# KIET School of Computer Applications (KSOCA)

## Technical TechEdge Newsletter

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## Systems of Intelligence (SOI) - Building Moats for Artificial

### Introduction

IDC forecasts that the worldwide artificial intelligence (AI) life-cycle software market will grow from $2.6 billion in 2020 to $14.4 billion in 2025 at a compound annual growth rate (CAGR) of 41.0%.

Growth in this market continues to be driven by increased adoption of AI technologies for digital transformations, the democratization of AI capabilities, and ever-expanding use cases for AI/machine learning (ML) such as conversation, NLP, vision, and time series data processing. IDC also expects cloud-based deployments of AI life-cycle software to grow at a CAGR of 57.1% — faster than on-premises deployments — and the revenue from cloud-based deployments of AI life-cycle software to surpass that from on-premises deployments by 2025. The AI life-cycle software market in 2020 grew at a rapid pace (29.5%) despite the uncertainty due to the COVID-19 pandemic and associated economic challenges. IDC expects that growth in this market will continue beyond 2021.

As customers are maturing in their AI adoption, the focus of AI life-cycle management is shifting up from the infrastructure layer to the operational aspects of the ML model life cycle. Customers need scalable ways for machine learning operations — including workflow collaboration, feature engineering, model deployment, model performance evaluation, and model monitoring. They are also increasingly looking at operationalizing model life-cycle management (ModelOps or MLOps) through capabilities including model repositories, model diagnostics, model feature store, model delivery, model governance, and model fairness.



### A Perfect Storm

A Perfect storm is a meteorological event aggravated by a rare combination of circumstances, In context to software company it provides perfect opportunity to develop and render the AI infrastructure at scale.

In any company at the bottom of the stack of systems, is usually a database on top of which an application is built. If the data and app power a critical business function, it becomes a "system of record. (SOR)" There are major systems of records in an enterprise - your customers, your employees, and your assets. CRM owns your customers, HCM, owns your employees, and ERP/Financials owns your assets. Generations of companies have been built around owning a system of record and every wave produced a new winner, but these are not enough in this current business scenario.  Similarly Systems of engagement™ (SOE) are the interfaces between users and the systems of record and can be powerful businesses because they control the end user interactions some of the examples are Mobile, web, chat..etc. The next level to this is the System of Intelligence (SOI), which are the new Moats. What makes the Systems of Intelligence (SOI) so valuable is that because that it typically crosses multiple data sets, multiple systems of record.

 Within OCI we are placed in a perfect situation, by building these new moats in the areas of artificial intelligence, It's not just applications that will be transformed by AI but also data center and infrastructure products.

A typical SOI in the world of artificial intelligence would consist of one or more machine learning models, data, a business process, and a workflow. The data for SOIs can be a combination of external market data along with data from multiple SORs/SOEs that is regularly augmented by training against new and larger datasets. We believe that Systems of Intelligence (SOI) stores will be the substrate that enables the SOI for software Apps and Offerings. With the next step of investments related to developing Systems of intelligence as shown below.
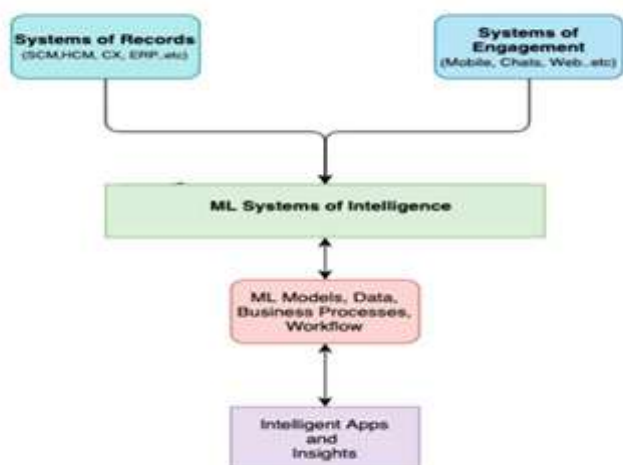


## Digital System Maturity Model
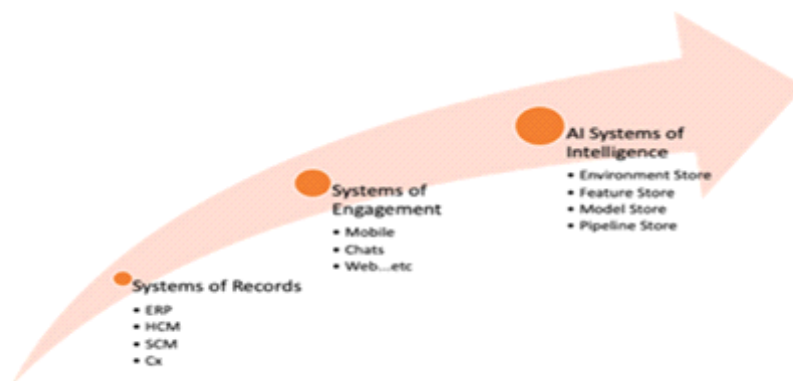
The image (right) shows an analogy of Systems of Intelligence with respect to Artificial Intelligence at a high level.

