

Graduate Students,
Information and
Communication
Technologies (ICT)

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01 INTRODUCTION

Background

- Buildings consume more than 40% of the total worldwide power consumption.
- There is a potential to supply consumers with evidence-based insights on the costs and merits of ICT-enabled energy-efficient practices.

Objectives

- As a result, the (EM)³ focuses on developing an energy efficiency platform that will:
- include behavior change theories utilizing recommender systems, AI/ML/DL, and effective data visualization utilizing IoT devices and end-user mobile applications, and
 - provide personalized and timely advice to help domestic end-users build and sustain energy-saving habits.

02 METHODOLOGY

- To achieve the stated goal, the framework merges a variety of sub-systems under one ecosystem. The data flow among the sub-systems is shown in Fig. 1.

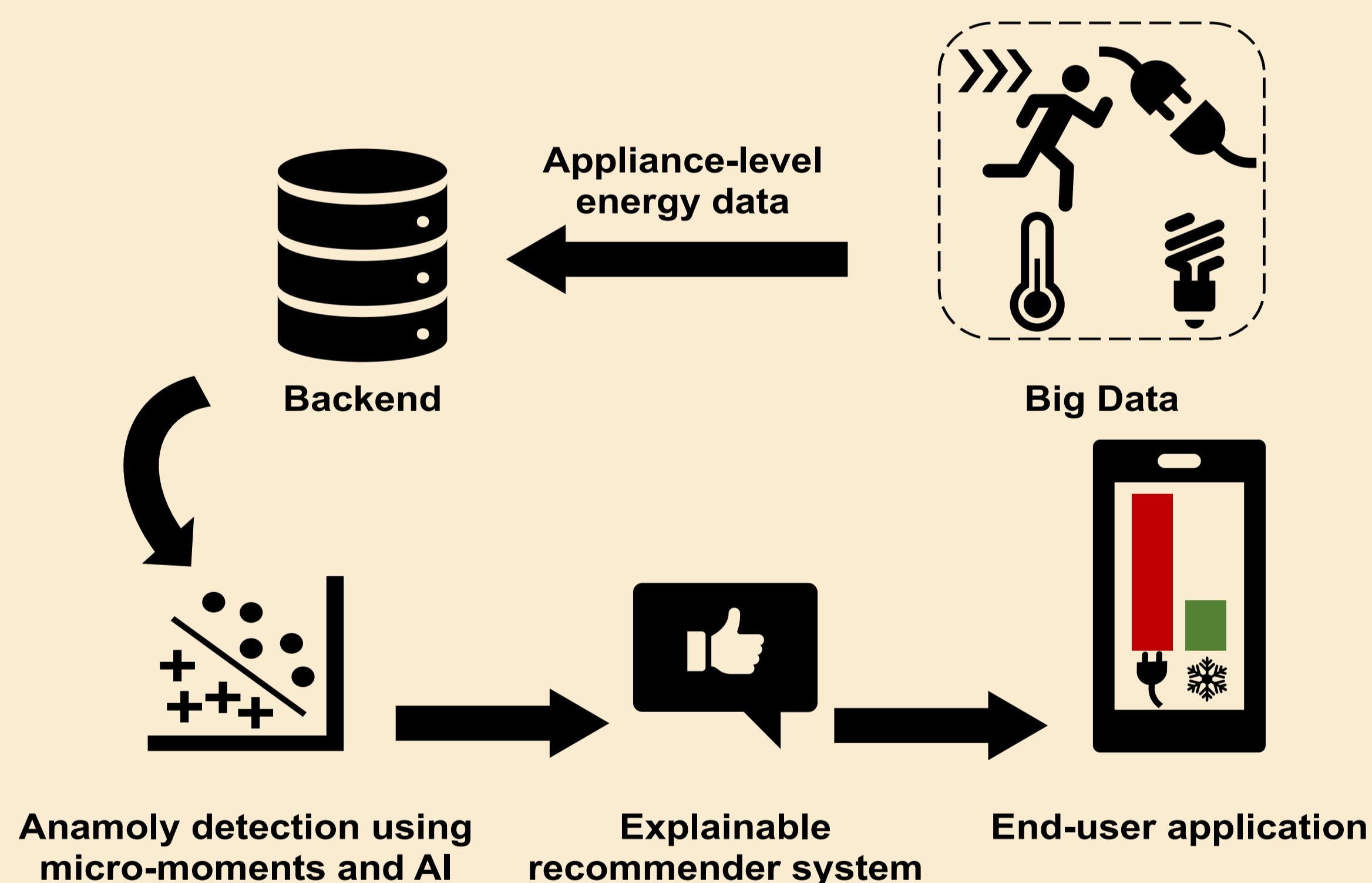


Fig. 1 Overview of the system.

