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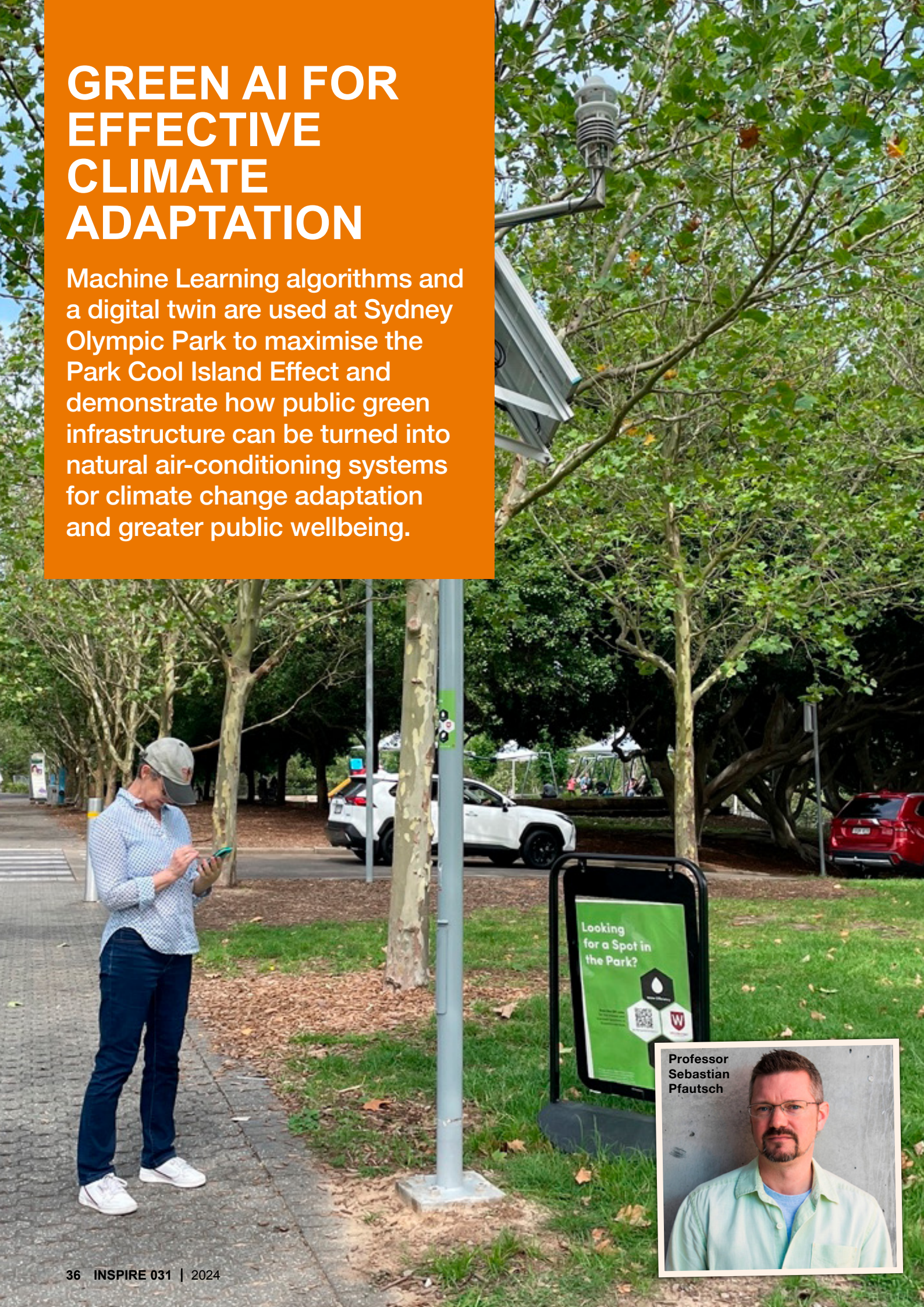
CLIMATE CHANGE EDITION

GREEN AI FOR EFFECTIVE CLIMATE ADAPTATION

Machine Learning algorithms and a digital twin are used at Sydney Olympic Park to maximise the Park Cool Island Effect and demonstrate how public green infrastructure can be turned into natural air-conditioning systems for climate change adaptation and greater public wellbeing.