## Why do we need Systems of Intelligence

Even though research in deep learning is making breathtaking advances, large enterprises still struggle to apply deep learning and other machine learning technologies successfully. While sophisticated ML algorithms and many tools exist for data scientists, putting ML into production (and continuously integrating new retraining) is still a challenge since it requires integrated discipline and practice between operations, data science, business analysts, data architects, and such parties. AI requires a radical shift from a deterministic to a probabilistic mindset, with changes required across all departments. While enterprise applications are typically self-contained units with codified logic that act in a consistent and deterministic fashion independent of the data upon which they act, the AI/ML life cycle is driven by the velocity of change in data. A model will react consistently in production only in response to data that has a similar pattern to that with which it was trained. If the patterns in data "drift" significantly in production, then the model's response to that data may have significant unexpected and potentially negative consequences. When a model's efficacy declines due to data drift or concept drift, then there is only one response: retrain and redeploy the model as soon as possible.

The key challenges include:



· **Expertise mismatch:** On the one side, IT operations administrators are experts in deployment and management of software and services in production. On the other side, data scientists are experts in the algorithms and associated mathematics. Operating ML/DL in production and deploying new models requires the combined skills of both groups and their respective processes.

· **Nonintuitive complexity:** In contrast to other analytics like rule-based relational database or pattern matching key value-based systems, the core of ML/DL algorithms is mathematical functions whose data-dependent behaviour is not intuitive to most humans. This complexity requires custom algorithmic knowledge beyond standard operations for diagnostics, test, and optimization.

# Scientists can now grow wood in a lab without cutting a single tree

The irony of the world is that almost every 'save the forests' meeting and conference happens inside a well-furnished room that is decorated with furniture made by cutting trees. The market for wood-derived products stood at $631 billion in 2021, and despite all the efforts that environmentalists have been putting in to prevent deforestation activities, it is expected to cross the mark of $900 billion by 2026. So have we already lost the fight to save our forests?

Well, not yet because there is a new solution that promises an end to our need of cutting trees. A team of researchers at MIT claims that lab-grown timber can replace deforestation driving products made from real wood. They have developed a technique using which timber can be produced in any shape and size, so for example, if you need a new wooden chair, using the researcher's technique, you can create it in a lab without cutting a single tree.

### How did the researchers create wood in a lab?

The researchers at MIT performed an experiment that gave stem cell-like properties to normal plant cells. They extracted cells from the leaves of a flowering plant called Common zinnia (*Zinnia elegans*) and then stored the same in a liquid medium for a couple of days. In the next step, the researchers treated the plant cells with a gel-based medium enriched with nutrients and hormones. After some time, the cells gave rise to new plant cells. The researchers also noticed that by changing the hormonal concentration in the gel medium, they could control the physical and mechanical properties of the newly grown cells. During the experiments, plant material that contained high hormone concentrations turned stiff.

"In the human body, you have hormones that determine how your cells develop and how certain traits emerge. In the same way, by changing the hormone concentrations in the nutrient broth, the plant cells respond differently. Just by manipulating these tiny chemical quantities, we can elicit pretty dramatic changes in terms of the physical outcomes," lead researcher Ashley Beckwith said, explaining the role of hormones in plant cell growth.

### Growing furniture in the lab is also waste-free

An estimate suggests that the current furniture-making process leads to the loss of about 30% of the total wood as waste. Interestingly, the 3D bioprinting technique suggested by the researchers at MIT does not generate any waste and can be employed to produce plant material of any shape and size. "The idea is that you can grow these plant materials in exactly the shape that you need, so you don't need to do any subtractive manufacturing after the fact, which reduces the amount of energy and waste," Beckwith said.

For now, scientists have been able to show that plant material can be grown in a lab and its mechnical properties can be manipulated, but the study is still in its early phase. More research and experiments are required to be done before the technique could be developed further and employed for producing 3D furniture in the lab on a commercial scale.

"Though still in its early days, this research demonstrates that lab-grown plant materials can be tuned to have specific characteristics, which could someday enable researchers to grow wood products with the exact features needed for a particular application," senior author and scientist Luis Fernando Velásquez-García claims.

# New dynamic glass can tint with an electric charge and is coming to your home

To adapt society for climate change, it's all about energy efficiency. If we focus too much on solar, wind, and other alternative power sources, we're leaving a lot of wasted energy in the margins. Therefore the U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL) have partnered with Glass Dyenamics to develop advanced glass technology that tints when an electric charge is applied. And now it's available for residential homes, at prices "equivalent to widely available premium glass," said Co-Founder and CEO of Glass Dyenamics Christopher Angelo, who is also the former CFO of Silicor Materials, in an emailed statement to IE.

## Dynamic Glass will offer climate impact, at scale

Controlling the rate of heat energy flowing in and out of buildings is quickly becoming an integral part of sustainable measures taken by private industries, to make offices more energy efficient by controlling the flow of heat through windows. Crucially, this next-gen dynamic glass is nearly affordable for the average consumer. "Our glass is available to consumers today at prices equivalent to widely available premium glass such as frosted or patterned glass," said Angelo. "We are entering the market with glass for front entryway door, sidelight, and transom windows and will scale manufacturing over the next twelve months."



