SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Weekly Discovery

We SHARE to inspire and ignite ideas!

12 Aug – 16 Aug 2024

AI

How Air-Powered Computers Can Prevent Blood Clots

"A new, air-powered computer sets off alarms when certain medical devices fail. The invention is a more reliable and lower-cost way to help prevent blood clots and strokes — all without electronic sensors.

Described in a paper in the journal Device, the computer not only runs on air, but also uses air to issue warnings. It immediately blows a whistle when it detects a problem with the lifesaving compression machine it is designed to monitor.

Intermittent pneumatic compression or IPC devices are leg sleeves that fill with air periodically and squeeze a person's legs to increase blood flow. This prevents clots that lead to blocked blood vessels, strokes, or death. Typically, these machines are powered and monitored by electronics.

"IPC devices can save lives, but all the electronics in them make them expensive. So, we wanted to develop a pneumatic device that gets rid of some of the electronics, to make these devices cheaper and safer," said William Grover, associate professor of bioengineering at UC Riverside and corresponding paper author."

Source: UC Riverside (14 Aug 2024)

AI

Umass Amherst Researchers Create New Method for Orchestrating Successful Collaboration Among Robots

"New research from the University of Massachusetts Amherst shows that programming robots to create their own teams and voluntarily wait for their teammates results in faster task completion, with the potential to improve manufacturing, agriculture and warehouse automation. This research was recognized as a finalist for Best Paper Award on Multi-Robot Systems at the IEEE International Conference on Robotics and Automation 2024.

"There's a long history of debate on whether we want to build a single, powerful humanoid robot that can do all the jobs, or we have a team of robots that can collaborate," says one of the study authors, Hao Zhang, associate professor in the UMass Amherst Manning College of Information and Computer Sciences and director of the Human-Centered Robotics Lab.

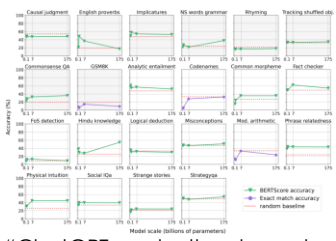
In a manufacturing setting, a robot team can be less expensive because it maximizes the capability of each robot. The challenge then becomes: how do you coordinate a diverse set of robots? Some may be fixed in place, others mobile; some can lift heavy materials, while others are suited to smaller tasks.

As a solution, Zhang and his team created a learning-based approach for scheduling robots called learning for voluntary waiting and subteaming (LVWS)."

Source: umass (17 Jul 2024)

AI

AI Poses No Existential Threat to Humanity – New Study Finds



"ChatGPT and other large language models (LLMs) cannot learn independently or acquire new skills, meaning they pose no existential threat to humanity, according to new research from the University of Bath and the Technical University of Darmstadt in Germany.

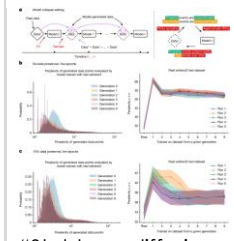
The study, published today as part of the proceedings of the 62nd Annual Meeting of the Association for Computational Linguistics (ACL 2024) – the premier international conference in natural language processing – reveals that LLMs have a superficial ability to follow instructions and excel at proficiency in language, however, they have no potential to master new skills without explicit instruction. This means they remain inherently controllable, predictable and safe.

The research team concluded that LLMs – which are being trained on ever larger datasets – can continue to be deployed without safety concerns, though the technology can still be misused."

Source: Eurekalert! (12 Aug 2024)

AI

AI Models Collapse When Trained on Recursively Generated Data



"Stable diffusion revolutionized image creation from descriptive text. GPT-2, GPT-3(.5) and GPT-4 demonstrated high performance across a variety of language tasks. ChatGPT introduced such language models to the public. It is now clear that generative artificial intelligence (AI) such as large language models (LLMs) is here to stay and will substantially change the ecosystem of online text and images. Here we consider what may happen to GPT-{n} once LLMs contribute much of the text found online. We find that indiscriminate use of model-generated content in training causes irreversible defects in the resulting models, in which tails of the original content distribution disappear. We refer to this effect as 'model collapse' and show that it can occur in LLMs as well as in variational autoencoders (VAEs) and Gaussian mixture models (GMMs). We build theoretical intuition behind the phenomenon and portray its ubiquity among all learned generative models. We demonstrate that it must be taken seriously if we are to sustain the benefits of training from large-scale data scraped from the web. Indeed, the value of data collected about genuine human interactions with systems will be increasingly valuable in the presence of LLM-generated content in data crawled from the Internet."

