SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

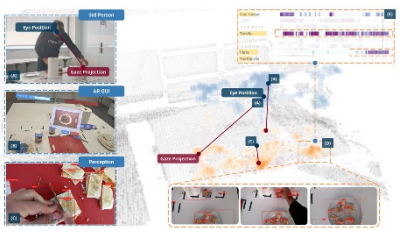
Weekly Discovery

We SHARE to inspire and ignite ideas!

9 Oct – 13 Oct 2023

AI

Developing the Next Generation of AI Assistant



"If you've ever learned to cook, you know how daunting even simple tasks can be at first. It's a delicate dance of ingredients, movement, heat, and techniques that newcomers need endless practice to master.

But imagine if you had someone – or something – to assist you. Say, an AI assistant that could walk you through everything you need to know and do to ensure that nothing is missed in real-time, guiding you to a stress-free delicious dinner.

Claudio Silva, director of the Visualization Imaging and Data Analytics (VIDA) Center and professor of computer science and engineering and data science at the NYU Tandon School of Engineering and NYU Center for Data Science, is doing just that. He is leading an initiative to develop an artificial intelligence (AI) "virtual assistant" providing just-in-time visual and audio feedback to help with task execution."

Source: IEEE Spectrum (21 Sep 2023)

AI

Is AI In the Eye Of The Beholder?

"Researchers from MIT and Arizona State University found that priming users — by telling them that a conversational AI agent for mental health support was either empathetic, neutral, or manipulative — influenced their perception of the chatbot and shaped how they communicated with it, even though they were speaking to the exact same chatbot.

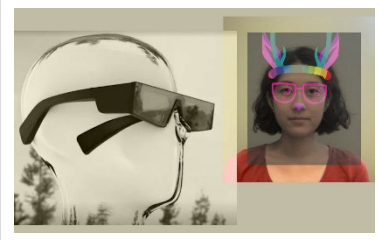
Most users who were told the AI agent was caring believed that it was, and they also gave it higher performance ratings than those who believed it was manipulative. At the same time, less than half of the users who were told the agent had manipulative motives thought the chatbot was actually malicious, indicating that people may try to "see the good" in AI the same way they do in their fellow humans.

The study revealed a feedback loop between users' mental models, or their perception of an AI agent, and that agent's responses. The sentiment of user-AI conversations became more positive over time if the user believed the AI was empathetic, while the opposite was true for users who thought it was nefarious."

Source: MIT (2 Oct 2023)

AR

AR Glasses Spawn a Whole New Social Dynamic



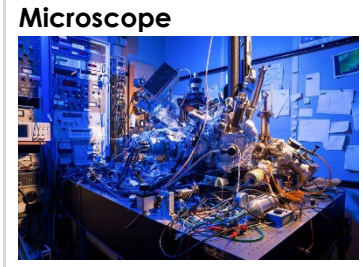
"Remember that viral video-call mishap of a lawyer getting stuck with the cat filter on? Imagine yourself in their shoes. Let's say you're talking to someone wearing eyewear akin to "smart" sunglasses that can discreetly overlay a cat filter on your face without your knowledge. How would that make you feel?

Researchers at Cornell University and Brown University teamed up to explore how this scenario would play out in a world with more ubiquitous augmented reality (AR) usage. In their study, presented in July at the 2023 ACM SIGCHI Conference on Designing Interactive Systems, the authors uncovered a social dynamic wherein a power imbalance favors the wearer of "smart" glasses, and offer insights on how the tech industry can design more inclusive AR technologies."

Source: IEEE Spectrum (25 Sep 2023)

COMPUTING

New Kind of Quantum Computer Made Using High-resolution Microscope



"Physicists have performed the first quantum calculations to be carried out using individual atoms sitting on a surface.

The technique, described on 5 October in Science, controls titanium atoms by beaming microwave signals from the tip of a scanning tunnelling microscope (STM). It is unlikely to compete any time soon with the leading approaches to quantum computing, including those adopted by Google and IBM, as well as by many start-up companies. But the tactic could be used to study quantum properties in a variety of other chemical elements or even molecules, say the researchers who developed it.

At some level, everything in nature is quantum and can, in principle, perform quantum computations. The hard part is to isolate quantum states called qubits — the quantum equivalent of the memory bits in a classical computer — from environmental disturbances, and to control them finely enough for such calculations to be achieved."

Source: Nature (5 Oct 2023)

DESIGN

From Sketch to Painting: A Digital Art Gallery to Inspire Everyday Architectural Work

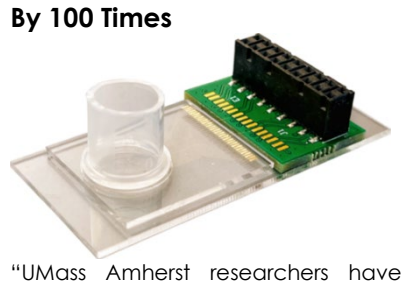
"The relationship between art and architecture is a recurring topic of discussion, seeing as architecture can be positioned at the intersection of structure, technology, and aesthetics. Despite the utilization of technical knowledge, architecture, and interior design also incorporate artistic concepts into their processes. From captivating illustrations during the design development phase to murals and artistic pieces that form an integral part of spatial conception, art plays an essential role in architectural production and society.

