Smart Readiness of Building and Load Monitoring

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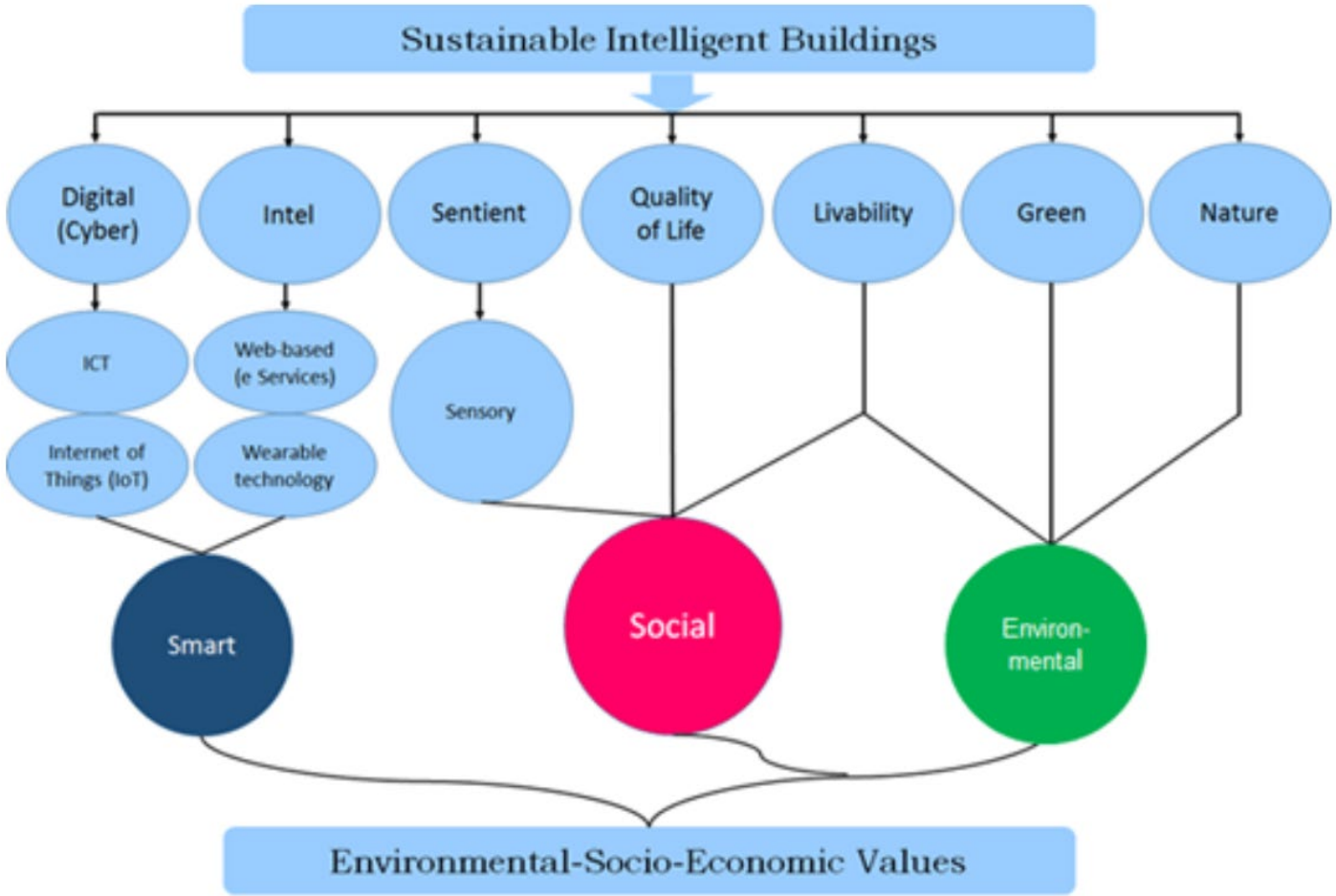
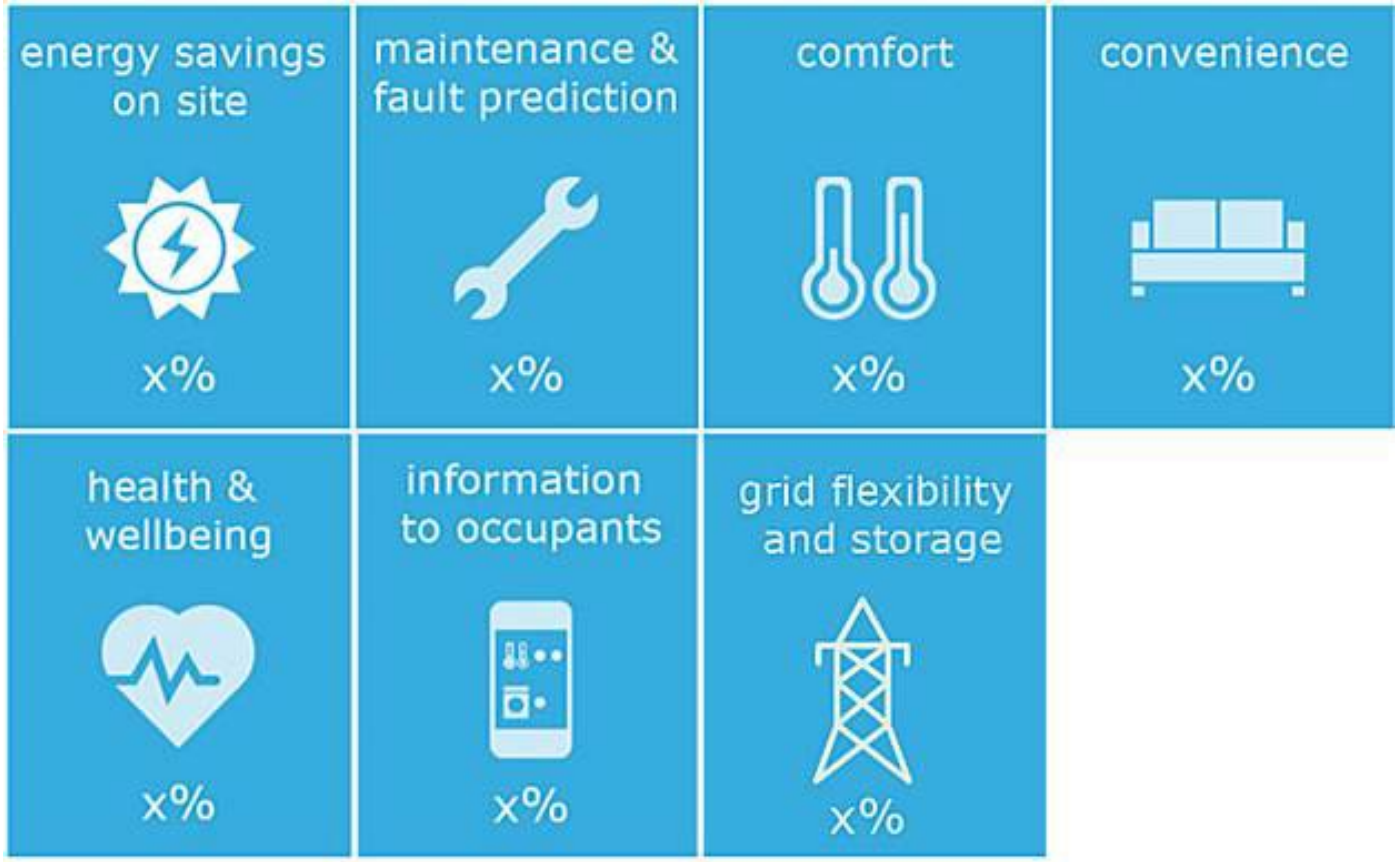


