MCPS PROJECT

HOUSE TEMPERATURE MONITORING SYSTEM & SMART AIR DISTRIBUTION

MOBILE AND CYBER-PHYSICAL SYSTEMS
A.Y. 2021/2022

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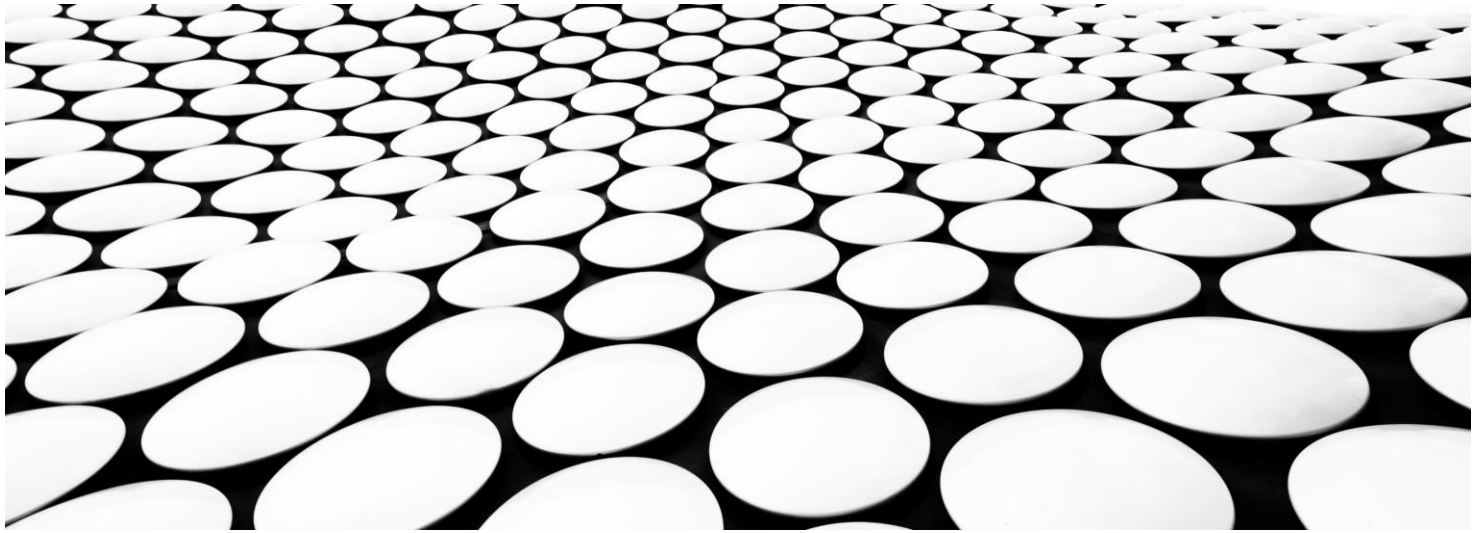
HTTPS://GITHUB.COM/ELIAPICCOLI/MCPS-PROJECT



