



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

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**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 **Drinking diet sodas and aspartame-sweetened beverages daily during pregnancy linked to autism in male offspring**

A new published study led by researchers at The University of Texas Health Science Center at San Antonio (UT Health San Antonio) has found an association between autism diagnosis in boys and daily consumption of either diet soda or a comparable amount of aspartame by their mothers during pregnancy or breastfeeding.



*Credit: Steven Lee, The University of Texas health science center at San Antonio*

In this case-control study, boys who had been diagnosed with autism were more than three times as likely as neurotypically developing boys to have been born to mothers who reported consuming one or more servings per day of diet soda, or comparable amounts of the leading artificial sweetener aspartame, during pregnancy or breastfeeding. No statistically significant association was found in female offspring.

For more information, visit the following link:

<https://news.uthscsa.edu/drinking-diet-sodas-and-aspartame-sweetened-beverages-daily-during-pregnancy-linked-to-autism-in-male-offspring/>

#### Reference

Lee, S. (Sep 20, 2023). Drinking diet sodas and aspartame-sweetened beverages daily during pregnancy linked to autism in male offspring. Recovered Sep 20, 2023, The University of Texas: <https://news.uthscsa.edu/drinking-diet-sodas-and-aspartame-sweetened-beverages-daily-during-pregnancy-linked-to-autism-in-male-offspring/>

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



## 1.2 Genetically modified bacteria break down plastics in saltwater

Researchers have genetically engineered a marine microorganism to break down plastic in salt water. Specifically, the modified organism can break down polyethylene terephthalate (PET), a plastic used in everything from water bottles to clothing that is a significant contributor to microplastic pollution in oceans.



*Credit: Naja Bertolt Jensen, North Carolina State University*

*“This is exciting because we need to address plastic pollution in marine environments,” says Nathan Crook, corresponding author of a paper on the work and an assistant professor of chemical and biomolecular engineering at North Carolina State University. “One option is to pull the plastic out of the water and put it in a landfill, but that poses challenges of its own. It would be better if we could break these plastics down into products that can be re-used. For that to work, you need an inexpensive way to break the plastic down. Our work here is a big step in that direction.”*

For more information, visit the following link:

<https://news.ncsu.edu/2023/09/breaking-down-marine-plastics/>

### Reference

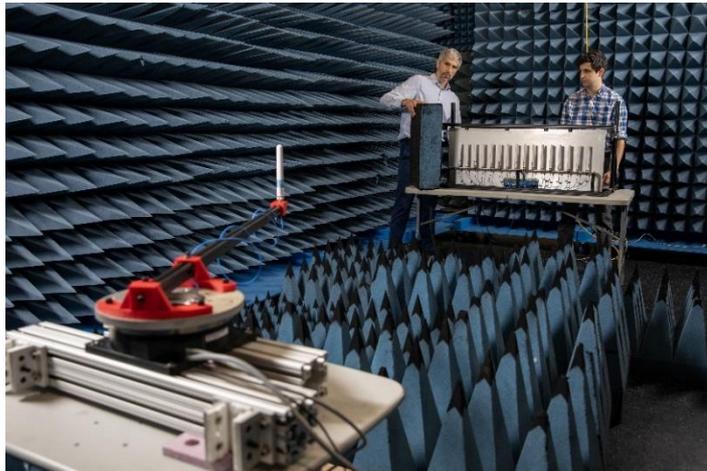
Shipman, M. (Sep 14, 2023). Genetically modified bacteria break down plastics in saltwater. Recovered Sep 15, 2023, North Carolina State University:  
<https://news.ncsu.edu/2023/09/breaking-down-marine-plastics/>

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



### 1.3 TRIAD streamlines edge processing of data in phased-array antennas

As the number of elements on phased array antennas continues to grow, so does the volume of data that must be processed to extract information from the signals gathered. Researchers at the Georgia Institute of Technology have developed a new approach to intelligently process that data closer to where it is generated - on the antenna subarrays themselves.



*Final TRIAD demonstration setup, with the transmit antenna in the foreground on a metal arm attached to a turntable and the elemental digital array in the background. Shown are Ryan Westafer and Alex Saad-Falcon.  
Credit: Georgia Institute of Technology*

Combining technologies including Machine Learning, field-programmable gate arrays (FPGAs), graphics processing units (GPUs), and a new radio-frequency image processing algorithm, the research has streamlined the modular handling of radar signals to reduce processing time and cost. *“The goal is to push processing up front, to where all the raw data is coming in,”* said Ryan Westafer, a principal research engineer at the Georgia Tech Research Institute (GTRI). *“We work to manage the high-dimensional data there and extract features in real-time. With so many data sources from autonomous vehicles to drones, we can’t be sharing all those raw data feeds. We need to be analyzing the data locally and sharing only the information content – the relevant features.”*