## Dynamic glass can offer homeowners up to '20 percent' in energy savings

A recent report from the NREL and Berkeley Lab shows that dynamic windows in residential neighborhoods could eliminate 78 million metric tons of $CO_2$ emissions per year by 2030. That's the energy equivalent of 9,393,008 million homes — more than $19 billion in savings on utility bills. In case you missed it, this represents an average energy bill cost per household of $2,060. "This also represents an exciting opportunity for us to support the development of domestic clean energy manufacturing and employment," said Ram Narayanamurthy, program manager of the DOE's emerging technologies program, in the release. Glass Dyenamics hopes its new glass systems will offer homeowners up to 20 percent in home energy savings — a value proposition reminiscent of rooftop solar power.

Critically, residential home dynamic window systems could constitute a value-proposition that's one-third the cost of solar, with no subsidies. "Our vision is that dynamic glass will be broadly adopted as a part of a lower cost and lower risk solution to achieve significant residential home energy efficiency either as a compliment or alternative to rooftop solar," said Angelo, in the release.

## Duck Duck Go isn't as private as you thought

DuckDuckGo made a deal with the devil. Due to a confidential search agreement, the DuckDuckGo browser does not block all Microsoft trackers. What's worse, DuckDuckGo only acknowledged this "privacy hole" after it was discovered by a security researcher.

As you may know, DuckDuckGo pulls its search results from other services, primarily Bing. You may also know that clicking a Microsoft-provided ad in DuckDuckGo will reveal your IP address to the Microsoft Advertising service—this is explicitly stated on DuckDuckGo's website and in the company's search engine.
But this partnership goes a bit deeper than we thought. Security researcher @thezedwards found that the mobile DuckDuckGo browser *does not block* Microsoft trackers on third-party websites, such as the Facebook-owned Workplace.com.

Gabriel Weinberg, the CEO of DuckDuckGo, is now running damage control on Twitter. He explains that Microsoft cannot see what you search in DuckDuckGo, and the DuckDuckGo browser blocks all Microsoft cookies. But if you visit a website that contains Microsoft's trackers, then your data is exposed to services like Bing and LinkedIn. This is the result of DuckDuckGo's "search syndication agreement" with Microsoft. In order to pull search information from Bing, the privacy experts at DuckDuckGo have to poke holes in their browser's security system.

While DuckDuckGo has a solid privacy policy when it comes to 'Microsofts ads, it hasn't explained how Microsoft uses data from third-party trackers. And that's quite alarming. Maybe this situation is overblown, or maybe Microsoft can build targeted ad profiles based on your web activity in DuckDuckGo—we don't know because DuckDuckGo signed a confidentiality agreement. Gabriel Weinberg says that DuckDuckGo is "working tirelessly behind the scenes" to improve its deal with Microsoft. Additionally, he expects DuckDuckGo to "include more third-party Microsoft protection" in a future update. It's clear that DuckDuckGo doesn't offer the level of privacy that it promises to users. And unfortunately, I'm not sure that any company or software can protect your browsing data. The internet doesn't run on privacy or anonymity; it runs on money, and your data is worth a lot of money.

## First patient injected with experimental cancer-killing virus in new clinical trial

An experimental cancer-killing virus has been administered to a human patient for the first time, with hopes the testing will ultimately reveal evidence of a new means of successfully fighting cancer tumors in people's bodies. The drug candidate, called CF33-hNIS (aka Vaxinia), is what's called an oncolytic virus, a genetically modified virus designed to selectively infect and kill cancer cells while sparing healthy ones.

In the case of CF33-hNIS, the modified pox virus works by entering cells and duplicating itself. Eventually, the infected cell bursts, releasing thousands of new virus particles that act as antigens, stimulating the immune system to attack nearby cancer cells. Previous research in animal models has shown the drug can harness the immune system in this way to hunt and destroy cancer cells, but up until now no testing has been done in humans.

That's just changed, with co-developers of the drug – the City of Hope cancer care and research center in Los Angeles, and Australia-based biotech company Imugene– now announcing that the first clinical trial in human patients is underway. "Our previous research demonstrated that oncolytic viruses can stimulate the immune system to respond to and kill cancer, as well as stimulate the immune system to be more responsive to other immunotherapies," says City of Hope oncologist and principal investigator Daneng Li.

"We believe CF33-hNIS has the potential to improve outcomes for our patients." Unlocking that potential will first depend on showing that CF33-hNIS is safe for people to take, with the first phase of the trial focusing on the safety and tolerability of the drug. The intervention is expected to enroll 100 participants in total, each being an adult patient with metastatic or advanced solid tumors who has previously tried at least two prior lines of standard treatment.

Once enrolled in the trial, these individuals will receive low doses of the experimental treatment via direct injection or intravenously. If early results are successful and CF33-hNIS is deemed safe and well tolerated, additional tests will investigate how the drug pairs with pembrolizumab, an existing antibody treatment already used in cancer immunotherapy.

