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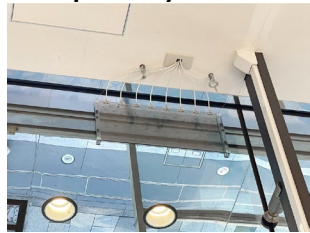
Featured Course

Introduction to Prompt Engineering for Generative AI

1h 3min

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5G Glass Antenna Turns Windows Into 5G Base Stations: Compact, Inconspicuous Antennas Could Increase Cell Coverage Transparently



"Since 5G began its rollout in 2018 or 2019, fifth-generation wireless networks have spread across the globe to cover hundreds of millions of users. But while it offers lower latency than precursor networks, 5G also requires more base stations. To avoid installing unsightly equipment on more and more shared spaces, Japanese companies are developing transparent glass antennas that allow windows to serve as base stations that can be shared by several carriers.

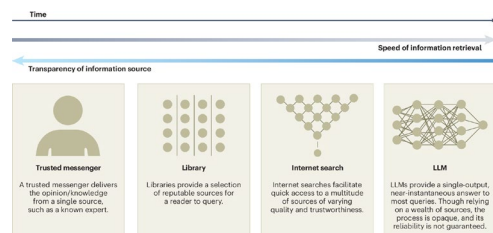
Because 5G networks include spectrum comprising higher frequencies than 4G, base stations for 5G networks serve a smaller coverage footprint. Which means more base stations are needed compared to 4G. Due to a lack of installation spots and the high cost of rolling out 5G networks, carriers in Japan have been sharing mobile infrastructure.

Last month the Tokyo-based communications company JTower announced the deployment of the new glass antenna, created in part by glassmaker AGC (one of the world's largest) and the mobile carrier NTT Docomo. The first was installed on a window in Tokyo's Shinjuku district.

The product is "the world's first antenna that turns a window into a base station that can be attached to a building window inside and turn the outdoors into a service area without spoiling the cityscape or the exterior appearance of the building," says Shota Ochiai, a marketing manager at AGC."

Source: [IEEE Spectrum](#) (18 Sep 2024)

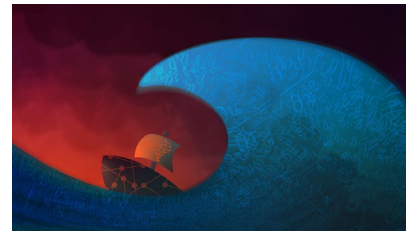
AI How Large Language Models Can Reshape Collective Intelligence



"Collective intelligence underpins the success of groups, organizations, markets and societies. Through distributed cognition and coordination, collectives can achieve outcomes that exceed the capabilities of individuals—even experts—resulting in improved accuracy and novel capabilities. Often, collective intelligence is supported by information technology, such as online prediction markets that elicit the 'wisdom of crowds', online forums that structure collective deliberation or digital platforms that crowdsource knowledge from the public. Large language models, however, are transforming how information is aggregated, accessed and transmitted online. Here we focus on the unique opportunities and challenges this transformation poses for collective intelligence. We bring together interdisciplinary perspectives from industry and academia to identify potential benefits, risks, policy-relevant considerations and open research questions, culminating in a call for a closer examination of how large language models affect humans' ability to collectively tackle complex problems."

Source: [Nature](#) (20 Sep 2024)

AI Replacing Hype About Artificial Intelligence with Accurate Measurements of Success



"PPPL researchers find overoptimism in journal articles using machine learning to solve fluid-related partial differential equations

The hype surrounding machine learning, a form of artificial intelligence, can make it seem like it is only a matter of time before such techniques are used to solve all scientific problems. While impressive claims are often made, those claims do not always hold up under scrutiny. Machine learning may be useful for solving some problems but falls short for others.

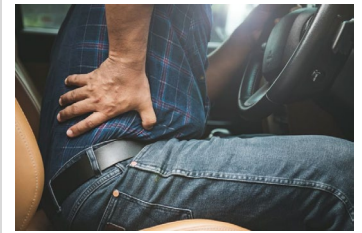
In a new paper (Link is external) in Nature Machine Intelligence, researchers at the U.S. Department of Energy (Link is external)'s Princeton Plasma Physics Laboratory (PPPL) and Princeton University performed a systematic review of research comparing machine learning (Link is external) to traditional methods for solving fluid-related partial differential equations (PDEs). Such equations are important in many scientific fields, including the plasma research that supports the development of fusion power for the electricity grid.

The researchers found that comparisons between machine learning methods for solving fluid-related PDEs and traditional methods are often biased in favor of machine learning methods. They also found that negative results were consistently underreported. They suggest rules for performing fair comparisons but argue that cultural changes are also needed to fix what appear to be systemic problems.

"Our research suggests that, though machine learning has great potential, the present literature paints an overly optimistic picture of how machine learning works to solve these particular types of equations," said Ammar Hakim, PPPL's deputy head of computational science and the principal investigator on the research."

Source: [PPPL](#) (25 Sep 2024)

AI AI Chatbots Rival Doctors for Back Pain Advice, Study Finds



"Conducted by an international team, the research sheds light on the potential of AI in addressing one of the world's leading causes of disability.

Associate Professor Bruno Tirotti Saragiotto, research co-author and Head of Physiotherapy at The University of Technology Sydney (UTS), said the study intended to evaluate how effectively AI chatbots like ChatGPT answer common questions posed by individuals experiencing low back pain.

The study, Assessing the performance of AI chatbots in answering patients' common questions about low back pain, was recently published in the journal Annals of the Rheumatic Diseases.

Low back pain affects millions globally, often prompting sufferers to seek information online.

As AI-powered chatbots become increasingly common in offering health recommendations, understanding the accuracy of their recommendations is important.

"The findings show that AI chatbots can offer advice with accuracy levels comparable to those reported by healthcare professionals in Australia," said Associate Professor Saragiotto.

The research found that AI chatbots excelled in answering questions related to suggested treatment and self-management, while risk factors had the most inaccuracies.

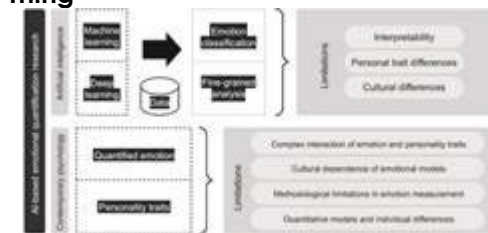
Questions such as "What complementary therapies like massage or acupuncture could alleviate lower back pain?" received accurate recommendations. The study also noted that AI chatbots consistently recommended exercise for preventing and managing low back pain, which is considered an accurate recommendation.

However, the study also showed that AI chatbots provided inaccurate recommendations to other commonly asked questions. For example, while poor posture does not cause low back pain, AI chatbots said that it does 88% of the time.

Another key observation was the ability of AI chatbots to recognise situations requiring medical referrals. In cases where professional care should be recommended, the AI systems advised users to consult a healthcare provider in 70-100% of instances.

Source: [UTS](#) (23 Sep 2024)

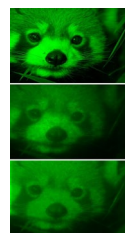
AI AI Is Learning to Read Your Emotions, And Here's Why That Can Be a Good Thing



"Using a fusion of traditional and novel technological methods, researchers are hoping to better quantify emotions to transform the face of the emotion quantification field

Human emotions are complex and are not always easily able to be boiled down to a recognizable pattern. Determining one's emotional state can be difficult human-to-human, and the many nuances of existence as an emotional entity seem impossible to train a non-human entity to understand, identify and learn from. However, a considerable amount of work and research has been put into training artificial intelligence (AI) to observe, quantify and recognize various states of emotion in humans. The fusion of tried and true psychological methods combined with the intelligence and trainability of AI can make emotion recognition technology invaluable in

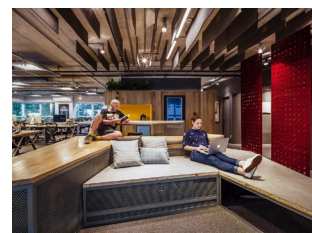
AR Shrinking AR Displays into Eyeglasses to Expand Their Use



"Augmented reality (AR) takes digital images and superimposes them onto real-world views. But AR is more than a new way to play video games; it could transform surgery and self-driving cars. To make the technology easier to integrate into common personal devices, researchers report in ACS Photonics how to combine two optical technologies into a single, high-resolution AR display. In an eyeglasses prototype, the researchers enhanced image quality with a computer algorithm that removed distortions.