For more information, visit the following link:

<https://research.gatech.edu/triad-streamlines-edge-processing-data-phased-array-antennas>

#### Reference

Toon, J. (Sep 15 2023). TRIAD streamlines edge processing of data in phased-array antennas. Recovered Sep 15, 2023, Georgia Institute of Technology:

<https://research.gatech.edu/triad-streamlines-edge-processing-data-phased-array-antennas>

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



#### 1.4 Artificial Intelligence driven tool makes it easy to personalize 3D-printable models

As 3D printers have become cheaper and more widely accessible, a rapidly growing community of novice makers are fabricating their own objects. To do this, many of these amateur artisans access free, open-source repositories of user-generated 3D models that they download and fabricate on their 3D printer.



*MIT researchers developed a user-friendly interface that enables a maker to customize the color, texture, and shape of the aesthetic characteristics of an open-source 3D model from an online repository, without affecting the functionality of the fabricated object.*

*Credit: courtesy of the researchers, Massachusetts Institute of Technology*

MIT researchers developed a generative-AI-driven tool that enables the user to add custom design elements to 3D models without compromising the functionality of the fabricated objects. A designer could utilize this tool, called Style2Fab, to personalize 3D models of objects using only natural language prompts to describe their desired design. The user could then fabricate the objects with a 3D printer.

For more information, visit the following link:

<https://news.mit.edu/2023/ai-driven-tool-personalize-3d-printable-models-0915>

#### Reference

Zewe, A. (Sep 15, 2023). AI-driven tool makes it easy to personalize 3D-printable models. Recovered Sep 18, 2023, Massachusetts Institute of Technology:

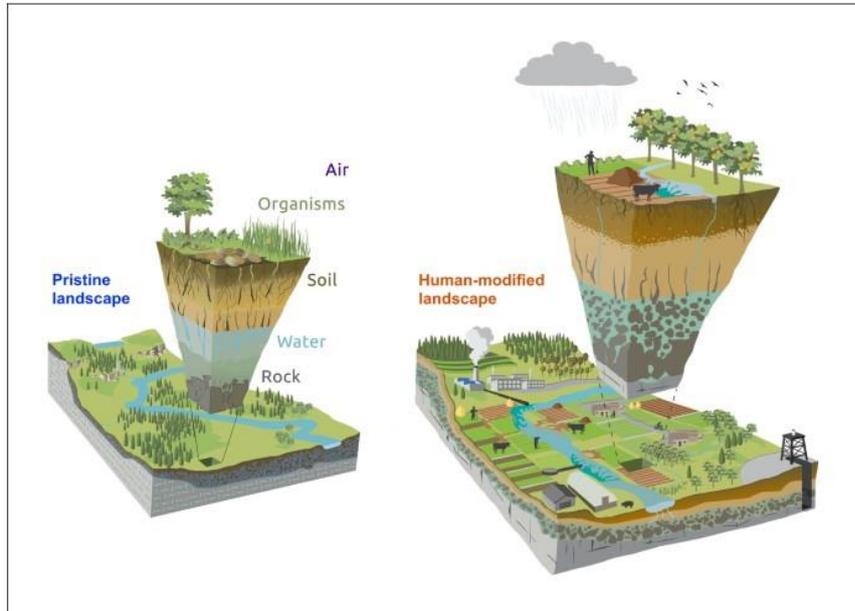
<https://news.mit.edu/2023/ai-driven-tool-personalize-3d-printable-models-0915>

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



## 1.5 New approach to critical zone science could help secure Earth's life support systems

Future plans to tackle the climate change's impacts on food security must integrate local knowledge to help preserve the Earth's critical zone, experts have warned.



*Humans are key modifiers of landscape processes that sustain ecosystems and humanity.  
Credit: Naylor et al. [2023a], Figure 1b, University of Exeter*

Researchers from the UK and China, including Professors Tim Quine and Jennifer Dungait from the University of Exeter, outline how their experience of working with farmers on land heavily altered by human activity has shown how the critical zone can be better managed and protected. Their insights are summarised in a new diagram, which seeks to visually convey human impact on the Earth's critical zone more clearly than ever before. The researchers suggest that the new diagram should replace a widely used, more simplified graphic, introduced in 2007, which focused on the natural processes that shape the critical zone without addressing human impact on landscapes.