The version of the virus now being clinically trialed produces human sodium iodide symportor (hNIS), a protein that enables researchers to image and monitor viral replication, as well as allowing an additional way to damage the cancer cells by adding radioactive iodine. Before efficacy is determined, however, researchers will first be looking to see how well the drug is handled by patients, recording the frequency and severity of any adverse effects, and also investigating how well participants fare as low doses are escalated.

Secondary measures – including assessments of how effectively CF33-hNIS shrinks treated tumors – will be analyzed later on down the track, but with the trial expected to take two years across multiple anticipated clinical sites, it will likely be some time before we know the results in detail. Which doesn't mean we can't get excited about the broad potential here; just that we should keep our expectations in check, because promising results in pre-clinical experiments don't necessarily guarantee similarly successful results in subsequent research involving human patients.
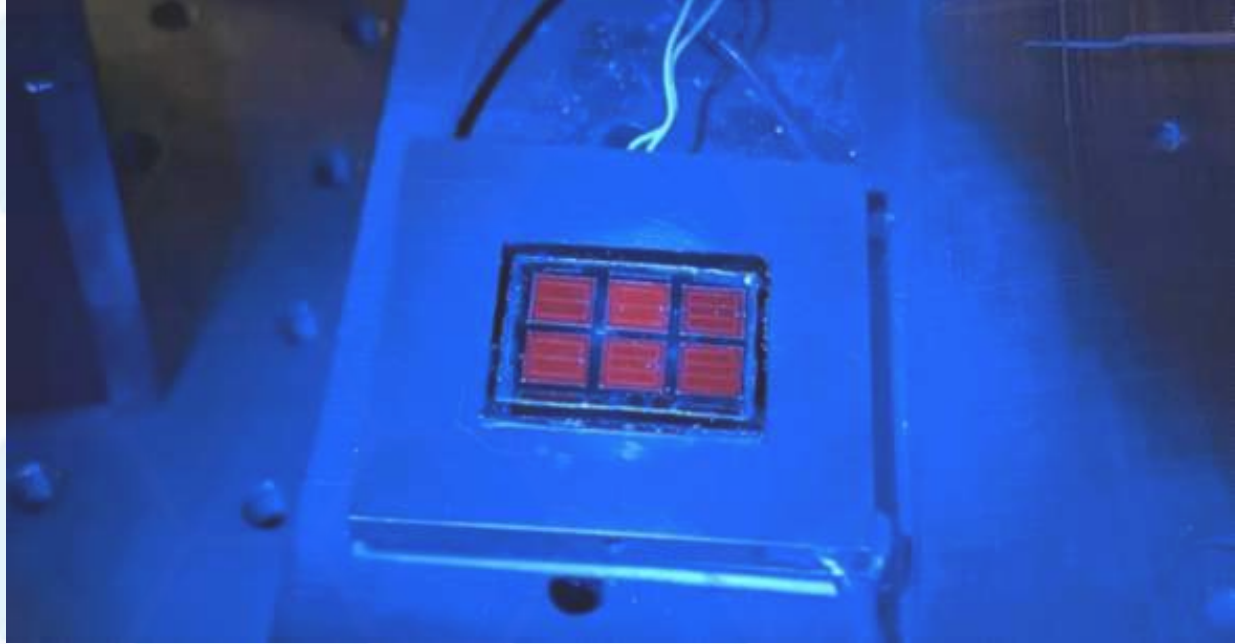
# Scientists just broke the record for the highest efficiency solar cell

The solar scene is being illuminated. And it's blinding. A team of researchers at the US Department of Energy's National Renewable Energy Laboratory (NREL) has created a solar cell with a record efficiency of 39.5 percent under 1-sun global illumination, breaking the world record for solar cell efficiency, according to a recent study published in the journal Joule. Amazingly, it has the highest efficiency recorded for any type of cell ever measured in real-world conditions.

### A record-setting solar cell
The record was accomplished under lighting conditions equivalent to that of the sun, according to a press release. While earlier experimental solar cells have attained efficiencies of up to 47.1 percent, it is crucial to emphasize that they did so under extremely concentrated light. In fact, the world record for solar cell efficiency at 47.1 percent was achieved in 2019, with researchers using multi-junction concentrator solar cells developed at National Renewable Energy Laboratory.

The solar cell was also tested for its potential in space, especially for powering communications satellites, which are powered by solar cells and require high cell efficiency. Under such conditions, it was seen that it has 34.2 percent efficiency. "The new cell is more efficient and has a simpler design that may be useful for a variety of new applications, such as highly area-constrained applications or low-radiation space applications," said principal investigator Myles Steiner, a senior scientist in NREL's High-Efficiency Crystalline Photovoltaics Group in an initial TechXplore report.

### The secret ingredient
The novel solar cell is built on an architecture known as inverted metamorphic multijunction (IMM) cells. The cell has three components that generate electric current in response to light. Importantly, each of those junctions is built of a different material: gallium indium phosphide on top, gallium arsenide in the center, and gallium indium arsenide on the bottom. As these materials specialize in various light wavelengths, this allows the cell to capture more energy from the whole light spectrum.

Moreover, the researchers used "quantum wells" in the middle layer, which enabled them to achieve the new record efficiency. When the researchers sandwiched a conductive layer between two other materials with a wider band gap, they were able to get the electrons confined to two dimensions, which allowed the material to capture more light in return. This solar cell's middle layer comprised up to 300 quantum wells, which greatly increased the total efficiency, according to a report from New Atlas. However, it should be noted that producing this type of cell is expensive, which is something that plagues the renewables industry already. Before the novel cell can become widespread, the researchers will need to reduce the expenses and find potential new uses.

# Watch Boeing launch a critical starliner test flight to the ISS

Boeing's Starliner spacecraft will once against make an attempt to reach the International Space Station (ISS) in a critical test flight that will determine whether it's finally ready for manned missions. NASA and the private space company have scheduled the launch for today, May 19th, with an instantaneous launch window at 6:54PM Eastern Time. The Starliner will launch on top of a United Launch Alliance Atlas V rocket from Cape Canaveral, and you can watch the coverage for the event in the video below or through the NASA live website starting at 6PM ET.

During its first test flight back in December 2019, Starliner made it into orbit but failed to reach the ISS. An automation system incorrectly assessed the timing of the flight and prevented the spacecraft's thrusters from firing when needed. NASA and the company investigated what had happened, and reports came out a few months later that Boeing didn't conduct launch-to-docking simulations on the spacecraft before its failed launch.

Boeing made its first Orbital Flight Test-2 launch attempt in August 2021, but it had to scrap its plans while the capsule was already on top of a rocket due to an issue with its propulsion system valves. Engineers managed to repair nine valves while the spacecraft was still ready for takeoff, but Boeing ultimately decided to conduct a "deeper-level troubleshooting" at its facility at the Kennedy Space Center. NASA had to give SpaceX more crewed flights in order to cover for Boeing's delays.

Now that its valve issues have been resolved— apparently, the interaction between oxidizer and water formed nitric acid and other corrosive agents that made the valves sticky — Starliner's launch is a go. The capsule must achieve its goal this time if Boeing wants to catch up with SpaceX, which has been ferrying astronauts to the ISS since2020. If no further issues arise, Starliner will reach the ISS with over 800 pounds of cargo in 24 hours. It will remain docked with the orbiting lab for five to 10 days before making its return journey back to Earth and landing in the western United States.

# Acer's new portable monitors can make 2D look like 3D

**P**ortable USB-powered displays aren't new but can be very helpful for editors on the move to get access to more screen real estate. Acer's new model turns things up a notch though and can take a 2D image and make it appear as if it were 3D. The advantage of having more than one monitor is obvious. The more screen space one has, the more effective and efficient the workflow becomes. This is even more important when working on a laptop out in the field. To address that issue, the portable USB-powered LED display was designed to take power from the laptop, thereby reducing the weight of the secondary display without sacrificing screen space. Acer's Spatial Labs View and Spatial Labs View Pro monitors provide all that real estate but also combine a hardware optical lens display with artificial intelligence to transform a 2D image into a stereoscopic conversion and make the image appear 3D without the need for glasses or a virtual reality headset.

The technology is similar to 'Dimencos 8K stereoscopic monitor, but a lot smaller and with less resolution. By reading the viewer's eye movement through a pair of eye tracking cameras, SpatialLabs says the tech works by creating a set of images for each through the optical lens at the right angle to simulate a 3D experience. The display was designed initially for CAD designers, 3D animators, content creators, and developers who need to see how edits are affected in a 3D space, but the SpatialLabs portable has expanded its customer base to include gamers through Acer's SpatialLabs TrueGame platform.

TrueGame is able to harness the depth and distance information in the game code that tells the game where every subject and object is in a given scene. SoatialLabs then displays the image with greater accuracy, as well as using "shading and driver technologies to enhance the scene. Acer says that by using this technique, a scene can appear far roomier than can normally be shown on the 15.6-inch screen size, making the objects and subjects in a scene appear "genuinely layered."

TrueGame technology also provides a larger game space for mobile gamers. Upon its release, TrueGame will support more than 50 games including BioShock Infinite, Borderlands 2, Forza Horizon 4 and 5, God of War, No Man's Sky, The Witcher 3: Wild Hunt, and Tiny Tina's Wonderland, with many more games on the way. The only real downside is its refresh rate, which is capped at 60hz which isn't considered fast enough for many gamers. Software packages Cinema 4D, Revit, and Solidworks are supported, along with associated files including such as Acer said the portable monitor supports "all major file formats," including OBJ, FBX, STEP, STL, COLLADA, IGES, glTF, 3DS, BLEND, PLY, DAE, IGS, and Datasmith.



Still photography can also take advantage of this technology, with the display being able to convert regular 2D stills into 3D images that Acer proclaims come to life Acer recommends using laptops and devices that have an Intel Core i7 CPU or higher, and either an RTX 2080 GPU for desktops or an RTX 3070 for laptops. No word on how much the SpatialView monitors will cost, but given the technology, it is not likely to be cheap.

# New US lab to create versions of atoms never recorded on Earth



From carbon to uranium, oxygen to iron, chemical elements are the building blocks of the world around us and the wider universe. Now, physicists are hoping to gain an unprecedented glimpse into their origins, with the opening of a new facility that will create thousands of peculiar and unstable versions of atoms never before recorded on Earth. By studying these versions, known as isotopes, they hope to gain new insights into the reactions that created the elements within exploding stars, as well as testing theories about the "strong force" – one of the four fundamental forces in nature, which binds protons and neutrons together in an atom's nucleus. The facility could also yield new isotopes for medical use. Atoms are composed of protons, neutrons and electrons. The number of protons dictates an atom's chemical behaviour and which element it is – eg carbon always has six protons, and gold 79 – whereas atoms of the same element containing different numbers of neutrons are called isotopes.

Because many isotopes are unstable and decay quickly – sometimes within fractions of a second – scientists have only studied a small proportion of those thought to exist. "There are 285 isotopes of elements that exist on Earth, but we think that there are potentially 10,000 isotopes for the elements up to uranium," said Prof Bradley Sherrill, the scientific director of the Facility for Rare Isotope Beams (FRIB) at Michigan State University, which officially opened on 2 May. "The goal of FRIB is to provide as wide of an access to this vast landscape of other isotopes as technology allows." Some of these "rare isotopes" may drive reactions crucial to the formation of elements, so by studying them physicists hope to gain a better understanding of the chemical history of the universe – including how we got here.

The vast majority of elements are thought to have been created within exploding stars, but "in many cases we don't know which stars created which elements, because these reactions involve unstable isotopes – things we couldn't readily get our hands on," said Prof Gavin Lotay, a nuclear physicist at the University of Surrey, who plans to use the new facility to investigate common explosions called X-ray bursts within neutron stars. Another goal is to understand atomic nuclei well enough to develop a comprehensive model of them, which could provide fresh insights into the role they play in the creation of energy for stars, or the reactions occurring within nuclear power plants. The facility could also yield medically useful isotopes. Already, doctors use radioactive isotopes in eg Pet scans and some types of radiotherapy, but the discovery of additional ones could help improve diagnostic imaging, or provide new ways of seeking out and destroying tumours. To generate these isotopes, FRIB will accelerate a beam of atomic nuclei to half the speed of light and send them shooting down a 450-metre pipe, before crashing them into a target that causes some of the atoms to fragment into smaller combinations of protons and neutrons. A series of magnets will then filter out the desired isotopes and direct them into experimental chambers for further study.

"Within a millionth of a second, we can select a particular isotope and deliver it to an experiment where [scientists] may catch it and watch for its radioactive decay, or we may use it to induce another nuclear reaction and use those reaction products to tell us something about the structure of the isotope," Sherrill said. The first experiments will involve making the heaviest possible isotopes of fluorine, aluminium, magnesium and neon, and comparing their rates of radioactive decay with those predicted by existing models. "The surprise will be if our observations agree with what we expected," Sherrill said. "Most likely they won't agree, and then we'll use that disagreement to refine our models."

Approximately a month later, FRIB researchers plan to measure the radioactive decay of isotopes thought to exist within neutron stars – some of the densest objects in the universe, formed when a massive star runs out of fuel and collapses – to better understand their behaviour. "Finally we have the tools to enable people to do research that they've been waiting 30 years to do," said Sherrill.

# Could video games be making kids smarter? A new study says yes

Screen time of any kind is generally considered to be a negative influence on a child's development but a new study from a team of European researchers makes a strikingly different case, presenting evidence that playing video games may actually boost a child's intelligence. Despite decades of research looking at the effects of television or video games on adolescent development, the digital landscape of the last decade has dramatically reshaped a child's relationship with screens. This means screen time now spans a multitude of different activities, including socializing with friends on smartphone apps, watching TV, playing video games, and even doing school work on a laptop.

"For our study, we created an intelligence index from five tasks: two on reading comprehension and vocabulary, one on attention and executive function (which includes working memory, flexible thinking and self-control), one assessing visual-spatial processing (such as rotating objects in your mind), and one on learning ability over multiple trials," explain Torkel Klingberg and Bruno Sauce, two of the researchers working on the study. Around 5,000 children were followed for two years. Aged between nine and 10 years at baseline, the participants completed the cognitive tests at the beginning and end of the study. Screen time was self-reported and divided into three categories: watching, socializing and gaming. At the beginning of the study the researchers detected no association between time spent gaming and below- or above-average intelligence. Interestingly, however, high levels of watching TV and videos, or socializing online, was slightly linked to lower levels of intelligence at baseline. After two years the follow-up results were even more surprising.

"While children who played more video games at 10 years were on average no more intelligent than children who didn't game, they showed the most gains in intelligence after two years, in both boys and girls," write Klingberg and Sauce. "For example, a child who was in the top 17 percent in terms of hours spent gaming increased their IQ about 2.5 points more than the average child over two years." At follow-up social media use was not associated with any change in intelligence but watching TV or online videos could be linked to a small increase in intelligence. The researchers note this increase was too small to be statistically significant. Klingberg is cautious to stress the limitations of his team's findings. The focus of the study was narrow, looking at just a few metrics of intelligence. So this study cannot suggest these types of screen time have no impact on other important factors such as sleep, school performance or physical activity.