In the context of contemporary society, many of our activities are carried out digitally, from booking accommodation for travel to manufacturing materials and creating art exhibitions. In this sense, digitalization has also permeated the art world, conceiving initiatives like SINGULART, which challenges the traditional concept of art galleries by existing in a digital format. This platform combines works from various sources of inspiration and artistic techniques, encompassing everything from sketches and paintings to architectural photography. It fuses multiple influences from various contexts, including architectural work."

Source: Archdaily (4 Oct 2023)

DNA

Bioengineering Breakthrough Increases DNA Detection Sensitivity By 100 Times



"UMass Amherst researchers have pushed forward the boundaries of biomedical engineering one hundredfold with a new method for DNA detection with unprecedented sensitivity.

"DNA detection is in the center of bioengineering," says Jinglei Ping, lead author of the paper that appeared in Proceedings of the National Academy of Sciences. Ping is an assistant professor of mechanical and industrial engineering, an adjunct assistant professor in biomedical engineering and affiliated with the Center for Personalized Health Monitoring of the Institute for Applied Life Sciences. "Everyone wants to detect the DNA at a low concentration with a high sensitivity. And we just developed this method to improve the sensitivity by about 100 times with no cost."

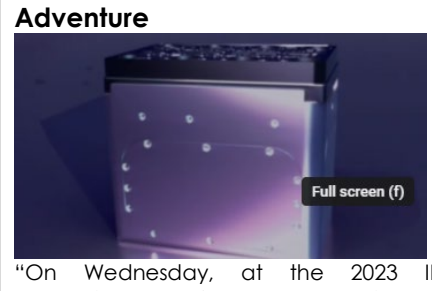
With traditional detection methods, he says, "The challenge is basically finding the needle in a haystack." There are lots of molecules present in a sample that aren't the target DNA that can interfere with the result.

That's where this method is different. The test sample is put within an alternating electric field. Then, "We let the DNA dance," he says. "When the strands of DNA dance, they have a specific oscillation frequency." Researchers can then read samples to see if there is a molecule moving in a way that matches the movement of the target DNA and easily distinguish it from different movement patterns. This even works when there is a very low concentration of the target DNA."

Source: UMASS (3 Oct 2023)

HEALTHCARE

Human Disease Simulator Lets Scientists Choose Their Own Adventure



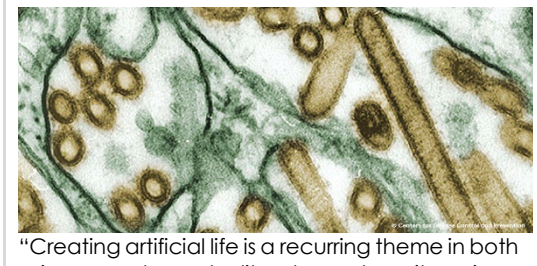
"On Wednesday, at the 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), in Detroit, a Disney Research team presented a brand new robotic character during their evening keynote address. The adorable robot packs an enormous amount of expression into its child-size body, from its highly expressive head and two wiggly antennae to its stubby little legs. But what sets this robot apart from other small bipeds is how it walks—it's full of personality, emoting as it moves in a way that makes it seem uniquely alive.

Programming robots to move in emotive ways is something that Disney is an expert in, going as far back as 1971, with its animatronic Hall of Presidents in Disney World. As robots have gotten more advanced and more mobile, though, it's become challenging for robot designers and robot animators to develop emotive behaviors that both take advantage of and are compatible with robotic hardware under real-world constraints. Disney Research has spent the last year developing a new system that leverages reinforcement learning to turn an animator's vision into expressive motions that are robust enough to work almost anywhere, whether that's a stage at IROS or a Disney theme park or a forest in Switzerland."

Source: Northwestern (2 Oct 2023)

HEALTHCARE

The Medicine of the Future Could Be Artificial Life Forms



"Creating artificial life is a recurring theme in both science and popular literature, where it conjures images of creeping slime creatures with malevolent intentions or super-cute designer pets. At the same time, the question arises: What role should artificial life play in our environment on Earth, where all life forms are created by nature and have their own place and purpose?

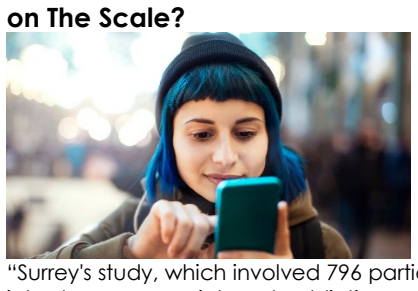
Associate professor Chenguang Lou from the Department of Physics, Chemistry, and Pharmacy, together with Professor Hanbin Mao from Kent State University, is the parent of a special artificial hybrid molecule that could lead to the creation of artificial life forms. They have now published a review in the journal Cell Reports Physical Science on the state of research in the field behind their creation. The field is called "hybrid peptide-DNA nanostructures," and it is an emerging field, less than ten years old.

