INTELLIGENT CLIMATE. A MACHINE LEARNING SOLUTION BUILT ON SAP LEONARDO & R FOR HVAC ENERGY AND COMFORT OPTIMIZATION

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Most of air-conditioning and heating systems (HVAC) follow a very traditional approach when ruling the environmental management programs, based on hardcoded rules (RBC – Rule-Based Controllers) that command the whole system in an inflexible fashion.

In our project, we have developed an intelligent climate solution. It involves machine learning models powered by R engine and integrated with Extended Application Services (XS); real-time data ingestion through the Internet of Things 4.0 service at SAP Cloud Platform (SCP); SAP HANA data model and storage; end-user interface built in Fiori framework with MQTT (communication protocol) integration to remotely send commands back to the indoor units, and hardware integration with BACnet industrial protocol.

SAP LEONARDO

SAP evolves to the next level, integrating all disruptive innovate technologies into a all-in-one platform. SAP Leonardo allows users to create, deploy and manage real value added projects.

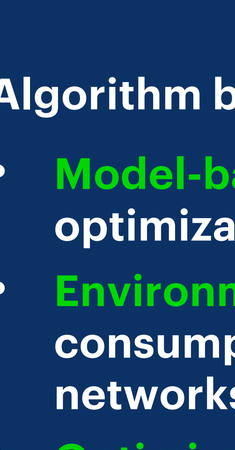
R INTEGRATION

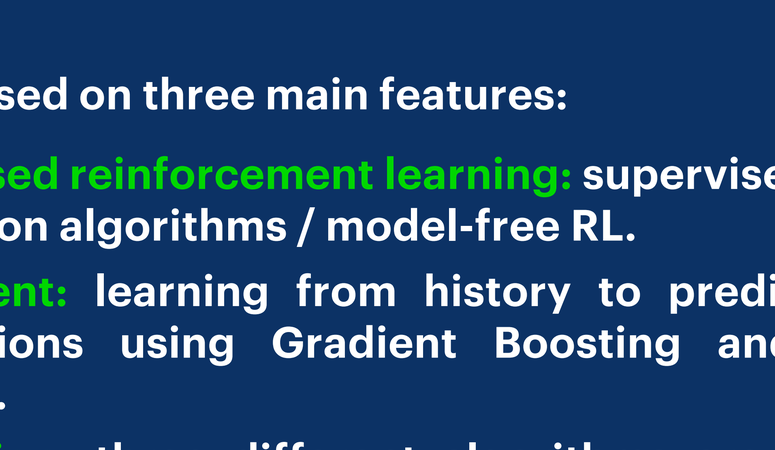
Algorithm based on three main features:

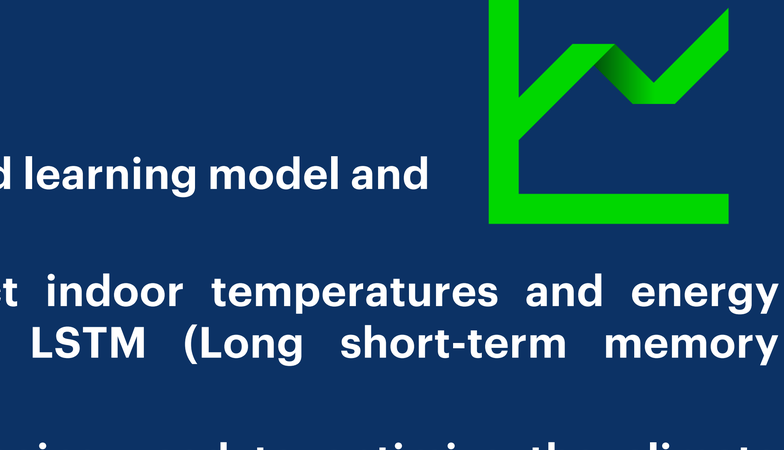
- **Model-based reinforcement learning:** supervised learning model and optimization algorithms / model-free RL.
- **Environment:** learning from history to predict indoor temperatures and energy consumptions using Gradient Boosting and LSTM (Long short-term memory networks).
- **Optimization:** three different algorithms are being used to optimize the climate conditions: Ant colony optimization; Fuzzy logic and Q-learning.

USER EXPERIENCE

The friendly and responsive front-end allows to manage and monitor all HVAC devices any time, anywhere. It includes a comprehensive and descriptive set of graphs and ratios.







HIGH PERFORMANCE. DELIVERED.

Preliminary results show an actual saving in energy consumption between the range of 12%-25%, and ROI in less than one year, depending on the size of the place and equipment.

Industry X.0