PROBLEM DESCRIPTION

Automatic temperature monitoring system

Future temperature prediction

Smart temperature balancing

PROPOSED SOLUTION

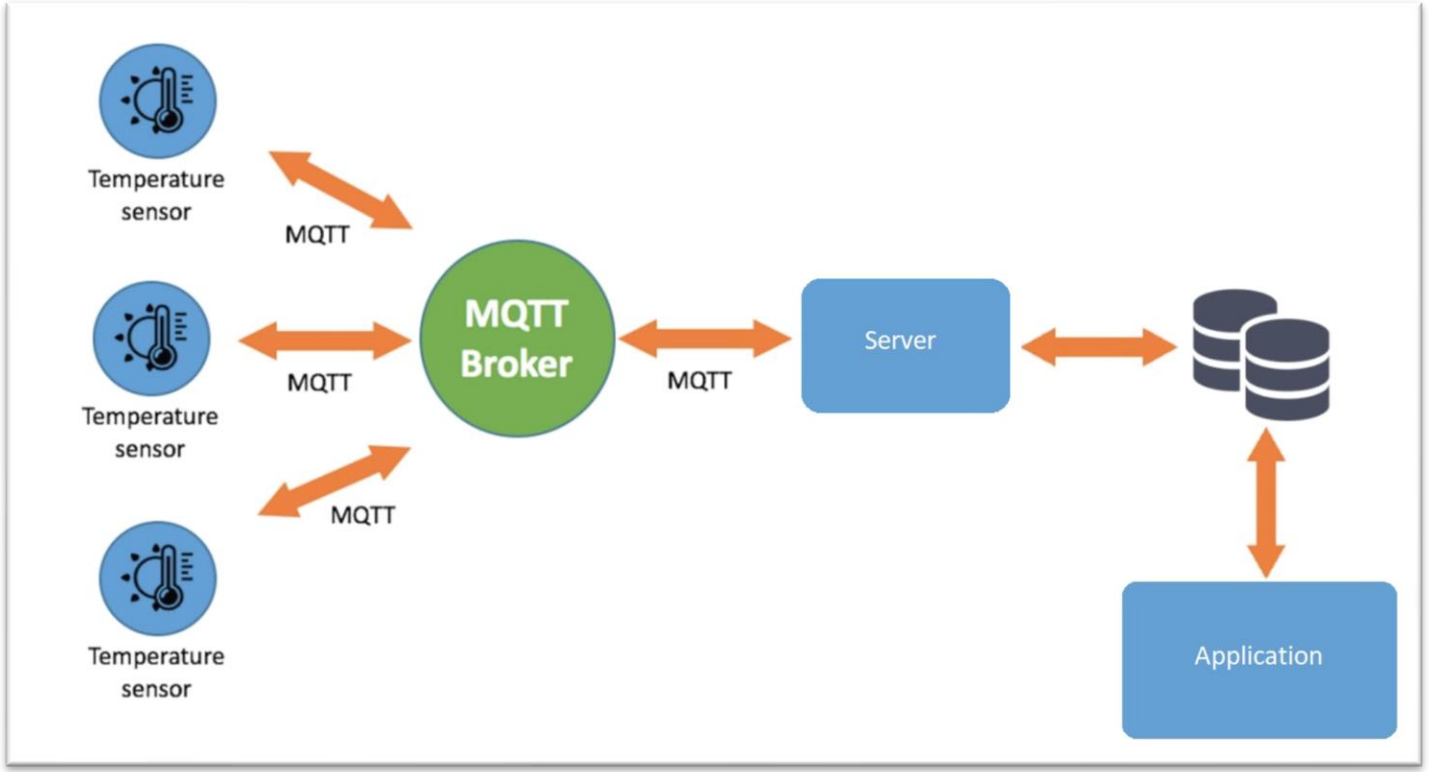
Sensor in each room of the house.

Graphical interface to monitor current temperatures and to show near future trend.

