

15 LIFE ON LAND



Research & Innovation

Novel e-Nose Technique for Brown Root Rot Disease Detection

In recent years, brown root rot disease (BRRD), caused by the fungal pathogen *Phellinus noxius* which triggers rapid health and structural deterioration of trees and potential tree failure, has been spotted with increased frequency, posing a serious threat to public safety. **Granted nearly HK\$1.5 million in funding**, the Department of Civil and Environmental Engineering has successfully developed a fast detection technique for BRRD-infected trees employing a calibrated portable e-nose. It has also developed a user-friendly platform for its practical use by the Highways Department of the Hong Kong Government, which maintains a significant number of trees across the City. This innovative technique can facilitate easy and early identification of BRRD-infected trees through a general application of an e-nose technique in field checks allowing for timely risk mitigation measures.



Applying Deep Learning in Effective Forest Management

Mapping standing dead trees, particularly in natural forests, is vital for the evaluation of a forest's health status and capability for storing carbon, and more broadly the conservation of biodiversity. However, effective forest management can only be achieved by employing a cost-effective automated approach as a classical field surveying method can be very challenging, time-consuming, labour-intensive, and unsustainable in a natural forest setting.

With the vision of harnessing the enormous potential of machine learning, PolyU researchers conducted a study to present an adjusted Mask R-CNN Deep Learning approach for detecting and segmenting standing dead trees in a dense mixed forest using aerial colour infrared imagery with strategically selected hyperparameters appropriate for the model's architecture.

Promising results were recorded in the assessment of the model's performance, suggesting that the model could be used for automation in standing dead tree detection and segmentation for enhanced forest management. With such first-hand forest health information, forest managers could reorient their strategies for keeping forests in a good state, which is equally significant for biodiversity conservation and forest carbon storage estimation, thereby contributing to a cleaner climate and healthier environment.

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Teaching & Learning

Leading Biodiversity Conservation and Sustainable Living

The University has developed a series of teaching and learning activities for students to explore and better appreciate the interwoven realities between humans, other organisms, and the natural environment. Students will investigate diverse topical areas focusing particularly on the importance of solar energy, fertile soil, and water to human life; green wealth that is the production of non-food agricultural products; green medicine which points to the potential medicinal use of living organisms and their conservation; and maintenance of natural resources. In addition, students are introduced to the physicochemical and biological structures of characteristic ecosystems, as well as energy flowing within the biological organisation.

By examining human-induced changes in land ecosystems, such as desertification and deforestation, students also become more aware of the severity of environmental degradation, identify the human-induced changes in ecosystems, and propose possible remediation to conserve biodiversity based on scientific reasoning and evidence. It is envisioned that knowledge of the diversity of ecosystems in the world combined with that of the latest scientific developments in our society and their likely environmental impacts will enable students to better understand the consequences of their everyday life actions on the environment and become ethical members of the global society, committed to sustainable living.



Sustainable Community-Based Tourism

The School of Hotel and Tourism Management this academic year launched a service-learning subject to promote and enhance ecotourism in Yim Tin Tsai Village. Prior to working with a non-governmental organisation on capacity-building initiatives, students were given classroom training relating to community-based tourism and ecotourism development. For instance, they assessed the potential ecotourism resources needed for sustainable tourism development and maintenance, and collaborated with local community members for cultural and customs exchange and documentation.

With such practical knowledge obtained, students designed promotional materials and branding for the project site, along with events and activities to raise awareness of the unique Hakka culture and ecology, and the importance of preserving the special local salt-making techniques. For the purpose of attracting

visitors, a new mascot for the community and souvenirs were designed as part of a comprehensive branding project. Students also redesigned the layout of the visitor centre and information leaflets and created new signs across the island. Furthermore, five senses activities were organised for visitors to more fully appreciate the natural and cultural landscape of Yim Tin Tsai Village. The initiatives **attracted around 200 visitors** in total, among whom **some 80 secondary school students from minority communities** joined a customised tour. Thanks to the boost in visitor numbers, additional revenue can help preserve the land and ecological environment of Yim Tin Tsai Village for the next generation.

