

Overview of Existing Tools for Extracting Health and Fitness Data from mHealth Apps

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Abstract. Wearable sensors and mHealth apps collect fitness and health data outside of clinical settings. These data are essential for precision medicine. This paper addresses and analyzes the available tools for extracting health and fitness data from wearables and mHealth apps. We focus on the most common tools used for research, namely, the Open mHealth-Shimmer application and Fitrockr research platform.

Keywords. Interoperability, mHealth, patient-generated health data, precision medicine, wearables

1. Introduction

Recent technological advancements in wearables and smartphones have created enormous opportunities for collecting mHealth data, including various lifestyle and physical activity data. Precision medicine requires collecting extensive data from multiple sources, including Patient-Generated Health Data (PGHD) collected by different mHealth apps [1]. Individual health information is also necessary for personalized prevention, treatment, and advancing health research. However, interoperability is considered a prerequisite to achieving these goals and subsequently making use of the full potential of digital medicine [2]. This paper addresses and analyzes current tools for extracting health and fitness data from third-party mHealth apps.

2. Methods

We conducted an initial literature review on mHealth interoperability projects and available data extraction tools via searching the standards organization portals (mainly HL7.org). The HL7 mHealth app Data Exchange Project presents a communication process model [3] Utilizing Open mHealth and its Shimmer application [4]. Additionally, the Fitrockr research and analytics platform is widely used in academic research [5]. Then, we analyzed both tools' advantages and limitations in supporting the Extract-

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Transform-Load (ETL) processes, ease of use-adapt the tool, the extent of support of third-party mHealth apps and various data types as well as live data, and compliance with healthcare interoperability standards.

3. Results and Discussion

Shimmer is an open-source tool for extracting data from wearables using major third-party Application Programming Interfaces (APIs), e.g., Google Fit and iHealth. It consists of individual shims (communication libraries), a resource server, and a console. It retrieves data in an Open mHealth compliant format via a simple RESTful operation. Thus, it eliminates the need to connect directly to third-party APIs to access provided data formats and authentication mechanisms. However, Shimmer's source code has not been updated for a long while. This lack of continuous development and technical support led to an inability to include data from widely used wearables, like Garmin devices, as well as various sets of data phenotypes.

Fitrockr provides three commercial apps that extract, manage, and synchronize data from major fitness and health tracking device brands. It supports live-stream health data from Garmin wearables only. A REST API is provided to connect wearables to the Fitrockr apps and hub. All raw data elements can be accessed, analyzed, and exported through a secured (General Data Protection Regulation (GDPR) compliant) platform. Extracted data can be downloaded in Excel, JSON format. Data can be exported via REST API either anonymized or individualized format and collected within a daily, hourly, minute, or second-level intervals. However, Fitrockr does not support health data standardization like Shimmer.

4. Conclusions

This paper explored the advantages and limitations of available tools for extracting data from mHealth apps. Choosing a proper data extraction tool will advance the interoperability of mHealth apps and other open research platforms. The next stage of this work is to enhance the transfer and load processes of Shimmer, an Open mHealth compliant tool, in addition to creating a common data model of the extracted data.

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