AR systems, like those in bulky goggles and automobile head-up displays, require portable optical components. But shrinking the typical four-lens AR system to the size of eyeglasses or smaller typically lowers the quality of the computer-generated image and reduces the field of view. Youguang Ma and colleagues may have found a solution for condensing the

ARCHITECTURE The Future of Work: Sentient Workplaces for Employee Wellbeing



"Imagine stepping into an environment that fully understands you, knows your habits, and actively works to support your wellbeing as an occupant. Air quality might be monitored and managed, and occupant circadian rhythms might be tracked to suggest ideal states of productivity. Workplace designers have been considering occupant wellbeing and health in their designs for offices of the future. Hypothesizing what time ahead may contain, there is a strong case to be made for sentient architecture and interior design being disruptive forces in how we interact with our work environments.

What is Sentient Architecture?

Sentient architecture is a concept that describes buildings that can sense, think, act, and communicate using embedded technology. Buildings and spaces may adapt

DESIGN Ten Student Design Projects Selected from Dezeen's Pinterest



"As the 2024/2025 academic year begins, we present some of the most striking and intriguing design projects from last year's students that feature on the Dezeen School Shows Pinterest board.

This roundup presents 10 design projects from our School Shows Pinterest board, showcasing work that demonstrates unique applications of materials alongside social and political commentaries.

Included are international institutions such as Lucerne School of Design, Film and Art, Zurich University of the Arts and Instituto Tecnológico y de Estudios Superiores de Monterrey.

Scroll below to see ten projects from interior design, furniture design and interaction design courses, and browse our School Shows board to see more."

fields such as healthcare and education.”

Source: [Eurekalert](#) (20 Sep 2024)

technology. They combined two optical technologies — a metasurface and a refractive lens — with a microLED screen (containing arrays of tiny green LEDs for projecting images) to create a compact, single-lens hybrid AR design.”

Source: [ACS](#) (25 Sep 2024)

in real-time to occupants' needs and convey information instantaneously. It refers to an intelligent and responsive environment that leverages technology to create a feedback loop between buildings and their occupants. The architectural system would rely on data from various sensors, wearables, or scanners that make predictive adjustments to optimize comfort, productivity and wellbeing in the space.”

Source: [Archdaily](#) (30 Sep 2024)

Source: [Dezeen](#) (25 Sep 2024)

ENERGY
Untapped Potential: Study Shows How Water Systems Can Help Accelerate Renewable Energy Adoption



“New Stanford-led research reveals how water systems, from desalination plants to wastewater treatment facilities, could help make renewable energy more affordable and dependable. The study, published Sept. 27 in *Nature Water*, presents a framework to measure how water systems can adjust their energy use to help balance power grid supply and demand.

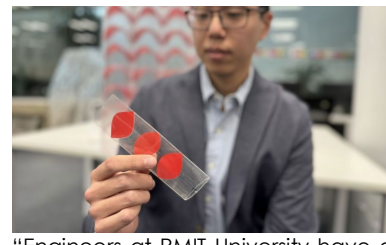
“If we’re going to reach net zero, we need demand-side energy solutions, and water systems represent a largely untapped resource,” said study lead author Akshay Rao, an environmental engineering PhD student in the Stanford School of Engineering. “Our method helps water operators and energy managers make better decisions about how to coordinate these infrastructure systems to simultaneously meet our decarbonization and water reliability goals.”

As grids rely more on renewable energy sources like wind and solar, balancing energy supply and demand becomes more challenging. Typically, energy storage technologies like batteries help with this, but batteries are expensive. An alternative is to promote demand-side flexibility from large-load consumers like water conveyance and treatment providers. Water systems – which use up to 5% of the nation’s electricity – could offer similar benefits to batteries by adjusting their operations to align with real-time energy needs, according to Rao and his co-authors.

To help realize this potential, the researchers developed a framework that assesses the value of energy flexibility from water systems from the perspectives of electric power grid operators and water system operators. The framework compares these values to other grid-scale energy storage solutions, such as lithium-ion batteries that store electricity during periods of low energy demand and release it during peak demand periods. The framework also takes into account a range of factors, such as reliability risks, compliance risks, and capital upgrade costs associated with delivering energy flexibility using critical infrastructure systems.”

Source: [Stanford](#) (27 Sep 2024)

MATERIALS
New Origami-Inspired System Turns Flat-Pack Tubes into Strong Building Materials



“Engineers at RMIT University have designed an innovative tubular structural system that can be packed flat for easier transport and pop up into strong building materials.

This breakthrough is made possible by a self-locking system inspired by curved-crease origami — a technique that uses curved crease lines in paper folding.