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Outreach & Engagement

Advancing Land and Waste Management Using Technologies

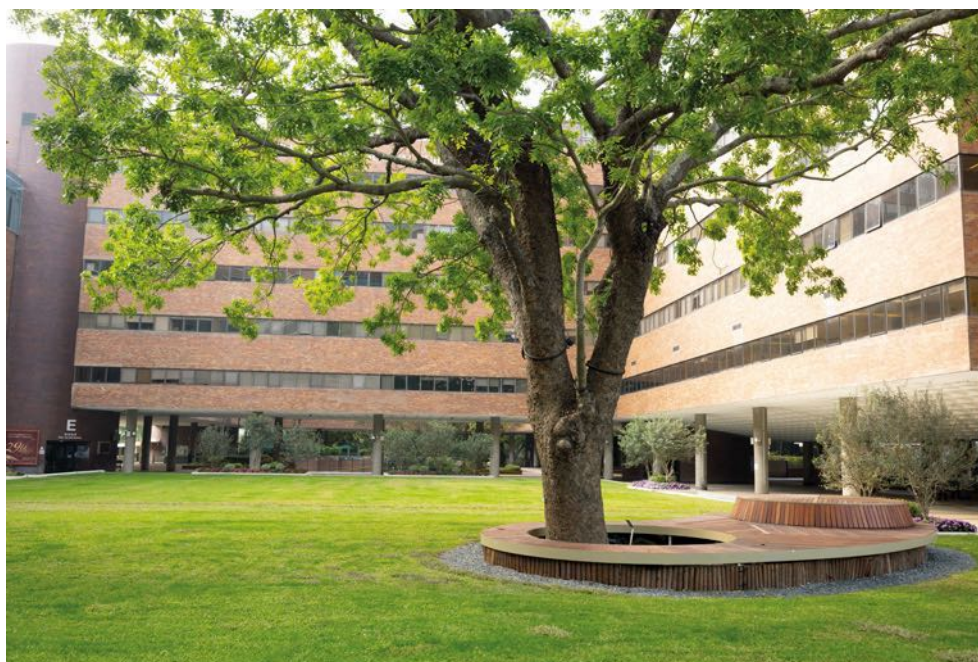
With the anticipated commissioning of Hong Kong's first integrated waste management facility on Shek Kwu Chau in 2025, the China Harbour-PolyU Joint Research Centre for Land Development has held its inaugural technical seminar on "Treatment and Reuse of Municipal Solid Waste Incineration Ash". Joined by a delegation from China Harbour, speakers from PolyU, City University of Hong Kong, Shenzhen University, and Guangdong Environmental Protection Group Co. Ltd. presented their ideas on ways to harness recent technologies to facilitate value-added production of construction materials using municipal solid waste incineration ash in Hong Kong and the Greater Bay Area. They also discussed the associated challenges and future development direction, thus promoting university-industry collaboration and technology transfer in the field.

Meanwhile, the PolyU Research Institute for Land and Space co-organised a three-day training course for the Hong Kong Lands Department, guiding around 20 participants in exploring topics concerning remote sensing and machine learning. In the lab sessions, participants were given the chance to apply their professional knowledge and skills to solve remote sensing related issues using deep learning techniques.

Governance & Operations

Enriching Campus Biodiversity and Human-Nature Relations

With an eye to creating a pleasant and relaxing experience for all campus users, the University has engaged in thoughtful landscape planning with a strategic vision to develop a welcoming outdoor space. The Landscape Master Plan was formulated for the execution of many improvement projects, including the introduction of a variety of green and flowering plants that would complement the iconic red bricks as well as optimising the irrigation system, and further improving the wildlife habitat and biodiversity to benefit both the campus community and the natural world. To this end, PolyU's latest landmark, the University Square, illustrates the University's commitment to a green and sustainable campus environment. Moreover, the Campus Facilities and Sustainability Office has launched Fauna@PolyU, a platform that contains descriptions of the rich variety of fauna species on campus and also features recordings of bird songs and calls for instant identification.



PolyU's latest landmark, the University Square

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