For more information, visit the following link:

<https://news.exeter.ac.uk/faculty-of-environment-science-and-economy/geography/new-approach-to-critical-zone-science-could-help-secure-earths-life-support-systems/>

### Reference

Sandes, D. (Sep 18, 2023). New approach to critical zone science could help secure Earth's life support systems. Recovered Sep 18, 2023, University of Exeter:  
<https://news.exeter.ac.uk/faculty-of-environment-science-and-economy/geography/new-approach-to-critical-zone-science-could-help-secure-earths-life-support-systems/>

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



## 1.6 Implantable device could enable injection-free control of diabetes

One promising approach to treating Type 1 diabetes is implanting pancreatic islet cells that can produce insulin when needed, which can free patients from giving themselves frequent insulin injections. However, one major obstacle to this approach is that once the cells are implanted, they eventually run out of oxygen and stop producing insulin.



*MIT engineers designed an implantable device that carries hundreds of thousands of islet cells along with its own on-board oxygen factory to keep the cells healthy.*  
*Credit: Felice Frankel, Massachusetts Institute of Technology*

To overcome that hurdle, MIT engineers have designed a new implantable device that not only carries hundreds of thousands of insulin-producing islet cells, but also has its own on-board oxygen factory, which generates oxygen by splitting water vapor found in the body. The researchers showed that when implanted into diabetic mice, this device could keep the mice's blood glucose levels stable for at least a month. The researchers now hope to create a larger version of the device, about the size of a stick of chewing gum, that could eventually be tested in people with Type 1 diabetes.

For more information, visit the following link:

<https://news.mit.edu/2023/implantable-device-enable-injection-free-control-diabetes-0918>

### Reference

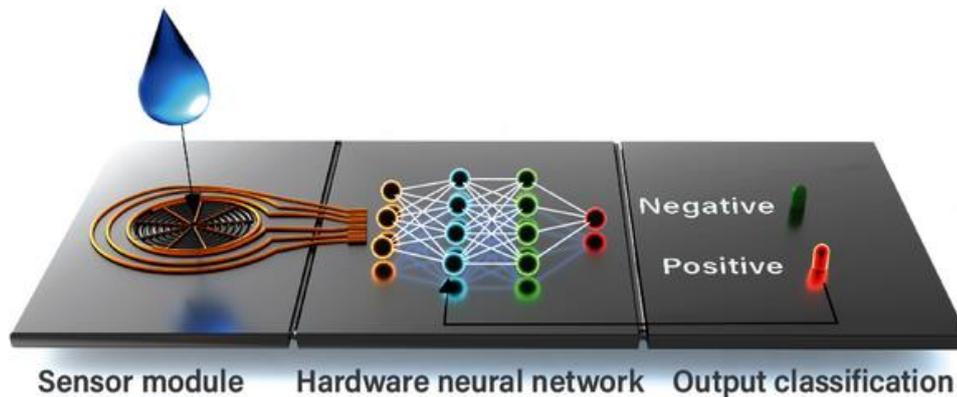
Trafton, A. (Sep 18, 2023). An implantable device could enable injection-free control of diabetes. Recovered Sep 18, 2023, Massachusetts Institute of Technology:  
<https://news.mit.edu/2023/implantable-device-enable-injection-free-control-diabetes-0918>

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



## 1.7 Breakthrough way to train neuromorphic chips

Using a biosensor to detect cystic fibrosis as the test case, TU/e researchers have devised an innovative way to train neuromorphic chips.



*The neuromorphic biosensing chip.  
Credit: Eindhoven University of Technology*

Neuromorphic computers – which are based on the structure of the human brain – could revolutionize our future healthcare devices. However, their widespread use is hindered by the need to train neuromorphic computers using external training software, which can be time-consuming and energy inefficient. Researchers from Eindhoven University of Technology and Northwestern University in the US have developed a new neuromorphic biosensor capable of on-chip learning that doesn't need external training. As a proof-of-concept, the researchers used the biosensor to diagnose cystic fibrosis based on sweat samples.

For more information, visit the following link:

<https://www.tue.nl/en/news-and-events/news-overview/14-09-2023-breakthrough-way-to-train-neuromorphic-chips>

### Reference

Fitzgerald, B. (Sep 14, 2023). Breakthrough way to train neuromorphic chips. Recovered Sep 18, 2023, Eindhoven University of Technology:  
<https://www.tue.nl/en/news-and-events/news-overview/14-09-2023-breakthrough-way-to-train-neuromorphic-chips>

**Information source:** (Eindhoven University of Technology, 2023)



## 1.8 Combustion powers bug-sized robots to leap, lift and race

Cornell researchers combined soft microactuators with high-energy-density chemical fuel to create an insect-scale quadrupedal robot that is powered by combustion and can outrace, outlift, outflex and outleap its electric-driven competitors.



*This combustion-powered quadrupedal robot is capable of multi-gait movements and can leap 60 centimeters in the air, or roughly 20 times its body length.  
Credit: Cornell University*

The four-legged robot, which is just over an inch long and weighs the equivalent of one and a half paperclips, is 3D-printed with a flame-resistant resin. The body contains a pair of separated combustion chambers that lead to the four actuators, which serve as the feet. Each actuator/foot is a hollow cylinder capped with a piece of silicone rubber, like a drum skin, on the bottom. When offboard electronics are used to create a spark in the combustion chambers, premixed methane and oxygen are ignited, the combustion reaction inflates the drum skin, and the robot pops up into the air.

For more information, visit the following link:

<https://news.cornell.edu/stories/2023/09/combustion-powers-bug-sized-robots-leap-lift-and-race>

### Reference

Nutt, D. (Sep 18, 2023). Combustion powers bug-sized robots to leap, lift and race. Recovered Sep 18, 2023, Cornell University:

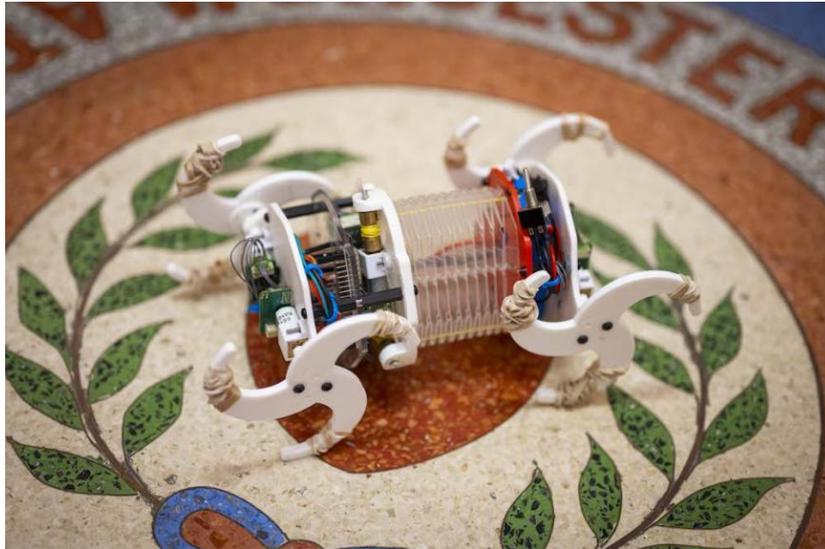
<https://news.cornell.edu/stories/2023/09/combustion-powers-bug-sized-robots-leap-lift-and-race>

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



## 1.9 The lizard you actually want crawling in the walls

Researchers at Princeton have developed an extraction technique that slashes the amount of land and time needed for lithium production. The researchers say their system can improve production at existing lithium facilities and unlock sources previously seen as too small or diluted to be worthwhile.



*Credit: Worcester Polytechnic Institute*

The team built the prototype robot—an “origami” design made of plastic, 3D-printed, and laser-machined parts, custom circuit boards, a miniature computer, sensors, a few metal parts and motors—and tested it in locations across the city that included City Hall and the Worcester Senior Center. Due to its size and shape, the prototype robot was able to maneuver into the nooks and crannies of the aging infrastructure to unobtrusively navigate inside walls, above drop ceilings, and into ductwork.

For more information, visit the following link:

<https://www.wpi.edu/news/lizard-you-actually-want-crawling-walls>

### Reference

Foskett, S. (Sep 19, 2023). The lizard you actually want crawling in the walls. Recovered Sep 19, 2023, Worcester Polytechnic Institute:

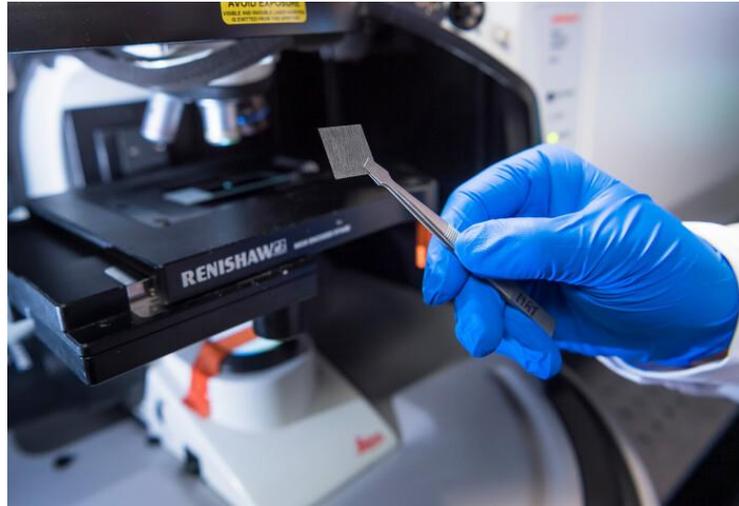
<https://www.wpi.edu/news/lizard-you-actually-want-crawling-walls>

**Information source:** (Worcester Polytechnic Institute, 2023)



### 1.10 Cheap and efficient catalyst could boost renewable energy storage

Storing renewable energy as hydrogen could soon become much easier thanks to a new catalyst based on single atoms of platinum. The new catalyst, designed by researchers at City University Hong Kong (CityU) and tested by colleagues at Imperial College London, could be cheaply scaled up for mass use.



