Title :

Digital twins, wearables and urban analytics for enhancing walkability and comfort in Southeast Asia

Full name of Speaker :

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Digital twins, wearables and urban analytics for enhancing walkability and comfort in Southeast Asia

Background :

SE Asian cities are perpetually hot, but exact drivers of comfort are not fully known, which is a requirement for urban design and planning interventions. Further, data on comfort of people is scarcely available.

Targets:

- Understanding drivers of comfort
- Regarding different thermal comfort phenotypes of people
- Providing monitoring and simulation capabilities - integration of data in an urban digital twin

https://motership.sg/2022/06/why-spore-weather-is-so-hot-in-may-explained/
https://weatherspark.com/y/114655/Average-Weather-in-Singapore-Year-Round
https://www.channelnewsasia.com/singapore/climate-change-rising-temperatures-effective-heat-mitigation-strategies-2852206
https://www.straitstimes.com/singapore/environment/more-green-walkways-for-nparks-city-in-a-garden-vision
https://www.ura.gov.sg/Corporate/Planning/Master-Plan/Master-Plan-2019/Themes/A-Sustainable-and-Resilient-City-of-the-Future/Adapting-To-Climate-Change
https://blogs.ntu.edu.sg/hp3203-2018-20/role-of-nature/mitigate-urban-heat-island-effect/
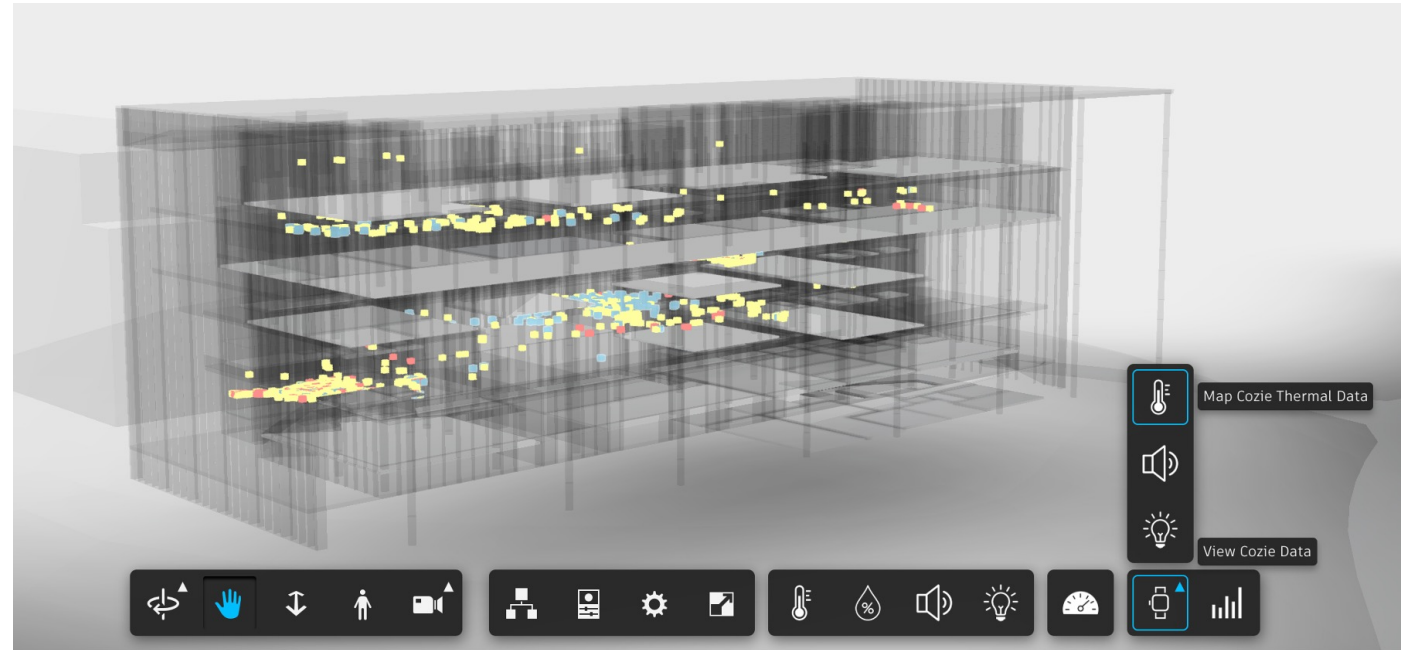https://worldlandscapearchitect.com/punggol-northshore-singapore-housing-development-board/?v=3a1ed7090bfa

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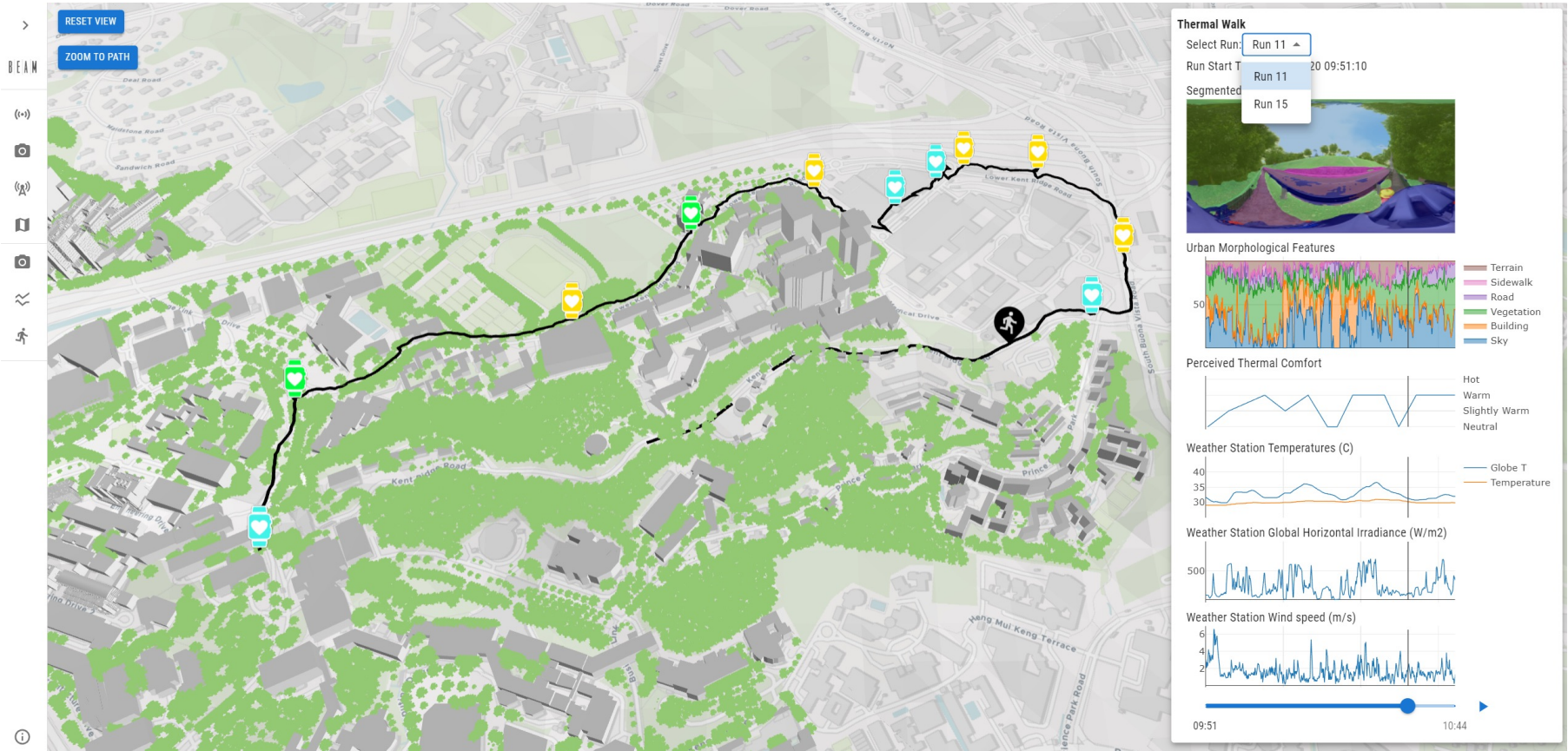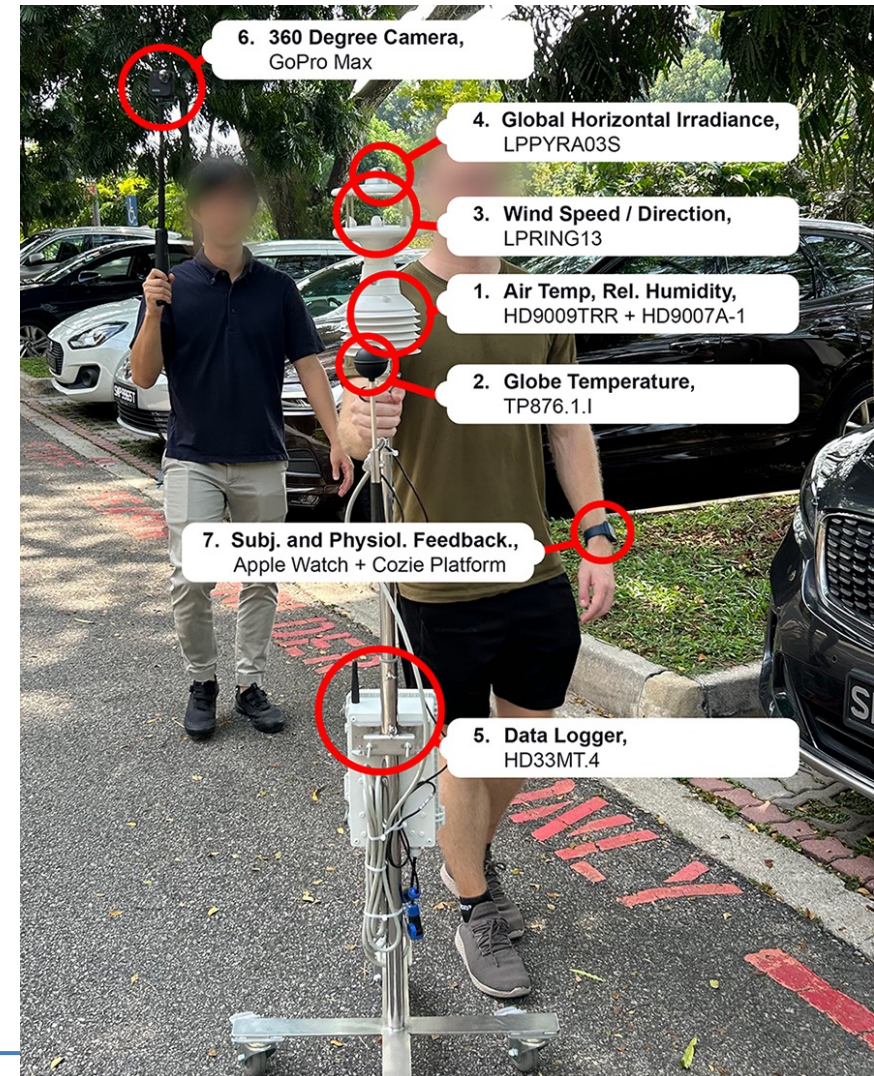
Jayathissa P, Quintana M, Abdelrahman M, Miller C. Humans-as-a-Sensor for Buildings—
Intensive Longitudinal Indoor Comfort Models. Buildings. 10: 174, 2020.
https://doi.org/10.3390/buildings10100174

Proposed Method:

Integrating wearable data, weather information, street view imagery / urban form data, etc. in an urban digital twin to support walkability/comfort studies

- Thermal walk: collection of comprehensive data at the ground-level — weather, urban form, and measurement of pedestrian comfort information with a smart watch (Cozie app)
  - Why thermal walks? Accurate and controlled data collection, continuous measurements across lots of locations
- Integration of all this data in a platform and visualisation
- Relying on open-source solutions

6. 360 Degree Camera, GoPro Max
4. Global Horizontal Irradiance, LPPYRA03S
3. Wind Speed / Direction, LPRING13
1. Air Temp, Rel. Humidity, HD9009TRR + HD9007A-1
2. Globe Temperature, TP876.1.I
7. Subj. and Physiol. Feedback., Apple Watch + Cozie Platform
5. Data Logger, HD33MT.4

Scientific and technological advancement in the development of ML models to predict comfort, tailored to SE Asia.

Giving more attention to comfort and analysing it as a multifaceted concept:

- Comfort is more than thermal comfort
- Comfort is influenced by myriads of factors

Predicting Human Comfort on the Sidewalk

Methodology
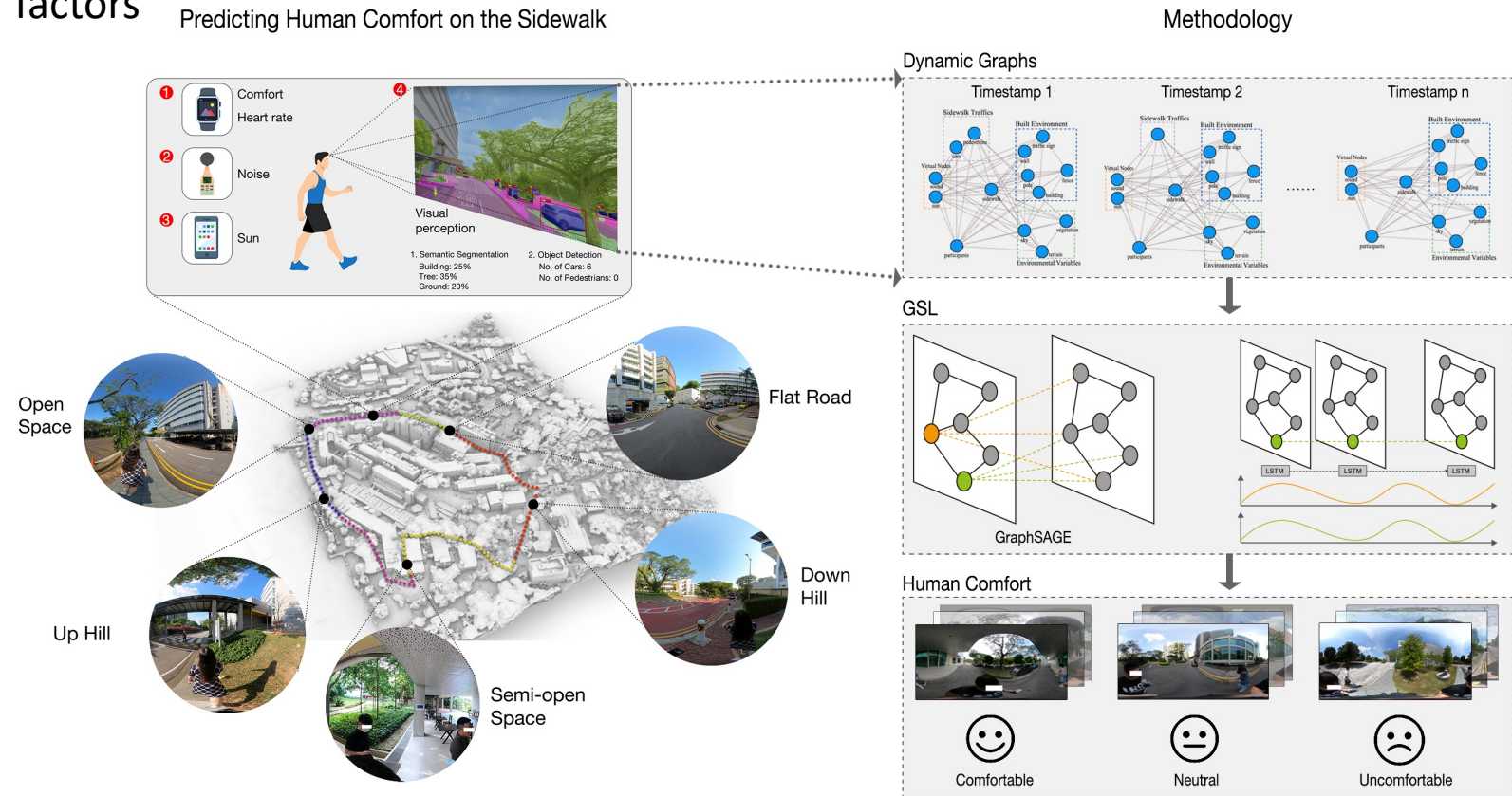
Liu P, Zhao T, Luo J, Lei B, Frei M, Miller C, and Biljecki F (2023): Towards Human-centric Digital Twins: Leveraging Computer Vision and Graph Models to Predict Outdoor Comfort. Sustainable Cities and Society 93: 104480

- Supporting walkability studies
- Predicting comfort at detailed resolution — both spatially and temporally
- Human-centric aspect - tailored models based on profiles and personal preferences

- Scaling our Singapore-based research to other geographies across the region
- Tailored models with regional impact
- Establishing new partnerships
- Demonstrated momentum in publications
- Capacity building
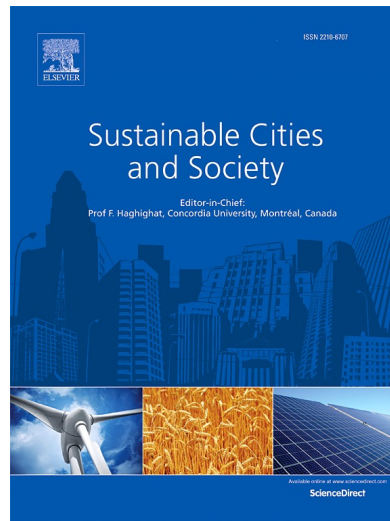
Output/Outcome: (Max. 2 slides)

- Combining urban data with advanced technologies to improve walkability and thermal comfort for residents.
- A robust platform that enables urban planners to make informed decisions about urban design and sustainability.
- Initiated collaborations with companies, e.g. Takenaka Corporation and Esri.
- Growing a network of complementary research groups in urban informatics in SE Asia
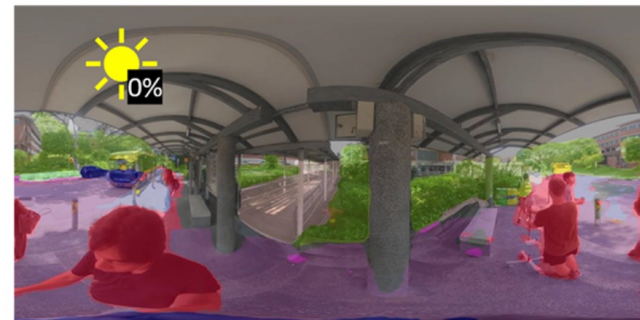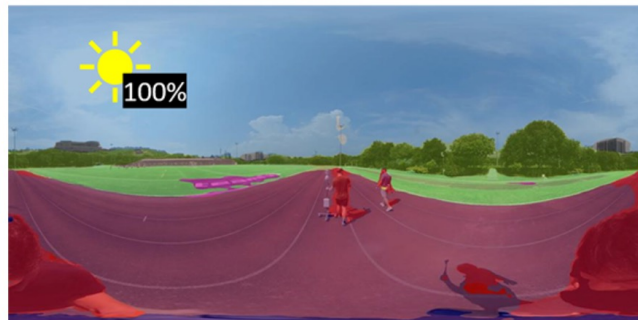
- Planning for walkability is increasingly difficult but is key to resilient and sustainable cities
- Lack of data actually understanding the comfort of pedestrians
- Missing local context
- Novel method combining wearables and urban digital twin technology to decouple factors influencing comfort
- Scalable across cities and the region