CIBSE Intelligent Building Group, since 1996, IB Road Map, https://www.cibse.org/get-involved/special-interest-groups/intelligent-buildings-group

Smart Readiness Indicator

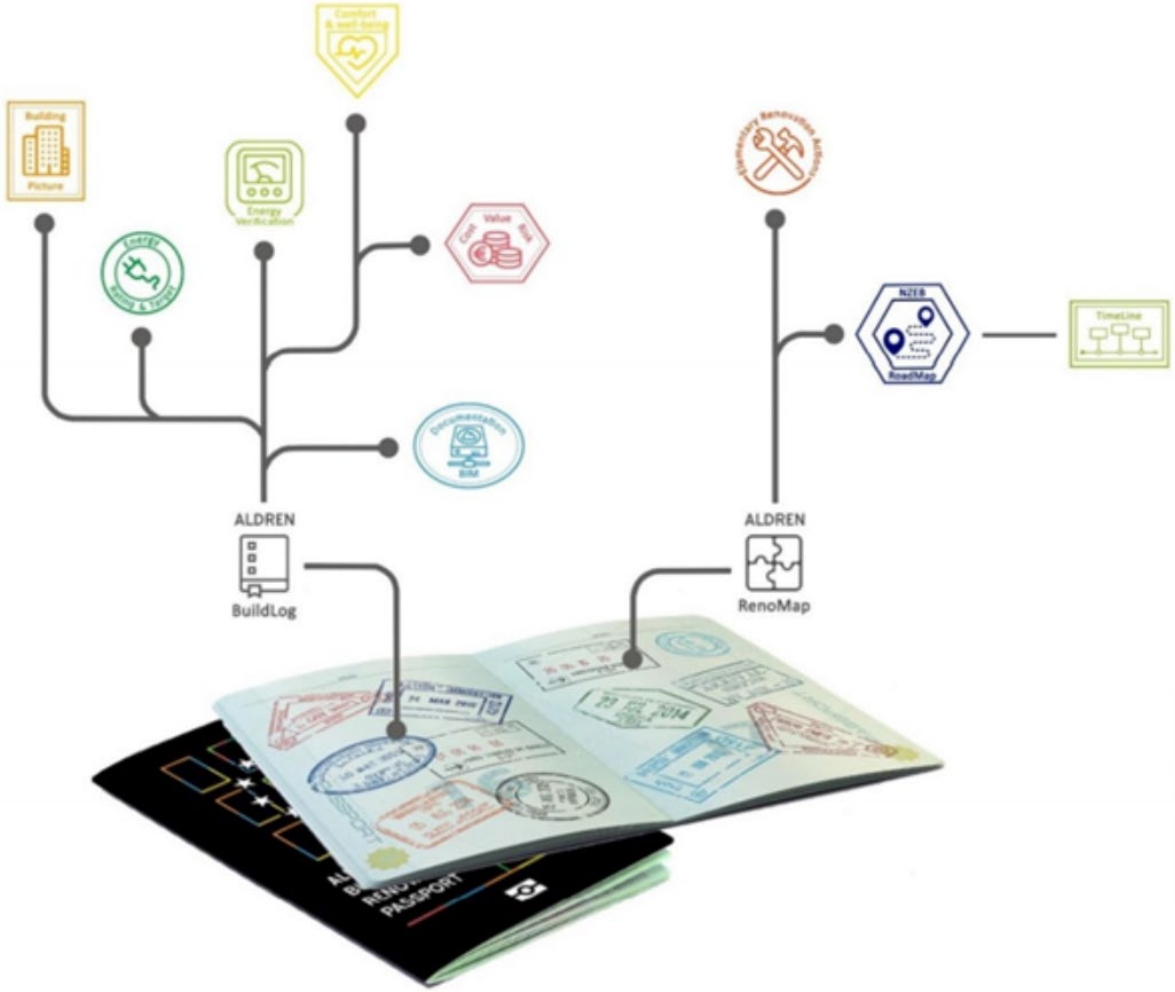
Verbeke et. al., 2020 Final report on the technical support to the development of a smart readiness indicator for buildings, Directorate-General for Energy (European Commission) , Vito, June 2020,

The seven Smart service impact criterion



Technical support studies on SRI – EU DG for Energy Efficiency: Buildings and Products

Building Renovation Passport (BRP)



