PRESS RELEASE

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NUS-led global study shows longer brain scans lower research costs, provide more accurate predictions

Singapore, 16 July 2025 — Artificial intelligence (AI) models trained on large datasets are increasingly seen as the key to unlocking personalised treatments for brain disorders. An important bottleneck for scaling AI is the cost of data collection. This raises a fundamental dilemma: is it more cost-effective to scan more people for a short time, or fewer people for longer? A study – published in the journal *Nature* – led by Associate Professor Thomas Yeo from the Centre for Sleep and Cognition, Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine), now offers a clear answer: 30-minute functional MRI (fMRI) scans deliver up to 22% in cost savings while still retaining or even improving prediction accuracy.

Traditional thinking in neuroscience emphasises collecting massive datasets by scanning thousands of people for brief durations, usually around 10 minutes for fMRI. AI models can then be trained to use the brain scans to make predictions of individual-level traits or outcomes. These traits and outcomes might include cognitive abilities (e.g. memory, executive function), mental health indicators and clinical outcomes (e.g. risk of Alzheimer's disease). Yet as participant numbers climb, so do the costs: even a brief scan can turn expensive once the hidden costs of recruiting, scheduling, and administratively tracking those volunteers are factored in. Short scans also may not capture enough high-quality information to make reliable personalised predictions.

The team posed a practical question: what if we focused on scanning fewer individuals, but for longer periods? Working with collaborators around the world, including Professor Thomas Nichols from the University of Oxford and Professor Nico Dosenbach from the Washington University in St. Louis, the researchers developed a mathematical model that predicts how changes in scan time and number of participants affect the performance of brain-based AI models. They validated their model using nine international imaging datasets encompassing thousands of individuals of varying ages, ethnicities, and health statuses. They found that their model can be used to customise study design to maximise prediction accuracy and minimise cost. Scanning each person for 30 minutes provides a sweet spot to maximise prediction accuracy and minimises research costs.

“For years, the mantra has been ‘bigger is better’. We’ve chased ever-larger cohorts without asking how long each person should be scanned. We show that in brain imaging, ‘bigger’ doesn’t have to mean larger cohorts. It can also mean more data per person,” said A/Prof Yeo. “In essence, we can get the best of both worlds – better prediction at a lower cost.”

This finding could reshape how researchers design neuroscience and mental health studies, especially for hard-to-recruit populations, such as patients with rare neurological conditions. The team is now refining their model using real-world clinical data and emerging brain imaging technology. Their goal: make it even easier for researchers and health systems worldwide to design smarter, more cost-effective brain studies. By helping studies collect better data for less money, the work could shape future research in neurology and psychiatry—and guide national and global efforts to deliver more personalised, affordable healthcare.

Professor Nico Dosenbach, a neurologist from the Washington University in St. Louis and a co-author of the study, added, “This is a game-changer for the field. It gives research teams a rigorous, quantitative way to design smarter studies, especially critical as we move toward precision neuroscience. Longer scans mean better estimates of brain connectivity, which translates into more reliable links to cognition and clinical symptoms.”

The study was jointly first authored by Dr Leon Ooi, Dr Csaba Orban, Dr Shaoshi Zhang, research fellows in the laboratory of Associate Professor Thomas Yeo who is the senior and corresponding author of the study.

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Our multidisciplinary and real-world approach to education, research and entrepreneurship enables us to work closely with industry, governments, and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, research centres of excellence, corporate labs and more than 30 university-level research institutes focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research, and cybersecurity.

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Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus on innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University of Singapore and a founding institutional member of the National University Health System. It is one of the leading medical schools in Asia and ranks among the best in the world (Times Higher Education World University Rankings 2025 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2025).

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About the National Medical Research Council (NMRC)

The NMRC was established in 1994 to oversee research funding from the Ministry of Health and support the development and advancement of biomedical research in Singapore, particularly in the public healthcare clusters and medical schools. NMRC engages in research strategy and planning, provides funding to support competitive research grants and core research enablers, and is responsible for the development of clinician scientists through awards and fellowships. The council's work is supported by the NMRC Office which is part of MOH Holdings Pte Ltd. Through its management of the various funding initiatives, NMRC promotes healthcare research in Singapore, for better health and economic outcomes.

About the National Research Foundation (NRF)

The National Research Foundation, Singapore (NRF), set up on 1 January 2006, is a department within the Prime Minister's Office. The NRF sets the national direction for research and development (R&D) by developing policies, plans and strategies for research, innovation and enterprise. It also funds strategic initiatives and builds up R&D capabilities by nurturing research talent. Learn more about the NRF at www.nrf.gov.sg.