*The catalyst material.  
Credit: CityU, Imperial College London*

Now, in a study published this week in *Nature*, the team have designed and tested a catalyst that uses as little platinum as possible to produce an efficient but cost-effective platform for water splitting. Lead researcher Professor Zhang Hua, from CityU, said: “*Hydrogen generated by electrocatalytic water splitting is regarded as one of the most promising clean energies for replacing fossil fuels in the near future, reducing environmental pollution and the greenhouse effect.*”

For more information, visit the following link:

<https://www.imperial.ac.uk/news/247853/cheap-efficient-catalyst-could-boost-renewable>

#### Reference

Dunning, H. (Sep 19, 2023). Cheap and efficient catalyst could boost renewable energy storage. Recovered Sep 19, 2023, Imperial College London:

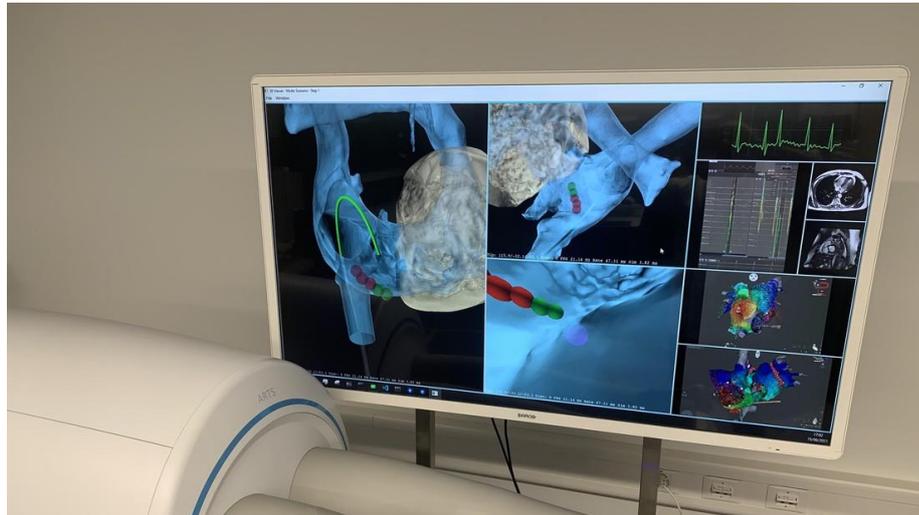
<https://www.imperial.ac.uk/news/247853/cheap-efficient-catalyst-could-boost-renewable>

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



### 1.11 How to mend a broken heart

Researchers from EPFL's Computer Vision Laboratory (CV Lab) in the School of Computer and Communication Sciences (IC), physicians from the interventional MRI center of the Cardiology Division of Lausanne's University Hospital (CHUV), and the Swiss company ADIS are jointly developing an Augmented Reality training system to enable doctors to practice on virtual 3D models of real patients' hearts.



*EPFL is collaborating with academic and industrial partners to develop a cardiac intervention simulator. This platform is designed to train interventionalists in much the same way as flight simulators are used to train pilots.*

*Credit: Petersen, T., Ecole Polytechnique Fédérale de Lausanne*

ADIS is in charge of developing the cardiac intervention simulator that allows a trainee to insert a real catheter into the "patient", which is nothing more than an empty box monitored by cameras observing the moving catheter. Its motion is transcribed into a 3D model of the catheter that is then inserted into a 3D heart model. In this way, the trainee can practice without any risk to a real patient.

For more information, visit the following link:

<https://news.epfl.ch/news/how-to-mend-a-broken-heart/>

#### Reference

Petersen, T. (Sep 19, 2023). How to mend a broken heart. Recovered Sep 19, 2023, Ecole Polytechnique Fédérale de Lausanne:

<https://news.epfl.ch/news/how-to-mend-a-broken-heart/>

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



### 1.12 Grow full wafers of high-performing 2D semiconductor that integrates with state-of-the-art chips

Thinner chip components would provide greater control and precision over the flow of electricity in a device, while lowering the amount of energy required to power it. A 2D semiconductor would also contribute to keeping the surface area of a chip to a minimum, lying in a thin film atop a supporting silicon device. But until recently, attempts to create such a material have been unsuccessful.



