SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

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23 Dec – 27 Dec 2024

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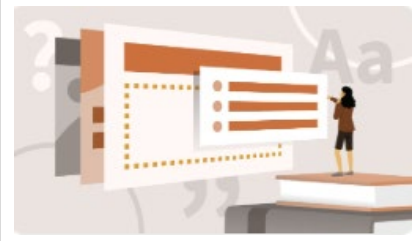

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AI

Machine Psychology – A Bridge to General AI

"Psychology and computer science

In parallel with his doctoral studies at LiU, he works as a teacher and researcher in clinical psychology at Stockholm University, where he is also an associate professor, a background that he used in his thesis Empirical Studies in Machine Psychology.

"I've used the principles of modern learning psychology to approach the issue of learning, thinking and intelligence. Then I used a specific form of adaptive artificial intelligence which is a logic system where I try to implement learning psychology," says Robert Johansson, who is now getting his second PhD.

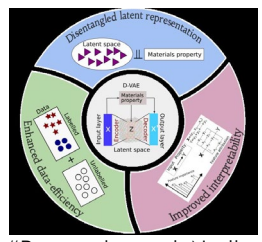
The logic system is called the Non-Axiomatic Reasoning System, NARS, and is designed to operate without complete data, with limited computational power and in real time. It provides a flexibility that is important for dealing with problems that may arise in the real world.

The combination of NARS and learning psychology principles constitutes an interdisciplinary approach that Robert Johansson calls Machine Psychology, a concept he was the first to coin but more actors have now started to use, including Google DeepMind."

Source: LI.U (19 Dec 2024)

AI

New AI Method Makes Materials Design More Efficient and Transparent



"Researchers at Northeastern University's Roux Institute have developed a groundbreaking approach to designing new materials using artificial intelligence (AI). The innovative method, which focuses on making the process both more data efficient and easier to interpret, could lead to better materials for industrial applications like corrosion protection and clean energy technologies.

What's New?

With the help of Artificial Intelligence (AI), inverse materials design has gained increasing popularity for creating materials tailored to specific properties. However, many existing approaches rely on generative models that learn a latent space where target properties are often entangled, making the process complex and difficult to interpret—especially when designing for multiple properties. To overcome this challenge, Dr. Cheng Zeng, Dr. Zulqarnain Khan, and Prof. Nathan Post from Northeastern University have developed a novel AI method using a Disentangled Variational Autoencoder (D-VAE) for inverse materials design."

Source: EurekAlert! (20 Dec 2024)

ARCHITECTURE

Adapt, Breathe, Regenerate: Envisioning A New Chapter in Architectural Materials

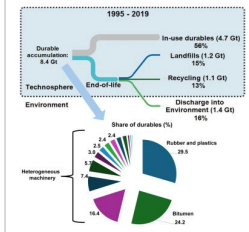
"The fine line between art and craft, creativity and functionality, personal expression and societal or industrial demands is one that architecture navigates with great care. This duality is increasingly shaped by the urgent need to address environmental challenges. At the forefront of this evolution are materials and construction systems, the essential building blocks of design and execution. Historically, architecture relied on natural raw materials like wood, stone, and metals, which defined built spaces but often strained ecosystems. Today, the discipline seems to be undergoing a profound transformation, shifting beyond mitigating negative impacts to actively fostering the planet's regeneration.

From regenerative materials that integrate biology and engineering to circular economy principles redefining resource use, and hybrid approaches that blend traditional methods with cutting-edge technology, these innovations are reshaping the blueprint for the built environment. In this article, we recap the year's key advancements in materials and construction systems, showcasing how they are driving architecture toward a sustainable future. Whether through carbon-sequestering materials, systems designed for disassembly and reuse, or technologies that merge nature with engineering, these developments underscore the essential role materials and construction systems play in creating a regenerative, resilient, and resource-conscious world."

Source: Archdaily (19 Dec 2024)

CARBON

The Extent and Fate of Fossil Carbon Accumulation in Our Technosphere



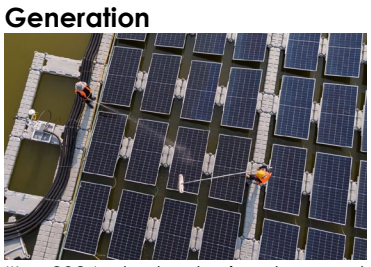
"This study examines how much fossil carbon is stored in long-lasting products, such as buildings and infrastructure, using data from 2011 and extending it to cover the years 1995–2019. Over these 25 years, 8.4 billion tons of fossil carbon have accumulated, with approximately 0.4 billion tons added each year, with a huge potential for further contribution to anthropogenic greenhouse gas emissions. A significant portion ends up in landfills, where it can take several hundred years to break down. This presents both challenges and opportunities for managing carbon and achieving climate goals. On one hand, durable goods and infrastructure act as temporary carbon storage. On the other hand, without proper management, much of this carbon will eventually be released into the atmosphere or biosphere.

Enhancing recycling rates and product lifetimes can lower demand for virgin fossil carbon, while better waste management can limit carbon leakage from landfills, preventing long-term environmental harm. These actions are crucial for meeting climate goals and building a more sustainable, circular economy."

Source: SCIENCE DIRECT (20 Dec 2024)

CLIMATE TECH

The Top 10 Climate Tech Stories Of 2024: Carbon Capture, Solar Panel Recycling, And Clean Energy Generation



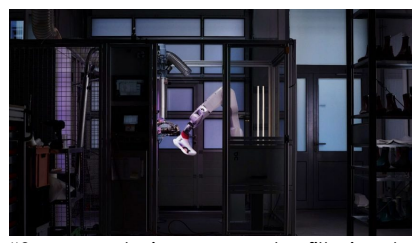
"In 2024, technologies to combat climate change soared above the clouds in electricity-generating kites, traveled the oceans sequestering carbon, and permeated the earth to power agritech in a new way. If these don't ring a bell, fret not! We've gathered our top 10 climate tech stories of the past year here for you to explore.

Climate tech is a rapidly advancing interdisciplinary field—we here at IEEE Spectrum are excited to see what stories about these technologies we'll be writing about for you in 2025."

Source: IEEE Spectrum (23 Dec 2024)

DESIGN

The Top 10 Product Designs Of 2024



"Spray-on trainers, a water-filtering bottle cap and inflatable self-defence devices for protestors feature in our roundup of the most impactful product designs from 2024.

This year saw designers tackle urgent topics from decarbonisation and water scarcity to the right to protest.

Meanwhile, companies focused on breaking records, with the world's thinnest watch and the first mass-market car without a rear window both making it onto the list."

Source: Dezeen (16 Dec 2024)

DESIGN

The Top 10 Gadgets Of 2024

"As part of our review of 2024, Dezeen design editor Jennifer Hahn shares her pick of this year's gadgets, including a transparent laptop, a medieval beat machine and hiking trousers that give the wearer a boost.

The past 12 months saw tech companies from LG to Huawei take their experiments with flexible screens to new heights, creating displays that can be bent, twisted and folded in three.

At the same time, boundaries between the real and virtual world continued to blur, as Apple and Lenovo experimented with mixed-reality technology and others used artificial intelligence (AI) to help people connect more deeply with nature."

Source: Dezeen (10 Dec 2024)

DRONES

The Small-Drone Revolution Is Coming — Scientists Need to Ensure It Will Be Safe

"This coming year will see a massive increase in the use of small drones for deliveries. Notably, China plans to expand the scale of its low-altitude economy— including drones, vertical take-off and landing aircraft and other general aviation components — to 1.5 trillion yuan (US$207 billion) by the end of 2025, to maintain its lead in such technologies.

The public is used to new technologies entering their lives — artificial intelligence (AI) is already commonplace and autonomous taxis operate on the streets of some cities in China, the United States and elsewhere. However, it remains unclear whether the public is prepared for daily encounters with thousands or even millions of drones in the sky — with their noise, potential crashes and intrusive views into our gardens and windows."

Source: Nature (18 Dec 2024)

ELECTRONICS

Physicists Magnetize a Material with Light

"MIT physicists have created a new and long-lasting magnetic state in a material, using only light.