Lou's vision is to create viral vaccines (modified and weakened versions of a virus) and artificial life forms that can be used for diagnosing and treating diseases."

Source: SDU (5 Oct 2023)

INTERNET ADDICTION

Study Introduces New Internet Addiction Spectrum: Where Are You on The Scale?



"Surrey's study, which involved 796 participants, introduces a new internet addiction spectrum, categorising internet users into five groups:

Casual Users (14.86%): This group mainly goes online for specific tasks and logs off without lingering. They show no signs of addiction and are generally older, with an average age of 33.4 years. They are the least interested in exploring new apps.

Initial Users (22.86%): These individuals often find themselves online longer than they initially planned and are somewhat neglectful of household chores but don't consider themselves addicted. They are moderately interested in apps and have an average age of 26.1 years.

Experimenters (21.98%): This group feels uneasy or anxious when not connected to the internet. Once they go online, they feel better.

NEUROARCHITECTURE

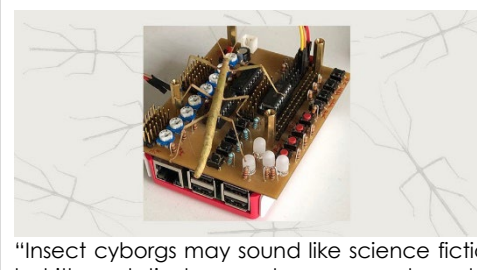
Architecture for Preventing Cognitive Decline: Contributions from Neuroscience to Healthy Aging

"Cognitive decline is a growing public health concern that affects millions of people around the world. Amid an aging population, strategies that help prevent or mitigate cognitive deterioration become increasingly relevant to support healthy aging and maintaining independence for longer. Studies in the field of neuroscience applied to architecture (neuroarchitecture) have shown that the physical environment, both internal and external, public and private, plays a fundamental role in this aspect. In this sense, architects and urban planners can direct their projects to create solutions that significantly contribute to this objective.

The human brain is a very plastic organ. In other words, it transforms functionally and structurally according to how it is stimulated. Although this plasticity is much more intense during the

ROBOTICS

Insect Cyborgs: Towards Precision Movement



"Insect cyborgs may sound like science fiction, but it's a relatively new phenomenon based on using electrical stimuli to control the movement of insects. These hybrid insect computer robots, as they are scientifically called, herald the future of small, high mobile and efficient devices.

Despite significant progress being made, however, further advances are complicated by the vast differences between different insects' nervous and muscle systems.

In a recent study published in the journal eLife, an international research group has studied the relationship between electrical stimulation in stick insects' leg muscles and the resultant torque (the twisting force that makes the leg move).

They focused on three leg muscles that play essential roles in insect movement: one for

ROBOTICS

How Disney Packed Big Emotion into a Little Robot

"On Wednesday, at the 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), in Detroit, a Disney Research team presented a brand new robotic character during their evening keynote address. The adorable robot packs an enormous amount of expression into its child-size body, from its highly expressive head and two wiggly antennae to its stubby little legs. But what sets this robot apart from other small bipeds is how it walks—it's full of personality, emoting as it moves in a way that makes it seem uniquely alive.

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Experimenters are more willing to try out new apps and technology, and their average age is between 22.8 and 24.3 years.

Addicts-in-Denial (17.96%): These users display addictive behaviours like forming new relationships online and neglecting real-world responsibilities to be online. However, they won't admit to feeling uneasy when they're not connected. They are also quite confident in using mobile technology.

Addicts (22.36%): This group openly acknowledges their internet addiction and recognises its negative impact on their lives. They are the most confident in using new apps and technology. Their time online is significantly greater than that of the Casual Users."

Source: SURREY (2 Oct 2023)

development period, it continues to exist throughout our lives. Therefore, keeping the brain stimulated during adulthood and aging is key to keeping cognition functioning at its best. In this context, recent studies indicate that certain stimuli help in the development of a cognitive reserve. This, in turn, is the brain's resilience capacity, which helps it to remain functional even throughout aging and even when some neurodegenerative diseases arise."

Source: Archdaily (27 Sep 2023)

propulsion, one for joint stiffness, and one for transitioning between standing and swinging the leg. The experiments involved the researchers keeping the body of the stick insects fixed, and electrically stimulating one out of the three leg muscles to produce walking-like movements."

Source: Tohoku (4 Oct 2023)

that both take advantage of and are compatible with robotic hardware under real-world constraints. Disney Research has spent the last year developing a new system that leverages reinforcement learning to turn an animator's vision into expressive motions that are robust enough to work almost anywhere, whether that's a stage at IROS or a Disney theme park or a forest in Switzerland."

Source: IEEE Spectrum (6 Oct 2023)