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## Inventors

**Karthik Kashinath Kulkarni**

**Florian Arwed Schneider**

**Tejaswi Gowda**

**Suren Jayasuriya**

**Ariane Middel**

## Contact

Physical Sciences Team

# MaRTiny- A Low Cost Bio-Meteorological Sensing Device with Embedded Computer Vision for Urban Climate Research

### -Background

The Earth recorded its largest surface temperature increase between the years of 2010 and 2020. The temperature increased by nearly 1.2°F over that period which resulted in the sixth highest surface temperature on record. In urban environments with large condensed populations, there is a growing need to examine the effects that rising heat has on human behaviors.

Air temperature has widely been used as a way to quantify urban heat. However, this has been shown to be inefficient in quantifying human heat exposure. A more human-centric approach would involve utilizing the "Mean Radiant Temperature (MRT)". The MRT quantifies the total shortwave and longwave radiation the human body is exposed to at a given location and time. However, there has yet to be adequate implementation of the MRT into the analysis of humans relative to the rising heat.

### Invention Description

Researchers at Arizona State University have developed a low-cost thermal and visual sensing device called MaRTiny that collects meteorological data and concurrently counts the number of people in the shade and sun. MaRTiny also utilizes a globe thermometer to track mean radiant temperature (MRT), which is then used to describe the collective heat experience of a human body in hot, dry environments. Observed meteorological conditions and people counts are streamed to an AWS server for further analysis of human thermal exposure and can then be used to analyze where further efforts in climate and shade management are needed.

The device combined with the AI software can be implemented into hot, arid environments at a low cost to the city and can provide much needed data that can reduce the effects of heat exposure by keeping the city informed where further efforts are needed.

### Potential Applications

- Infrastructure management for hot-arid cities
- Research applications in geothermal mapping
- Analyzing surface temperature for geotechnical applications and city planning

### Benefits & Advantages

- Low-cost device that can be quickly implemented

- Measures MRT instead of air temperature for more accurate heat representation
- Analysis of both meteorological and population in a given space

Related Publication: [MaRTiny- A Low-Cost Biometeorological Sensing Device with Embedded Computer Vision for Urban Climate Research, Frontiers in Environmental Science](#)