of identifying fraud ranking in mobile applications is still under research. To specify the solutions for these issues various machine learning algorithms are compared and the best results are obtained from Random Forest algorithm approach.

Keywords: Fraud ranking, Spam Review Detection, Ranking based evidence, Mobile Apps.

1 Introduction

In the world now a day's huge number of people is using various mobile applications in their smart phones. Ranking fraud [1] is the most important challenging task in front of the mobile App market. Due to increasing development of e-commerce and utilization of resources online including shopping, paid reading apps and entertainment like paid gaming apps customers are increasingly using the mobile apps for fulfilling their needs and desires. After every purchase and utilization of apps utilities most of the customers of various mobile apps writes reviews about their app usage experiences, feelings of positivity or negativity, and emotions of their satisfaction or dissatisfaction. New customers for those apps look at these reviews for making pur-

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chasing decisions or for making decisions in utilizing those apps. Most of the customers blindly believe in reviews for making their decisions in making purchases or in utilizing the mobile apps. Such customers think that if reviews are positive mobile apps are authentic and hence they can make purchases. Otherwise they think that mobile apps are not authentic and they stop using those apps in fulfilling their needs. This attitude of most of the new customers is considered as the weakness and considered as strength for fraudulent organizations or groups in giving fake reviews.

Fake reviews detection and review spammers detection is becoming a research topic for the researchers as spam behavior becomes more and more now a day's causing destructive results. Hence there is a urgent need for detecting fake or false positive reviews and false negative reviews, which misguide the customers in utilizing or purchasing the products in mobile applications. Also to defame the genuine mobile applications, fake reviews are generated by paying money to the people who create such fake reviews. So precision and recall of the mobile apps reviews is to be found by the researchers in detecting fake reviews through some machine learning frame work or algorithm. Among various supervised machine learning algorithms few are compared in this paper. The empirical results from the experiments conducted show that the Random Forest algorithm performs well with good Precision and Recall scores.

2 Literature Review

We gone through various journals as part of literature review and few papers [3] are listed below specifying the authors details,data sets used ,method used and results.

Reference Number	Authors of the paper and year of publication	Dataset used	Data Preprocessing and Machine Learning algorithms used.	Results
[3]	Alsubari et al., 2022	Hotel Review and data sets from trip advisor.	TF-IDF, Ngram approaches are used for data preprocessing. Machine learning algorithms used are Naïve Bayes (NB), Support vector machine(SVM), Adaptive Boosting(AB), and Random Forest (RF)	NB-88% SVM-93% AB-94% RF-95% Test accuracy and F1 score
[4].	Elmurngi & Gherbi, 2017	Yelp restaurant reviews	KNN, Naive Bayes (NB), SVM, Logistic Regression,and Random forest. N-gram language models	KNN outperforms with the best f-score of 82.40%
[5].	Oh et al. (2013)	1,711,556 reviews mined from 24,000 Google Play apps	SVM	0.8981 (Precision), 0.8165 (Recall), 0.8553 (F-Measure)
[6]	McIlroy et al. (2015a)	User reviews from the Apple app store and Google Play	Naïve Bayes, Decision Tree, SVM	Average 59% (Accuracy), 44 percent (Exact Match), 65 percent (Precision), 64% (F-measure micro) and 56% (F-measure macro))

Fig. 1. Table of papers surveyed

3 Research Method and Data

For this study we collected a dataset i.e., Official reviews dataset from Apple App Store[9] consisting 1,40,000 apps metadata and reviews. Reviews are crawled using GoLang based on iTunes APIs. Reviewers wrote around 26 thousand distinct reviews, i.e., using their Apple IDs. We used the Language Identification approach i.e LangID tool library to identify and retrieve fake English language reviews only. Also N-gram[10] approach may be used for language identification.

To detect fake reviews, a labeled and balanced dataset is created to train and evaluate multiple classifiers based on the of fake reviews and official reviews with Feature extraction and machine learning approach. There are various ways of creating fake reviews. One way is Fake reviewers assign review requests to themselves on certain products or mobile applications. They submits an appropriate fake review to the mobile application store. As a proof, they upload a review edit screen screenshot showing their rating and review to the provider.

Category	Official Reviews Dataset		
	Rank	Apps	Reviews
Books	19	25069 (1.75%)	0.89%
Business	3	130825 (9.15%)	1.35%
Catalogs	23	10951 (0.77%)	0.29%
Education	2	131302 (9.18%)	1.74%
Entertainment	5	79504 (5.56%)	5.68%
Finance	14	34684 (2.43%)	1.66%
Food & Drink	9	50944 (3.56%)	1.34%
Games	1	326864 (22.86%)	49.95%
Health & Fitn.	8	54410 (3.80%)	3.23%
Lifestyle	4	102183 (7.15%)	2.46%
Medical	16	30101 (2.10%)	0.42%
Music	11	43874 (3.07%)	2.72%
Navigation	20	21559 (1.51%)	0.80%
News	18	26358 (1.84%)	1.64%
Newsstand	25	1021 (0.07%)	0.00%
Photo & Video	12	40034 (2.80%)	6.54%
Productivity	10	44191 (3.09%)	3.35%
Reference	15	34465 (2.41%)	1.50%
Shopping	22	15253 (1.07%)	2.15%
Social Netw.	17	27488 (1.92%)	5.41%
Sports	13	37060 (2.59%)	1.14%
Stickers	21	20979 (1.47%)	0.01%
Travel	7	64846 (4.53%)	1.30%
Utilities	6	71680 (5.01%)	3.61%
Weather	24	4446 (0.31%)	0.82%
		$\sum = 1,430,091$	

