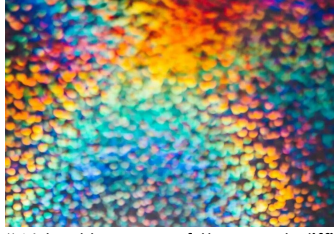


AI
AI Tackles One of The Most Difficult Challenges in Quantum Chemistry



"AI tackles one of the most difficult challenges in quantum chemistry

New research using neural networks, a form of brain-inspired AI, proposes a solution to the tough challenge of modelling the states of molecules.

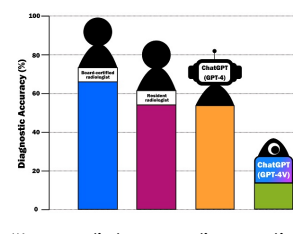
The research shows how the technique can help solve fundamental equations in complex molecular systems.

This could lead to practical uses in the future, helping researchers to prototype new materials and chemical syntheses using computer simulation before trying to make them in the lab.

The study, led by Imperial College London and Google DeepMind scientists, is published today in [Science](#)."

Source: [IMPERIAL](#) (22 Aug 2024)

AI
Let Me Take a Look: AI Could Boost Diagnostic Imaging Results



"In radiology, diagnostic imaging requires specialized knowledge to interpret the findings associated with a wide variety of diseases. Fortunately, in recent years, generative AI models, such as Chat Generative Pre-trained Transformer (ChatGPT), have shown potential as diagnostic tools in the medical field, but their accuracy must be evaluated for optimal use in the future.

Therefore, Dr. Daisuke Horiuchi and Associate Professor Daiju Ueda of Osaka Metropolitan University's Graduate School of Medicine led a research team that compared the diagnostic accuracy of ChatGPT and radiologists. They used 106 musculoskeletal radiology cases with patient medical history, images, and imaging findings.

For this study, each case's information was put into GPT-4 and GPT-4 with vision (GPT-4V) to generate diagnoses. As for the radiologists, a radiology resident and a board-certified radiologist were provided with the same cases and asked to determine the diagnoses. Results showed that GPT-4 outperformed GPT-4V and was on par with radiology residents. On the contrary, the diagnostic accuracy of ChatGPT was subpar in comparison to board-certified radiologists.

"While the results of this study indicate that ChatGPT may be useful for diagnostic imaging, its accuracy cannot compare to a board-certified radiologist. Additionally, this study suggests that its performance as a diagnostic tool must be fully understood before it can be used," stated Dr. Horiuchi. "Generative AI, including ChatGPT, is advancing every day, and it is greatly expected to become an auxiliary tool for diagnostic imaging in the future."

Source: [OMU](#) (22 Aug 2024)

AI
How To Harness AI's Potential in Research — Responsibly and Ethically

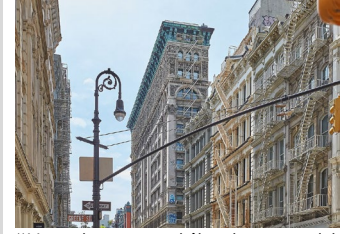


"The rapid growth of artificial intelligence (AI) offers immense potential for scientific advancements, but it also raises ethical concerns. AI systems can analyse vast data sets, detect patterns, optimize resource use and generate hypotheses. And they have the potential to help address global challenges including climate change, food security and diseases. However, the use of AI also raises questions related to fairness, bias and discrimination, transparency, accountability and privacy. Image-generating AI programs can perpetuate and amplify biases, such as associating the word 'Africa' with poverty, or 'poor' with dark skin tones. And some technology giants fail to disclose important information about their systems, hindering users' efforts towards accountability.

Four researchers from different countries give their perspectives on the significant promise and pitfalls of AI used in scientific research. They discuss the need for data sets that accurately represent populations in their entirety, and the importance of understanding the limitations of AI tools. Experts from Africa caution that AI systems should benefit all, and not further increase inequities between richer and poorer countries."