ALDREN BRP elements and modules (source: The ALDREN project https://aldren.eu/)

Load monitoring and control

- Smart metering to promote smart readiness of buildings
- Important for energy consumption controls and planning
- Appliances usage feedbacks result in energy-saving
- Behaviour patterns
- Grid management and demand side approaches

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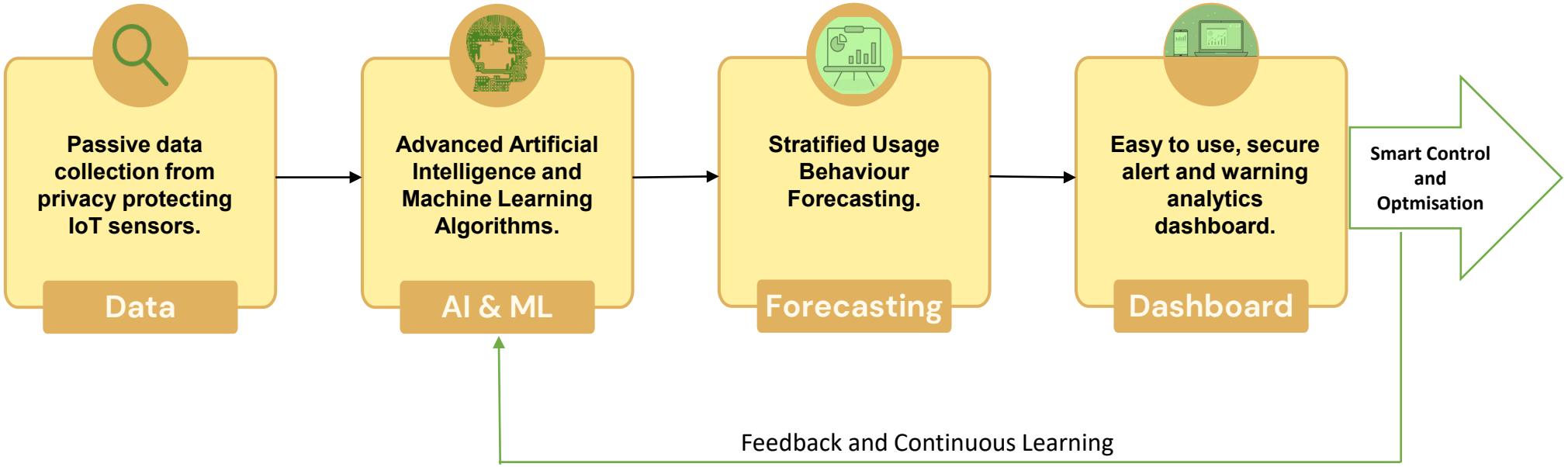
AI and Machine Learning in IoT, On-going project



Source: Xing, Mohammed, and Archenhold, 2024, Smart Building and Sustainability Forum, VOX Conference Centre, Birmingham