"But our results support the claim that screen time generally doesn't impair children's cognitive abilities, and that playing video games can actually help boost intelligence," added Klingberg. "This is consistent with several experimental studies of video-game playing." Another limitation of the study is the way all forms of video game use were rolled into a homogenous whole, from smartphone gaming to first-person shooters on a console. So it is unclear whether specific kinds of video gaming confer cognitive benefits over others. The findings certainly fit into a growing body of research discovering some benefits for children in different kinds of screen time. One study last year found a compelling correlation between video game use and



increasedmental well-being, while another recent study found a link between time spent on social media apps and larger friendship groups in children. All of these findings of course don't suggest it is healthy for children to have unlimited volumes of screen time. But they do highlight the complexity of the screen time problem and indicate not all screen uses may be detrimental.

# 'An army of robots' and zero human workers will build a dam in China

China is using artificial intelligence (AI) to effectively turn a dam project on the Tibetan Plateau into the world's largest 3D printer, according to scientists involved in the project.

The 180 metre (590 feet) high Yangqu hydropower plant will be built slice by slice - using unmanned excavators, trucks, bulldozers, pavers and rollers, all controlled by AI - in the same additive manufacturing process used in 3D printing. When completed in 2024, the Yangqu dam will send nearly five billion kilowatt-hours of electricity each year from the upper reaches of the Yellow River to Henan, the cradle of Chinese civilisation and home to 100 million people. The power will travel via a 1,500km (932 miles) high voltage line built exclusively for green energy transmission.

According to the project's lead scientist Liu Tianyun, in a paper published in the peer-reviewed Journal of Tsinghua University (Science and Technology), dam construction and 3D printing are "identical by nature". After years of development testing, 3D print technology for large, filled infrastructure had matured enough for mass applications and would "free humans from heavy-duty, repetitive and dangerous work", he said.

Liu, an associate researcher with the state key laboratory of hydroscience and engineering at Tsinghua University, and his team came up with the idea of "printing" large-scale building projects about ten years ago. They thought an entire construction site could be turned into a giant printer, with a large number of automated machines working seamlessly together as different components.



The 3D printer was initially developed as a less wasteful way to manufacture components from precious materials. Printing - or adding - materials produces less waste than cutting and grinding. Since then, some architects have started to apply the technology to buildings, although projects have so far been small. The first 3D-printed office building, the Dubai Future Foundation headquarters, stands at just six metres (20 feet).

Chinese civil engineers are no strangers to AI, which was used to build Baihetan, the world's second-largest dam, in just four years. But until now, it has mainly played a coordinating role in projects. Testing of the technology in previous construction projects suggested smart machines could do a better job than humans, ", especially in some harsh and dangerous environments", said Liu and his colleagues.

Liu did not immediately respond to questions about Yangqu dam's progress, but according to state media reports work started at the end of last year in Hainan Tibetan autonomous prefecture, Qinghai province. After "slicing" a computer model of the dam into layers, the AI at the heart of the project would assign a team of robots to add one layer at a time, the paper said. Unmanned excavators will be able to identify and load materials from a stockpile yard into a fleet of automated trucks, some powered by electricity.

# New eye drops improve aging vision without glasses. here's how they work

When people get into their 40s and beyond, their close-up vision starts to worsen. For many people, cranking up the font size on a phone or maxing out the brightness on a computer is the only way to be able to read some text.

This condition is known as presbyopia, and it affects around 128 million people in the US and more than a billion people worldwide. In late 2021, the US Food and Drug Administration approved a new eye drop medication to treat presbyopia. As an optometrist, I was initially skeptical.

Prior to the release of these eye drops – called Vuity – people would either need glasses, contacts or eye surgery to alleviate presbyopia. But after learning how these eye drops work, I recognized that for many people, they could offer an easier and safer way to see clearly again.

### How eyes focus
Many parts of the human eye interact with incoming light to produce a clear image.

The first thing light hits is the cornea, the clear outer layer that initially bends the light. Then light passes through the iris and pupil, which can shrink or grow to let more or less light into the inside of the eye. It then travels through the lens, which further bends the light and precisely focuses it onto the center of the retina. Finally, the light signal is transferred to the optic nerve at the back of the eye, for the brain to interpret as an image. To produce a clear image, your eyes need to adjust to how far away an object is. Your eyes take three major steps to focus on objects close to your face: your eyes point toward the object you want to look at, your lenses change shape and your pupils constrict.

Once you point your gaze at what you're interested in, a small muscle in the eye contracts, which changes the shape of the lens to make it thicker. The thicker the lens is, the more the light bends as it passes through. At the same time, your pupils constrict to block some of the incoming light from other objects in the distance.
When light bounces off an object and enters your eye, the rays of light at the center are what provide a clear image. Blocking the scattering light by constricting the pupil helps to sharpen the image of close objects.
You can simulate this process using a camera on your cellphone. First, point the camera at something in the distance. Then, move your thumb into the image, holding it about 6 inches away. Your thumb will start off blurry, but as the camera's lens changes shape, your thumb will come into focus.