*Credit: Seunguk Song, University of Pennsylvania*

Certain 2D semiconductors have performed well on their own, but required such high temperatures to deposit they destroyed the underlying silicon chip. Others could be deposited at silicon-compatible temperatures, but their electronic properties — energy usage, speed, precision — were lacking. Some fit the bill for temperature and performance but could not be grown to the requisite purity at industry-standard sizes. Now, researchers at the University of Pennsylvania School of Engineering and Applied Science have grown a high-performing 2D semiconductor to a full-size, industrial-scale wafer. In addition, the semiconductor material, indium selenide (InSe), can be deposited at temperatures low enough to integrate with a silicon chip.

For more information, visit the following link:

<https://blog.seas.upenn.edu/silicon-ally-penn-engineers-grow-full-wafers-of-high-performing-2d-semiconductor-that-integrates-with-state-of-the-art-chips/>

#### Reference

Fischler, D. (Sep 19, 2023). Silicon ally: penn engineers grow full wafers of high-performing 2D semiconductor that integrates with state-of-the-art chips. Recovered Sep 19, 2023, University of Pennsylvania: <https://blog.seas.upenn.edu/silicon-ally-penn-engineers-grow-full-wafers-of-high-performing-2d-semiconductor-that-integrates-with-state-of-the-art-chips/>

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



### 1.13 3D insights into an innovative manufacturing process

3D printing can produce highly complex shapes. But printing ceramic objects with the help of a laser is a more difficult challenge. 3D printing is already being used to produce many objects. Additive manufacturing is increasingly being used in the aerospace and automotive industry, for example, as well as in medicine. The method commonly used for metals and plastics is known as laser-based powder bed fusion (LPBF). In LPBF, the material is applied as a fine powder layer on a substrate and then the laser passes over the powder and melts it to form it into the desired shape. The next thin layer of powder is deposited and once again melted by the laser. The component is built up sequentially in this way, layer by layer.

Now researchers at the Paul Scherrer Institute PSI have for the first time taken tomograms revealing what happens at microscopic level during this fabrication process. The findings will help improve this very promising technology. The scientists used aluminium oxide for their experiments. This ceramic material is typically used, for example, in the chemical industry for components exposed to high temperatures, in electrical engineering as an insulator, or in medicine for implants. Because this material is extremely hard and brittle, however, fabricating complex shapes with conventional technology presents huge challenges. The researchers could also observe how pores and hollows formed as the material hardened, which is important for future applications.

For more information, visit the following link:

<https://www.psi.ch/en/media/our-research/3d-insights-into-an-innovative-manufacturing-process>

#### Reference

Grażyna, M.; Van Petegem, S. & Marone, F. (Sep 19, 2023). 3D insights into an innovative manufacturing process. Recovered Sep 19, 2023, Paul Scherrer Institut:  
<https://www.psi.ch/en/media/our-research/3d-insights-into-an-innovative-manufacturing-process>

**Information source:** (Paul Scherrer Institut, 2023)



### 1.14 Machine Learning models can produce reliable results even with limited training data

The researchers, from the University of Cambridge and Cornell University, found that for partial differential equations – a class of physics equations that describe how things in the natural world evolve in space and time – Machine Learning models can produce reliable results even when they are provided with limited data.

Most Machine Learning models require large amounts of training data before they can begin returning accurate results. Traditionally, a human will annotate a large volume of data – such as a set of images, for example – to train the model. *“Using humans to train Machine Learning models is effective, but it’s also time-consuming and expensive,”* said first author Dr Nicolas Boullé, from the Isaac Newton Institute for Mathematical Sciences. *“We’re interested to know exactly how little data we actually need to train these models and still get reliable results.”* Other researchers have been able to train Machine Learning models with a small amount of data and get excellent results, but how this was achieved has not been well-explained. For their study, Boullé and his co-authors, Diana Halikias and Alex Townsend from Cornell University, focused on partial differential equations (PDEs).

For more information, visit the following link:

<https://www.cam.ac.uk/research/news/machine-learning-models-can-produce-reliable-results-even-with-limited-training-data>

#### Reference

Collins, S. (Sep 19, 2023). Machine Learning models can produce reliable results even with limited training data.. Recovered Sep 19, 2023, University of Cambridge:

<https://www.cam.ac.uk/research/news/machine-learning-models-can-produce-reliable-results-even-with-limited-training-data>

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



### 1.15 New approach may help extract more heat from geothermal reservoirs

Geothermal heat offers a promising source of renewable energy with almost zero emissions, but it remains a relatively expensive option to generate electricity. A new technique proposed by Penn State scientists may help prevent “*short-circuits*” that can cause geothermal power plants to halt production, potentially improving the efficiency of geothermal power, the researchers said.



