



**Weekly Newsletter**  
**TECHNOLOGY**  
**SURVEILLANCE**

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**CONCYTEC**



**OBJECTIVE:** *To provide weekly information about the latest global scientific and technological advancements, as well as the most innovative products and services entering the international market.*

## I. NEWS

### 1.1 Ways of helping teachers adopt supports for students with autism

A new study from the University of Kansas and University of Washington sheds light on the best ways to train teachers so they understand the practices and can implement them in their classrooms. Research has shown more than a dozen practices to be effective at helping students with autism in general education settings.



*Credit: The University of Kansas*

Survey respondents indicated active learning, collective participation, content focus, cohesion and sustained duration were the most effective methods of delivering training. Professional development can be delivered in multiple ways, though, and webinars and conferences were shown to be the least likely to help educators use the practices to aid their students with autism.

For more information, visit the following link:

<http://today.ku.edu/2023/08/15/study-identifies-best-ways-helping-teachers-adopt-supports-students-autism>

#### Reference

Krings, M. (Aug 15, 2023). Ways of helping teachers adopt supports for students with autism. Recovered Aug 15, 2023, The University of Kansas:

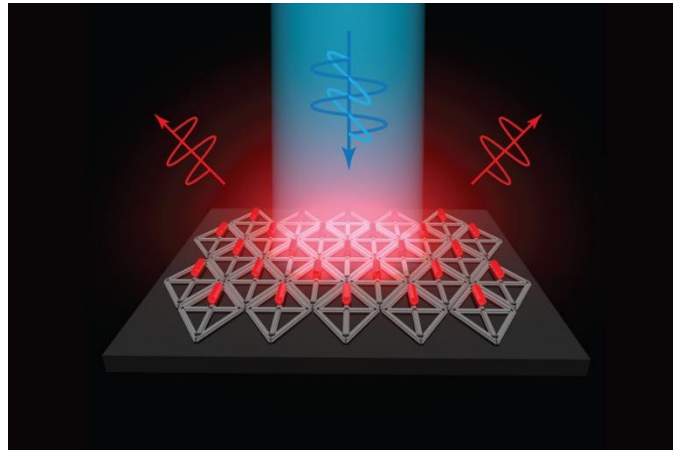
<http://today.ku.edu/2023/08/15/study-identifies-best-ways-helping-teachers-adopt-supports-students-autism>

**Information source:** (The University of Kansas, 2023)



## 1.2 Arrays of quantum rods could enhance TVs or virtual reality devices

Using scaffolds made of folded DNA, MIT engineers have come up with a new way to precisely assemble arrays of quantum rods. By depositing quantum rods onto a DNA scaffold in a highly controlled way, the researchers can regulate their orientation, which is a key factor in determining the polarization of light emitted by the array. This makes it easier to add depth and dimensionality to a virtual scene.



*MIT engineers have used DNA origami scaffolds to create precisely structured arrays of quantum rods, which could be incorporated into LEDs for televisions or virtual reality devices.*

*Credit: Dr. Xin Luo, Bathe BioNanoLab, Massachusetts Institute of Technology*

*“One of the challenges with quantum rods is: How do you align them all at the nanoscale so they’re all pointing in the same direction?” says Mark Bathe, an MIT professor of biological engineering and the senior author of the new study. “When they’re all pointing in the same direction on a 2D surface, then they all have the same properties of how they interact with light and control its polarization.”*

For more information, visit the following link:

<https://news.mit.edu/2023/arrays-quantum-rods-could-enhance-tv-virtual-reality-devices-0811>

### Reference

Trafton, A. (Aug 11, 2023). Arrays of quantum rods could enhance TVs or virtual reality devices. Recovered Aug 15, 2023, Massachusetts Institute of Technology:

<https://news.mit.edu/2023/arrays-quantum-rods-could-enhance-tv-virtual-reality-devices-0811>

**Information source:** (Massachusetts Institute of Technology, 2023)





### 1.3 Using quantum computing to protect ai from attack

Machine learning is a field of artificial intelligence (AI) where computer models become experts in various tasks by consuming large amounts of data. This is instead of a human explicitly programming this level of expertise.



*The vulnerability of neural networks raises safety concerns in potentially life-threatening situations like self-driving cars*

*Credit: Shutterstock, The University of Melbourne*

Recent advances in quantum computing have generated much excitement about the prospect of enhancing machine learning with quantum computers. Various 'quantum machine learning' algorithms already having been proposed, including quantum generalisations of the standard classical methods. Generalisation refers to a learning model's ability to adapt properly to new, previously unseen data. It is believed quantum machine learning models can learn certain types of data drastically faster than any model designed for current or 'classical' computers. Ordinary computers work with bits of data that can be either 'zero' or 'one' - a two-level classical system. Quantum computers work with 'qubits', states of two-level quantum systems, which exhibit strange additional properties that can be harnessed in order to tackle certain problems more efficiently than their classical counterparts.

For more information, visit the following link:

<https://pursuit.unimelb.edu.au/articles/using-quantum-computing-to-protect-ai-from-attack>

#### Reference

West, M. & Erfani, S. (Aug 14, 2023). Using quantum computing to protect ai from attack. Recovered Aug 15, 2023, The University of Melbourne:

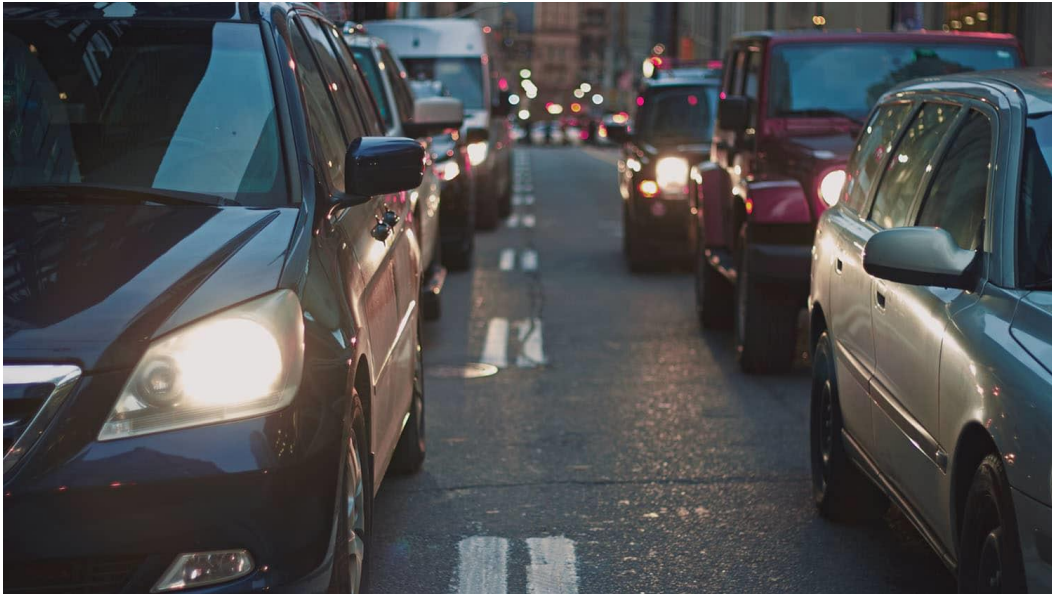
<https://pursuit.unimelb.edu.au/articles/using-quantum-computing-to-protect-ai-from-attack>

**Information source:** (The University of Melbourne, 2023)



#### 1.4 Novel physics-encoded Artificial Intelligence model helps to learn spatiotemporal dynamics

For the study, the researchers used a computational model that simulates traffic conditions. The researchers accounted for four types of vehicles: human-driven vehicles (HVs); connected vehicles (CVs) – which are driven by humans, but share information with other connected vehicles and with the control system that manages traffic lights; automated vehicles (AVs); and connected automated vehicles (CAVs).



*Credit: Nabeel Syed, North Carolina State University*

*“Because of their programming, AVs are assumed to move more cautiously compared to human drivers,” Hajbabaie, an associate professor of civil, construction and environmental engineering at North Carolina State University, says. “Their safety stems, in part, from their being programmed to drive conservatively. CVs and CAVs are designed to receive information about the future state of traffic lights and adjust their speeds to avoid stopping at intersections. As a result, the movement of CVs and CAVs is expected to be smoother – and have a lower number of stops – than HVs and AVs.”*

For more information, visit the following link:

[https://english.cas.cn/newsroom/research\\_news/infotech/202308/t20230802\\_334222.shtml](https://english.cas.cn/newsroom/research_news/infotech/202308/t20230802_334222.shtml)

#### Reference

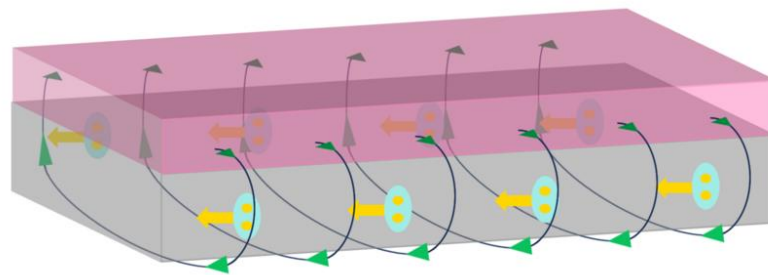
Hajbabaie, A. & Shipman, M. (Aug 14, 2023). Novel physics-encoded Artificial Intelligence model helps to learn spatiotemporal dynamics. Recovered Aug 15, 2023, North Carolina State University: [https://english.cas.cn/newsroom/research\\_news/infotech/202308/t20230802\\_334222.shtml](https://english.cas.cn/newsroom/research_news/infotech/202308/t20230802_334222.shtml)

**Information source:** (North Carolina State University, 2023)



## 1.5 Simple superconducting device could dramatically cut energy use in computing, other applications

MIT scientists and their colleagues have created a simple superconducting device that could transfer current through electronic devices much more efficiently than is possible today. As a result, the new diode, a kind of switch, could dramatically cut the amount of energy used in high-power computing systems, a major problem that is estimated to become much worse. Even though it is in the early stages of development, the diode is more than twice as efficient as similar ones reported by others. It could even be integral to emerging quantum computing technologies.



*In one design of the new superconducting device, the diode consists of a ferromagnetic strip (pink) atop a superconducting thin film (grey). The team also identified the key factors behind the resulting current that travels in only one direction with no resistance.*

*Credit: A. Varambally, Y-S. Hou, and H. Chi, Massachusetts Institute of Technology*

In sum, the team discovered that the edge asymmetries within superconducting diodes, the ubiquitous Meissner screening effect found in all superconductors, and a third property of superconductors known as vortex pinning all came together to produce the diode effect.

For more information, visit the following link:

<https://news.mit.edu/2023/simple-superconducting-device-could-dramatically-cut-energy-use-computing-other-important-0815>

### Reference

Thomson, E. (Aug 15, 2023). Simple superconducting device could dramatically cut energy use in computing, other applications. Recovered Aug 15, 2023, Massachusetts Institute of Technology:  
<https://news.mit.edu/2023/simple-superconducting-device-could-dramatically-cut-energy-use-computing-other-important-0815>

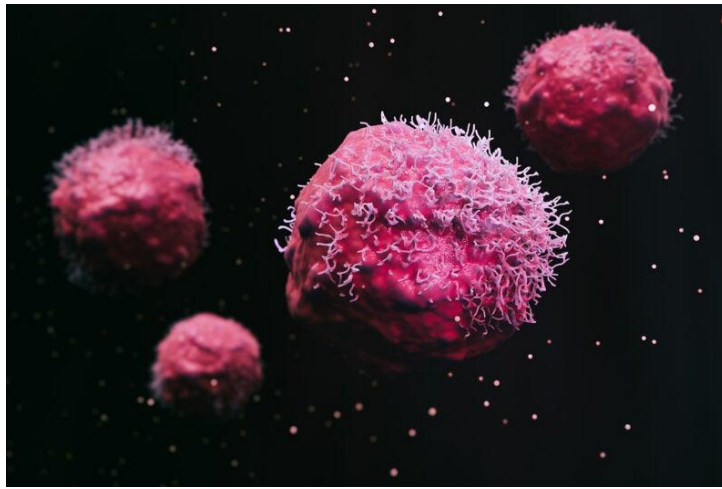
**Information source:** (Massachusetts Institute of Technology, 2023)





## 1.6 A bioengineered enzyme-based scissors cuts off cancer cells' defenses

Cancer cells can evade the body's immune defenses by exploiting a normally helpful and ubiquitous group of molecules known as mucins. Now, Stanford researchers have engineered a biomolecule that removes mucins specifically from cancer cells – a discovery that could play a significant role in future therapies for cancer. Mucins are sugar-coated proteins whose primary function is to defend the body against physical insults and pathogens. But cancer cells can co-opt mucins to aid their survival. Cutting mucins off cancer cells is a plausible therapy, but mucins exist in various forms on every cell in mammalian bodies, so targeting mucins indiscriminately could have unforeseen side effects.



*Stanford researchers have engineered a biomolecule that selectively cuts sugar-coated proteins called mucins off cancer cells.*

*Credit: Stanford University*

The solution devised by the Stanford-led research team is essentially an enzyme-based scissors composed of a mucinase – a protein-cutting enzyme (called a protease) that specifically cuts mucins – fused to a cancer-cell-targeting nanobody (an antibody fragment). This two-part biomolecule selectively targets and prunes only mucins associated with specific cancer cells.

For more information, visit the following link:

<https://news.stanford.edu/2023/08/10/bioengineered-tool-unmasks-cancer-cells/>

### Reference

Alyssa, H. (Aug 10, 2023). Deep learning for new protein design. Recovered Aug 15, 2023, Stanford University:

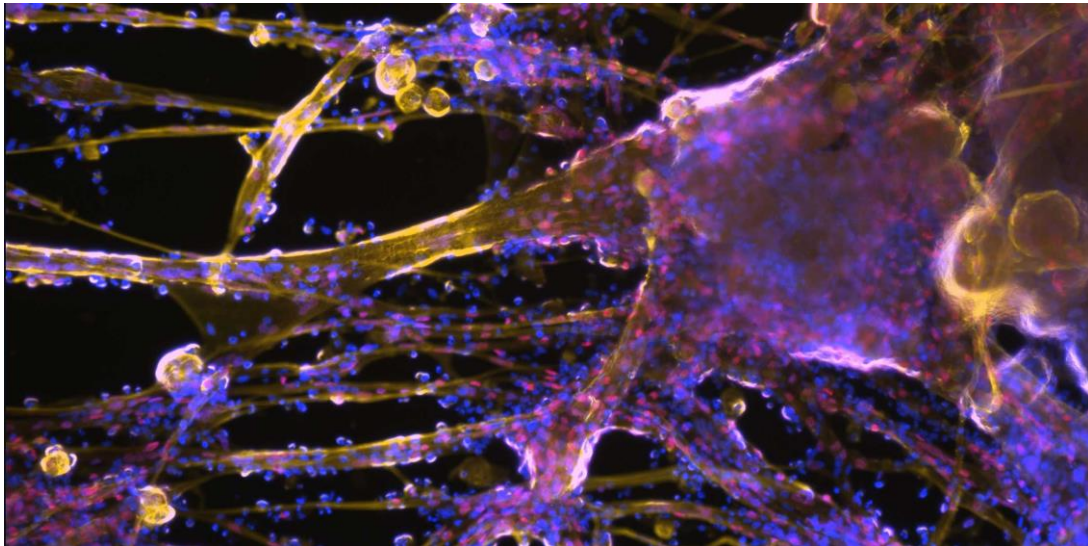
<https://news.stanford.edu/2023/08/10/bioengineered-tool-unmasks-cancer-cells/>

**Information source:** (Stanford University, 2023)



### 1.7 Method allows large quantities of muscle stem cells to be safely obtained in cell culture

ETH Zurich Professor Ori Bar-Nur and his team grow muscle cells in the laboratory. In this case, they are mouse cells, but the researchers are also interested in human and cow cells. Promising applications resonate with both: human muscle tissue cultured in the lab could be used in surgery, while human muscle stem cells could help people with muscle diseases; meanwhile, lab-grown cow muscle tissue could revolutionise the meat industry by enabling the production of meat with no need to slaughter animals.



*Muscle stem cells and fibers can be grown in the laboratory from reprogrammed connective tissue cells (microscopy image).*

*Credit: Bar-Nur lab, Eidgenössische Technische Hochschule Zürich*

An important component of the used cocktail – and a central catalyst for cell transformation – is the protein MyoD. This is a transcription factor which regulates the activity of certain muscle genes in the cell nucleus. MyoD is not normally present in connective tissue cells. Before these cells can turn into muscle cells, scientists have to coax them to produce MyoD in their nucleus for several days.

For more information, visit the following link:

<https://ethz.ch/en/news-and-events/eth-news/news/2023/08/building-muscle-in-the-lab.html>

#### Reference

Bergamín, F. (Aug 16, 2023). Building muscle in the lab. Recovered Aug 16, 2023, Eidgenössische Technische Hochschule Zürich:

<https://ethz.ch/en/news-and-events/eth-news/news/2023/08/building-muscle-in-the-lab.html>

**Information source:** (Eidgenössische Technische Hochschule Zürich, 2023)





## 1.8 Incorporating human error into machine learning

Human error and uncertainty are concepts that many artificial intelligence systems fail to grasp, particularly in systems where a human provides feedback to a machine learning model. Many of these systems are programmed to assume that humans are always certain and correct, but real-world decision-making includes occasional mistakes and uncertainty.