INTEGRATED SYSTEM TECHNOLOGIES

Innovate UK | Knowledge Transfer Partnerships

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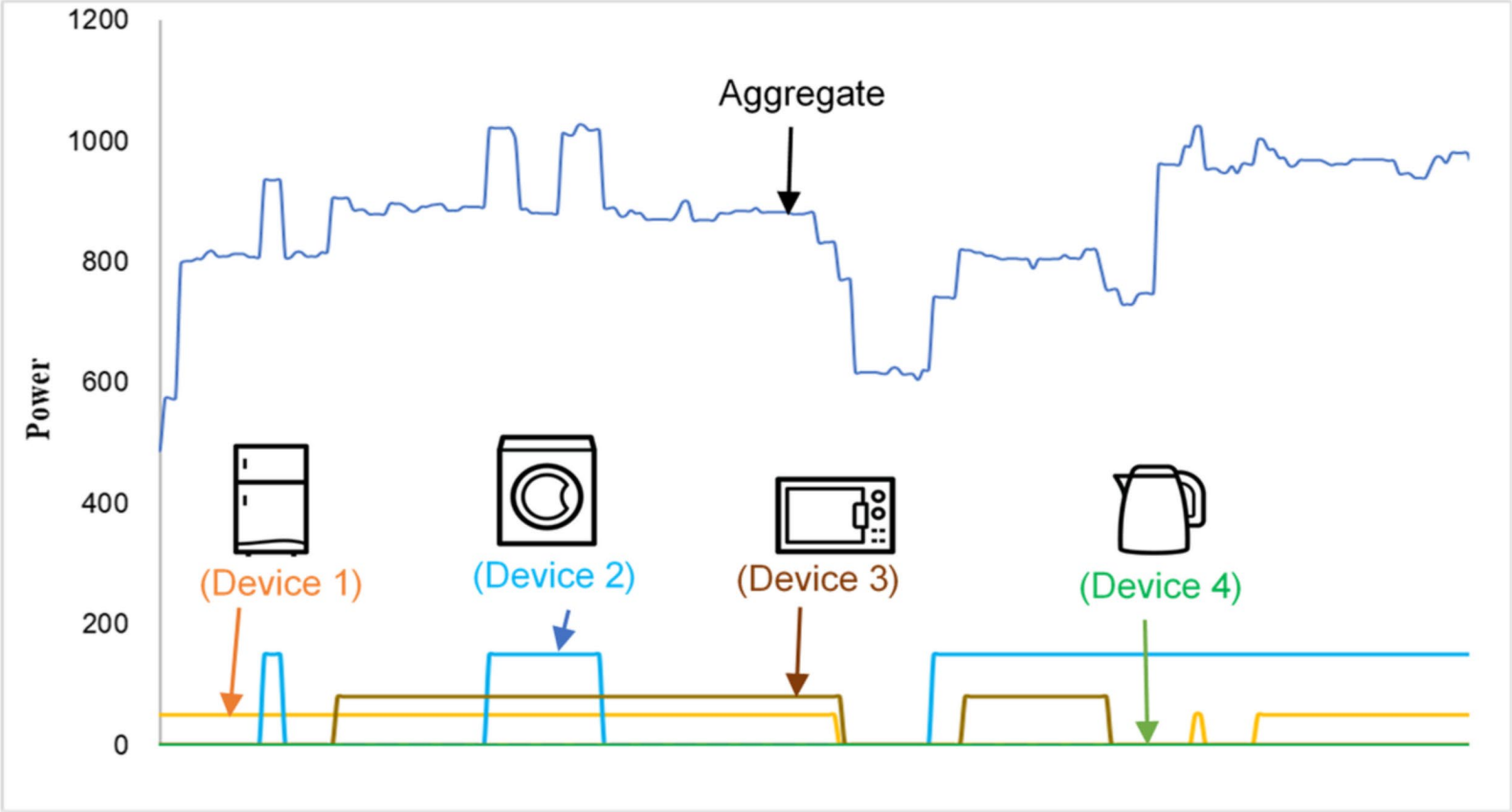
- Bilal Mohammed, Meng, MSc, Machine learning Engineer, IST
- Dr. Yangang Xing, Associate Professor, FCIBSE, NTU
- Dr. Geoff Archenhold, PhD, Director of IST

Load Monitoring



Power Monitoring profile for residential building Sensors 2022, 22(11), 4036; https://doi.org/10.3390/s22114036

Non-Intrusive Load Monitoring (NILM)

- NILM techniques aim to separate aggregate data into individual loads where the NILM problem formulation is summarized by equation (1):

$$Y(t) = \sum_{n=1}^{M} y_n(t) + \varepsilon(t), \qquad \text{Eq. 1}$$

- Where Y(t) is the aggregate signal which consists of a sum of M individual appliance loads and the ε noise and approximation error.