*To produce more efficient geothermal systems, researchers have proposed a process called the fracture conductivity tuning technique. This approach involves preventing cold water and allowing hot water to flow through fractures — like the ones pictured here — in rock deep underground.*

*Credit: Provided by Arash Dahi Taleghani. All Rights Reserved, The Pennsylvania State University*

Enhanced geothermal systems involve injecting cold water into hot dry rock deep underground. The water travels through fractures in the rock and heats up, and production wells then pump the heated liquid to the surface where a power plant turns it into electricity. However, wide fractures may allow large volumes of water to move too quickly to sufficiently heat up before reaching the production wells. Cooler production liquid impacts the efficiency of the power plant and can compromise the economics of the project, the scientists said.

For more information, visit the following link:

<https://www.psu.edu/news/research/story/no-shortcuts-new-approach-may-help-extract-more-heat-geothermal-reservoirs/>

#### Reference

Carroll, M. (Sep 19, 2023). No shortcuts: New approach may help extract more heat from geothermal reservoirs. Recovered Sep 19, 2023, The Pennsylvania State University:

<https://www.psu.edu/news/research/story/no-shortcuts-new-approach-may-help-extract-more-heat-geothermal-reservoirs/>

**Information source:** (The Pennsylvania State University, 2023)



### 1.16 Efficient next-generation solar panels on the horizon following breakthrough

A scientific breakthrough brings mass production of the next generation of cheaper and lighter perovskite solar cells one step closer thanks to researchers at the University of Surrey's Advanced Technology Institute (ATI).



*Credit: University of Surrey*

A nanoscale “ink” coating of aluminium oxide on metal halide perovskite improves the potential of this emerging photovoltaic technology and stabilises the drop in energy output which currently plagues perovskite technology. Hashini Perera, lead author of the study at the University of Surrey, said: *“In the past, metal oxides have been shown to either benefit or degrade the performance of perovskite solar cells. We’ve identified aluminium oxide, which can improve performance and minimises the drop in efficiency during conditioning of perovskite solar cells. We show that this nano-oxide allows a uniform coating of perovskite material on highly promising organic molecules that self-assemble on a surface and improve device output.”*

For more information, visit the following link:

<https://www.surrey.ac.uk/news/efficient-next-generation-solar-panels-horizon-following-breakthrough>

#### Reference

Jayawardena, I. & Silva, R. (Sep 20, 2023). Efficient next-generation solar panels on the horizon following breakthrough. Recovered Sep 20, 2023, University of Surrey:

<https://www.surrey.ac.uk/news/efficient-next-generation-solar-panels-horizon-following-breakthrough>

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



### 1.17 Genetically modifying individual cells in animals

One proven method for tracking down the genetic causes of diseases is to knock out a single gene in animals and study the consequences this has for the organism. The problem is that for many diseases, the pathology is determined by multiple genes. This makes it extremely difficult for scientists to determine the extent to which any one of the genes is involved in the disease. To do this, they would have to perform many animal experiments – one for each desired gene modification.



*With the new method, the cells in individual organs of animals can be genetically modified in a mosaic-like manner (symbol image created with Midjourney).  
Credit: Eidgenössische Technische Hochschule Zürich*

Researchers led by Randall Platt, Professor of Biological Engineering at the Department of Biosystems Science and Engineering at ETH Zurich in Basel, have now developed a method that will greatly simplify and speed up research with laboratory animals: using the CRISPR-Cas gene scissors, they simultaneously make several dozen gene changes in the cells of a single animal, much like a mosaic. While no more than one gene is altered in each cell, the various cells within an organ are altered in different ways. Individual cells can then be precisely analysed. This enables researchers to study the ramifications of many different gene changes in a single experiment.

For more information, visit the following link:

<https://ethz.ch/en/news-and-events/eth-news/news/2023/09/genetically-modifying-individual-cells-in-animals.html>

#### Reference

Bergamín, F. (Sep 20, 2023). Genetically modifying individual cells in animals. Recovered Sep 20, 2023, Eidgenössische Technische Hochschule Zürich:  
<https://ethz.ch/en/news-and-events/eth-news/news/2023/09/genetically-modifying-individual-cells-in-animals.html>

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



### 1.18 New brain networks critical to memory formation

Researchers at The University of Queensland have identified new regions of the brain crucial to the formation of long-term memory. Associate Professor Kai-Hsiang Chuang from the Queensland Brain Institute said the finding challenges the conventional notion that the hippocampus is central to memory consolidation, by demonstrating that a different set of brain networks play a role.



*Credit: Adobe, University of Queensland*

*“Memory consolidation involves the reorganisation of brain networks during rest and sleep,” Dr Chuang said. “But pinpointing which area of the brain supports memory consolidation is difficult and poorly understood because the process is highly spontaneous.”* The researchers used magnetic resonance imaging (MRI) of mice to see that two types of spatial memory training resulted in distinct functional brain connections.