*Credit: University of Cambridge*

Researchers from the University of Cambridge, along with The Alan Turing Institute, Princeton, and Google DeepMind, have been attempting to bridge the gap between human behaviour and machine learning, so that uncertainty can be more fully accounted for in AI applications where humans and machines are working together. This could help reduce risk and improve trust and reliability of these applications, especially where safety is critical, such as medical diagnosis. The team adapted a well-known image classification dataset so that humans could provide feedback and indicate their level of uncertainty when labelling a particular image. The researchers found that training with uncertain labels can improve these systems' performance in handling uncertain feedback, although humans also cause the overall performance of these hybrid systems to drop.

For more information, visit the following link:

<https://www.cam.ac.uk/research/news/how-sure-is-sure-incorporating-human-error-into-machine-learning>

### Reference

Collins, S. (Aug 10, 2023). How sure is sure? Incorporating human error into machine learning. Recovered Aug 16, 2023, University of Cambridge:

<https://www.cam.ac.uk/research/news/how-sure-is-sure-incorporating-human-error-into-machine-learning>

**Information source:** (University of Cambridge, 2023)



## 1.9 New way for alternative materials to let computers access information quickly

Scientists led by NTU Singapore investigators have made a significant advance in developing alternative materials for the high-speed memory chips that let computers access information quickly and that bypass the limitations of existing materials. They found a straightforward way that allows them to make sense of previously hard-to-read data stored in these alternative materials, known as antiferromagnets. This is done by figuring out what states the materials are configured in. In the past, there were no practical methods to do this.

Researchers consider antiferromagnets to be attractive materials to make chips for computer memory, or random-access memory (RAM), because they are potentially more energy efficient than traditional ones made of silicon. Antiferromagnetic chips are also expected to store and change data more quickly than chips made from certain magnetic materials, which is useful for resource-intensive computing tasks.

For more information, visit the following link:

<https://www.ntu.edu.sg/news/detail/new-way-for-alternative-materials-to-let-computers-access-information-quickly>

### Reference

Nanyang Technological University. (Aug 14, 2023). New way for alternative materials to let computers access information quickly. Recovered Aug 16, 2023, Nanyang Technological University:

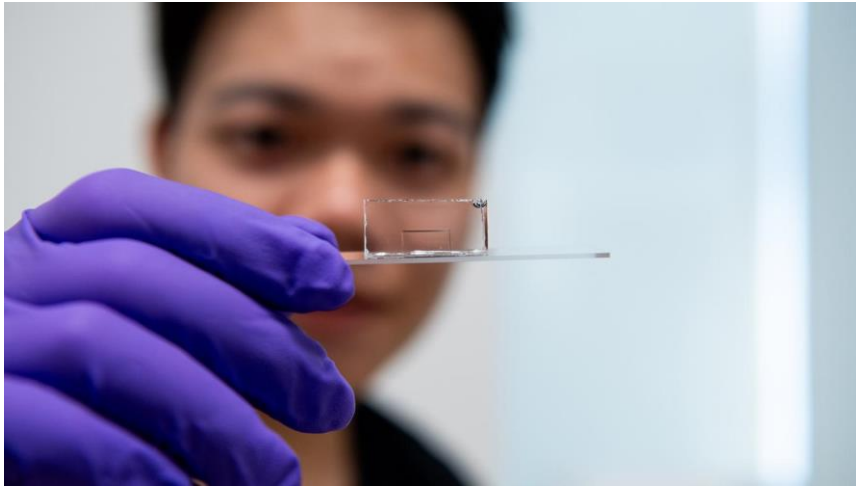
<https://www.ntu.edu.sg/news/detail/new-way-for-alternative-materials-to-let-computers-access-information-quickly>

**Information source:** (Nanyang Technological University, 2023)



### 1.10 Invent smallest known way to guide light

University of Chicago Prof. Jiwoong Park, however, wondered what would happen if you made even thinner and flatter strands—in effect, so thin that they’re actually 2D instead of 3D. What would happen to the light? Through a series of innovative experiments, he and his team found that a sheet of glass crystal just a few atoms thick could trap and carry light. Not only that, but it was surprisingly efficient and could travel relatively long distances—up to a centimeter, which is very far in the world of light-based computing..



*Scientists at the University of Chicago found a glass crystal just a few atoms thick can trap and carry light—and could be used for applications. The material is visible as the thin line in the center of the plastic, held by study co-author Hanyu Hong.*

*Credit: Jean Lachat, University of Chicago*

Photonic circuits already exist, but they are much larger and three-dimensional. Crucially, in existing waveguides, the particles of light—called photons—always travel enclosed inside the waveguide. With this system, the scientists explained, the glass crystal is actually thinner than the photon itself—so part of the photon actually sticks out of the crystal as it travels.

For more information, visit the following link:

<https://news.uchicago.edu/story/university-chicago-scientists-invent-smallest-known-way-guide-light>

#### Reference

Lerner, L. (Aug 10, 2023). University of Chicago scientists invent smallest known way to guide light. Recovered Aug 16, 2023, University of Chicago:  
<https://news.uchicago.edu/story/university-chicago-scientists-invent-smallest-known-way-guide-light>

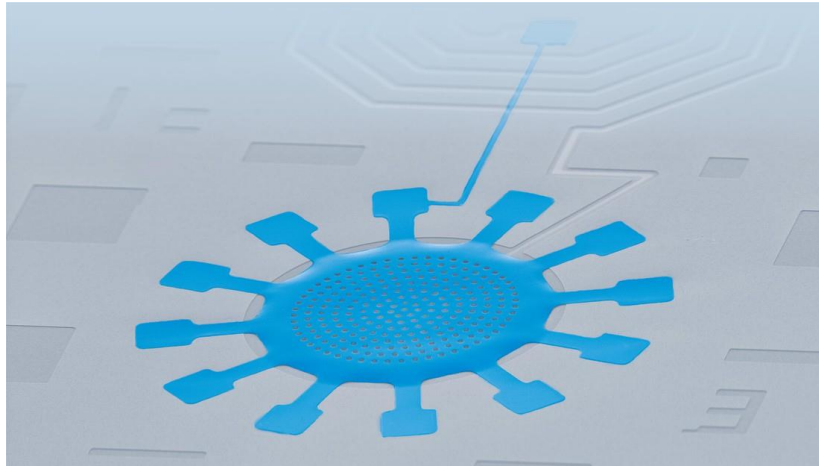
**Information source:** (University of Chicago, 2023)





### 1.11 A quantum leap in mechanical oscillator technology

Over the past decade, scientists have made tremendous progress in generating quantum phenomena in mechanical systems. What seemed impossible only fifteen years ago has now become a reality, as researchers successfully create quantum states in macroscopic mechanical objects.



*Credit: Ecole Polytechnique Fédérale de Lausanne*

By coupling these mechanical oscillators to light photons - known as “optomechanical systems”-, scientists have been able to cool them down to their lowest energy level close to the quantum limit, “squeeze them” to reduce their vibrations even further, and entangle them with each other. These advancements have opened up new opportunities in quantum sensing, compact storage in quantum computing, fundamental tests of quantum gravity, and even in the search for dark matter.

For more information, visit the following link:

<https://news.epfl.ch/news/a-quantum-leap-in-mechanical-oscillator-technology/>

#### Reference

Papageorgiou, N. (Aug 16, 2023). A quantum leap in mechanical oscillator technology. Recovered Aug 16, 2023, Ecole Polytechnique Fédérale de Lausanne:

<https://news.epfl.ch/news/a-quantum-leap-in-mechanical-oscillator-technology/>

**Information source:** (Ecole Polytechnique Fédérale de Lausanne, 2023)



### 1.12 Turning kale waste into treasure

Scientists from NTU Singapore have developed a new technique to convert kale waste for use in health and personal care products, reducing food waste and emissions. Phytochemicals found in plants are known to prevent damage to cells in the body and are widely used in consumer products. They include health-promoting supplements, like antioxidants and lutein, as well as face scrubs and hair shampoo with kale extracts.

Current processes for extracting phytochemicals from kale are energy-intensive, requiring high pressure and temperatures, which contribute additional CO<sub>2</sub> emissions to the environment. Moreover, the industrial extraction processes only target a single type of phytochemical each time. Seeking a more sustainable and efficient method to turn vegetable waste into “*treasure*”, the NTU researchers mixed processed kale waste with naturally derived natural deep eutectic solvents (NADES) - non-toxic liquids made up of plant-based compounds such as amino acid, sugar, and vegetable oil by-product – and found that when the kale waste and NADES mixture is stirred and set aside, it naturally separated into layers, facilitating the easy extraction of the phytochemicals from kale (polyphenols, carotenoids, and chlorophylls) without the need for heating.

For more information, visit the following link:

<https://www.ntu.edu.sg/news/detail/turning-kale-waste-into-treasure>

#### Reference

Nanyang Technological University (Aug 16, 2023). Turning kale waste into treasure. Recovered Aug 16, 2023, Nanyang Technological University:

<https://www.ntu.edu.sg/news/detail/turning-kale-waste-into-treasure>

**Information source:** (Nanyang Technological University, 2023)



### 1.13 QR code for cancer cells

A research team led by engineers at the University of Pennsylvania and Northwestern University scientists has created a new synthetic biology approach, or a “QR code for cancer cells,” to follow tumor cells over time, finding there are meaningful differences in why a cancer cell dies or survives in response to anti-cancer therapies.



*Credit: iStock/ktsimage, University of Pennsylvania*

The study outlined the team’s new technology platform that developed a QR code for each of the millions of cells for scientists to find and use later—much like tagging swans in a pond. The QR code directs researchers to a genome-wide molecular makeup of these cells and provides information about how they’ve reacted to cancer treatment.

For more information, visit the following link:

<https://penntoday.upenn.edu/news/penn-engineering-qr-code-cancer-cells>

#### Reference

University of Pennsylvania (Aug 10, 2023). QR code for cancer cells. Recovered Aug 16, 2023, University of Pennsylvania:

<https://penntoday.upenn.edu/news/penn-engineering-qr-code-cancer-cells>

**Information source:** (University of Pennsylvania, 2023)





### 1.14 “Trashbots” clean up, connect

A third-year doctoral student in computer science and human-computer interaction based at Cornell Tech, Bu oversaw the deployment of a pair of trash barrel robots – one for landfill waste, one for recycling – in Brooklyn’s Albee Square in July. The trashbots are 32-gallon garbage and recycling pails on top of repurposed hoverboards, with 360-degree cameras attached.



*Trashbots — one for landfill waste, one for recycling — draw stares during their deployment in Albee Square, Brooklyn, in July.  
Credit: Cornell University*

Bu said the trashbots, which can run for up to four hours between charges, roamed Albee Square for a couple of weeks, usually from 2-4 p.m., following the lunchtime rush. The experiment employed the “Wizard of Oz” method: The public thinks the robots are acting autonomously when, in fact, they are being controlled by humans – in this case, student interns supervised by Bu.

For more information, visit the following link:

<https://news.cornell.edu/stories/2023/08/trashbots-help-brooklynites-clean-connect>

#### Reference

Fleischman, T. (Aug 17, 2023). “Trashbots” help Brooklynites clean up, connect. Recovered Aug 17, 2023, Cornell University:

<https://news.cornell.edu/stories/2023/08/trashbots-help-brooklynites-clean-connect>

**Information source:** (Cornell University, 2023)



### 1.15 BlueDot is using AI to get ahead of the next pandemic

BlueDot's intelligence platform combines a computer's ability to understand human language, known as natural language understanding (NLU), and machine learning, a form of AI that imitates humans' ability to learn and gradually become more accurate. The platform sorts through massive volumes of online information – ranging from news reports, social media sites, government websites, and more – from around the globe, in more than 130 languages, every 15 minutes of every day.

*"We've basically trained a machine to pick up early clues around the world and around the clock,"* explains Khan. The clues get cross-referenced with historic data to determine what is outside of the norm, and then triaged into high, medium and low risk threats. Global data – including commercial air travel data, climate conditions, mosquito observances and population demographics – are also added to the mix to determine whether a threat could spread. This data analytic sequence is how BlueDot accurately predicted a Zika virus outbreak in Florida six months before it occurred, and sounded the alarm about COVID-19 nearly a week before it was officially reported by public health organizations like the CDC and WHO.

For more information, visit the following link:

<https://www.utoronto.ca/news/bluedot-using-ai-get-ahead-next-pandemic>

#### Reference

Nath, I. (Aug 15, 2023). BlueDot is using AI to get ahead of the next pandemic. Recovered Aug 17, 2023, University of Toronto:

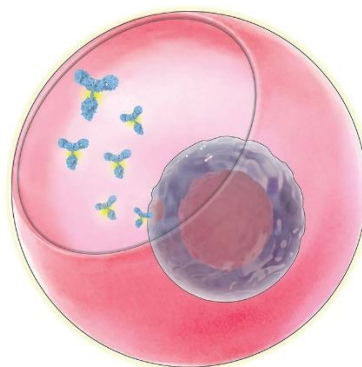
<https://www.utoronto.ca/news/bluedot-using-ai-get-ahead-next-pandemic>

**Information source:** (University of Toronto, 2023)



### 1.16 Genes linked to high production of key antibody

A collaboration led by UCLA and the Seattle Children's Research Institute has yielded new knowledge about the genes responsible for the production and release of immunoglobulin G, the most common type of antibody in the human body.



*A rendering of a nanovial, a microscopic bowl-shaped container that the scientists used to capture individual cells and their secretions. The dark, donut-shaped object to the right is a cell; the blue-and-yellow objects to the left are secreted immunoglobulin G antibodies.*

*Credit: University of California, Los Angeles*

Antibodies are a group of proteins that are crucial to the immune system. Immunoglobulin G, or IgG, stores memories of past infections and tags dangerous microbes to be eliminated by immune cells. Mothers' IgG is also vital for their newborns' immune defense. Scientists have known for decades that a population of white blood cells, called plasma B cells, make IgG. Plasma B cells are highly efficient, producing more than 10,000 IgG molecules every second. But the molecular mechanisms that enable plasma cells to secrete antibodies into the bloodstream are still not fully understood. In order to learn more about those mechanisms, the researchers performed an analysis that had never been done before: They captured thousands of single plasma B cells as well as their individual secretions, and then connected the amount of proteins each individual cell released to an atlas mapping tens of thousands of genes expressed by that same cell.

For more information, visit the following link:

<https://newsroom.ucla.edu/releases/genes-linked-to-high-production-key-antibody>

#### Reference

Lewis, W. (Aug 14, 2023). New study identifies genes linked to high production of key antibody. Recovered Aug 17, 2023, University of California – Los Angeles:  
<https://newsroom.ucla.edu/releases/genes-linked-to-high-production-key-antibody>

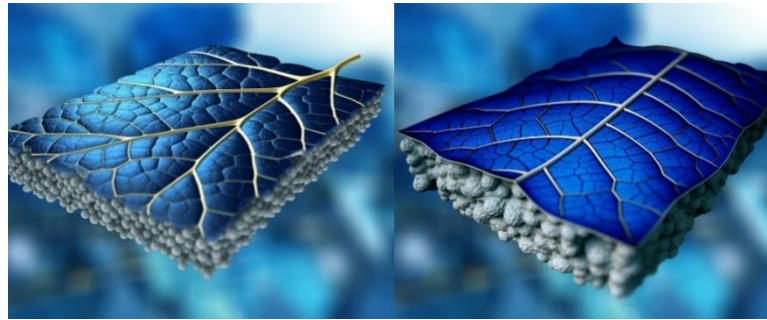
**Information source:** (University of California – Los Angeles, 2023)





### 1.17 A new bio-inspired solar leaf design with increased harvesting efficiency

Photovoltaic solar energy is obtained by converting sunshine into electricity – and researchers from Imperial have developed a new leaf-like design with increased efficiency. The new photovoltaic leaf (PV-leaf) technology uses low-cost materials and could inspire the next generation of renewable energy technologies. A series of experiments has demonstrated that a PV-leaf can generate over 10% more electricity compared to conventional solar panels, which lose up to 70% of the incoming solar energy to the environment.



*Conceptual structure of PV-leaf.  
Credit: Dr Gan Huang, Imperial College London*

The new PV-leaf design developed here at Imperial could also produce over 40 billion cubic metres of freshwater annually. This design eliminates the need for pumps, fans, control units and expensive porous materials, can generate additional clean water and thermal energy, and adapt to ambient temperature and solar condition variations.

For more information, visit the following link:

<https://www.imperial.ac.uk/news/246833/bio-inspired-solar-leaf-design-with-increased/>

#### Reference

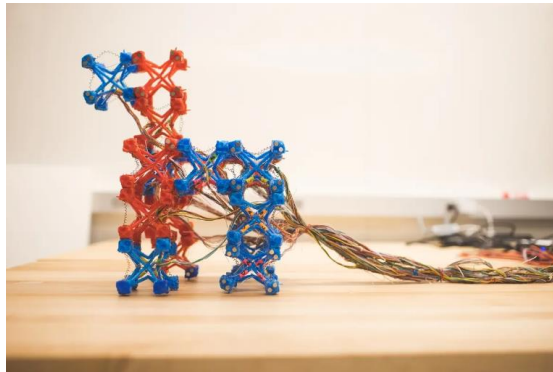
Ravate, B. (Aug 15, 2023). A new bio-inspired solar leaf design with increased harvesting efficiency. Recovered Aug 17, 2023, Imperial College London:  
<https://www.imperial.ac.uk/news/246833/bio-inspired-solar-leaf-design-with-increased/>

**Information source:** (Imperial College London, 2023)



### 1.18 Flexible robots

Dartmouth researchers are crafting soft robotic blocks that can work in unison to create structures able to bear weight, roll, walk, grip objects, and transport loads. Depending on the task at hand, the blocks can assume the shape most suited to carry it out. For example, such robots could potentially be useful in rapid response during emergencies—large-scale versions dropped by drones or helicopters could assemble into protective, makeshift tents for rescue.



*A dog-inspired structure built with StarBlocks helps researchers explore walking gaits.  
Credit: Katie Lenhart, Dartmouth College*

StarBlocks, a tabletop prototype created by Zhao and her collaborators from the Dartmouth Reality and Robotics Lab, Rutgers University, and Yale University, demonstrates the idea and its potential to be a dynamic toolbox. Each block, or module, has a star-shaped skeleton. Made by 3D printing from a material that combines the properties of plastic and rubber, the module's core is light yet stretchy.

For more information, visit the following link:

<https://home.dartmouth.edu/news/2023/08/computer-science-researcher-creates-flexible-robots?date-from=2023-08-10&page=1>

#### Reference

Barath, H. (Aug 14 2023). Computer science researcher creates flexible robots. Recovered Aug 17, 2023, Dartmouth College:

<https://home.dartmouth.edu/news/2023/08/computer-science-researcher-creates-flexible-robots?date-from=2023-08-10&page=1>

**Information source:** (Dartmouth College, 2023)



### 1.19 How AI can help turn data into food

Artificial intelligence could hold the key to feeding 10 billion people by 2050 in the face of climate change and rapidly evolving pests and pathogens according to researchers at The University of Queensland. Professor Lee Hickey from UQ's Queensland Alliance for Agriculture and Food Innovation said AI offered opportunities to accelerate the development of high performing plants and animals for better farm sustainability and profitability.

Professor Ben Hayes, the co-inventor of genomic prediction, said the QAAFI team had identified four applications for AI in crop and livestock breeding. *"The first one is deciding what to breed – it might sound simple, but this decision is becoming more complex,"* Professor Hayes said. *"In an increasingly challenging environment, consumer acceptance will be more important, so AI is a good way to pull together the preferences of millions of people. The second use involves analysing images taken on a large scale to capture genetic variation between related lines of plants and certain traits in animals that we want. The third area is to take genetic markers and use that information to predict how good a variety is going to be for breeding."* Professor Hayes said the fourth application of AI was shifting the way researchers approached breeding.

For more information, visit the following link:

<https://www.uq.edu.au/news/article/2023/08/how-ai-can-help-turn-data-food>

#### Reference

Hickey, L.; Hayes, B. & MacGregor, N. (Aug 11, 2023). How AI can help turn data into food. Recovered Aug 17, 2023, The University of Queensland, 2023:

<https://www.uq.edu.au/news/article/2023/08/how-ai-can-help-turn-data-food>

**Information source:** (The University of Queensland, 2023)





### 1.20 Researchers deconstruct bee stinger to help develop tiny medical devices

The high-resolution 3D deconstructions produced by UNSW Canberra researchers reveal the unique properties of the bee's powerful defense mechanism, including the numerous barbs responsible for why the stinger is able to work its way deeper into the skin while pumping venom after stinging. According to lead researcher, Associate Professor Sridhar Ravi, the autonomous delivery mechanism of the bee stinger has numerous characteristics that could help researchers develop small-scale and minimally intrusive medical devices in the future.



*The autonomous delivery mechanism of the bee stinger has unique characteristics.  
Credit: The University of New South Wales*

A/Prof. Ravi said there is also the possibility of developing improved 'anchoring' methods that will allow medical devices or adhesive patches to hold onto the skin without the need for chemical adhesives which can cause irritation or be unviable on moist surfaces, like the inside of the body. *"Previous studies have shown that a bee stinger is very good at piercing skin with minimal force, but it is very hard to remove once it is embedded,"* A/Prof. Ravi said. *"This is a really useful property for medical devices that need to be very precisely inserted without damaging surrounding tissues."* The 3D deconstructions have also led to the UNSW Canberra research team developing prototype devices that simulate a bee stinger's unique piercing and pumping actions.

For more information, visit the following link:

<https://newsroom.unsw.edu.au/news/science-tech/researchers-deconstruct-bee-stinger-help-develop-tiny-medical-devices>

#### Reference

Whittock, D. (Aug 17, 2023). Researchers deconstruct bee stinger to help develop tiny medical devices. Recovered Aug 17, 2023, The University of New South Wales: <https://newsroom.unsw.edu.au/news/science-tech/researchers-deconstruct-bee-stinger-help-develop-tiny-medical-devices>

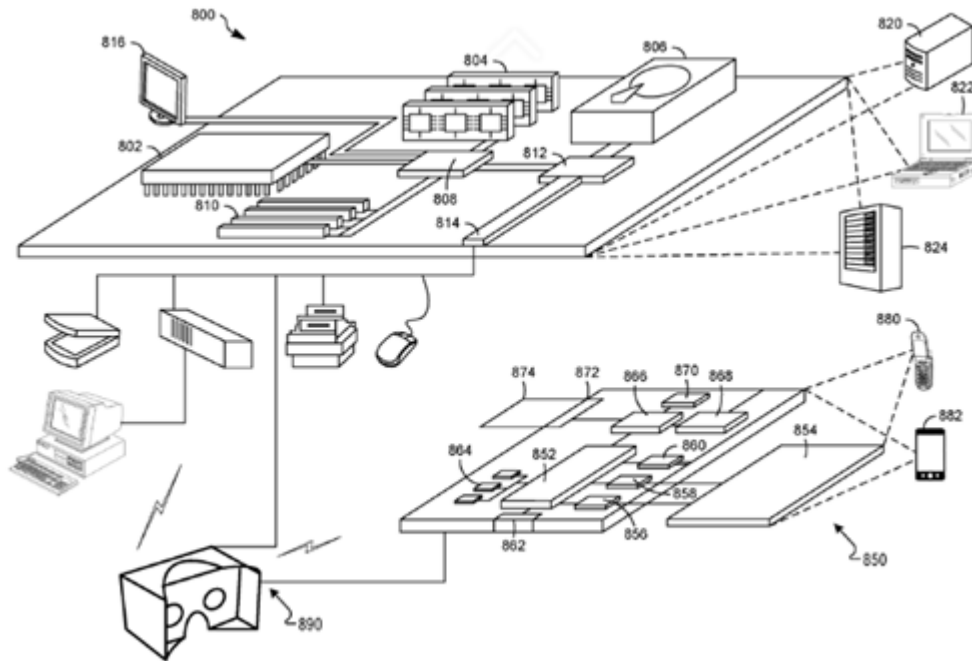
**Information source:** (The University of New South Wales, 2023)



## II. PATENTS

### 2.1. Accurate video event inference using 3D information

According to an aspect, a method for sharing a collaborative augmented reality (AR) environment including obtaining, by a sensor system of a first computing system, visual data representing a physical space of an AR environment, where the visual data is used to create a three-dimensional (3D) map of the physical space.



*Illustrates example computing devices of the AR system according to an aspect.  
Credit: Wu, S. & James, A., WIPO IP Portal*

The 3D map includes a coordinate space having at least one virtual object added by a user of the first computing system. The method includes broadcasting, by a transducer on the first computing system, an ultrasound signal, where the ultrasound signal includes an identifier associated with the 3D map. The identifier is configured to be detected by a second computing system to join the AR environment.

For more information, visit the following link:

[https://patentscope.wipo.int/search/es/detail.jsf?docId=US403905867&\\_cid=P20-LLCIDH-89322-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=US403905867&_cid=P20-LLCIDH-89322-1)

#### Reference

Wu, S. & James, A. (Aug 10, 2023). Triggering a collaborative augmented reality environment using an ultrasound signal. Recovered Aug 15, 2023, WIPO IP Portal:

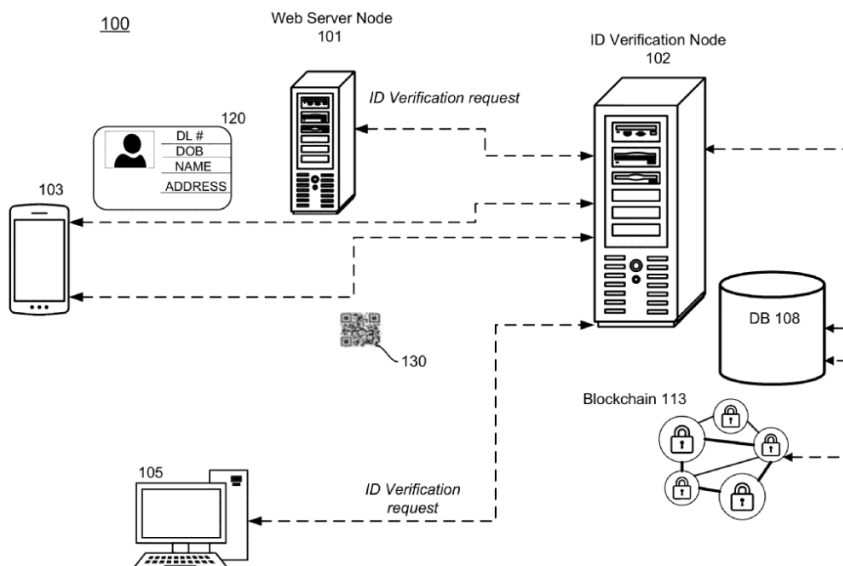
[https://patentscope.wipo.int/search/es/detail.jsf?docId=US403905867&\\_cid=P20-LLCIDH-89322-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=US403905867&_cid=P20-LLCIDH-89322-1)

**Information source:** (WIPO IP Portal, 2023)



## 2.2. Decentralized secure true digital ID for communication

A system includes a processor of an ID verification node and a memory of a decentralized digital identifier for communication (DsTC) module on which are stored machine-readable instructions that when executed by the processor, cause the processor of the ID verification node to: receive a verifiable credential associated with a user, wherein the verifiable credential is uploaded by a sender.



*Network diagram of a system 100 for including an ID Verification node implementing a Decentralized Secure True Digital Identifier (ID) for communication (DsTC), according to disclosed embodiments.*

*Credit: Johnson, J., WIPO IP Portal*

Apply artificial intelligence (AI)/machine learning (ML) to scan biometric image data to verify the sender of the verifiable credential corresponds with the user associated with the verifiable credential; verify the authenticity of the verifiable credential with an issuer of the verifiable credential; in response to verifying that the verifiable credential is authentic, generate an intermediate representation to create a secure true digital ID corresponding to the user; and provide role based access for the user based on the secure true digital ID.

For more information, visit the following link:

[https://patentscope.wipo.int/search/es/detail.jsf?docId=US403907608&\\_cid=P20-LLBBWA-18951-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=US403907608&_cid=P20-LLBBWA-18951-1)

### Reference

Johnson, J. (Aug 10, 2023). Decentralized secure true digital id for communication. Recovered Aug 15, 2023, WIPO IP Portal:

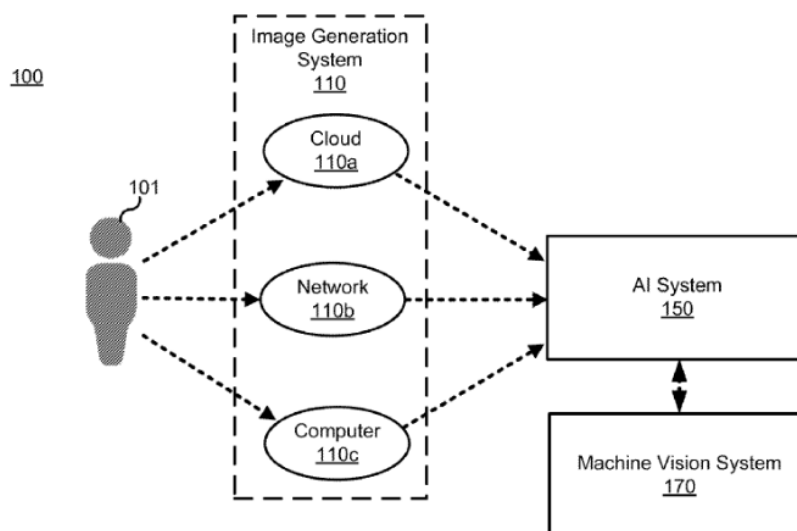
[https://patentscope.wipo.int/search/es/detail.jsf?docId=US403907608&\\_cid=P20-LLBBWA-18951-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=US403907608&_cid=P20-LLBBWA-18951-1)

**Information source:** (WIPO IP Portal, 2023)



### 2.3. Systems and methods for generating images for training artificial intelligence systems

An image training system comprises a memory, and a processor configured to: simulate a physical environment containing an object, the simulated physical environment corresponding to a real physical environment in which the object is disposed.



*Is a block diagram illustrating an example machine learning system that includes an image generation system, and an AI system associated with a machine vision system, according to an embodiment.*

*Credit: Gilpin, M., WIPO IP Portal*

The processor is configured to simulate a camera lens view of the physical environment, which corresponds to a view of the real physical environment that would be captured by one or more image capture devices. The processor is configured to render the camera lens view to obtain a photorealistic view of the physical environment. The processor generates a plurality of simulated images of the physical environment, annotate the plurality of simulated images so as to generate a plurality of annotated images, and generate a data package containing the plurality of annotated images. The plurality of annotated images are configured to train an artificial intelligence (AI) system associated with the one or more image capture devices.

For more information, visit the following link:

[https://patentscope.wipo.int/search/es/detail.jsf?docId=US403905894&\\_cid=P20-LLBBWA-18951-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=US403905894&_cid=P20-LLBBWA-18951-1)

#### Reference

Gilpin, M. (Aug 10, 2023). Systems and methods for generating images for training artificial intelligence systems. Recovered Aug 14, 2023, WIPO IP Portal:

[https://patentscope.wipo.int/search/es/detail.jsf?docId=US403905894&\\_cid=P20-LLBBWA-18951-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=US403905894&_cid=P20-LLBBWA-18951-1)

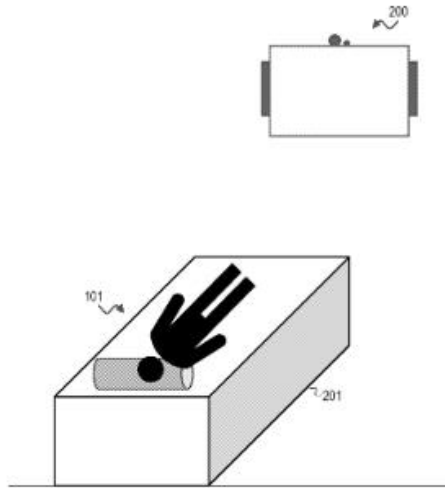
**Information source:** (WIPO IP Portal, 2023)





## 2.4. Cyber-physical system to enhance usability and quality of telehealth consultation

A cyber-physical system for conducting a telehealth session. In embodiments, the system includes a hardware control box that enables patients (e.g., elderly or cognitively-impaired patients) to easily participate in the telehealth session.



*Is a diagram of the patient system according to another exemplary embodiment.*

*Credit: Garbey, M. & Joerger, G., WIPO IP Portal*

In some embodiments, the system analyzes sensor data (e.g., thermal images, eye tracking data, etc.) and calculates state variables that form a mathematical representation (a "digital twin") indicative of the physical, emotive, cognitive, or social state of the patient. In some of those embodiments, the system calculates Myasthenia Gravis core examination metrics by performing computer vision analysis on patient video data and/or audio analysis on patient audio data. In some embodiments, the system controls a pan-tilt-zoom camera to zoom in on each region of interest that is relevant to the examination. In some embodiments, the digital twin is used as an input of a heuristic computer reasoning system, which uses artificial intelligence to support clinical diagnosis and decision-making.

For more information, visit the following link:

[https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023147285&\\_cid=P10-LL5Z1C-54634-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023147285&_cid=P10-LL5Z1C-54634-1)

### Reference

Garbey, M. & Joerger, G. (Aug 10, 2023). Cyber-physical system to enhance usability and quality of telehealth consultation. Recovered Aug 14, 2023, WIPO IP Portal:

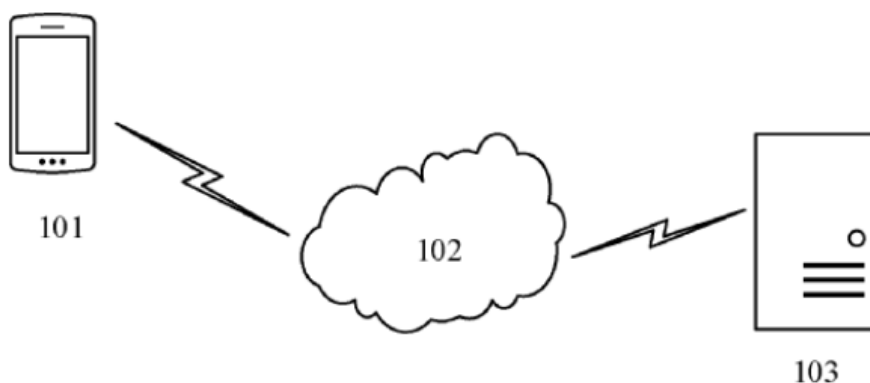
[https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023147285&\\_cid=P10-LL5Z1C-54634-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023147285&_cid=P10-LL5Z1C-54634-1)

**Information source:** (WIPO IP Portal, 2023)



## 2.5. Method of displaying text, electronic device and storage medium

Provided are a method of displaying a text, an electronic device, and a storage medium, which relate to a field of artificial intelligence, and in particular to fields of content management and text technology.



*Schematically shows a system architecture of a method and an apparatus of displaying a text according to an embodiment of the present disclosure,  
Credit: Cui, S.; Xin, Y.; Su, W. & Zhao, H., WIPO IP Portal*

The method includes: determining, in a process of displaying a text page, a first target position associated with a target triggering operation in response to the target triggering operation being detected, wherein the target triggering operation indicates that a text content combination is to be performed; determining a target character content associated with the target triggering operation, in response to a text combination instruction, which is generated based on the target triggering operation, being detected; and adjusting a display position of the target character content to the first target position, so as to combine the target character content with a target text corresponding to the first target position to obtain a combined target text.

For more information, visit the following link:

[https://patentscope.wipo.int/search/es/detail.jsf?docId=US403904797&\\_cid=P20-LLBBWA-18951-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=US403904797&_cid=P20-LLBBWA-18951-1)

### Reference

Cui, S.; Xin, Y.; Su, W. & Zhao, H. (Aug 10, 2023). Method of displaying text, electronic device and storage medium. Recovered Aug 14, 2023, WIPO IP Portal:

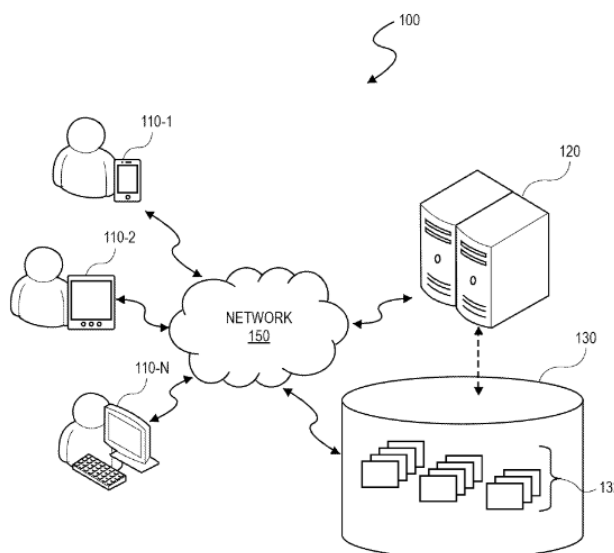
[https://patentscope.wipo.int/search/es/detail.jsf?docId=US403904797&\\_cid=P20-LLBBWA-18951-1](https://patentscope.wipo.int/search/es/detail.jsf?docId=US403904797&_cid=P20-LLBBWA-18951-1)

**Information source:** (WIPO IP Portal, 2023)



## 2.6. Sequential model for determining user representations

Described are systems and methods for providing a sequential trained Machine Learning model that may be configured to generate a user embedding that is representative of the user and is configured to predict a plurality of the user's actions over a period of time. The exemplary sequential trained Machine Learning model may be employed, for example, in connection with recommendation, search, and/or other services.



*Illustration of an exemplary computing environment, according to exemplary embodiments of the present disclosure.*

*Credit: Zhai, A.; Pancha, N.; Chen, H. & Boakye, K, Espacenet Patent Search*

Exemplary embodiments of the present disclosure may also employ the user embeddings generated by the exemplary sequential trained Machine Learning model in connection with one or more conditional retrieval systems that may include an end-to-end learned model, which are configured to generate updated user embeddings based on the user embeddings generated by the exemplary sequential trained Machine Learning model and certain contextual information.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/080930114/publication/EP4223684A1?q=Machine%20learning>

### Reference

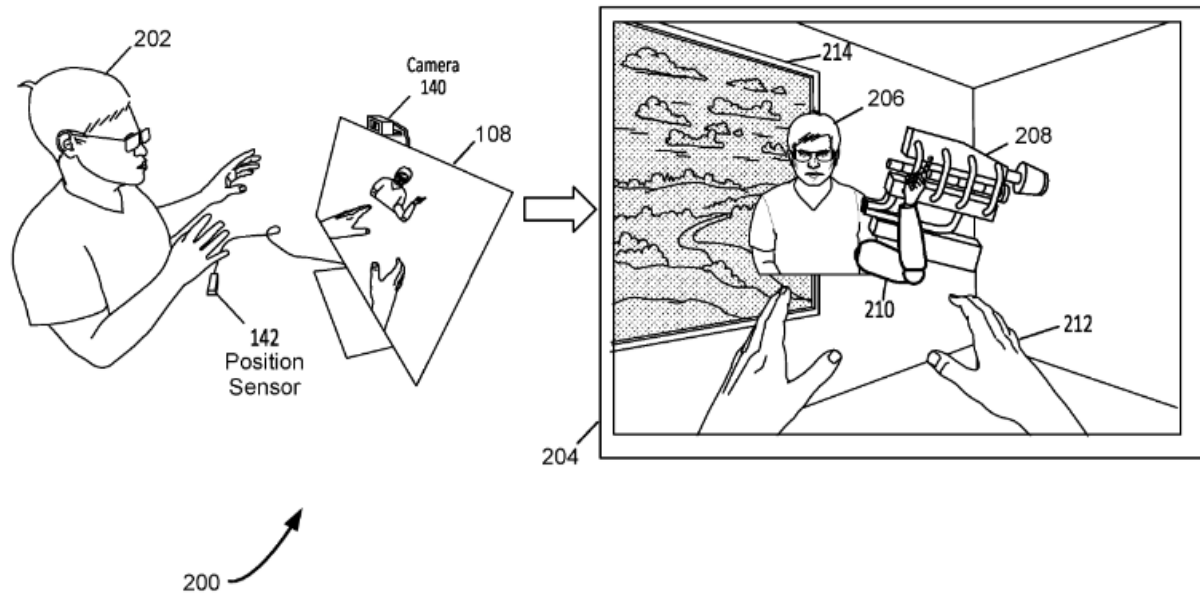
Zhai, A.; Pancha, N.; Chen, H. & Boakye, K. (Aug 10, 2023). Yarn tension and breakage sensor system. Recovered Aug 14, 2023, Espacenet Patent Search:  
<https://worldwide.espacenet.com/patent/search/family/080930114/publication/EP4223684A1?q=Machine%20learning>

**Information source:** (Espacenet Patent Search, 2023)



## 2.7. Virtual 3D pointing and manipulation

Certain aspects and features of this disclosure relate to virtual 3D pointing and manipulation. For example, video communication is established between a presenter client device and a viewer client device.



*Is an example of system for virtual 3D pointing and manipulation according to certain embodiments.  
Credit: Habib, K.; Wang, T.; DiVerdi, S. & Wei, L, Espacenet Patent Search*

A presenter video image is captured. A 3D image of a 3D object is rendered on the client devices and a presenter avatar is rendered on at least the viewer client device. The presenter avatar includes at least a portion of the presenter video image. When a positional input is detected at the presenter client device, the system renders, on the viewer client device, an articulated virtual appurtenance associated with the positional input, the 3D image, and the presenter avatar. A virtual interaction between the articulated virtual appurtenance and the 3D image appear to a viewer as naturally positioned for the interaction with respect to the viewer.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/087521276/publication/US2023252746A1?q=3d>

### Reference

Habib, K.; Wang, T.; DiVerdi, S. & Wei, L. (Aug 10, 2023). Virtual 3D pointing and manipulation. Recovered Aug 14, 2023, Espacenet Patent Search:

<https://worldwide.espacenet.com/patent/search/family/087521276/publication/US2023252746A1?q=3d>

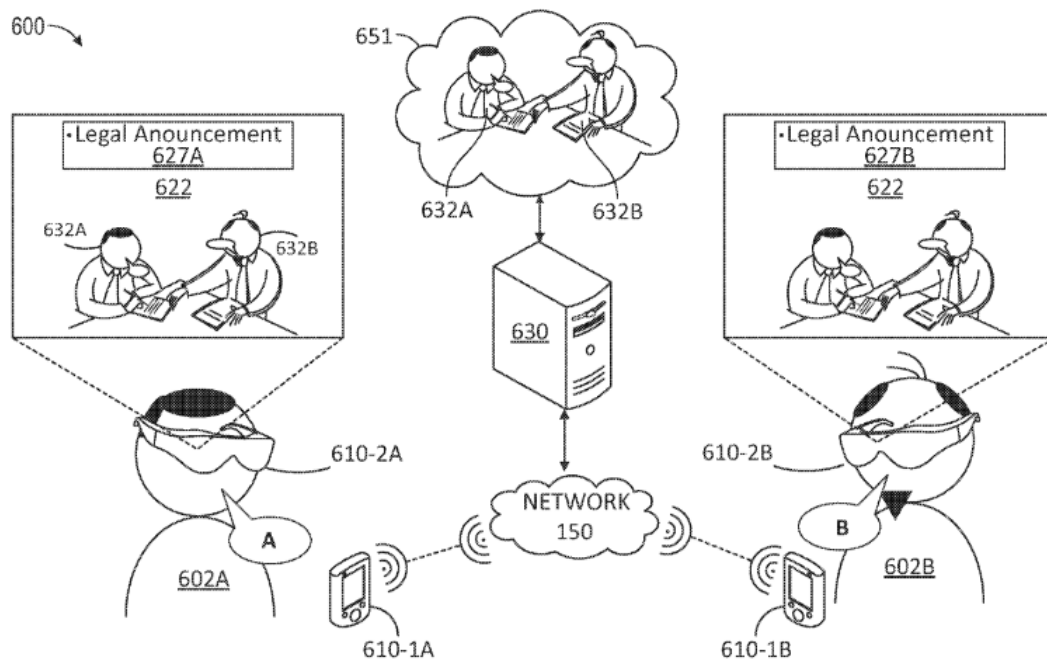
**Information source:** (Espacenet Patent Search, 2023)





## 2.8. Authentication of avatars for Immersive Reality applications

A method for authenticating an avatar for use in a virtual reality/augmented reality (VR/AR) application is provided. The method includes receiving, from a client device, a request for authenticating an identity of a user of an immersive reality application running in the client device, wherein the user is associated with a subject-based avatar in the immersive reality application.



*Illustrates a contractual scenario with subject-based avatars interacting in a virtual environment by a virtual reality application, according to some embodiments.*

*Credit: Saragih, J.; Silverstein, B. & Kreuz, T., Espacenet Patent Search*

The computer-implemented method also includes verifying, in a server, a public key provided by the client device against a private key stored in the server, the private key associated with the subject-based avatar, providing, to the client device, a certificate of validity of the identity of the user when the public key matches the private key, and storing an encrypted version of the certificate of validity in a memory. A memory storing instructions and a system to perform the above method are also provided.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/086185357/publication/WO2023150280A1?q=virtual%20reality>

### Reference

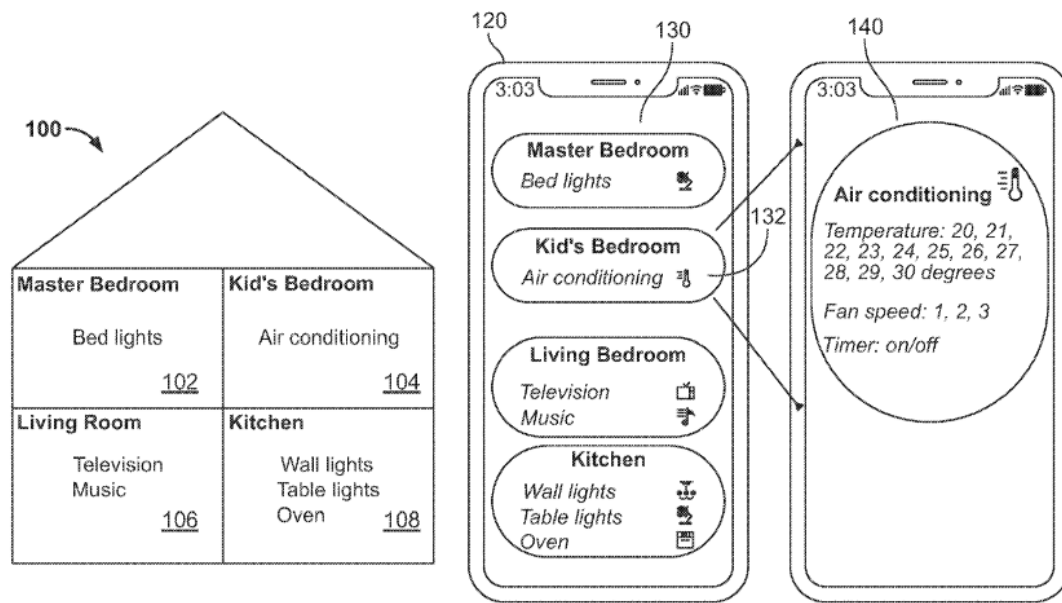
Saragih, J.; Silverstein, B. & Kreuz, T. (Aug 10, 2023). Authentication of avatars for Immersive Reality applications. Recovered Aug 14, 2023, Espacenet Patent Search:  
<https://worldwide.espacenet.com/patent/search/family/086185357/publication/WO2023150280A1?q=virtual%20reality>

**Information source:** (Espacenet Patent Search, 2023)



## 2.9. Procedural knowledge for a smart home automation system

According to at least one embodiment, an artificial intelligence apparatus includes at least one audio sensor configured to capture audio data in an environment, and at least one processor. The at least one processor is configured to: detect an utterance in the audio data; determine an inability to comprehend the utterance based on information being missing in the utterance; and acquire the missing information.



*Show exemplary screenshots of various displays and alerts that may be provided to a user in real-time by the ACF application during contactless finger-printing as per certain embodiments of the present disclosure.*

*Credit: Gazeau, M.; Singh, H.; Sequiera, R. & Ferreira, K., Espacenet Patent Search*

The at least processor is further configured to acquire the missing information by at least: acquiring the missing information from at least one smart device of a plurality of smart devices located in the environment; or acquiring the missing information from a knowledge base of the artificial intelligence apparatus. The at least one processor is further configured to complete comprehension of the utterance based on the acquired missing information.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/087521287/publication/US2023252990A1?q=artificial%20intelligence>

### Reference

Gazeau, M.; Singh, H.; Sequiera, R. & Ferreira, K. (Aug 10, 2023). Procedural knowledge for a smart home automation system. Recovered Aug 14, 2023, Espacenet Patent Search:

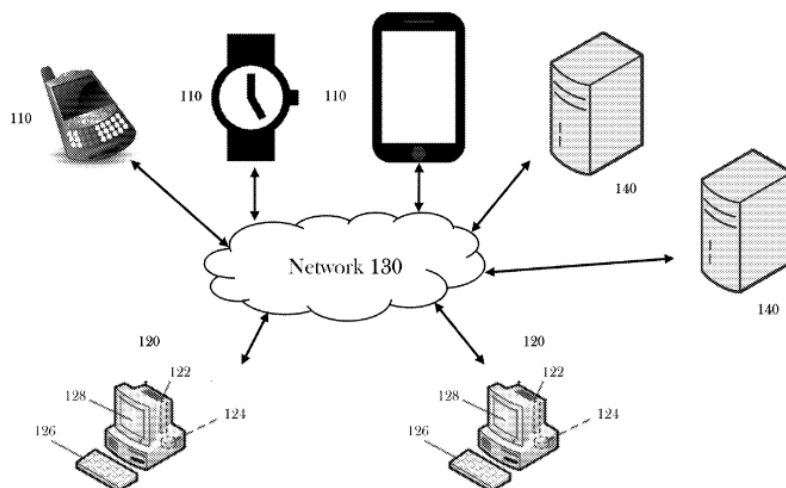
<https://worldwide.espacenet.com/patent/search/family/087521287/publication/US2023252990A1?q=artificial%20intelligence>

**Information source:** (Espacenet Patent Search, 2023)



## 2.10. Systems and methods for Blockchain-based information sharing

Systems and methods are disclosed for managing information. In certain embodiments, a server receives one or more information queries and associated entries and stores references to them as well as associated metadata as a smart contract. The server then modified references and metadata of the entries/queries based on expert and user interactions.



*Is a diagram of an exemplary embodiment of the hardware of the system of the present invention.*

*Credit: Kachur, S, Espacenet Patent Search*

The economic activity of these interactions is guided by organizations of self-governing expert participants who are responsible for setting prices, community policies, and credentialing requirements. Over-time the incentive mechanisms of the protocol, incentive mechanisms associated with governance and constant improvement of input/output algorithms via neural network analyses of iterative user-system interactions optimize the function and increase the value of the knowledge economy, creating vibrant knowledge marketplaces that collect fees in exchange for data distribution to users and distribute those fees among expert individuals and their knowledge communities.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/087521120/publication/US2023252510A1?q=blockchain>

### Reference

Kachur, S. (Aug 10, 2023). Systems and methods for blockchain-based information sharing. Recovered Aug 14, 2023, Espacenet Patent Search:

<https://worldwide.espacenet.com/patent/search/family/087521120/publication/US2023252510A1?q=blockchain>

**Information source:** (Espacenet Patent Search, 2023)