Source: [Nature](#) (23 Aug 2024)

ARCHITECTURE
How To Adapt Static Structures for New Demands? Lessons From Soho In New York City and Wong Chuk Hang In Hong Kong



"How have architecture and building design adapted to unforeseen future uses? As cities evolve, their needs for buildings inevitably change. Buildings may transition between cultural, commercial, industrial, and office functions depending on a city's identity and economic activity. In a world that is becoming increasingly dynamic and fast-paced, it's essential to consider the challenges static structures face when required to meet new demands. Cities have repurposed these static structures in ways not anticipated during their original design, with many successes in repurposing industrial buildings. Unlike structures designed with flexibility in mind, most manufacturing facilities were not initially intended for multiple uses. Yet, how have cities, communities, and occupants used these spaces, and what are the challenges of transforming a building's existing uses?"

Source: [Archdaily](#) (24 Aug 2024)

CLIMATE CHANGE
Extreme Heat Is a Huge Killer — These Local Approaches Can Keep People Safe



"George Luber was warming up to compete in his third tennis match on a hot summer's day in Connecticut. Suddenly, in a daze, he started to drift in circles around the end of the court. Then he began vomiting. The next thing Luber remembers is waking up in hospital, where he was treated for heat stroke for three days. He was a healthy 12-year-old, and it was 1982.

Luber, now a medical anthropologist at Emory University in Atlanta, Georgia, knows that those most at risk from extreme heat include older people, pregnant women and outdoor workers. But his experience shows that hot weather can affect you even "if you're a healthy young person with no pre-existing conditions".

Extreme heat is a George Luber was warming up to compete in his third tennis match on a hot summer's day in Connecticut. Suddenly, in a daze, he started to drift in circles around the end of the court. Then he began vomiting. The next thing Luber remembers is waking up in hospital, where he was treated for heat stroke for three days. He was a healthy 12-year-old, and it was 1982. erious public-health threat: on average, it kills more people in the United States than any other weather event, including hurricanes, floods and extreme cold. The effects of scorching temperatures are exacerbated in cities, where buildings and roads soak up warmth. As Earth's warming climate intensifies the problem, scientists are investigating evidence-based measures to make cities safer during hot periods. Researchers say that although progress has been made to address the threat, there are still obstacles to cities' efforts to track mortality rates and implement solutions."

Source: [Nature](#) (22 Aug 2024)

DESIGN
"The Role of Smartphones in Contemporary Life Feels Increasingly Stupid"



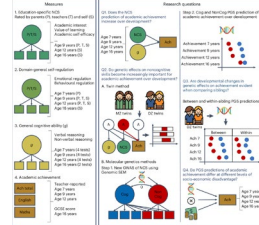
"Today the design, production and impact of phones are no longer exciting sources of positive change but increasingly alarming headlines: only 17 per cent of electronic waste is recycled, meaning of the five billion phones thrown away in a typical year, the vast majority are in landfill. The conditions cobalt miners suffer to enable the production of smartphones' lithium-ion batteries are nightmarish, as grim as some of the most exploitative labour practices in human history.

The products themselves are not improving either. My Android is now so big that I can barely operate it one-handed without straining my thumb to stretch across its bloated width. The baffling fragility of the glass screen means, unlike that tough retro Nokia, an additional rubbery case with reinforced corners is a non-negotiable.

The camera protrudes from the back rather than sitting flush as the early iPhone cameras did. Even Google's app icons have been confusingly redesigned into a slew of almost identical abstract shapes. And all of this deteriorating design quality even as production ethics crumble and handset prices spiral."

Source: [Dezeen](#) (21 Aug 2024)

EDUCATION RESEARCH
Non-Cognitive Skills: The Hidden Key to Academic Success



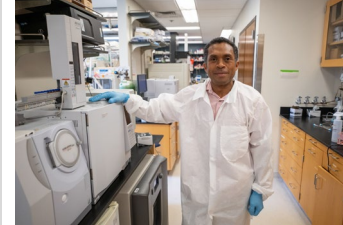
"A new Nature Human Behaviour study, jointly led by Dr Margherita Malanchini at Queen Mary University of London and Dr Andrea Allegrini at University College London, has revealed that non-cognitive skills, such as motivation and self-regulation, are as important as intelligence in determining academic success. These skills become increasingly influential throughout a child's education, with genetic factors playing a significant role. The research, conducted in collaboration with an international team of experts, suggests that fostering non-cognitive skills alongside cognitive abilities could significantly improve educational outcomes.