Intrusive Load Monitoring (ILM) and Non-Intrusive Load Monitoring (NILM)

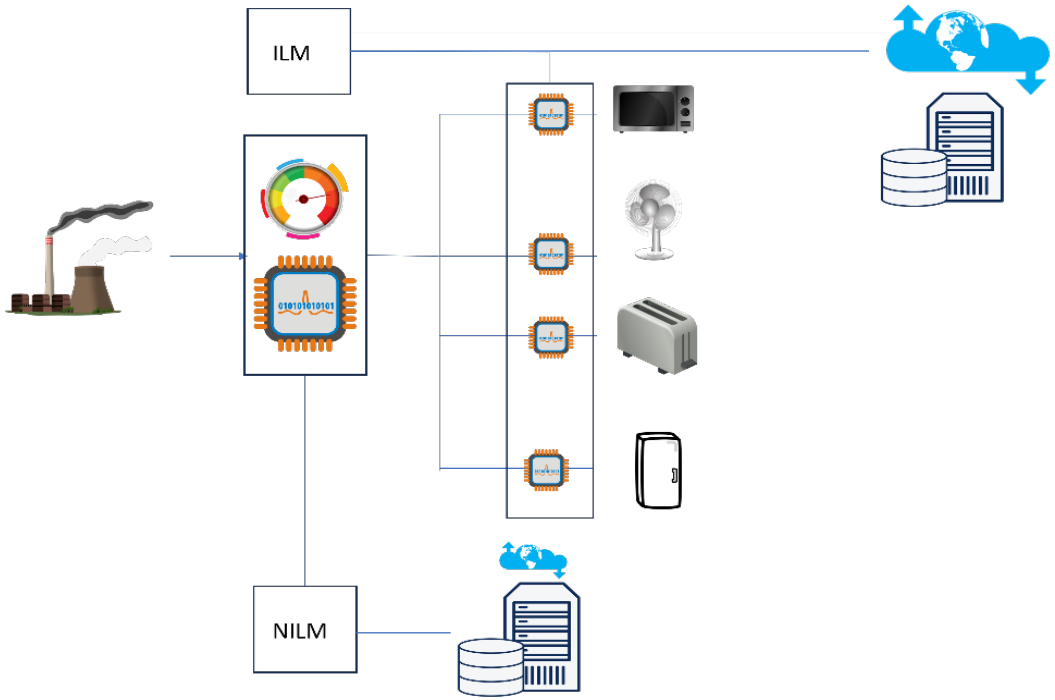


Figure 8: ILM/NILM Architecture

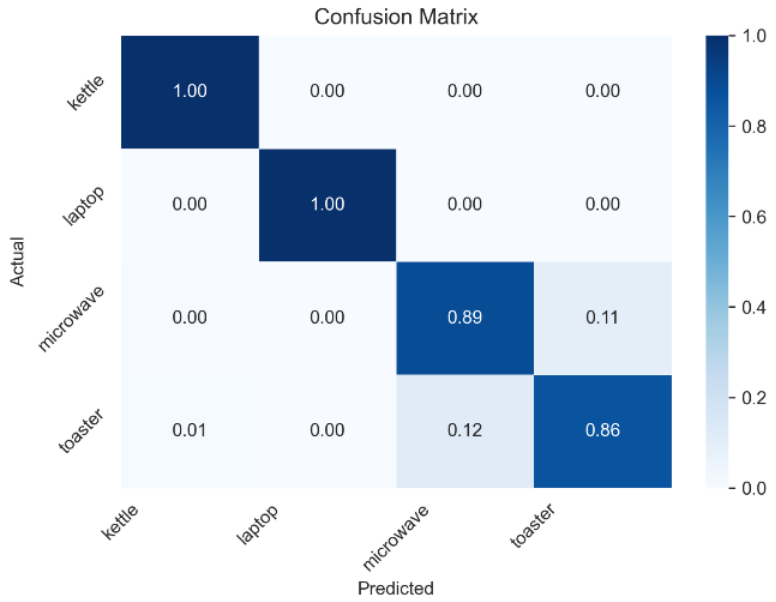


Figure 9: Automatic Plug-Load Classification in ILM (initial results)

Interested in Collaborating?

If you are interested in trying out our system or discussing potential collaboration opportunities, please get in touch with us!

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- Based on the load behavior, devices can be classified into four categories:

- Type I (with ON/OFF states),
- Type II (withmulti-states),
- Type III (continuously varies) and
- Type IV (constant power).