3D PRINTING
Artificial Cartilage with The Help of 3D Printing
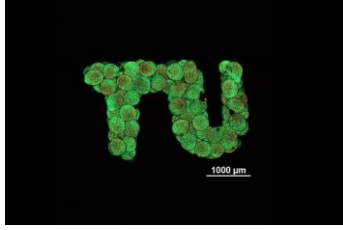
"Is it possible to grow tissue in the laboratory, for example to replace injured cartilage? At TU Wien (Vienna), an important step has now been taken towards creating replacement tissue in the lab - using a technique that differs significantly from other methods used around the world.

A special high-resolution 3D printing process is used to create tiny, porous spheres made of biocompatible and degradable plastic, which are then colonized with cells. These spheroids can then be arranged in any geometry, and the cells of the different units combine seamlessly to form a uniform, living tissue. Cartilage tissue, with which the concept has now been demonstrated at TU Wien, was previously considered particularly challenging in this respect."

Source: TUWIEN (12 Feb 2024)

AI
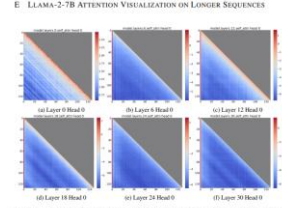### A New Way to Let AI Chatbots Converse All Day Without Crashing

"When a human-AI conversation involves many rounds of continuous dialogue, the powerful large language machine-learning models that drive chatbots like ChatGPT sometimes start to collapse, causing the bots' performance to rapidly deteriorate.

A team of researchers from MIT and elsewhere has pinpointed a surprising cause of this problem and developed a simple solution that enables a chatbot to maintain a nonstop conversation without crashing or slowing down.

Their method involves a tweak to the key-value cache (which is like a conversation memory) at the core of many large language models. In some methods, when this cache needs to hold more information than it has capacity for, the first pieces of data are bumped out. This can cause the model to fail.

By ensuring that these first few data points remain in memory, the researchers' method allows a chatbot to keep chatting no matter how long the conversation goes.

The method, called StreamingLLM, enables a model to remain efficient even when a conversation stretches on for more than 4 million words. When compared to another method that avoids crashing by constantly recomputing part of the past conversations, StreamingLLM performed more than 22 times faster."

Source: Eurekalert! (13 Feb 2024)

ARCHITECTURE
Why Nearly Every City in the U.S. Needs a Walkability Study

"About two weeks ago, I received an intriguing email from Jeff Speck, the author of two of the most influential books on urban planning in the past two decades: Suburban Nation (2010; co-authored by Andrés Duany and Elizabeth Plater-Zyberk) and Walkable City (2012; reissued in 2022 with new material). The press release it contained announced the formation of a new partnership, SpeckDempsey, "a new planning and design firm serving government, non-profit, and private clients." Prior to this, Speck was a potent and highly visible one-man band spreading the gospel of walkable cities. After spending a decade as director of town planning at Duany and Plater-Zyberk's firm, Speck served as director of design for the National Endowment for the Arts before setting up Speck & Associates in 2007. Now he has joined forces with Chris Dempsey, a Boston-area transportation advocate, with the joint goal of bringing walkable city practices to scale. Last week, I talked to them about their new partnership, their methodology, and their plans for the future."

Source: Archdaily (2 Feb 2024)

COMPUTING
Open-Source Security Chip Released
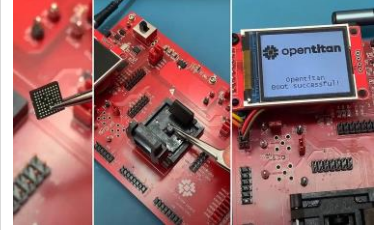
"The first commercial silicon chip that includes open-source, built-in hardware security was announced today by the OpenTitan coalition.

This milestone represents another step in the growth of the open hardware movement. Open hardware has been gaining steam since the development of the popular open-source processor architecture RISC-V

RISC-V gives an openly available prescription for a how a computer can operate efficiently at the most basic level. OpenTitan goes beyond RISC-V's open-source instruction set by delivering an open-source design for the silicon itself. Although other open-source silicon has been developed, this is the first one to include the design verification stage and to produce a fully functional commercial chip, the coalition claims.