Professor Sebastian Pfautsch

Australia is the driest and hottest permanently inhabited continent, facing annual heatwaves more deadly than all other natural disasters combined, AdaptNSW (2023) reports.

Urban areas, home to over 85% of Australia's population (Worldbank), exacerbate heat events as concrete, buildings, and asphalt absorb, retain and reemit heat, making cities at least 1-3°C warmer when compared to nearby reference sites covered in vegetation. With the Bureau of Meteorology and CSIRO forecasting hotter, drier summers ahead, particularly impacting urban spaces, the role of green spaces in cooling cities, enhancing health, wellbeing, and ecology becomes crucial.

As cities densify and expand, the preservation and expansion of quality green spaces are imperative. The areas encompassing vegetation are increasingly acknowledged for their essential role in cooling urban areas naturally, through air and surface temperature reduction, alongside providing health and wellbeing benefits, and overall social advantages. However, these increasingly essential areas are threatened by drought and rising temperatures. Addressing these challenges, Professor Sebastian Pfautsch of Western Sydney University has spearheaded the Smart Irrigation Management for Parks and Cool Towns (SIMP@CT) project. This initiative unites 12 partners from academia, government, and the private sector to combat urban heat, water scarcity, and the necessity for quality public green space using smart technology.

Implemented in Sydney's Bicentennial Park, a beloved 42-hectare space attracting over a million visitors annually, SIMP@CT aims to create a green, cool oasis promoting health and social equity. The project employs Ground to Cloud technology, integrating over 200 LoRaWAN soil moisture and temperature sensors and 7 weather stations, streaming live data to the park's digital twin. The system also ingests location-specific weather forecasts and turbocharges existing data streams by comparing anticipated and delivered water volumes which further assists in quality control of irrigation scheduling and fault detection of the irrigation hardware. An online dashboard helps people know where the coolest and warmest areas are so they can factor microclimate conditions in when planning their run, bike ride or picnic. The first detailed analyses have shown that air temperature in the irrigated park can be 7°C cooler compared to the nearby commercial and entertainment centre (see p.314 ff in these Proceedings).

The impact of SIMP@CT has been remarkable, delivering environmental, economic, and social benefits. On the utilities side, SIMP@CT provides savings in energy consumption and pumping costs due to increased distribution efficiencies. At the same time SIMP@CT provides the aforementioned real-time information to park visitors and local residents to better locate 'cool zones'. Arguably this provides for 'avoided public health costs' - given the increased social connection that occurs in public green spaces and improved outcomes for both mental and physical health where people can access live information on their nearby zones of thermal comfort.

Financially, the project has demonstrated substantial payback. An analysis revealed a net present value ranging from $9.72 to $12.44 million, and a benefit-cost ratio of 2.62-3.07, suggesting that for every dollar invested, more than $3 are returned. The Cost Benefit Analysis by the NSW Government has estimated that the improved park microclimate could generate savings of $2,260,000 every year from reduced heat-induced deaths and $32,600 from reduced heat-induced hospitalisation.

Australia is taking notice. In 2023, SIMP@CT received state and national awards and was a finalist in the World Smart Cities Awards competition. Receiving awards from the Internet of Things Association Australia (IOTAA) for 'Best Research Project' and 'IoT for Good' and two Innovation AUS 2023 Awards for Excellence, including the 'People's Choice' award signifies that the industry clearly sees merit in our solution to cool cities. The project team also won a prestigious Banksia Foundation Sustainability Award, trailblazing the pathway for innovation around urban green infrastructure and its capacity to cool our cities during increasingly hotter summers.

Continuing to push the boundaries of innovation, the team has been focused on scalability. The digital architecture of the project was design to easily scale up or down. Being so flexible and web-based makes it possible to adopt the SIMP@CT technology for any irrigated greenspace like golf courses, sport fields or botanic gardens in Australia and overseas. This represents a unique approach that turns green spaces into effective cooling assets in a warming word, making SIMP@CT a pioneering solution in utilizing urban green infrastructure to combat the effects of increasingly warmer summers. The team continues its work and hope to set a new standard for climate resilience in urban planning and green space management. For more information reach out to the project team by clicking here.

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