

Designing and Developing a Wearables Hub with Report Generation for AMI Research

Degree programme : Master of Science in Engineering
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This project develops a centralized platform to collect, integrate, and analyze data from wearable devices like Fitbit and Withings, addressing data format challenges. Key features include role-based user management, cross-device data comparison, and customizable, multilingual report generation using large language models like Llama, enabling data privacy through local model deployment.

Context and Motivation

This project is part of ongoing research initiatives within the Applied Machine Intelligence (AMI) research group, which focuses on applying generative AI for mental health and well-being. Wearables, such as Fitbit and Withings, have been selected as data collection tools due to their widespread availability and ability to capture key health metrics from their APIs. However, the differences in data formats, export capabilities, and proprietary protocols across these devices present significant challenges for data integration and analysis. Addressing these challenges is crucial to provide a unified platform capable of delivering meaningful insights from wearable health data.

Objectives

The primary objective of this project is to design and implement a centralized platform that can integrate and analyze health data from multiple wearable devices. In addition to providing a detailed data management solution, the platform is intended to automatically generate textual health reports using large language model. These reports aim to provide wearable users and health care researchers with clear information derived from the collected data. Addi-

tional features include a user management system with distinct roles and a framework for analysing and comparing data from wearables.

System Design and Development

The platform is designed with usability and scalability in mind, making it adaptable for all users. Health care researchers can access aggregated data for broader comparative users data analysis while enabling standard users to view personalized analysis. A modular architecture supports dedicated pipelines for Fitbit and Withings devices, managing data ingestion, transformation, and storage in a central MongoDB database. The system's analytical framework supports cross-device comparisons and extracts key health trends, such as steps, heart rate, and sleep efficiency.



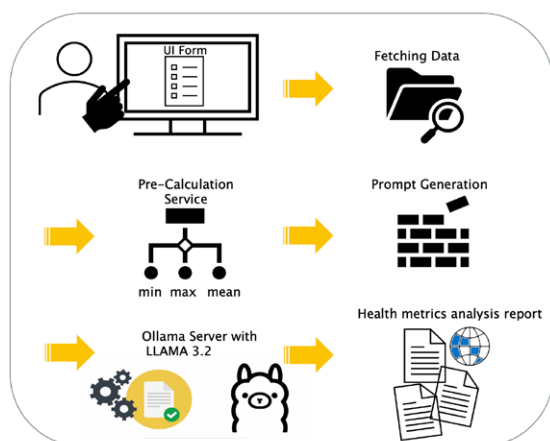
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Report Generation Module

A significant contribution of this thesis is the development of a module for generating text-based health reports using large language models like Llama. These reports, customizable based on user-selected parameters like time range and focus areas, provide clear and accessible summaries of health metrics. They are available in multiple languages, including English, German, French, and Ukrainian. The module prioritizes data privacy by running language models locally, making sure that sensitive health information does not leave the platform's environment.

Future Prospects

Future developments could include expanding the range of supported devices, incorporating additional language models, and improving the customization options for report generation. Further work is also planned to improve the interpretability of the generated reports and to refine the integration of health data for even greater accuracy and usability. The platform supports both research and practical applications in mental health and well-being by merging AI with wearable technology.



The process of report generation based on structured data.