"Our research challenges the long-held assumption that intelligence is the primary driver of academic achievement," says Dr Malanchini, Senior Lecturer in Psychology at Queen Mary University of London. "We've found compelling evidence that non-cognitive skills – such as grit, perseverance, academic interest, and value attributed to learning – are not only significant predictors of success but that their influence grows stronger over time."

The study, which followed over 10,000 children from age 7 to 16 in England and Wales, employed a combination of twin studies and DNA-based analyses to examine the complex interplay between genes, environment, and academic performance."

Source: [Eurekalert!](#) (26 Aug 2024)

MATERIALS
Turning Bacteria into Bioplastic Factories



"A study led by graduate student Eric Conners found that two relatively obscure species of purple bacteria have the ability to produce polyhydroxyalkanoates (PHAs), natural polymers that can be purified to make plastic.

Another study led by research lab supervisor Tahina Ranaivoarisoa showed that genetic engineering could coax a well-studied but notoriously stubborn species of purple bacteria to dramatically ramp up its production of PHAs.

Conners and Ranaivoarisoa work in the lab of Arpita Bose, associate professor of biology and corresponding author of the new studies. "There's a huge global demand for bioplastics," Bose said. "They can be produced without adding CO2 to the atmosphere and are completely biodegradable. These two studies show the importance of taking multiple approaches to finding new ways to produce this valuable material."

Purple bacteria are a special group of aquatic microbes renowned for their adaptability and ability to create useful compounds from simple ingredients. Like green plants and some other bacteria, they can turn carbon dioxide into food using energy from the sun. But instead of green chlorophyll, they use other pigments to capture sunlight.

The bacteria naturally produce PHAs and other building blocks of bioplastics to store extra carbon. Under the right conditions, they can keep producing those polymers indefinitely."

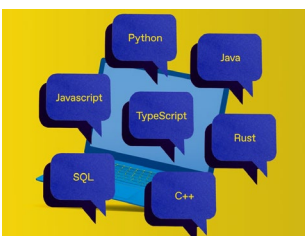
Source: [WashU](#) (21 Aug 2024)

PROGRAMMING LANGUAGE
The Top Programming Languages 2024: Typescript and Rust Are Among the Rising Stars

QUANTUM COMPUTING
Unconventional Interface Superconductor Could Benefit Quantum Computing

SUSTAINABILITY
Fisheries Research Overestimates Fish Stocks

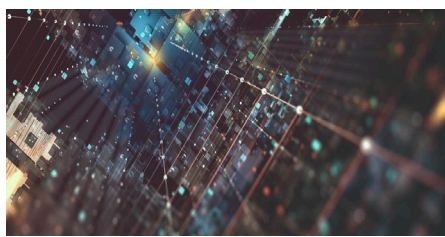
WEARABLES
New Nano-Device Could Mean Your Run Could Power Your Electrical Wearables



"Welcome to IEEE Spectrum's 11th annual rankings of the most popular programming languages. As always, we combine multiple metrics from different sources to create three meta rankings. The "Spectrum" ranking is weighted towards the profile of the typical IEEE member, the "Trending" ranking seeks to spot languages that are in the zeitgeist, and the "Jobs" ranking measures what employers are looking for.

At the top, Python continues to cement its overall dominance, buoyed by things like popular libraries for hot fields such as AI as well as its pedagogical prominence. (For most students today, if they learn one programming language in school, it's Python.) Python's pretty popular with employers too, although there its lead over other general purpose languages is not as large and, like last year, it plays second fiddle to the database query language SQL, which employers like to see paired with another language. SQL popularity with employers is a natural extension of today's emphasis on networked and cloud-based system architectures, where databases become the natural repository for all the bytes a program's logic is chewing on."

