Mining Minds, an opensource initiative towards health and wellness platforms

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Abstract—**The focus of healthcare and wellness technologies has shifted towards personal vital signs devices. From health applications over the smartphones, the technology has evolved to be enclosed into devices with much smaller form-vector like fitness bands and smartwatches. The novelty of these devices is the accumulation of sensory data as its users go by their daily life routine; consequently, empowering themselves in self-management as well as enhancing traditional wellness and healthcare procedures. Although substantial domain-specific contributions have been made; however, due to device specific implementations, these contributions fail to execute as independent data accumulation platforms. In this paper, we present the third iteration of Mining Minds, open source health and wellness platform.**

Keywords—Health and Wellness platform, Data curation, Knowledge engineering, wearable devices, Human behavior, Digital health, Wearable sensors, Big data, Cloud computing, Context-awareness, Knowledge bases

I. INTRODUCTION

Recently, a shift has occurred in the theory of handling healthcare and its supporting systems. This change has made a substantial impact on the intention of healthcare models. Rather than late disease management and cure, these models are focusing on preventive, personalized health. Therefore, service providers are pushing forward for wellness based models and conducting researches to investigate their effectiveness. Advanced studies in biomedical healthcare have shown that the most common diseases are partly caused by the poor lifestyle that people maintain in their daily routine. Unhealthy and fast-food diets, use of tobacco, sedentary routines with the lack of exercise are among the potential contributors to develop illnesses and also limit the effectiveness of medical treatments [1] [2] [3]. In spite of this enormous effort by the industry and research, most of the current solutions are single device focused with limited scope and lack of interoperability and performance [4]. Considering the limitations of existing efforts as an opportunity, we have proposed and implemented a comprehensive health and wellness platform called Mining Minds [5].

Mining Minds is built on the core ideas of digital health and wellness paradigms to enable the provisioning of personalized support [5]. It is built on the utilization of prominent digital technologies ranging from real-time raw sensory data acquisition, big data, cloud computing to wearable and Internet of things (IoT), as well as modern concepts and methods such as context-awareness, knowledge basis with analytics, to holistic and continuous investigation on people's lifestyle and provide a variety of smart coaching and support services.

II. METHODOLOGY

Mining Minds is a state-of-the-art wellness platform that is designed to be a layered architecture as illustrated in the fig 1. Each layer pertains to the abstraction on raw sensory data acquired from multimodal data sources. Starting from top, Service Curation Layer (SCL) is responsible for curating recommendation based services based on several different user scenarios; Knowledge Curation Layer (KCL) is responsible for curating data- and expert-driven knowledge that is further extracted as rules which play decisive role in user lifelog monitoring and recommendation generation; Information Curation Layer (ICL) is responsible for context identification of the user based on the raw sensory data; and Data Curation Layer (DCL) is the foundation of Mining Minds platform, responsible for not only real-time data acquisition but also its non-volatile persistence. Furthermore, the user context identified by ICL is continuously monitored by DCL based on the rules provided by KCL for situation detection in which a user might require assistance in the form of recommendations via SCL
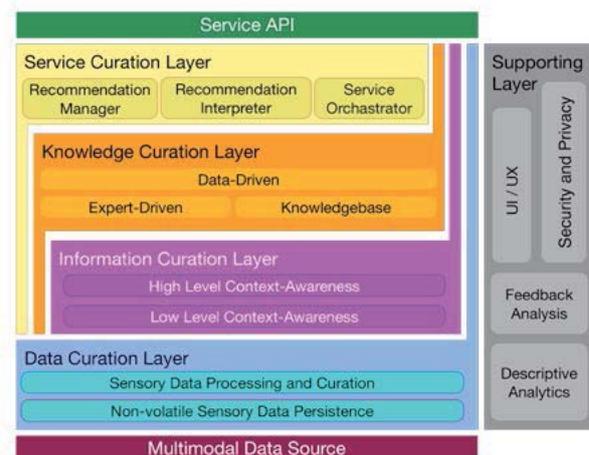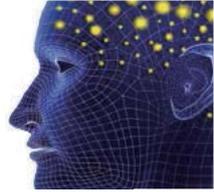
Fig. 1. Mining Minds abstract architecture

Mining Minds platform is a hybrid cloud implementation with raw-sensory data and its processing components hosted on a private cloud; however, services and other layers are deployed on MS. Azure public cloud platform. For the sharability of this implementation, we intend on releasing Mining Minds as open source platform. This intention will enable health and wellness researchers to collaborate and extend our implementation to further possibilities and usages.

III. CONCLUSION

This work presents Mining Minds, a novel digital framework for personalized healthcare and wellness support. The framework has been designed by taking into consideration the requirements of health and wellness systems. The unique architecture of Mining Minds platform is built to support the necessary functionality that enables curation of data, information, knowledge, and services for personalized health and wellness support.

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