SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Weekly Discovery

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13 Nov – 17 Nov 2023

AERIAL ROBOTS

The Long Jump: Athletic, Insect-Scale Long Jumping Robots Reach Where Others Can't

"A team of engineers from the University of Illinois has published the first known study documenting the long-jumping motion of 3D-printed insect-scale robots.

The new study, published in the journal Smart Materials and Structures, follows a previous publication that documented the same lab's investigation of vertical jumping in insect-scale robots. The study is led by Professor Sameh Tawfick, an associate professor and Ralph A. Andersen Faculty Scholar in the Department of Mechanical Science and Engineering. His lab, the Kinetic Materials Research Group, studies the development of artificial muscles as part of its focus on bio-inspired materials manufacturing.

"To my knowledge, this is the first time anyone has demonstrated long jumping in insect-scale robots," Tawfick said of his lab's accomplishment. "This is significant because it gives the robot planned mobility, where it can now jump from A to B, traversing terrain rougher than its own size."

Source: Eurekalert! (13 Nov 2023)

AI

This AI Robot Chemist Could Make Oxygen on Mars

"Researchers in China have developed a robot chemist powered by artificial intelligence (AI) that might be able to extract oxygen from water on Mars. The robot uses materials found on the red planet to produce catalysts that break down water, releasing oxygen. The idea could complement existing oxygen-generating technologies or lead to the development of other catalysts able to synthesize useful resources on Mars.

"If you think about the challenge of going to Mars, you have to work with local materials," says Andy Cooper, a chemist at the University of Liverpool, UK. "So, I can see the logic behind it."

The study, published in Nature Synthesis, was led by Jun Jiang at the University of Science and Technology of China in Hefei. Jiang and his team used a mobile machine the size of a refrigerator with a robotic arm to analyse five meteorites that had either come from Mars or been collected on Earth but mimicked the Martian surface. The team's goal was to investigate whether the machine could produce useful catalysts from the material."

Source: Nature (13 Nov 2023)

AI

New AI Noise-Canceling Headphone Technology Lets Wearers Pick Which Sounds They Hear

"Most anyone who's used noise-canceling headphones knows that hearing the right noise at the right time can be vital. Someone might want to erase car horns when working indoors, but not when walking along busy streets. Yet people can't choose what sounds their headphones cancel.

Now, a team led by researchers at the University of Washington has developed deep-learning algorithms that let users pick which sounds filter through their headphones in real time. The team is calling the system "semantic hearing." Headphones stream captured audio to a connected smartphone, which cancels all environmental sounds. Either through voice commands or a smartphone app, headphone wearers can select which sounds they want to include from 20 classes, such as sirens, baby cries, speech, vacuum cleaners and bird chirps. Only the selected sounds will be played through the headphones."

Source: UW (9 Nov 2023)

ARCHITECTURE

Cultivating Non-Violent Cities: 10 Examples of Friendly Public Spaces

"Violent cities result from social and economic inequality, which also affects the urban landscape and the way we live. In honor of International Cities Day, we have selected a series of projects to reflect on non-violent ways of using public space.

In 2018, Mexican NGO Seguridad, Justicia y Paz (safety, justice and peace) published a list of the 50 most violent cities in the world based on the rate of homicides per 100,000 citizens. Brazil has 17 of the 50 most violent cities, followed by Mexico with 12, Venezuela with 5, and the United States with 4. Meanwhile, the Gini index, a statistical measure to represent the income inequality within a nation or a social group, shows that the four aforementioned countries, as well as the others in the ranking, all have high coefficients, between 41 and 53, meaning they have a high degree of income inequality among their population. It is important to point out that all these countries were colonized and have been victims of genocide and mass slavery throughout history, resulting in a social structure that marginalizes minorities."

Source: Archdaily (31 Oct 2023)

ENERGY

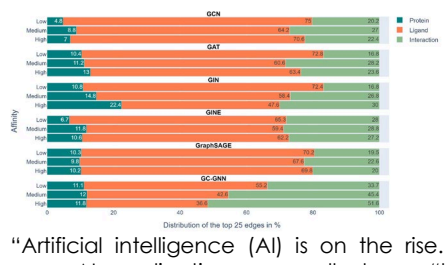
Energy Transition: A Super-Model to Guide Policy Makers

"How can we ensure that an energy policy will achieve its objectives? To find out, scientists and public authorities can rely on computer models of varying degrees of accuracy. However, these models have a number of limitations, including the fact that they are not very effective for generating projections on a regional scale. A team from the University of Geneva (UNIGE) has designed a super-model to simulate the spread of three green technologies in Swiss municipalities by 2050. It is based on available statistics and combines twelve existing models of technology growth, while testing their relevance. The results, published in the journal PNAS Nexus, could help inform political decision-making."

Source: UNIGE (6 Nov 2023)

HEALTHCARE

Artificial Intelligence: Unexpected Results

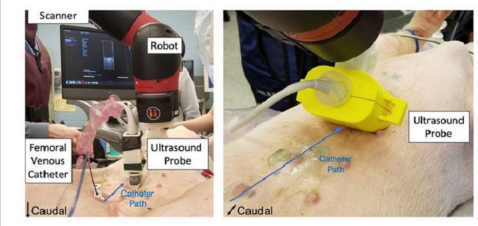


"Artificial intelligence (AI) is on the rise. Until now, AI applications generally have "black box" character: How AI arrives at its results remains hidden. Prof. Dr. Jürgen Bajorath, a cheminformatics scientist at the University of Bonn, and his team have developed a method that reveals how certain AI applications work in pharmaceutical research. The results are unexpected: the AI programs largely remembered known data and hardly learned specific chemical interactions when predicting drug potency. The results have now been published in "Nature Machine Intelligence."