- The micro-moment smart plug is shown in Fig.2, together with the modules that collect power usage data and identify anomalies.

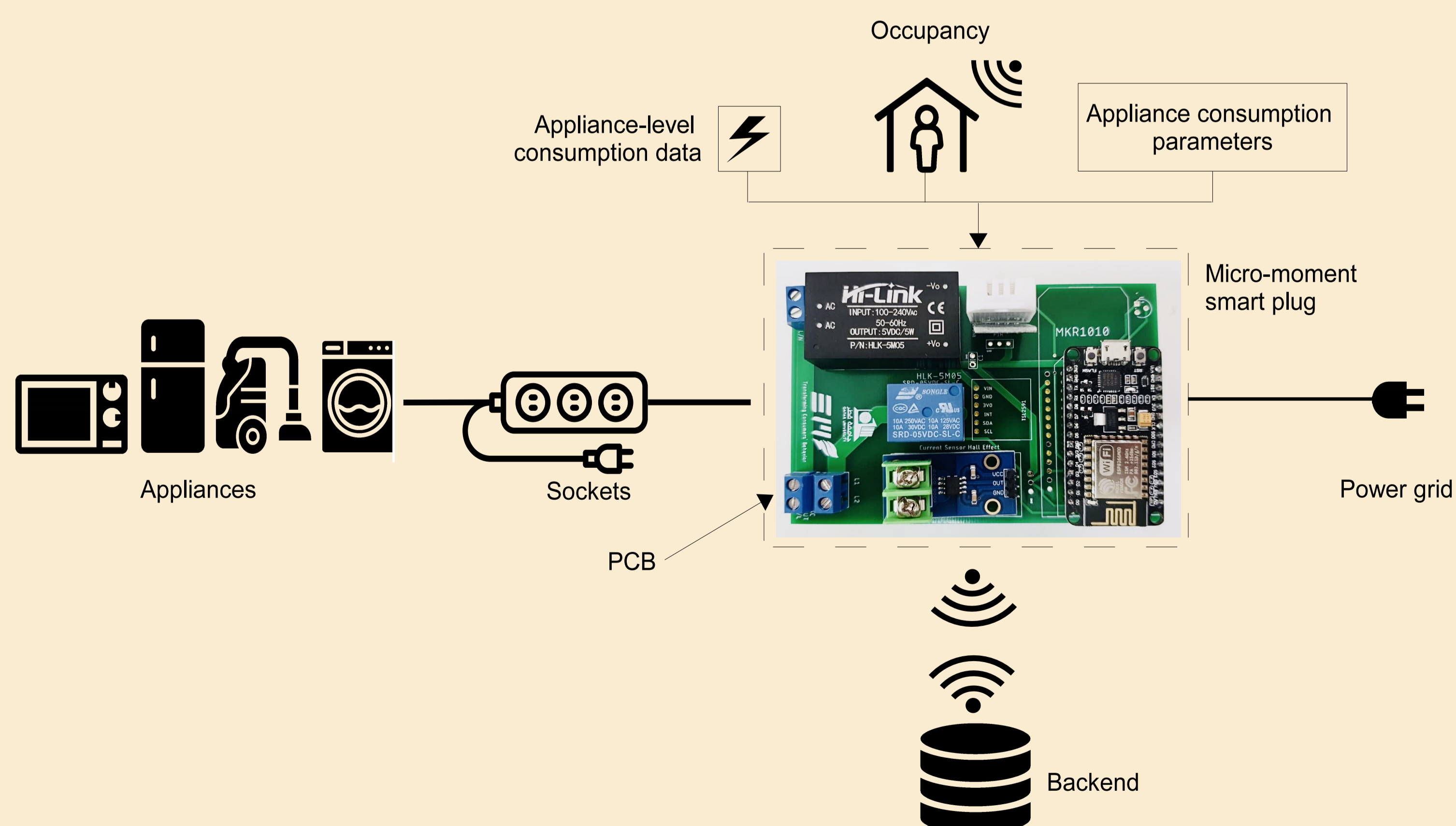


Fig. 2 Micro-moment smart plug.