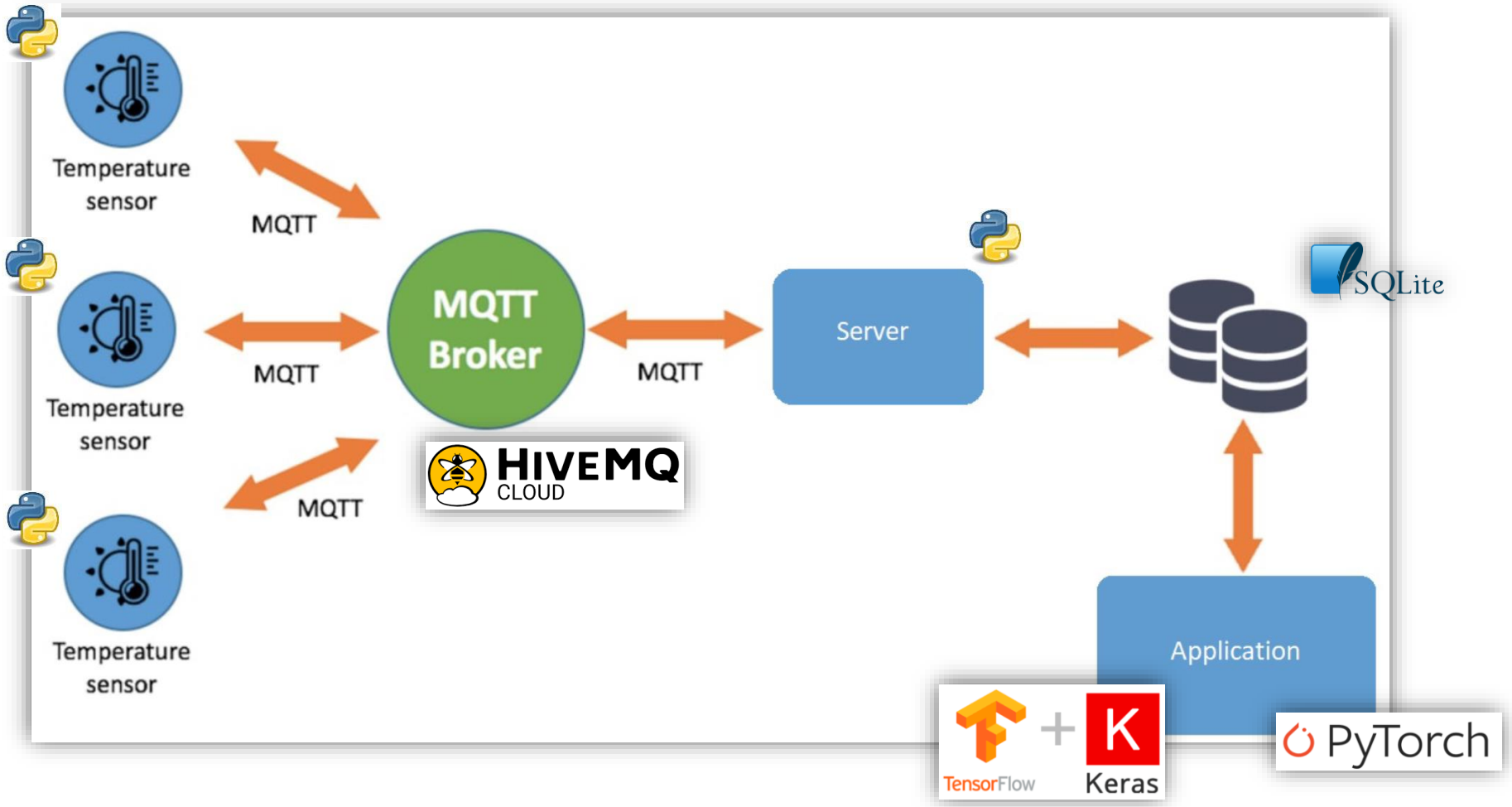
System that interacts with the ventilation system of each room.

SYSTEM ARCHITECTURE

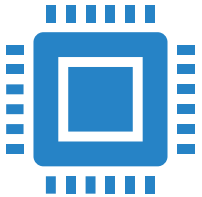
- Sensors
- MQTT broker
- Server
- Relational database
- Application



IMPLEMENTATION OF THE SOLUTION



SENSORS AND SERVER



Sensors

- Simulate data using a Gaussian function that shifts its mean through time

- Sample data at a rate given by the user

- Sends data to the MQTT broker in the topic *“temperature/<device_name>”*

Server

- Subscribes to the topic *“temperature/#”* in order to receive data from all the sensors