Source: UNI BONN (13 Nov 2023)

MACHINE LEARNING

Using Deep Learning to Process Raw Photoacoustic Channel Data and Guide Cardiac Interventions



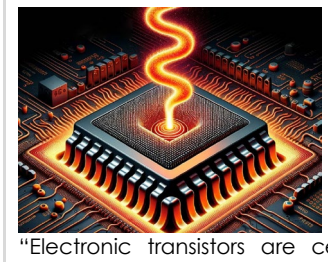
"Cardiovascular diseases rank among the top causes of death across the world, and cardiac interventions are similarly very common. For example, cardiac catheter ablation procedures, which are used to treat arrythmias, number in several tens of thousands per year in the US alone. In these procedures, surgeons insert a thin, flexible tube called a catheter into the femoral vein in the leg and navigate their way up to the heart, where the problematic tissue is destroyed using cold or focused radiation.

Even though cardiac catheter-based procedures are considered minimally invasive, the position of the catheter tip must be carefully monitored and controlled to prevent damage to the heart. In most cases, surgeons rely on fluoroscopy to localize and guide the catheter tip. However, this approach exposes both the patient and the medical staff to ionizing radiation, which can lead to problems such as increased risk of cancer or birth defects."

Source: Eurekalert! (13 Nov 2023)

SEMICONDUCTORS

Thermal Transistors Handle Heat with No Moving Parts



"Electronic transistors are central to modern electronics. These devices precisely control the flow of electricity, but in doing so, they generate heat. Now, researchers at the University of California Los Angeles have developed a solid-state thermal transistor—the first device of its kind that can use an electric field to control the flow of heat through electronics. Their study, which was recently published in Science, demonstrates the capabilities of the new technology.

"There has been a strong desire from engineers and scientists to control heat transfer the same way we control electronics, but it has been very challenging," says study lead author Yongjie Hu, a professor of mechanical and aerospace engineering at UCLA."

Source: IEEE Spectrum (13 Nov 2023)

SUSTAINABILITY

Food Waste Prevention in Europe Can Generate Major Footprint Savings

"New calculations show that the European countries have great potential for reducing the demand for global food resources and the associated GHG footprint. Researchers have estimated the climate footprint savings that may be obtained from reducing food loss and waste along Europe's food supply chain by 50 % by 2030…

"Halving Europe's food loss and waste, together with a redistribution of global food resources, could solve the challenges of food shortages in the world," says Marianne Thomsen, research leader and professor of sustainable food systems at the Department of Food Science at the University of Copenhagen (UCPH FOOD)."

Source: UOC (6 Nov 2023)

SUSTAINABLE DESIGN

Dissolvable Binder for EV Batteries Wins 2023 Earthshot Prize

"Prince William has announced the five projects that are taking home this year's Earthshot Prize, including an AI-powered soil carbon marketplace and a more circular manufacturing process for lithium-ion batteries.

Founded by the British royal in 2021, the annual Earthshot Prize rewards innovative solutions to the world's most pressing environmental challenges – air and water pollution, environmental degradation, waste and climate change.

From more than 1,100 entries, a winner was chosen for each of these five categories and awarded a £1 million cash prize to help scale up the project and increase its positive impact.

"Our winners and all our finalists remind us that, no matter where you are on our planet, the spirit of ingenuity and the ability to inspire change surrounds us all," Prince William said in a speech at the awards ceremony in Singapore."

Source: Dezeen (8 Nov 2023)

VIDEO CONFERENCING

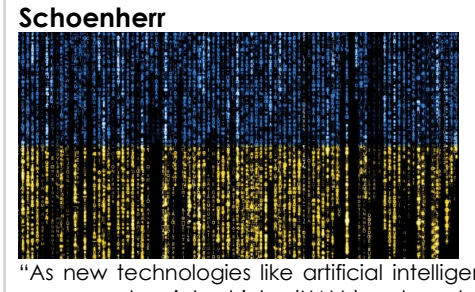
"Zoom Fatigue": Exhaustion Caused by Video Conferencing Proven on A Neurophysiological Level for The First Time

"Following the COVID-19 pandemic, the increase in virtual interactions has created a new challenge: fatigue caused by video calls, also known as Zoom fatigue or videoconference fatigue. This exhaustion, characterized by a feeling of tiredness and alienation due to too long or inappropriate video-based communication, had previously only been investigated through surveys and self-assessments by users. An interdisciplinary research team led by René Riedl from the University of Applied Sciences Upper Austria/Campus Steyr and Gernot Müller-Putz from Graz University of Technology has now managed to provide neurophysiological evidence of videoconference fatigue."

Source: TUGRAZ (13 Nov 2023)

WARFARE

21st Century Total Wars Will Enlist Technologies in Ways We Don't Yet Understand, Writes Jordan Richard Schoenherr



"As new technologies like artificial intelligence, unmanned aerial vehicles (UAVs) such as drones and so-called 'cyberweapons' such as malware and Internet-based disinformation campaigns become integral to our daily lives, researchers are working to grasp the role they will play in warfare.

Jordan Richard Schoenherr, an assistant professor in the Department of Psychology, writes in a new paper that our understanding of warfare is now outdated. The role sociotechnical systems—meaning the way technology relates to human organizational behaviour in a complex, interdependent system—plays in strategic thinking is still far from fully developed. Understanding their potential and their vulnerabilities will be an important task for planners in the years ahead."

Source: Concordia (8 Nov 2023)

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