Source: Nature (24 Jul 2024)

ARCHITECTURE

The Venues Set to Host The 2028 Summer Olympics In Los Angeles

"After the Olympic flag was passed to Los Angeles at last night's Paris 2024 closing ceremony, we conclude our Olympic Impact series with a look ahead to the venues set to host the next games in 2028.

Although the Olympic and Paralympic Games in Los Angeles may be four years away, all the main venues are already built.

Over the past decade there has been a gradual reduction in the number of buildings constructed for the Olympics, with Paris only building one major permanent venue – the timber aquatics centre. This trajectory will reach its logical conclusion in Los Angeles with the city not building any permanent venues for the Olympics in 2028.

Instead of new venues, the games will be hosted across the city's numerous existing sports venues, arenas and conference centres, supplemented with several specialist temporary venues."

Source: Dezeen (12 Aug 2024)

ARCHITECTURE

How Dense Is Too Dense? The Future of Social Housing in Metropolises

"Density in cities is often touted as a positive and desirable way to live. Various studies have repeatedly suggested that higher density can lead to better lifestyles, a more sustainable environment, and improved health. In The Death and Life of Great American Cities, journalist Jane Jacobs identifies several possible advantages of density: increased walkability, close-knit communities, and a concentration of resources while maintaining diversity that better serves the population.

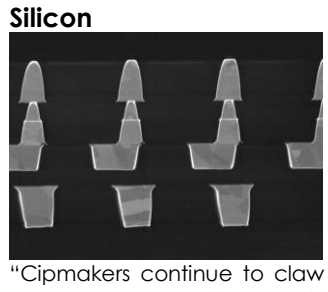
Naturally, a higher population density prevents the formation of ghost towns and vacant shops, which can become hotbeds for crime. However, these positive views on dense living environments often rest on optimistic assumptions about urbanism, such as minimal friction among individuals, easily maintained hygiene and a natural formation of diversity.

These assumptions, however, do not always hold. Tensions can flare within communities, and maintaining cleanliness can be challenging, as evidenced by the rat problems in New York City and pest infestations in Hong Kong. Achieving diversity can also be complicated in planned neighborhood clusters. When density is poorly managed, grouping only the narrowest range of income groups, household types, and economic activities may result in highly repressive and monotonous environments, limiting residents' daily experiences."

Source: Archdaily (12 Aug 2024)

CHIPS

Hybrid Bonding Plays Starring Role In 3D Chips: Tech Makes Millions of Connections in A Square Millimeter of Silicon



"Cipmakers continue to claw for every spare nanometer to continue scaling down circuits, but a technology involving things that are much bigger—hundreds or thousands of nanometers across—could be just as significant over the next five years.

Called hybrid bonding, that technology stacks two or more chips atop one another in the same package. That allows chipmakers to increase the number of transistors in their processors and memories despite a general slowdown in the shrinking of transistors, which once drove Moore's Law. At the IEEE Electronic Components and Technology Conference (ECTC) this past May in Denver, research groups from around the world unveiled a variety of hard-fought improvements to the technology, with a few showing results that could lead to a record density of connections between 3D stacked chips: some 7 million links per square millimeter of silicon."

Source: IEEE Spectrum (11 Aug 2024)

DESIGN

Ten Design Projects by Students At Hong Kong Polytechnic University

"**Dezeen School Shows:** a virtual reality device to improve productivity for people with ADHD features in this school show by students at the Hong Kong Polytechnic University.

Also included is and a self-service restaurant in Hong Kong and an AI-powered storytelling platform for children."

Source: Dezeen (6 Aug 2024)

DESIGN

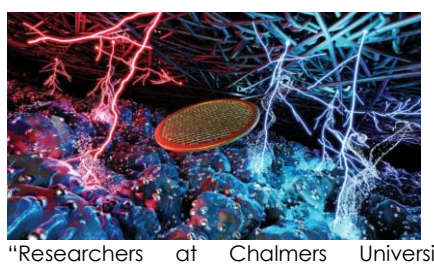
New Brain-Computer Interface Allows Man with ALS To 'Speak' Again

"A new brain-computer interface (BCI) developed at UC Davis Health translates brain signals into speech with up to 97% accuracy — the most accurate system of its kind.

