Università di Camerino

Heatmap IoT Analytics

Goal and Objectives

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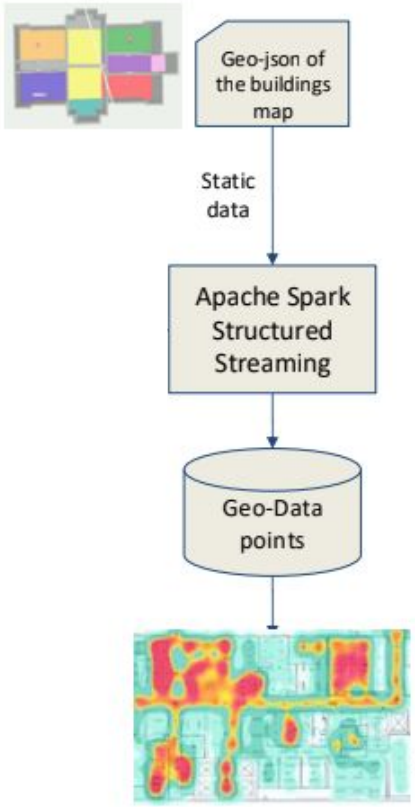
Problem Statement

And Project Proposal

We have time series data that contain temporal information about IoT events and we have the geolocation information of the source device outside of this stream.

Our objective was to develop an analytical pipeline to match this data with the geolocation information and perform aggregation over time windows of 30 and 60 minutes, resulting in geo-heatmap visualization tool.



Tool Pipeline

Methodologies

A Big Data Approach

Data Regularization

Dataset Complexity

Dataset was adjusted with our goal by adding a column ID to better retrieve the room.

Project Configuration

Teamwork and GitHub Setup

https://github.com/SamuelePirani/heatmap-iot-analytics

1. Github setup using Github Projects as a Backlog for better understanding of tasks to do.
2. We made good use of Github Issues and Pull Requests to keep track of our progresses.
3. In the project, we took care of setting up a configuration builder to set the folder paths of our project so that it could work between different devices.

Environment Creation

Dependencies Management

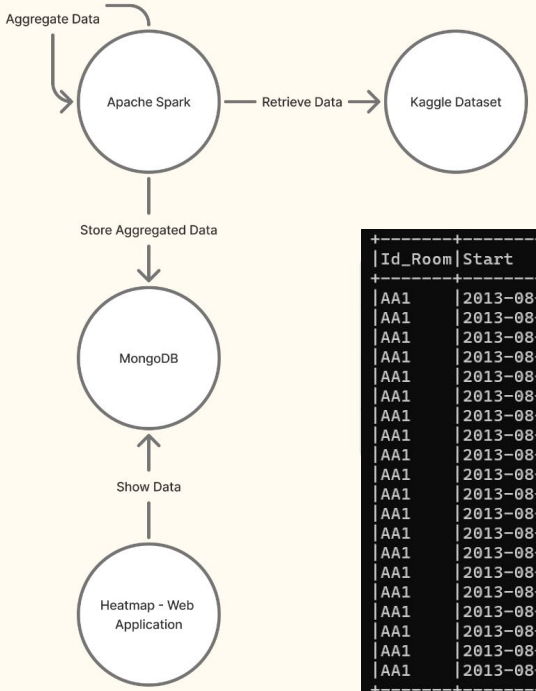
1. We used a tool to ease the building process of our project and the installing of our dependencies.
2. Also, this tool was really useful when creating environment variables, so that we can have them locally saved without hardcoding them in the codebase.

Data Aggregation

The Creation of our Dataframes

Data needed to be aggregated in dataframes with all the informations we wanted to show.

