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NTU Singapore Revolutionising Cancer Care

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In a significant breakthrough, a team of researchers led by Nanyang Technological University, Singapore (NTU Singapore), has unveiled a pioneering computer programme designed to identify potential breast tumours at an early stage. Named Physics-informed Neural Network (PINN), this innovative programme leverages the unique heat distribution patterns exhibited by malignant breast tumours compared to healthy breast tissue.

Image credits: Nanyang Technological University

Developed in collaboration with medical professionals from Nazarbayev University in Kazakhstan and with input from breast imaging specialists in Singapore, PINN represents a fusion of artificial intelligence (AI) and heat-imaging technology.

By analysing thermal infrared images of breast tissue, PINN can swiftly flag any possible malignant tumours within just five minutes of examination. The programme's development involved calibrating it with infrared breast scans from thousands of patients in Kazakhstan, both with and without malignant breast tumours.

PINN has shown promising results in accurately identifying harmful tumours, boasting an impressive 91% accuracy rate when tested on hundreds of infrared images of breasts with malignant tumours. This development comes as a significant boon in the fight against breast cancer, which stands as the most common cancer among women globally. Given the challenges associated with traditional detection methods like mammography, which include cost and availability constraints, PINN offers a non-invasive and painless alternative.

The programme's methodology involves using an infrared camera to capture breast images from various angles, which are then subjected to computer analysis. Unlike mammograms, which expose patients to ionising radiation during the procedure, PINN's heat-imaging technology provides a safer option, particularly for women at higher risk of breast cancer or those with a family history of the disease.

However, the researchers emphasise that PINN is not intended to replace existing diagnostic methods but rather to complement them. It serves as a valuable tool for early detection, aiding healthcare professionals in prioritising complex cases and contributing to better treatment outcomes.

Moreover, ongoing research aims to further enhance PINN's capabilities, with the ultimate goal of developing it into a portable AI tool for routine breast examinations. This ambitious endeavour has the potential to revolutionise early breast cancer detection, offering a more accessible and efficient screening solution for women worldwide.

In another cancer-related development spearheaded by NTU Singapore, researchers have introduced a cutting-edge method for treating glioblastoma, the most prevalent form of brain cancer, employing a significantly reduced dose of X-rays.

This innovative radiodynamic therapy, leveraging a novel compound called a molecular radio afterglow dynamic probe (MRAP), demonstrates promising outcomes in restraining brain tumour growth with minimal side effects, potentially transforming the landscape of brain cancer treatment.

Glioblastoma, affecting over 300,000 individuals globally annually, presents a formidable challenge due to the limited efficacy of conventional radiation therapies. While radiodynamic therapy offers a promising alternative, the heavy metals in existing compounds often lead to unintended damage to healthy cells.

OpenGov Asia also reported that an international team of researchers from NTU has unveiled a revolutionary flexible electrode, inspired by the remarkable properties of spider silk. This innovative electrode is designed to conform to muscles, nerves, and even the heart, exhibiting superior performance in electrical stimulation and signal recording compared to conventional stretchable electrodes.

Crafted from a material that contracts in response to moisture, this flexible electrode can seamlessly mould around tissues and organs, offering unparalleled adaptability and precision. The material, engineered into a thin film through repeated stretching, mirrors the intricate structure of spider silk, providing both flexibility and strength.

This cutting-edge technology holds immense promise for biomedical applications, with potential implications for areas such as irregular heartbeat monitoring, nerve repair, wound closure, and scar reduction.

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