Source: [IEEE Spectrum](#) (22 Aug 2024)



"A multi-institutional team of scientists in the United States, led by physicist Peng Wei at the University of California, Riverside, has developed a new superconductor material that could potentially be used in quantum computing and be a candidate "topological superconductor."

Topology is the mathematics of shape. A topological superconductor uses a delocalized state of an electron or hole (a hole behaves like an electron with positive charge) to carry quantum information and process data in a robust manner.

The researchers report today in Science Advances that they combined trigonal tellurium with a surface state superconductor generated at the surface of a thin film of gold. Trigonal tellurium is a chiral material, which means it cannot be superimposed on its mirror image, like our left and right hands. Trigonal tellurium is also non-magnetic. Nonetheless, the researchers observed quantum states at the interface that host well-defined spin polarization. The spin polarization allows the excitations to be potentially used for creating a spin quantum bit — or qubit.

"By creating a very clean interface between the chiral material and gold, we developed a two-dimensional interface superconductor," said Wei, an associate professor of physics and astronomy. "The interface superconductor is unique as it lives in an environment where the energy of the spin is six times more enhanced than those in conventional superconductors."

Source: [UCR](#) (23 Aug 2024)



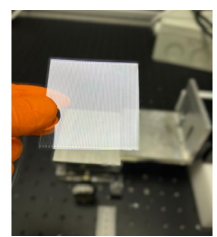
"The state of fish stocks in the world's ocean is worse than previously thought. While overfishing has long been blamed on fisheries policies that set catch limits higher than scientific recommendations, a new study by four Australian research institutions reveals that even these scientific recommendations were often too optimistic. The result? Far more global fish stocks are overfished or have collapsed than we thought. Dr Rainer Froese from the GEOMAR Helmholtz Centre for Ocean Research Kiel and Dr Daniel Pauly from the University of British Columbia have provided their insights on the study. In their Perspective Paper, published today in the journal Science alongside the new study, the two fisheries experts call for simpler yet more accurate models and, when in doubt, a more conservative approach to stock assessments.

Many fish stocks around the world are either threatened by overfishing or have already collapsed. One of the main reasons for this devastating trend is that policymakers have often ignored the catch limits calculated by scientists, which were intended to be strict thresholds to protect stocks. But it has now become clear that even these scientific recommendations were often too high.

In the European Union (EU), for example, fisheries are primarily managed through allowable catch limits, known as quotas, which are set by the European Council of Agriculture Ministers on the basis of scientific advice and recommendations from the European Commission. A new study by Australian scientists (Edgar et al.) shows that already the scientific advice has been recommending catch limits that were too high.

The journal Science, where the study is published today, asked two of the world's most cited fisheries experts, Dr Rainer Froese from the GEOMAR Helmholtz Centre for Ocean Research Kiel and Dr Daniel Pauly from the University of British Columbia, to interpret the findings. In their Perspective Paper, they advocate for simpler, yet more realistic models based on ecological principles, and call for more conservative stock assessments and management when uncertainties arise."

Source: [GEOMAR](#) (22 Aug 2024)



"Surrey's Advanced Technology Institute (ATI) has developed highly energy-efficient, flexible nanogenerators, which demonstrate a 140-fold increase in power density when compared to conventional nanogenerators. ATI researchers believe that this development could pave the way for nano-devices that are as efficient as today's solar cells.

Surrey's devices can convert small amounts of everyday mechanical energy, like motion, into a significantly higher amount of electrical power, similar to how an amplifier boosts sound in an electronic system. For instance, if a traditional nanogenerator produces 10 milliwatts of power, this new technology could increase that output to over 1,000 milliwatts, making it suitable for energy harvesting in various everyday applications.

ATI's nanogenerator works like a relay team – instead of one electrode (the runner) passing energy (charge) by itself. Each runner collects a baton (charge), adds more and then passes all batons to the next runner, boosting the overall energy that is collected in a process called the charge regeneration effect."

Source: [SURREY](#) (21 Aug 2024)

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