Utilizing a RISC-V based processor core, the chip, called Earl Grey, includes a number of built-in hardware security and cryptography modules, all working together in a self-contained microprocessor. The project began back in 2019 by a coalition of companies, started by Google and shepherded by the non-profit lowRISC in Cambridge, UK. Modeled after open-source software projects, it has been developed by contributors from around the world, both official affiliates with the project and independent coders. Today's announcement is the culmination of five years of work."

Source: IEEE Spectrum (13 Feb 2024)

DESIGN
Elon Musk's Neuralink Implants Brain Chip into First Human Patient
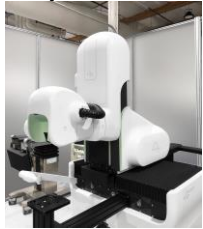
"Technology company Neuralink has implanted its brain-computer interface Telepathy in a human patient for the first time as part of a clinical trial, founder Elon Musk has announced.

The brain chip, which Musk has dubbed Telepathy, was designed to allow users to control a phone or computer using only their thoughts.

The first subject, who was fitted with the brain-computer interface (BCI) on Sunday, is recovering well, Musk announced on X (formerly Twitter).

The trial was greenlit by the US Food and Drug Administration (FDA) last May and began recruiting for in-human clinical trials in September. It will focus on people with quadriplegia – the paralysis of all four limbs – and other types of limited mobility."

Source: Dezeen (30 Jan 2024)

MACHINE LEARNING
Apple Vision Pro: What Does It Mean for Scientists?

"Apple's virtual-reality (VR) headset, the Vision Pro, was released only 10 days ago — but scientists are already grappling with some of the research implications. Researchers say that the headset could be a watershed in the path towards widespread VR use, and that its high precision could aid research tasks and analogue activities such as surgery. All have implications for human behaviour, opening up a torrent of research questions for scientists.

"This is insane for me," says Ken Pfeuffer, who studies human–computer interaction at Aarhus University in Denmark. In 2017, Pfeuffer designed a 'gaze and pinch' feature that is similar to the one Apple Vision Pro uses for virtual navigation. When he gets hold of a Vision Pro headset, Pfeuffer plans to study how it uses this feature.

Since its US release on 2 February, the US$3,499 Vision Pro has won accolades as the most advanced VR and augmented reality (AR) headset ever made — although Apple calls it a spatial computer. Sam Altman, chief executive of OpenAI, which created ChatGPT, called it the "second most impressive" technology since the iPhone."

Source: Nature (12 Feb 2024)

MED TECH
UW-Developed Smart Earrings Can Monitor a Person's Temperature

"Smart accessories are increasingly common. Rings and watches track vitals, while Ray-Bans now come with cameras and microphones. Wearable tech has even broached brooches. Yet certain accessories have yet to get the smart touch.

University of Washington researchers introduced the Thermal Earring, a wireless wearable that continuously monitors a user's earlobe temperature. In a study of six users, the earring outperformed a smartwatch at sensing skin temperature during periods of rest. It also showed promise for monitoring signs of stress, eating, exercise and ovulation.

The smart earring prototype is about the size and weight of a small paperclip and has a 28-day battery life. A magnetic clip attaches one temperature sensor to a wearer's ear, while another sensor dangles about an inch below it for estimating room temperature. The earring can be personalized with fashion designs made of resin (in the shape of a flower, for example) or with a gemstone, without negatively affecting its accuracy.

Researchers published their results Jan. 12 in Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies. The device is not currently commercially available."

Source: University of Washington (7 Feb 2024)

MED TECH
Can Hydrogels Help Mend a Broken Heart?

"You can mend a broken heart this Valentine's Day now that researchers invented a new hydrogel that can be used to heal damaged heart tissue and improve cancer treatments.

University of Waterloo chemical engineering researcher Dr. Elisabeth Prince teamed up with researchers from the University of Toronto and Duke University to design the synthetic material made using cellulose nanocrystals, which are derived from wood pulp. The material is engineered to replicate the fibrous nanostructures and properties of human tissues, thereby recreating its unique biomechanical properties.

"Cancer is a diverse disease and two patients with the same type of cancer will often respond to the same treatment in very different ways," Prince said. "Tumour organoids are essentially a miniaturized version of an individual patient's tumour that can be used for drug testing, which could allow researchers to develop personalized therapies for a specific patient."

As director of the Prince Polymer Materials Lab, Prince designs synthetic biomimetic hydrogels for biomedical applications. The hydrogels have a nanofibrous architecture with large pores for nutrient and waste transport, which affect mechanical properties and cell interaction."

Source: UWATERLOO (12 Feb 2024)

OPTICS
Spiral-Shaped Lens Provides Clear Vision at A Range of Distances and Lighting Conditions

"Researchers have developed a spiral-shaped lens that maintains clear focus at different distances in varying light conditions. The new lens works much like progressive lenses used for vision correction but without the distortions typically seen with those lenses. It could help advance contact lens technologies, intraocular implants for cataracts and miniaturized imaging systems.

"Unlike existing multifocal lenses, our lens performs well under a wide range of light conditions and maintains multifocality regardless of the size of the pupil," said Bertrand Simon from Photonics, Numerical and Nanosciences Laboratory (LP2N), a joint

SUSTAINABILITY
Green Doesn't Always Mean Clean: Cleaning Products Urgently Need Better Regulation, Researchers Warn

"Many cleaning products labelled as "green" emit just as many harmful chemicals as regular products, new research has revealed.

Researchers say there needs to be better regulation and more guidance for consumers about how safe cleaning products really are.

Potentially harmful

The study, published by The Royal Society of Chemistry in the journal Environmental Science: Processes & Impact, found that fragranced cleaning products can be potentially harmful for the air quality in people's homes.

Cleaning products emit a wide range of

TELECOMMUNICATIONS
Darting Around with A Tiny Brain

"With a brain the size of a pinhead, insects perform fantastic navigational feats. They avoid obstacles and move through small openings. How do they do this, with their limited brain power? Understanding the inner workings of an insect's brain can help us in our search towards energy-efficient computing, physicist Elisabetta Chicca of the University of Groningen demonstrates with her most recent result: a robot that acts like an insect.

It's not easy to make use of the images that come in through your eyes, when deciding where your feet or wings should do. A key aspect here is the apparent motion of things as you move. 'Like when you're on a train', Chicca explains. 'The

TELECOMMUNICATIONS
The FCC's Ban on AI In Robocalls Won't Be Enough

"In the days before the U.S. Democratic Party's New Hampshire primary election on 23 January, potential voters began receiving a call with AI-generated audio of a fake President Biden urging them not to vote until the general election in November. Voters in Slovakia audio posted to Facebook contained fake, AI-generated audio of a presidential candidate planning to steal the election—which may have tipped the election in another candidate's favor. Recent elections in Indonesia and Taiwan have been marred by AI-generated misinformation, too.

In response to the faux-Biden robocall in New

research unit between the Institut d'Optique Graduate School, the University of Bordeaux and the CNRS in France. "For potential implant users or people with age-related farsightedness, it could provide consistently clear vision, potentially revolutionizing ophthalmology."."

volatile organic compounds (VOCs), including some which are hazardous or can undergo chemical transformations to generate harmful secondary pollutants. In recent years, "green" cleaners have become increasingly popular, with an implicit assumption that these are better for our health and the environment. But the University of York research found this was not the case."

trees nearby appear to move faster than the houses far away. Insects use this information to infer how far away things are. This works well when moving in a straight line, but reality is not that simple.

Moving in curves makes the problem too complex for insects. To keep things manageable for their limited brainpower, they adjust their behaviour: they fly in a straight line, make a turn, then make another straight line. Chicca explains: 'What we learn from this is: if you don't have enough resources, you can simplify the problem with your behaviour."

Hampshire, the U.S. Federal Communications Commission moved to make AI-generated voices in robocalls illegal on 8 February. But experts IEEE Spectrum spoke to aren't convinced that the move will be enough, even as generative AI brings new twists to old robocall scams and offers opportunities to turbocharge efforts to defraud individuals.

The total lost to scams and spam in the United States in 2022 is thought to be US $39.5 billion, according to TrueCaller, which makes a caller ID and spam blocking app. That same year, the average amount of money lost by people scammed in the United States was $431.26, according a survey by Hiya, a company that provides call protection and identity services. Hiya says that amount stands to go up as the usage of generative AI gains traction."

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