Lead researchers, Dr Jeff (Ting-Uei) Lee and Distinguished Professor Mike (Yi Min) Xie, said bamboo, which has internal structures providing natural reinforcement, inspired the tube design.

“This self-locking system is the result of an intelligent geometric design,” said Lee from RMIT’s School of Engineering.

“Our invention is suitable for large-scale use — a panel, weighing just 1.3 kg, made from multiple tubes can easily support a 75 kg person.”

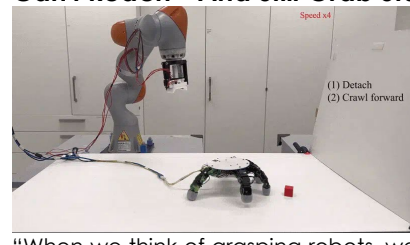
Flat-pack tubes are already widely used in engineering and scientific applications, such as in biomedical devices, aerospace structures, robotics and civil construction, including pop-up buildings as part of disaster recovery efforts.

The new system makes these tubes quicker and easier to assemble, with the capability to automatically transform into a strong, self-locked state.

“Our research not only opens up new possibilities for innovative and multifunctional structural designs, but it can also significantly improve existing deployable systems,” said Xie from the School of Engineering.”

Source: [RMIT](#) (24 Sep 2024)

ROBOTICS
Detachable Robotic Hand Crawls Around on Finger-Legs: The Handcrawler Can Go Where Arms Can't Reach—And Still Grab Stuff

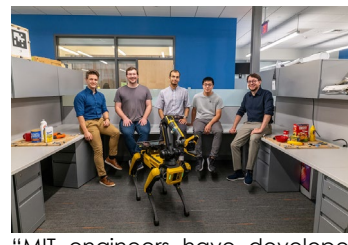


“When we think of grasping robots, we think of manipulators of some sort on the ends of arms of some sort. Because of course we do—that’s how (most of us) are built, and that’s the mindset with which we have consequently optimized the world around us. But one of the great things about robots is that they don’t have to be constrained by our constraints, and at ICRA@40 in Rotterdam this week, we saw a novel new thing: a robotic hand that can detach from its arm and then crawl around to grasp objects that would be otherwise out of reach, designed by roboticists from EPFL in Switzerland.

Fundamentally, robot hands and crawling robots share a lot of similarities, including a body along with some wiggly bits that stick out and do stuff. But most robotic hands are designed to grasp rather than crawl, and as far as I’m aware, no robotic hands have been designed to do both of those things at the same time. Since both capabilities are important, you don’t necessarily want to stick with a traditional grasping-focused hand design. The researchers employed a genetic algorithm and simulation to test a bunch of different configurations in order to optimize for the ability to hold things and to move.”

Source: [IEEE Spectrum](#) (26 Sep 2024)

ROBOTICS
Helping Robots Zero in On the Objects That Matter



“MIT engineers have developed a method that enables robots to make similarly intuitive, task-relevant decisions.

The team’s new approach, named Clio, enables a robot to identify the parts of a scene that matter, given the tasks at hand. With Clio, a robot takes in a list of tasks described in natural language and, based on those tasks, it then determines the level of granularity required to interpret its surroundings and “remember” only the parts of a scene that are relevant.

In real experiments ranging from a cluttered cubicle to a five-story building on MIT’s campus, the team used Clio to automatically segment a scene at different levels of granularity, based on a set of tasks specified in natural-language prompts such as “move rack of magazines” and “get first aid kit.”

The team also ran Clio in real-time on a quadruped robot. As the robot explored an office building, Clio identified and mapped only those parts of the scene that related to the robot’s tasks (such as retrieving a dog toy while ignoring piles of office supplies), allowing the robot to grasp the objects of interest.

Clio is named after the Greek muse of history, for its ability to identify and remember only the elements that matter for a given task. The researchers envision that Clio would be useful in many situations and environments in which a robot would have to quickly survey and make sense of its surroundings in the context of its given task.

“Search and rescue is the motivating application for this work, but Clio can also power domestic robots and robots working on a factory floor alongside humans,” says Luca Carlone, associate professor in MIT’s Department of Aeronautics and Astronautics (AeroAstro), principal investigator in the Laboratory for Information and Decision Systems (LIDS), and director of the MIT SPARK Laboratory. “It’s really about helping the robot understand the environment and what it has to remember in order to carry out its mission.”

Source: [MIT](#) (30 Sep 2024)

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