1) Shaeri, P[1,*], Y. Mohammadpour[2], and A. Middel [3].
Data-Driven Analysis of Playground Use under Varying Weather Conditions Using MaRTiny

Extreme heat is a major urban climate challenge in hot, arid cities such as Phoenix, Arizona, where high thermal exposure limits outdoor activity, social interaction, and safe play for children. Mean Radiant Temperature (MRT) is the most relevant indicator of personal heat exposure, but it is difficult and costly to measure at fine spatial scales. MaRTiny is a low-cost biometeorological sensing system with embedded computer vision designed to link microclimate conditions with human behavior in public spaces. The platform integrates environmental sensing (air temperature, humidity, wind speed, globe temperature, and UV radiation) with automated pedestrian detection and shade classification. Recent system updates include dual microprocessors (ESP32 and Arduino) for improved resilience and real-time data logging, with visual data streamed to a server for processing using YOLO-based human detection and shadow segmentation refined by semantic models such as SAM and SegFormer. This study examines how people use playgrounds under varying weather conditions, using data from a year-long deployment at a public playground in Kiwanis Park, Tempe, Arizona. Pedestrian counts indicate that more than 67% of visitors occupy shaded areas during peak heat periods, demonstrating a preference for shade when available. Despite challenges related to sensor noise and visual variability, the integration of low-cost sensing with AI-driven detection provides reliable shade-use classification, highlighting the potential of scalable, data-driven approaches to evaluate shade interventions and support urban heat mitigation strategies.

[*]Lead author/presenter: Pouya Shaeri (Graduate student);
[1]School of Computing and Augmented Intelligence, Arizona State University, Tempe, AZ 85281;
[2]School of Social and Behavioral Sciences, Arizona State University, Tempe, AZ 85281; and
[3]The GAME School, Arizona State University, Tempe, AZ 85281

2) Pouya Shaeri, Yasaman Mohammadpour, and Ariane Middel. Data-Driven Analysis of Playground Use under Varying Weather Conditions Using MaRTiny

3) Urban Climate and Air Quality