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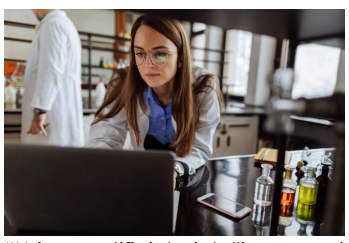
AI

How Are Researchers Using AI? Survey Reveals Pros and Cons for Science



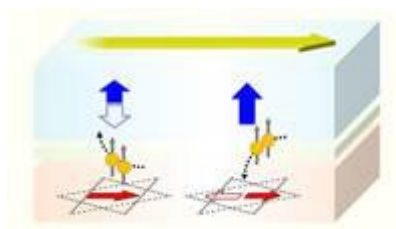
"Using artificial intelligence (AI) tools for processes such as preparing manuscripts, writing grant applications and peer review will become widely accepted within the next two years, suggests a survey of nearly 5,000 researchers in more than 70 countries by the publishing company Wiley.

The survey asked researchers how they are currently using generative AI tools — which include chatbots such as ChatGPT and DeepSeek — as well as how they feel about various potential applications of the technology. The results suggest that the majority of researchers see AI becoming central for scientific research and publishing (see 'Acceptable use'). More than half of the respondents think that AI currently outperforms humans at more than 20 of the tasks given as example use cases, including reviewing large sets of papers, summarizing research findings, detecting errors in writing, checking for plagiarism and organizing citations. More half of the survey participants expect AI to become mainstream in 34 out of 43 use cases in the next two years."

Source: Nature (4 Feb 2025)

AI

New AI Function on The Horizon Thanks to Electrically Programmable Spintronic Device



"AI transformational impact is well under way. But as AI technologies develop, so too does their power consumption. Further advancements will require AI chips that can process AI calculations with high energy efficiency.

This is where spintronic devices enter the equation. Their integrated memory and computing capabilities mimic the human brain, and they can serve as a building block for lower-power AI chips.

Now, researchers at Tohoku University, National Institute for Materials Science, and Japan Atomic Energy Agency have developed a new spintronic device that allows for the electrical mutual control of non-collinear antiferromagnets and ferromagnets. This means the device can switch magnetic states efficiently, storing and processing information with less energy - just like a brain-like AI chip. The breakthrough can potentially revolutionize AI hardware via high efficiency and low energy costs."

Source: Eurekalert! (7 Feb 2025)

AI

DeepSeek: A Game Changer in AI Efficiency?

"DeepSeek, a Chinese AI start-up founded in 2023, has quickly made waves in the industry. With fewer than 200 employees and backed by the quant fund High-Flyer ($8 billion assets under management), the company released its open-source model, DeepSeek R1, one day before the announcement of OpenAI's $500 billion Stargate project.

What sets DeepSeek apart is the prospect of radical cost efficiency. The company claims to have trained its model for just $6 million using 2,000 Nvidia H800 graphics processing units (GPUs) vs. the $80 million to $100 million cost of GPT-4 and the 16,000 H100 GPUs required for Meta's LLaMA 3. While the comparisons are far from apples to apples, the possibilities are valuable to understand.

DeepSeek's rapid adoption underscores its potential impact. Within days, it became the top free app in US app stores, spawned more than 700 open-source derivatives (and growing), and was onboarded by Microsoft, AWS, and Nvidia AI platforms."

Source: Bain (Feb 2025)

ARCHITECTURE

Designing For Density: How Modernist Principles Continue to Shape Social Housing Solutions Today

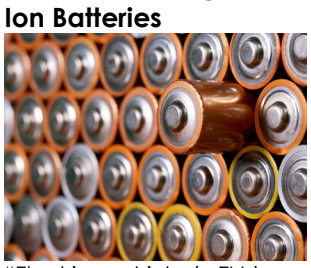
"When discussing modernist living, several iconic private residential projects may first come to mind—Le Corbusier's Villa Savoye, the Case Study Houses, most notably by Richard Neutra, Pierre Koenig, and Charles and Ray Eames, as well as the glass houses by Mies van der Rohe and Philip Johnson. Most of these projects exemplified an idealized vision of modern living, set in picturesque landscapes and characterized by experimentation with new construction methods, materials, and spatial concepts. Their designs embraced openness, blurring the boundaries between private and public spaces, largely unburdened by constraints such as density, efficiency, accessibility, public transit integration, or communal considerations.

While these modern homes remain influential in contemporary residential design, they also—perhaps unexpectedly—laid the groundwork for high-density housing principles. Concepts such as the interplay between public and private space, modular construction, and prefabrication, initially explored in these private residences, have been adapted to the vastly different constraints of social housing."

Source: Archdaily (3 Feb 2025)

BATTERIES

A Pinch of Salt Boosts Aluminium Batteries: This Sustainable, Solid-State Electrolyte Design Outlives Lithium-Ion Batteries



"Electric vehicles(EVs) and green energy sources rely heavily on batteries to store electricity. Currently, more than 75 percent of the world's energy storage depends on batteries that contain lithium, an expensive mineral that's subject to volatile pricing. Lithium-ion (Li-ion) batteries themselves can be volatile, too, because they use a flammable electrolyte that can catch fire when overcharged.

Now, a group of scientists based in Beijing believes that aluminum offers a better solution. Aluminum is the third-most abundant mineral in the Earth's crust and costs about one-quarter as much as lithium. And if built right, aluminum-based batteries may offer longer life expectancy and a safer, more sustainable design than their volatile counterparts. Led by scientists from the Beijing Institute of Technology and the University of Science and Technology Beijing, the group has found a way to stabilize aluminum batteries that can last far longer."

Source: Dezeen (5 Feb 2025)

BIOMED

Novel 'Living' Biomaterial Aims to Advance Regenerative Medicine

"A biomaterial that can mimic certain behaviors within biological tissues could advance regenerative medicine, disease modeling, soft robotics and more, according to researchers at Penn State.

Materials created up to this point to mimic tissues and extracellular matrices (ECMs) — the body's biological scaffolding of proteins and molecules that surrounds and supports tissues and cells — have all had limitations that hamper their practical applications, according to the team. To overcome some of those limitations, the researchers developed a bio-based, "living" material that encompasses self-healing properties and mimics the biological response of ECMs to mechanical stress."

Source: PSU (3 Feb 2025)

COMPUTING

Google's Quantum Simulator Reveals New Facet of Magnetism: A Hybrid Digital-Analog Quantum Computer Made a Surprising Discovery

"When Nobel laureate Richard Feynman first suggested the idea of quantum computers, he proposed they might perform the kind of complex quantum simulations that may yield insights into next-generation batteries or novel drugs. Now a new quantum simulator from Google has discovered that magnetism does not always work the way scientists think, suggesting that it has promise for unearthing more discoveries in the future.

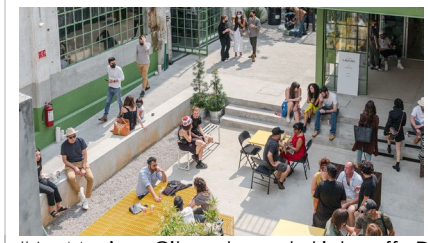
The new research combines two kinds of quantum computing—analog and digital. In analog quantum computing, qubits can serve as analogues of other objects that display quantum behavior, such as molecules, atoms, and subatomic particles. Analog quantum computing is often used to simulate molecular interactions that are too complex for any classical computer to model within our lifetimes.

In contrast, digital quantum computers run sequences of elementary operations, called quantum logic gates, on a set of qubits. With enough qubits, a quantum computer could theoretically vastly outperform all classical computers on a number of applications. For instance, on quantum computers, Shor's algorithm can crack modern cryptography, and Grover's algorithm can search databases at staggering speeds."

Source: Dezeen (7 Feb 2025)

DESIGN

Ten Exhibitions for Design Lovers During Mexico City Art Week



"As Mexico City art week kicks off, Dezeen has selected 10 exhibitions and showcases in architecture and design, from a collection of architect Alberto Kalach's notebooks to fairs showcasing collectible and industrial design.

Anchored by Zona Maco, the yearly art week has been a stop on the international fair circuit for years, but only recently began to be a destination for designers.

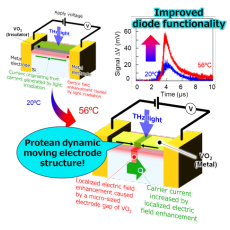
Galleries, institutions, and even full fairs dedicated to design have cropped up to represent the design world in the Mexican capital.

Read on for 10 exhibitions to visit during Mexico City art week 2025."

Source: Dezeen (3 Feb 2025)

ELECTRONICS

‘Living’ Electrodes Breathe New Life into Traditional Silicon Electronics



“Researchers from SANKEN (The Institute of Scientific and Industrial Research), at Osaka University discover that temperature-controlled conductive networks in vanadium dioxide enhance the sensitivity of silicon device to terahertz light.

High-speed electronic devices that do not use much power are useful for wireless communication. High-speed operation has traditionally been achieved by making devices smaller, but as devices become smaller, fabrication becomes increasingly difficult. Have we reached a dead end?

Not yet! A research team at Osaka University is exploring another way to improve device performance: placing a patterned metal layer, i.e., a structural metamaterial, on top of a traditional substrate, e.g., silicon, to accelerate electron flow. This method is promising, but a challenge is to make the structure of the metamaterial controllable, thereby allowing the properties of the metamaterial to be adjusted based on real-word conditions.

In search of a solution, the research team examined vanadium dioxide (VO2). When heated appropriately, small areas in a VO2 layer transform from insulating to metallic. These metallic regions can carry charge, thus behaving as tiny dynamic electrodes. The researchers exploited this behavior to produce ‘living’ microelectrodes that selectively enhanced the response of silicon photodetectors to terahertz light.”

Source: Sanken (Feb 2025)

EV

UTEP Engineers Model Electric Grid Demand for EVs To Charge While in Motion

“Running out of gas in a remote area far from a gas station is every driver’s worst nightmare. A similar stressor, known as “range anxiety,” exists for owners of electric vehicles who worry about how far their EV’s can drive without running out of battery.

As EVs become more common on roadways — annual EV sales are estimated to reach 7.2 million by 2030 — innovative new methods are being developed to more easily charge them. One of these methods, a new mechanism that could charge vehicles while they are in motion, is the focus of a new University of Texas at El Paso-led study published in the journal IEEE Access.

The UTEP research group is part of a National Science Foundation and Department of Energy-funded coalition of engineers focused on an EV in-motion charging technology known as a Dynamic Wireless Power Transfer (DWPT) roadway. A DWPT roadway would embed transmitter pads within road surfaces, thereby allowing EVs to charge while driving without needing to be hooked up to a power outlet, said Paras Mandal, Ph.D., professor of electrical and computer engineering at UTEP and the study’s principal investigator.

“The field of electrified transportation is evolving, and modeling the load demand on our electrical grid is a very significant part of the work,” said Mandal. “Our research will allow for a comprehensive understanding of new EV charging methods to ensure sustainable use of our transportation infrastructure coupled with power utilities.”

The DWPT technology is still in development, but Mandal said that before it can be adopted, engineers, utilities and local governments need to have a thorough understanding of the future load demand on the electrical grid. Modeling “load demand” is challenging because engineers need to account for vehicles of varying sizes, different lengths of roadways, and varying degrees of traffic. In order to understand the impact of a DWPT roadway on the electrical grid at varying degrees of usage, Mandal’s team developed a novel method of measuring load demand called modified Toeplitz convolution or mCONV. The model is essentially the mathematical formulation of DWPT that allows the engineers to understand dynamic electric load demand while taking into account different distances, traffic flow and vehicle types.

“The next steps in this research will be to understand how DWPT will affect power system stability and reliability,” Mandal said.”

Source: UTEP (4 Feb 2025)

LIFE ON EARTH

Multinational Research Project Shows How Life on Earth Can Be Measured from Space

“Measurements and data collected from space can be used to better understand life on Earth.

An ambitious, multinational research project funded by NASA and co-led by UC Merced civil and environmental engineering Professor Erin Hestir demonstrated that Earth's biodiversity can be monitored and measured from space, leading to a better understanding of terrestrial and aquatic ecosystems. Hestir led the team alongside University of Buffalo geography Professor Adam Wilson and Professor Jasper Slingsby from the University of Cape Town on BioSCape, which collected data over six weeks in late 2024.

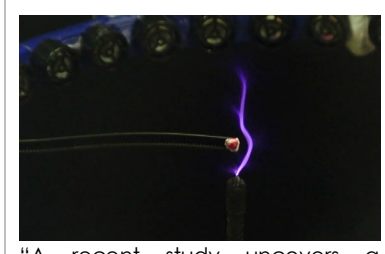
Two NASA aircraft and one South African aircraft flew over South Africa's Greater Cape Floristic Region - one of the most biodiverse places on the planet - to collect ultraviolet, visual, thermal and other images. That data, combined with field work by the large team of scientists from the United States and South Africa, provides a comprehensive look at the region's biodiversity, or life systems.

"This was NASA's first ever biodiversity-focused campaign," Hestir said. "We successfully hit all our measurement targets, and the data collected are contributing to novel techniques and methods to be able to monitor biodiversity from space across the globe. It's a lot of exciting science."

Source: Ucmerced (3 Feb 2025)

POWER

Making An Invisible Electric Wire: Guiding Electricity with Sound



“A recent study uncovers a way of transporting electricity through air by ultrasonic waves. The level of control of the electric sparks allows to guide the spark around obstacles, or to make it hit specific spots, even into non-conductive materials.

"We observed this phenomenon more than one year ago, then it took us months to control it, and even longer to find an explanation," says Dr. Asier Marzo from the Public University of Navarre, lead researcher of the work.

This guidance occurs because the sparks heat up the air, which expands and lowers its density. The hot air is then guided by ultrasonic waves into regions where the sound intensity is higher and the next sparks then follow these regions of lighter air because of its lower breakdown voltage.

"Precise control of sparks allows their utilization in a wide variety of applications, such as atmospheric sciences, biological procedures and selective powering of circuits," comments Prof. Ari Salmi from the University of Helsinki.

Previously, sparks could only be guided with laser induced discharges colloquially called Electrolasers which required the use of dangerous lasers, as well as precise timing between the laser and the electric discharge. The developed method uses ultrasound rather than lasers, and it is safe to the eyes and skin. The equipment is compact, affordable and can be operated continuously.

"I am excited about the possibility of using very faint sparks for creating controlled tactile stimuli in the hand, perhaps creating the first contactless Braille system," says Josu Irisarri, first author of the publication from the Public University of Navarre.”

Source: Helsinki (6 Feb 2025)