# Experimental weight-loss drug shows surgery-like results in new trial

Pharmaceutical company Eli Lilly last week disclosed the latest data from a phase III trial of its experimental type 2 diabetes and obesity drug, tirzepatide: People who took the drug lost up to 22% of their body weight and achieved far greater weight loss on average than the placebo group. The findings, while preliminary, suggest tirzepatide may become the second major medicine in a new era of obesity treatments, provided that patients can actually afford it.

The SURMOUNT-1 study involved over 2,500 patients who were overweight (defined as having a body mass index from 25 to 30) or obese (a BMI over 30), and also had a condition possibly related to their weight, with the exception of diabetes. These patients were randomized to receive either a placebo or one of three different doses of tirzepatide, delivered weekly via an injection under the skin. In addition to the treatment, each group was advised to go on a reduced calorie diet and increase their physical activity. The trial was ran in the U.S., Argentina, Brazil, China, India, Japan, Mexico, Russia, and Taiwan.

Each group lost weight on average over the course of 72 weeks, but the loss was much greater in the tirzepatide groups. Those given a 5-milligram dose lost 15% body weight on average; those on a 10-milligram dose lost 19.5%, and those on the 15-milligram dose lost 20.9%, compared to the 3.1% weight loss seen in the placebo group. When accounting for people who dropped out of the study early, the study's researchers estimated that people on the highest dose lost an average of 22% body weight, or around 50 pounds. Adverse effects were generally mild to moderate, but included nausea, vomiting, and diarrhea, which often occurred early on as people's doses escalated.

The findings have yet to be published in a peer-reviewed journal, so they should be taken with some caution. But the figures seen here, assuming they're sound, are simply unprecedented for a drug, according to Samantha Harris, an endocrinologist at the Scripps Clinic who focuses on weight management and diabetes care.

Last June, Novo Nordisk's Wegovy won approval from the Food and Drug Administration for treating obesity. Wegovy is a higher-dose version of semaglutide, the same active ingredient used in its type 2 diabetes medications Ozempic and Rybelsus. The pivotal trials for Wegovy showed that patients lost an average 15% body weight on it—numbers now matched or surpassed by tirzepatide.

Both semaglutide and tirzepatide work by essentially boosting levels of a hormone called GLP-1. But tirzepatide also boosts levels of a second hormone called GIP (glucose-dependent insulin tropic polypeptide). These incretins, as they're known, play a crucial role in regulating our metabolism and hunger. And the combination of GLP-1 and GIP activity seen with tirzepatide could very well account for its superiority over semaglutide in trials so far, Harris said.

Incretin-based drugs have shown to be valuable and safe treatments for type 2 diabetes for over a decade now, particularly through increased insulin production that helps keep blood sugar in check. But the continued success we're seeing with these drugs outside of diabetes might just be the start, according to Michael Albert, an obesity specialist. Patients taking them have also shown improvements in cardiovascular health, for instance, and some studies have even suggested they could provide a protective effect against dementia, though more research will be needed there to confirm any benefits.

# Apple, Google, and Microsoft want to kill the password with "Passkey" standard

The first Thursday of May is apparently "World Password Day," and to celebrate Apple, Goole, and Microsoft are launching a "joint effort" to kill the password. The major OS vendors want to "expand support for a common passwordless sign-in standard created by the FIDO Alliance and the World Wide Web Consortium."

The standard is being called either a "multi-device FIDO credential" or just a "passkey." Instead of a long string of characters, this new scheme would have the app or website you're logging in to push a request to your phone for authentication. From there, you'd need to unlock the phone, authenticate with some kind of pin or biometric, and then you're on your way. This sounds like a familiar system for anyone with phone-based two-factor authentication set up, but this is a replacement for the password rather than an additional factor.

Similar to how a password manager can unify your logins under a single password, your passkeys can be backed up by some big platform-holder like Apple or Google. This would let you easily bring your credentials to a new device, prevent you from losing them, and make it easy to sync passkeys across devices. If you lose your device, you can still recover your accounts by signing in (uh—with a password?) to your big platform-holder account. It may also be a good idea to have more than one device set up as an authenticator.

Companies have been trying to go "passwordless" for years, but getting there has been tough. Google has a whole timeline on its blog post starting from 2008. Passwords work fine if they are long, random, secret, and unique, but the human element of passwords is always a problem. We aren't great at memorizing long, random strings of characters. It's tempting to write down passwords or reuse them, and phishing schemes try to trick you into giving your password to a third party. When a security breach happens, username and password pairs are easy to share, and there are huge databases of compromised credentials out there.

The FIDO blog post says: "These new capabilities are expected to become available across Apple, Google, and Microsoft platforms over the course of the coming year." Apple, which seems to have started the whole "passkey" trend, already has a system up and running in iOS 15 and macOS Monterey, but it's not compatiblewith other platforms yet. Google's passkey support has already benn spotted in Play Services on Android, so it should quickly be supported by even older Android devices as soon as it's ready