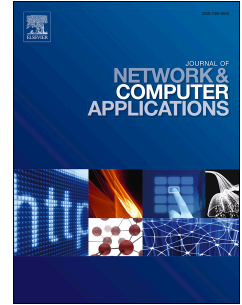


Accepted Manuscript

Continuous authentication of smartphone users based on activity pattern recognition using passive mobile sensing

Muhammad Ehatisham-ul-Haq, Muhammad Awais Azam, Usman Naeem, Yasar Amin, Jonathan Loo



PII: S1084-8045(18)30071-7

DOI: [10.1016/j.jnca.2018.02.020](https://doi.org/10.1016/j.jnca.2018.02.020)

Reference: YJNCA 2079

To appear in: *Journal of Network and Computer Applications*

Received Date: 14 May 2017

Revised Date: 31 January 2018

Accepted Date: 27 February 2018

Please cite this article as: Ehatisham-ul-Haq, M., Awais Azam, M., Naeem, U., Amin, Y., Loo, J., Continuous authentication of smartphone users based on activity pattern recognition using passive mobile sensing, *Journal of Network and Computer Applications* (2018), doi: 10.1016/j.jnca.2018.02.020.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 Research Paper

2 **Continuous Authentication of Smartphone Users Based on** 3 **Activity Pattern Recognition Using Passive Mobile Sensing**

4 **Muhammad Ehatisham-ul-Haq^{a,*}, Muhammad Awais Azam^a, Usman Naeem^b, Yasar Amin^a,**
5 **Jonathan Loo^c**

6 ^a Faculty of Telecom and Information Engineering, University of Engineering and Technology, Taxila, Punjab, Pakistan.

7 ^b School of Architecture, Computing and Engineering, University of East London, UK.

8 ^c School of Computing and Engineering, University of West London, London, UK.

9 * *Corresponding author:* ehatishamuet@gmail.com

10 **Abstract:** Smartphones are inescapable devices, which are becoming more and more intelligent and
11 context-aware with emerging sensing, networking and computing capabilities. They offer a captivating
12 platform to the users for performing a wide variety of tasks including socializing, communication, sending or
13 receiving emails, storing and accessing personal data etc. at anytime and anywhere. Nowadays, loads of people
14 tend to store different types of private and sensitive data in their smartphones including bank account details,
15 personal identifiers, accounts credentials, and credit card details. A lot of people keep their personal e-accounts
16 logged in all the time in their mobile devices. Hence these mobile devices are prone to different security and
17 privacy threats and attacks from the attackers. Commonly used approaches for securing mobile devices such as
18 passcode, PINs, pattern lock, face recognition, and fingerprint scan are vulnerable and exposed to several
19 attacks including smudge attacks, side-channel attacks, and shoulder-surfing attacks. To address these
20 challenges, a novel continuous authentication scheme is presented in this study, which recognizes smartphone
21 users on the basis of their physical activity patterns using accelerometer, gyroscope, and magnetometer sensors
22 of smartphone. A series of experiments are performed for user recognition using different machine learning
23 classifiers, where six different activities are analyzed for the multiple locations of smartphone on the user's
24 body. SVM classifier achieved the best results for user recognition with an overall average accuracy of 97.95%.
25 A comprehensive analysis of the user recognition results validates the efficiency of the proposed scheme.

26 **Keywords:** Activity Pattern Recognition, Behavioral Biometrics, Continuous Authentication, Mobile Sensing,
27 Smartphone User Recognition, Ubiquitous Computing

28 **1. Introduction**

29 Smartphone and mobile technologies have become much popular in a very short span of time. We have
30 moved from larger phones to very slim yet powerful smartphones. These devices have aided people with
31 internet connectivity and enabled them to do their routine tasks at anytime and anywhere. At the moment, 68%
32 of the entire world's inhabitants possesses a mobile phone and this number is anticipated to reach up to 72% by
33 2019 ("The Statistic Portal", 2017). Smartphones have started to replace personal computers and laptops. A
34 market research has shown that mobile phone shipments worldwide are projected to add up to 1.93 billion in
35 2019 (Gartner, 2017). Due to the increased use of smartphones, more and more data is being produced, stored,
36 accessed, and analyzed on these devices at homes, offices, and workplaces on daily basis. This data also
37 includes sensitive and confidential information including personal identifiers, bank account details, and credit
38 card information etc. As much as these mobile devices have become popular and improved worker's output, the
39 security and privacy of sensitive data stored on these devices is still a key problem to be resolved (Krupp et al.,
40 2017). The ever growing popularity of smartphones and mobile devices has resulted in several incentives for the
41 attackers. The attackers are shifting their focus on mobile and hand-held devices as these devices can be stolen
42 easily and victims' confidential data can be compromised. By stealing mobile devices, the attackers can easily
43 reach and contaminate more machines and earn more money by misusing individuals' private details or by

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات