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Editorial

Special Issue on Advanced Data Analytics and Technologies for Decoding Human Health and Well-Being in Built Environments

This special issue (SI) on advanced data analytics and technologies for decoding human health and well-being in built environments that comes to partial closure in this issue is a necessary first step in a larger and longer conversation centered on the well-being of the people within built environments. The discussion started in 2022 with an International Workshop in Nottingham, UK, funded by the US National Science Foundation. The workshop, titled “Biosensing-Enabled, Wellbeing-Centric Sustainable Built Environment Ecosystems,” covers the topics of human health and well-being, and the use of data and building energy technologies were discussed amply by a group of experts from the USA and the UK. Fundamental questions in this conversation include how it may be possible to measure and quantify human well-being in different contexts of indoor and outdoor environments, work-places, or health centers and how technology at different scales and components, from the individual scale to the outdoor, community environments, can enable a reasonable state of well-being.

The subject is also becoming increasingly relevant as a warming global climate is challenging the normal state of well-being with extreme heat events that are becoming far more frequent and intense. The summer of 2023 was among the most intense in the western hemisphere, with cascading consequences in sectors not typically impacted by heat [1], such as school systems closing for days. This summer, 2024, is already on track to surpass 2023 with new record-breaking temperatures and heat indices above 100 °F for most of the North American Continent.

The collection of articles in this SI includes a series of contributions addressing this relevant topic. The work by Sharp [2] in exploring the extreme meteorological years and impacts on energy demands is a sound contribution to expanding our knowledge of new norms, with clear suggestions for building energy strategies to accommodate these extreme conditions in different geographical contexts. The work by Klavekoske et al. [3] links indoor air quality, a human-centric variable, to energy efficiency strategies in commercial buildings, which is followed by the work of Fil and Sözer [4] exploring energy efficiency strategies to control the indoor thermal environment using multi-zones, a human-centered approach. These works are accompanied by the contributions of Yang et al. [5] in exploring the control of humidity and latent thermal loads using a novel entropy-based approach and by the work of McMullen and Wemhoff [6] in optimizing data centers, a key component of data-driven approaches, using on-site generation. The SI will likely be followed by several contributions in the near future that expand the conversation of human-centered approaches for building systems and the use of data-driven methods to monitor

and enable acceptable levels of well-being in different contexts and under a changing climate.

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Yimin Zhu
 Professor

Department of Construction Management,
 Louisiana State University,
 Baton Rouge, LA 70803
 e-mail: yiminzhu@lsu.edu

Ming Sun
 Professor

School of Architecture, Design and the Built Environment,
 Nottingham Trent University,
 Nottingham NG1 4FQ, UK
 e-mail: ming.sun@ntu.ac.uk

Yong Tao
 Professor

Department of Mechanical Engineering,
 Cleveland State University,
 Cleveland, OH 44115
 e-mail: y.tao19@csuohio.edu

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