

SCOUTS: Smart Community Urban Thermal Sensing framework

In this research, we are monitoring the heat exposure to people, in urban areas, in order to analyze and mitigate the human heat exposure hazards. This framework enables us to have live readings and heat-maps from multiple resources along with a personalized heat exposure profile for each user. SCOUTS will help us get one step closer to have fully smart cities and communities.

Most of the existing heat-maps have two main limitations: their spatiotemporal granularities are too coarse. For example, the thermal band resolution of Landsat8 satellite imagery that has been broadly used in remote sensing to produce heat-maps is 100 meters and for a given location there is only one image every sixteen days. On the other hand, these maps have been generated based on the surface reflectance data and they are not fully representative of the actual heat exposure to the individuals.

Weather stations are the other source to be used, but in reality, they are representing the temperature of only some static locations and most of the times they are installed in high altitudes. Considering that the air pockets in different altitudes may not have the same temperature, they could not be a reliable representative of heat exposure to human beings in urban areas.

During our experiment on 28 Sept 2018, we attached our temperature sensors to the backpacks of four individuals walking around the UGA campus around the noon. In the Figure. 1, we can see the actual heat exposure is different from the result from the satellite image taken at the same time and also from weather stations readings. In a 30-minute window, the exposed temperature ranges from around 30 to 40 degrees Celsius, while the weather station shows less than 3 degrees variation from 29 to 32 degrees Celsius.

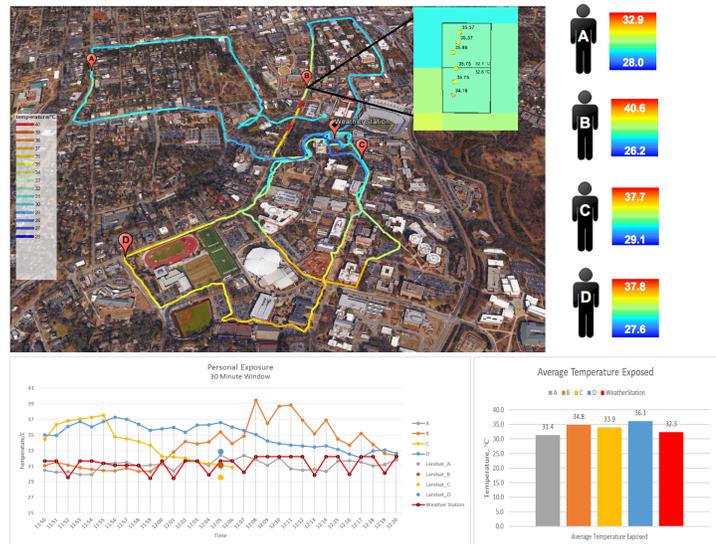


Figure 1. Heat Exposure Map

Following is an overview of our proposed framework, which is based on dynamic sensors (human-borne, vehicle-borne, drone-borne sensors) and measures the actual exposed temperature to individuals. It also incorporates the readings from weather stations. It is scalable and analyzes the data in real-time so that we can come up with high resolution heat exposure maps of different urban areas.

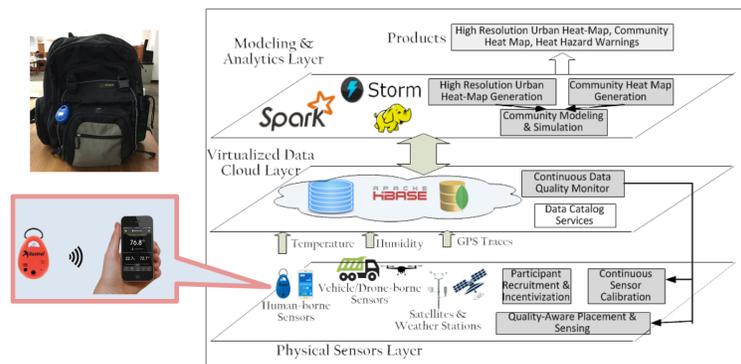


Figure 2. High Level Architecture of the Framework