Fig. 2. Content overview of Official Reviews data set

Classifier	Accuracy	Precision	Recall	F1	AUC/ROC
RandomForestClassifier	0.970	0.973	0.967	0.970	0.989
DecisionTreeClassifier	0.953	0.949	0.957	0.953	0.953
MLPClassifier	0.919	0.921	0.916	0.918	0.969
SVC(kernel='rbf')	0.901	0.879	0.930	0.904	0.959
SVC(kernel='linear')	0.899	0.878	0.926	0.902	0.960
LinearSVC	0.895	0.861	0.941	0.900	0.964
GaussianNB	0.765	0.731	0.889	0.755	0.955

Fig. 3. Comparision of various algorithms in detecting fake reviews from data set

Above Fig.3 shows the results of the seven classification algorithms. The results and its values can be observed in the Figure. Among all, the best scores and values are achieved by RF algorithm with a recall of 0.967 and AUC/ROC curve value of 0.989.

4 Conclusion and Future Enhancements

Based on the specified results it can be concluded that most of reviews in mobile app stores are identified to be fake. These reviewers are expected to be paid and are asked to give intentionally fake reviews. Sometimes providers buy reviews with high expensive amounts usually in dollars or deal with reviews in exchange portals of mobile applications. Fake reviews seem to look genuine and authentic which may not be identified by the users of mobile apps. Fake and genuine reviews are classified from the values specified in the Fig 3.

Based on the variations noticed preprocessing and feature extraction is done. We trained, and compared various supervised machine learning approaches. It is noticed from observation that the RF approach identifies fake reviews, with a recall of 96% and AUC/ROC value of 99%.Still further research is needed to improvise the features and precision and recall of RF approach.

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References

1. H. Zhu, H. Xiong, Y. Ge, and E. Chen, "Ranking fraud detection for mobile apps: A holistic view," in Proc. 22nd ACM Int. Conf.Inform. Knowl. Management 2013, pp. 619–628.
2. Alturaief, N., Aljamaan, H., Baslyman, M.: "Aware: aspect-based sentiment analysis dataset of apps reviews for requirements elicitation". In: 2021 36th IEEE/ACM International Conference on Automated Software Engineering Workshops (ASEW), pp. 211–218. IEEE (2021)
3. Alsubari, S. N., Deshmukh, S. N., Alqarni, A. A., Alsharif, N., Aldhyani, T.H. H., Alsaade, F. W., & Khalaf, O I. (2022). "Data analytics for the identifi cation of fake reviews

using supervised learning". Computers,Materials and Continua, 70(2), 3189–3204. https://doi.org/10.32604/cmc.2022.019625.

4. Elmurngi, E., & Gherbi, A. (2017). "Detecting Fake Reviews through Sentiment Analysis Using Machine Learning Techniques." DATA ANALYTICS 2017 : The Sixth International Conference on Data Analytics Detecting, c, 65–72.
5. Oh, D. Kim, U. Lee, J. Lee, J. Song "Facilitating developer-user interactions with mobile app review digests",2013 ACM SIGCHI Conference on Human Factors in Computing Systems, CHI '13, Paris, France, April 27–May 2, 2013, Extended Abstracts (2013), pp. 1809-1814, 10.1145/2468356.2468681
6. S. McIlroy, N. Ali, H. Khalid, A. E. Hassan "Analyzing and automatically labelling the types of user issues that are raised in mobile app reviews" Empir. Softw. Eng. (2015), pp. 1-40.
7. Indriati, A. Kusyanti and D. Zakia, "Sentiment Analysis in the Mobile Application Review Document Using the Improved K-Nearest Neighbor Method," 2019 International Conference on Sustainable Information Engineering and Technology (SIET), Lombok, Indonesia, 2019, pp. 332-337, doi: 10.1109/SIET48054.2019.8986037.
8. W. Martin, F. Sarro, Y. Jia, Y. Zhang and M. Harman, "A Survey of App Store Analysis for Software Engineering," in IEEE Transactions on Software Engineering, vol. 43, no. 9, pp. 817-847, 1 Sept. 2017, doi:10.1109/TSE.2016.2630689.
9. Lin Zhang, Kun Hua, Honggang Wang, Guanqun Qian, Li Zhang, Sentiment Analysis on Reviews of Mobile Users,Procedia Computer Science,Volume 34, 2014,Pages 8-465,ISSN 1877.