The researchers implanted sensors in the brain of a man with severely impaired speech due to amyotrophic lateral sclerosis (ALS). The man was able to communicate his intended speech within minutes of activating the system.

ENERGY

A Method That Paves the Way for Improved Fuel Cell Vehicles



"Researchers at Chalmers University of Technology have developed a new method for studying what affects the ageing of fuel cells by tracking a specific particle in the fuel cell during use. The team of researchers have studied an entire fuel cell by taking it apart at regular intervals. Using advanced electron microscopes, they have then been able to follow how the cathode electrode degrades in specific areas during the cycles of use. Previous

MICROPLASTICS

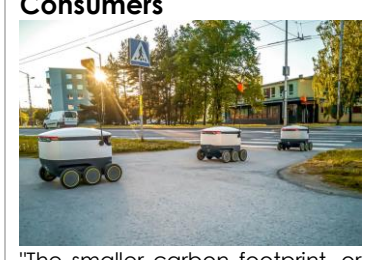
Mizzou Scientists Achieve More Than 98% Efficiency Removing Nanoplastics from Water

"University of Missouri scientists are battling against an emerging enemy of human health: nanoplastics. Much smaller in size than the diameter of an average human hair, nanoplastics are invisible to the naked eye.

Linked to cardiovascular and respiratory diseases in people, nanoplastics continue to build up, largely unnoticed, in the world's bodies of water. The challenge remains to

ROBOTS

Delivery Robots' Green Credentials Make Them More Attractive to Consumers



"The smaller carbon footprint, or wheel print, of automatic delivery robots can encourage consumers to use them when ordering food, according to a Washington State University study.

The suitcase-sized, self-driving electric vehicles are much greener than many traditional food delivery methods because they have low, or even zero, carbon

A study about this work was published today in the New England Journal of Medicine.

The new technology is being developed to restore communication for people who can't speak due to paralysis or neurological conditions like ALS. It can interpret brain signals when the user tries to speak and turns them into text that is 'spoken' aloud by the computer.

"Our BCI technology helped a man with paralysis to communicate with friends, families and caregivers," said UC Davis neurosurgeon David Brandman. "Our paper demonstrates the most accurate speech neuroprosthesis (device) ever reported."

Source: ucdavis (14 Aug 2024)

studies have been done on so-called half-cells, which are similar (but not the same as) half of a fuel-cell and are carried out under conditions that differ significantly from the real fuel cell.

"It has previously been assumed that the performance would be affected by the fuel cell being disassembled and studied in the way we have done, but it turned out that this assumption is not correct, which is surprising," says research leader Björn Wickman, Associate Professor at the Department of Physics at Chalmers.

The researchers at Chalmers have been able to explore how the material in the fuel cell degrades at both the nano and micro level, and pinpoint exactly when and where the degradation occurs. This provides valuable information for the development of new and improved fuel cells with a longer lifespan."

Source: chalmers (14 Aug 2024)

develop a cost-effective solution to get rid of nanoplastics while leaving clean water behind.

That's where Mizzou comes in. Recently, researchers at the university created a new liquid-based solution that eliminates more than 98% of these microscopic plastic particles from water."

Source: missouri (13 Aug 2024)

emissions. In this study, participants who had more environmental awareness and knowledge about carbon emissions were more likely to choose the robots as a delivery method. The green influence went away though when people perceived the robots as a high-risk choice — meaning they worried that their food would be late, cold or otherwise spoiled before it arrived.

The findings, reported in the International Journal of Hospitality Management, indicate a way to promote the use of delivery robots.

"Much of the marketing focus has been on the functionality and the convenience of these automatic delivery robots, which is really important, but it would enhance these efforts to promote their green aspects as well," said lead author Jennifer Han, a doctoral student in WSU's Carson College of Business.

Working with WSU researchers Hyun Jeong Kim and Soobin Seo, Han conducted an online survey with 418 adult participants recruited through MTurk, Amazon's crowdsourcing platform. More than half were from urban areas, and many were already familiar with delivery robots, which are gaining in popularity in big cities. The participants watched short videos about automatic delivery robots and answered questions about carbon emissions as well as the robots themselves.

The researchers found a strong correlation between high ranked statements related to carbon emissions and the willingness to use the automatic delivery robots or ADRs. That connection broke, however, among people who thought using the technology was risky."

Source: WSU (13 Aug 2024)