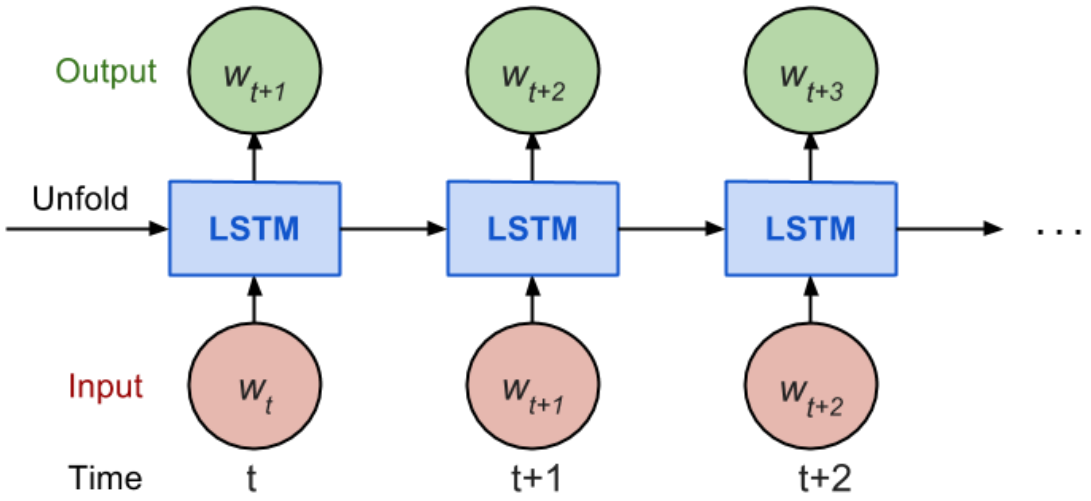
- Stores data in the local database that will be used by the applications

APPLICATIONS

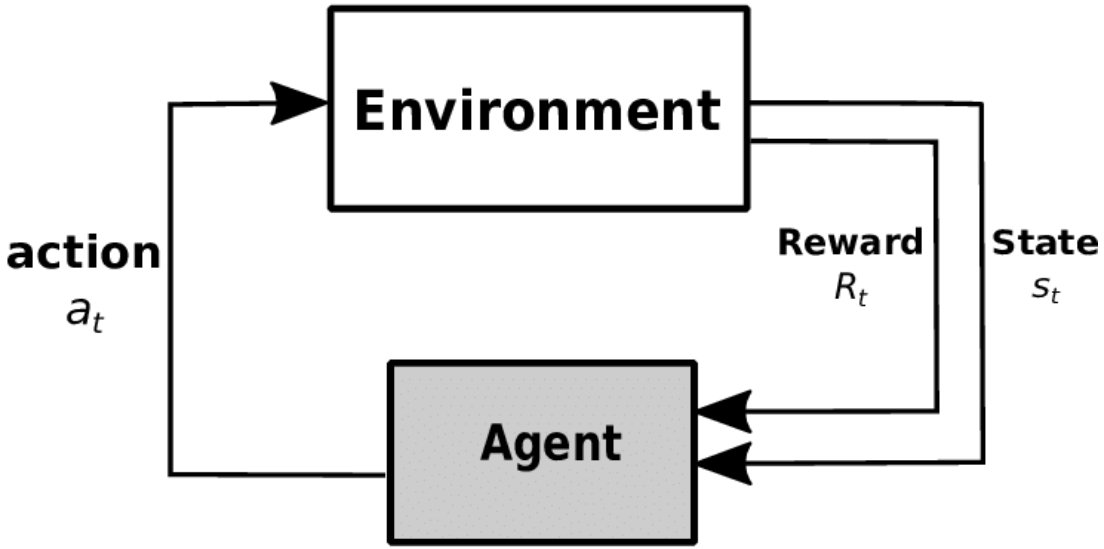
- *Real time interface* to monitor temperature inside the house
- *Real time plot* of the temperature for a specific room
  - Can show the future trend of the temperature
  - The prediction is given using a LSTM model
- *Activate ventilation system* to balance temperatures among all rooms
  - User select the ventilation force of the system
  - The ventilation system is controlled by an Artificial Intelligence trained with Reinforcement Learning

QUICK INSIGHT ON NN MODELS

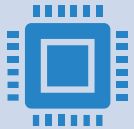
- *Long-Short Term Memory (LSTM)*



- *Reinforcement Learning Agent*



FUTURE WORK



Install real sensors in a house with a built-in programmable ventilation system.

Interact with an air conditioning system: let the user set a desired temperature.

For large rooms manage more than one sensor.

Start
LIVE DEMO