03 RESULTS

- The outcomes were achieved via the development of a fully functioning energy efficiency framework with :
 - Implementing multiple techniques for identifying appliance-level power usage from disaggregated main load and anomaly detection methods by utilizing AI/ML/DL algorithms.

- Developing behavior change-based strategies to endorse consumption change via the use of micro-moments identification, personalized mobile recommendation systems and proper data visualization (shown in Fig. 3).

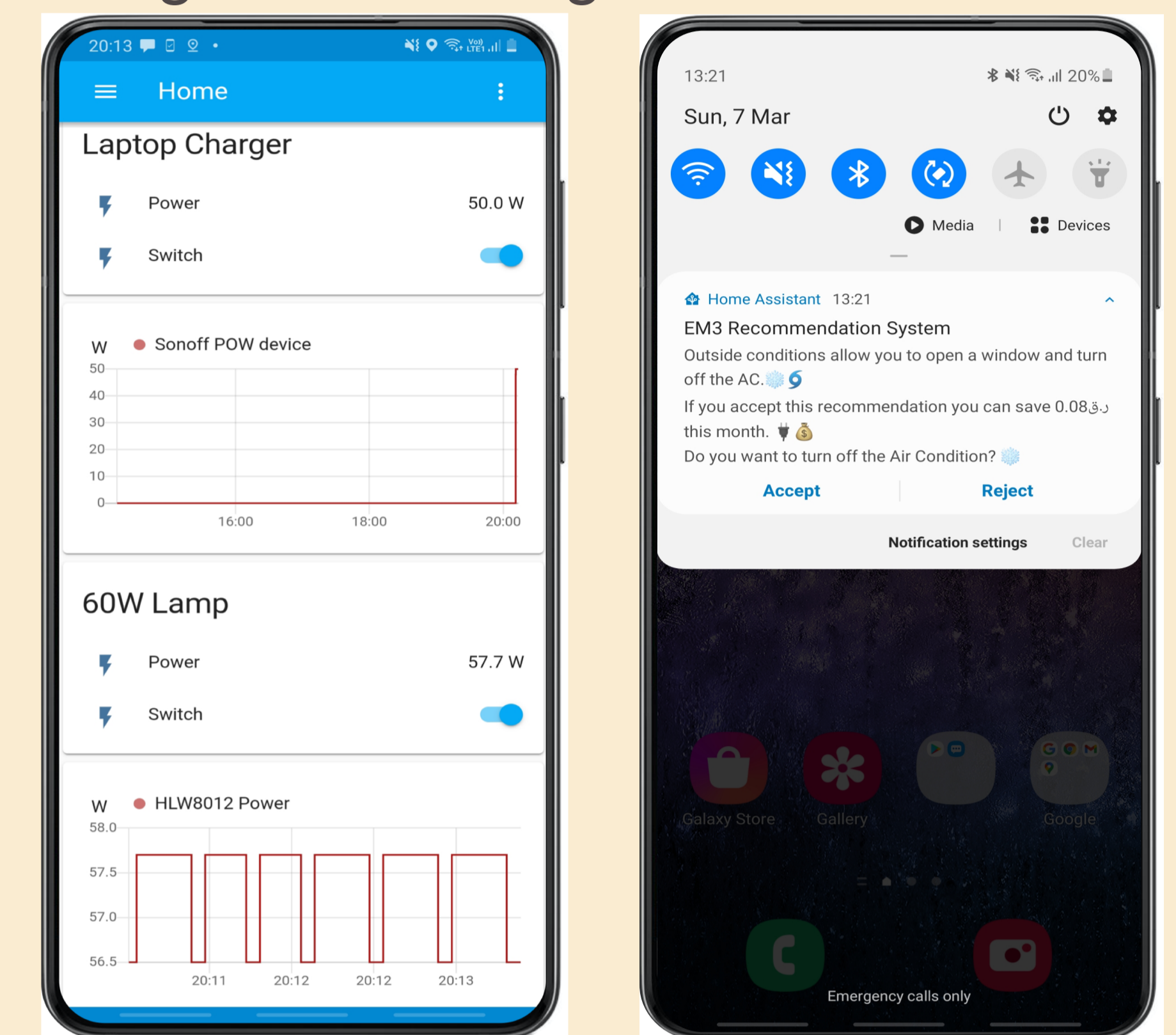


Fig. 3 Data visualization and delivered saving tips via the HA mobile application.

- Integrating the energy-efficient framework into the Home-Assistant (HA) platform illustrated in Fig.4.