In a study appearing today in Nature, the researchers report using a terahertz laser — a light source that oscillates more than a trillion times per second — to directly stimulate atoms

HEALTHCARE

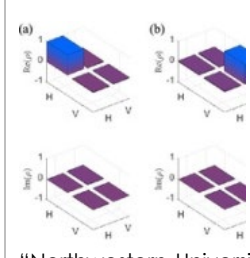
Researcher Defines 'Kindness' In Healthcare

"A researcher has defined 'kindness' and believes this could hold the key to better communication within healthcare teams and improve care for patients.

"Kindness has been strongly linked to patient experience and outcome measures, including safety, better engagement with healthcare

QUANTUM

First Demonstration of Quantum Teleportation Over Busy Internet Cables



"Northwestern University engineers are the first to successfully demonstrate quantum teleportation over a fiber optic cable already carrying Internet traffic.

The discovery introduces the new possibility of combining quantum communication with existing Internet cables — greatly simplifying

ROBOTS

Magnetic Swarm Intelligence of Mass-Produced, Programmable Microrobot Assemblies for Versatile Task Execution

"Swarm robotics has emerged as a promising methodology for accomplishing complicated tasks through the collective behavior of multiple robots. Through inter-robot communications, robotic swarms can execute terrain reconnaissance, pattern formation, and cargo transportation. However, in miniaturized robotic systems,

in an antiferromagnetic material. The laser's oscillations are tuned to the natural vibrations among the material's atoms, in a way that shifts the balance of atomic spins toward a new magnetic state.

The results provide a new way to control and switch antiferromagnetic materials, which are of interest for their potential to advance information processing and memory chip technology."

Source: MIT (18 Dec 2024)

services and reduced readmissions to hospital," says Nicki Macklin, a doctoral candidate in the School of Population Health at Waipapa Taumata Rau, University of Auckland.

"On the flip-side, unkindness in healthcare teams – rude manners, unclear or abrasive communication – has been shown in large studies to be the root cause of three out of four patient harm events in hospital settings.

"So, while kindness may sound like a lovely, soft, concept, it's actually a very serious tool for enhancing patient safety, experiences and outcome measures."

Source: AUCKLAND (15 Dec 2024)

the infrastructure required for distributed quantum sensing or computing applications.

The study was published today (Dec. 20) in the journal Optica.

"This is incredibly exciting because nobody thought it was possible," said Northwestern's Prem Kumar, who led the study. "Our work shows a path towards next-generation quantum and classical networks sharing a unified fiber optic infrastructure. Basically, it opens the door to pushing quantum communications to the next level."

An expert in quantum communication, Kumar is a professor of electrical and computer engineering at Northwestern's McCormick School of Engineering, where he directs the Center for Photonic Communication and Computing.

Only limited by the speed of light, quantum teleportation enables a new, ultra-fast, secure way to share information between distant network users, wherein direct transmission is not necessary. The process works by harnessing quantum entanglement, a technique in which two particles are linked, regardless of the distance between them. Instead of particles physically traveling to deliver information, entangled particles exchange information over great distances — without physically carrying it.

"In optical communications, all signals are converted to light," Kumar explained. "While conventional signals for classical communications typically comprise millions of particles of light, quantum information uses single photons."

"By performing a destructive measurement on two photons — one carrying a quantum state and one entangled with another photon — the quantum state is transferred onto the remaining photon, which can be very far away," said Jordan Thomas, a Ph.D. candidate in Kumar's laboratory and the paper's first author. "The photon itself does not have to be sent over long distances, but its state still ends up encoded onto the distant photon. Teleportation allows the exchange of information over great distances without requiring the information itself to travel that distance."

Source: northwestern (20 Dec 2024)

robots possess low kinetic energy to operate in various environments owing to their low body mass. Furthermore, battery- and sensor-free actuation of robots complicates inter-robot communication, limiting the extension of their functionalities. Herein, we present multifunctional swarm intelligence capable of versatile task execution via mass-produced magnetic microrobot swarms with programmed assembly configurations. The versatile task execution via microrobot swarms exhibits significant potential for various applications in robotic engineering, expanding foundational technology for developing advanced collective robot systems."

Source: SCIENCE DIRECT (18 Dec 2024)