

Big Biodata platform enabling smart connected health and point-of-care diagnostics in obese, cancer and ICU patients

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Abstract— The evolution of precision medicine demands integration of information at a number of levels including biomolecular data, physiology and phenotype data arising from eHealth, connected health and point of care applications both in clinical and non-clinical settings. This approach aims in sustainable health delivery solutions based on the P4 (predictive, preventive, personalized, and participatory) medicine. To achieve this big biodata service chains have commenced appearing although still at infancy. We present new approaches for data management and analysis from the AEGLE EU project where data from clinical and health care systems are addressed, and the BigO and WELCOME projects with big biodata coming from social and telemonitoring platforms.

INTRODUCTION

Precision medicine relies on personalisation of health through better clustering of groups of people with common health characteristics. This has resulted in the development of personal health systems (PHS) [1]. These include sensor networks of medical devices, contact centres, medical decision support systems (DSS), coaching and educational services, and frameworks for interoperable medical knowledge management. Thus the evolving ‘big biodata’ space brings volume, versatility velocity and veracity (V⁴); thus, the information and predictive models’ outcomes should be susceptible to changes in overall knowledge, individual knowledge and interventional / treatment possibilities as well as the overall state of the patient.

From home-care, to mobile health (mHealth), ubiquitous health (uHealth) and personalised health (pHealth), the current eHealth ecosystem forms the connected health (CH) model, referring to the emerging technology-enabled model of healthcare delivery [2].

Thus, smart CH enables a shift from reactive, to proactive and patient-centric healthcare models, connecting and empowering stakeholders across the spectrum.

BIG BIODATA MANAGEMENT AND ANALYTICS PLATFORMS

In the WELCOME project, the smart CH model is used for managing and empowering the patient/citizen, while in parallel new integrated care models are investigated to improve care of complex chronic COPD multi-morbid patients. Such integrated healthcare system incorporates feedback from multi-scale and multi-level predictive modelling through telemonitoring systems and can be used to manage and trigger interactions between the patient/citizen and the healthcare professionals enabling a co-decision space.

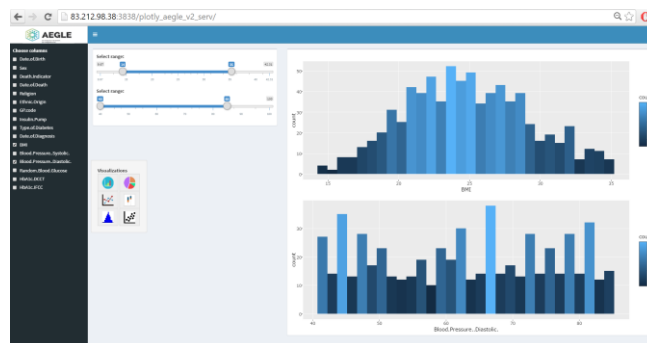


Fig. 1. The AEGLE big biodata visual I/F architecture in ICU

These new types of systems such as the WELCOME have the capacity to generate large volumes of data, dictating the development of new platforms for big biodata management and analytics both in clinical and non-clinical environments.. One of the major relevant projects funded by the EU d is the AEGLE project, where the communication between the local users and platforms and the cloud tools and data computing and storage infrastructures via a data anonymisation and interoperability layer are exchanged and user and medical DSS queries are carried out, no matter the types of data (biomolecular, streaming data, Electronic Health Records, medical images, behavioural and social networking, etc.). In Fig. 1 AEGLE I/F is shown for the ICU data application viewed as point-of-care streaming data [3].

A second example is the newly launched BigO EU project where big biodata are used to fight obesity in young children by means of preventive ways using nutrition data, activity, social and other ambient sources of data and information. Biodata analytics can be performed at cloud level, with HPC reconfigurable resources and accelerators are available, for machine learning and data transforms are needed (anonymisation, visualization, medical DSS).

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