Aggregation Criteria



In our case, the Kaggle Dataset represents rooms and IoT sensor in a hotel

Matteo Machella

Id_Room	Start	End	co2_mean	co2_min	co2_max
AA1	2013-08-24 01:00:00	2013-08-24 01:30:00	514.565	487.0	542.0
AA1	2013-08-24 01:30:00	2013-08-24 02:00:00	539.592	504.0	568.0
AA1	2013-08-24 02:00:00	2013-08-24 02:30:00	532.008	511.0	556.0
AA1	2013-08-24 02:30:00	2013-08-24 03:00:00	522.819	495.0	552.0
AA1	2013-08-24 03:00:00	2013-08-24 03:30:00	501.483	467.0	532.0
AA1	2013-08-24 03:30:00	2013-08-24 04:00:00	483.294	463.0	504.0
AA1	2013-08-24 04:00:00	2013-08-24 04:30:00	477.672	455.0	502.0
AA1	2013-08-24 04:30:00	2013-08-24 05:00:00	476.083	451.0	502.0
AA1	2013-08-24 05:00:00	2013-08-24 05:30:00	471.6	447.0	496.0
AA1	2013-08-24 05:30:00	2013-08-24 06:00:00	468.469	447.0	494.0
AA1	2013-08-24 06:00:00	2013-08-24 06:30:00	463.028	439.0	487.0
AA1	2013-08-24 06:30:00	2013-08-24 07:00:00	458.183	438.0	480.0
AA1	2013-08-24 07:00:00	2013-08-24 07:30:00	458.631	439.0	476.0
AA1	2013-08-24 07:30:00	2013-08-24 08:00:00	454.144	435.0	476.0
AA1	2013-08-24 08:00:00	2013-08-24 08:30:00	452.964	435.0	472.0
AA1	2013-08-24 08:30:00	2013-08-24 09:00:00	449.506	427.0	476.0
AA1	2013-08-24 09:00:00	2013-08-24 09:30:00	450.836	431.0	477.0
AA1	2013-08-24 09:30:00	2013-08-24 10:00:00	450.086	431.0	472.0
AA1	2013-08-24 10:00:00	2013-08-24 10:30:00	448.844	431.0	472.0
AA1	2013-08-24 10:30:00	2013-08-24 11:00:00	446.2	430.0	466.0

Aggregation Criteria

Data Storage

Aggregated data persistency

1. All the aggregated data is stored on a NoSQL database as a JSON file.
2. NoSQL queries are implemented to search for data we need to show to the UI.

Heatmap UI

Geolocated data visualization

1. Following our project proposal, in the end we decided to develop this Web Page that shows an Heatmap and can filter data based on user interests.

Technologies

Tools and More

Big Data

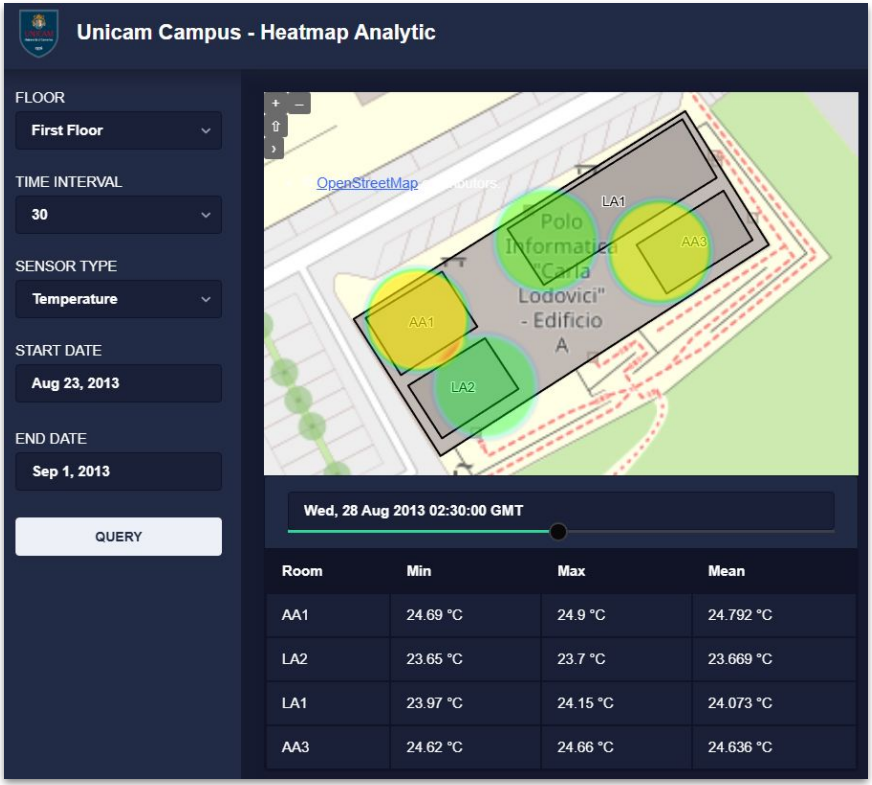
Backend

Frontend

Achieved Results

UI and Data Visualization

Heatmap Application



Next Steps

And Future Improvements

Real-time Analysis

A way to monitor our campus

This project can be improved by implementing a pipeline to compute real-time analysis.

In this way, we can monitor our campus' rooms, detect issues and prevent problems.

Improvements

New Features and Bug Fixes

1. Slider reset on change of Floor.
2. Using real campus data as a dataset instead of the one provided.
3. Adding more sensors for each type.

Thanks for your attention!

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