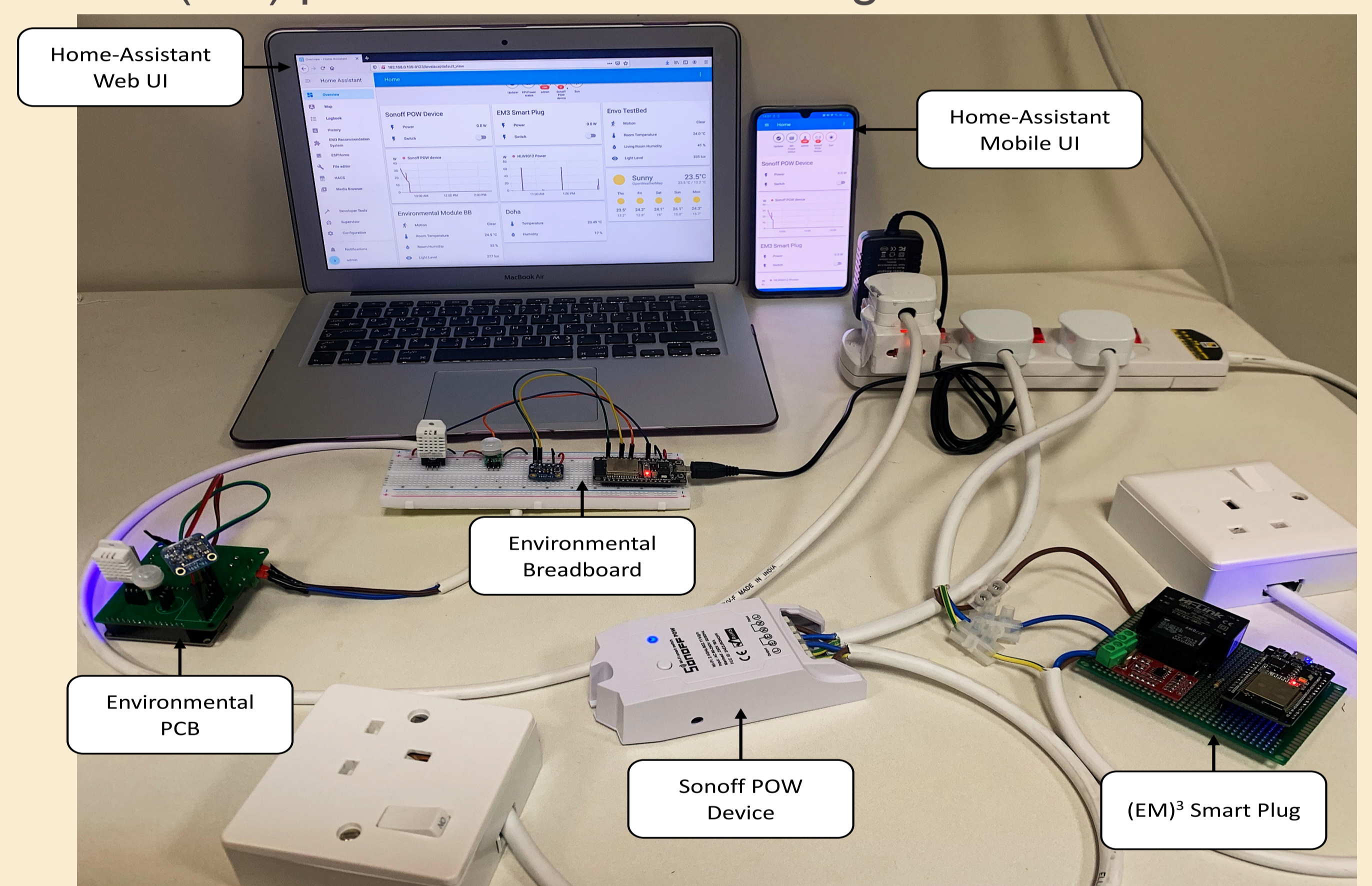


Fig. 4 The (EM)³ hardware setup.

04 CONCLUSION & FUTURE WORK

Conclusions

- Implementation of a complete energy-saving framework based on behavioral change concepts to progressively transform the consumers' behavior.
- Full integration of the system into Home-Assistant to provide data visualization and host the recommender system.

Future Work

- Enhance the packaging for the final hardware products.
- Evaluate the system performance with a group of participants.

ACKNOWLEDGEMENT

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