Northwestern and Toyota Research Institute Join Forces to Find Materials to Drive Clean Energy Transition

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Toyota Research Institute (TRI) and Northwestern University today announce their collaboration to help accelerate the discovery, design and development of new materials with the world's first nanomaterial "data factory."

This AI-driven methodology goes far beyond the traditional trial and error by exploring vast parameter sets. It collects data and then empowers AI to search the materials genome — the set of all nanoparticle combinations of any of the usable elements in the periodic table — to find the best materials for a given application. While the first application of the data factory will be to discover new catalysts to make fuel cell vehicles more efficient, TRI and Northwestern believe this method of materials discovery will have wide-ranging applications in the future.

Teams use AI to design and synthesize next-generation materials to help reduce carbon emissions.

Inflection point in powering clean energy transition

"This groundbreaking research marks an inflection point in how we discover and develop critical materials," said Chad Mirkin, director of the International Institute for Nanotechnology and the George B. Rathmann Professor of Chemistry at Northwestern. "Together with TRI, we're poised to empower the scientific community to find the best materials that can truly power the clean energy transition."

"Meeting the growing demand for automotive mobility without emitting carbon is a major

challenge," said Brian Storey, TRI senior director of energy and materials. "Through this partnership with Northwestern, we have significantly reduced the time it takes to test and find new materials that can be used in batteries and fuel cells to decarbonize transportation."

Research across disciplines for greater impact

Northwestern's strong cross-disciplinary research is rooted in an ecosystem that, by design, encourages cross-institutional research to flourish — notably with its more than 35 University Research Institutes and Centers (URICs), which bring together interdisciplinary expertise from across Northwestern. By bridging schools, departments and knowledge domains, URICs, like the International Institute for Nanotechnology, help fuel collaboration, innovation and high-impact discovery with great societal value.

TRI and Northwestern developed a machine learning algorithm capable of synthesizing materials at record speeds to sift through Northwestern's new Megalibraries — a library containing more new inorganic materials than scientists have ever collected and categorized. Together, these concepts form the first nanomaterial data factory — a groundbreaking effort to create and mine large sets of high-quality, complex data. The team is using this new approach to find catalysts that can be used instead of expensive, rare materials the world currently depends on, such as platinum and iridium.

Prior to this collaboration, machine learning algorithms have been trained on lower-quality, inconsistently gathered datasets. Now, with Northwestern and TRI's new capabilities, high-quality data sets can be used by the team to train complex algorithms that enable the rapid and objective discovery of crucial materials for unmet needs.

Read the original article on Northwestern University.