For more information, visit the following link:

<https://www.uq.edu.au/news/article/2023/09/uq-research-reveals-new-brain-networks-critical-memory-formation>

#### Reference

Pye, M. & Pye, E. (Sep 21, 2023). UQ research reveals new brain networks critical to memory formation. Recovered Sep 21, 2023, The University of Queensland:  
<https://www.uq.edu.au/news/article/2023/09/uq-research-reveals-new-brain-networks-critical-memory-formation>

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



### 1.19 The appeal of an almighty “*super app*” to rule your phone

If you’ve ever had the urge to Marie Kondo the untidy mess of apps on your phone, you can see the appeal of a single app that melds a range of functions, from social media and texting to banking and food delivery.



*Credit: University of Colorado Boulder*

A super app is one app that offers a very large variety of different services, such as financial transactions, electronic commerce, hotel booking, texting and food delivery. It’s a platform that hosts other apps or offers its own version of them. For example, it could include its own version of a hotel booking app like Booking.com or it could host Booking.com. Everything is integrated into that one app so that the user doesn’t have to download hundreds of different apps. It really makes the lives of consumers easier.

For more information, visit the following link:

<https://www.colorado.edu/today/2023/09/21/appeal-almighty-super-app-rule-your-phone>

#### Reference

Marquardt, K. (Sep 21, 2023). The appeal of an almighty “*super app*” to rule your phone. Recovered Sep 21, 2023, University of Colorado Boulder:

<https://www.colorado.edu/today/2023/09/21/appeal-almighty-super-app-rule-your-phone>

**Information source:** (University of Colorado Boulder, 2023)



## 1.20 Shape-changing smart speaker lets users mute different areas of a rooms

A team led by researchers at the University of Washington has developed a shape-changing smart speaker, which uses self-deploying microphones to divide rooms into speech zones and track the positions of individual speakers.



*To charge, the microphones automatically return to their charging station.  
Credit: April Hong, University of Washington*

With the help of the team's deep-learning algorithms, the system lets users mute certain areas or separate simultaneous conversations, even if two adjacent people have similar voices. Like a fleet of Roombas, each about an inch in diameter, the microphones automatically deploy from, and then return to, a charging station. This allows the system to be moved between environments and set up automatically. In a conference room meeting, for instance, such a system might be deployed instead of a central microphone, allowing better control of in-room audio.

For more information, visit the following link:

<https://www.washington.edu/news/2023/09/21/shape-changing-smart-speaker-ai-noise-canceling-alexa-robot/>

### Reference

Milne, S. (Sep 21, 2023). UW team's shape-changing smart speaker lets users mute different areas of a room. Recovered Sep 14, 2023, University of Washington:  
<https://www.washington.edu/news/2023/09/21/shape-changing-smart-speaker-ai-noise-canceling-alexa-robot/>

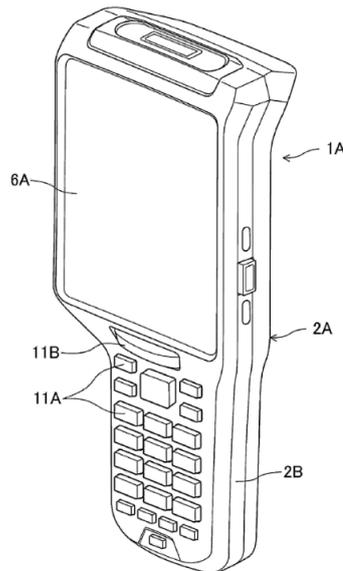
**Information source:** (University of Washington, 2023)



## II. PATENTS

### 2.1. Optical information reading device

To suppress an increase in processing time due to a load of inference processing while improving reading accuracy by the inference processing of Machine Learning.



*Is a perspective view of a handheld optical information reading device.  
Credit: Yamada, I., WIPO IP Portal*

An optical information reading device includes a processor including: an inference processing part that inputs a code image to a neural network and executes inference processing of generating an ideal image corresponding to the code image; and a decoding processing part that executes first decoding processing of decoding the code image and second decoding processing of decoding the ideal image generated by the inference processing part. The processor executes the inference processing and the first decoding processing in parallel, and executes the second decoding processing after completion of the inference processing.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=US407342363>

#### Reference

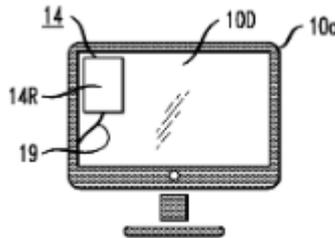
Yamada, I. (Sep 14, 2023). Optical information reading device. Recovered Sep 15, 2023, WIPO IP Portal: <https://patentscope.wipo.int/search/es/detail.jsf?docId=US407342363>

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



## 2.2. Authentication and security protocols for on-line instructional system

Disclosed herein is an authentication system that may be used to control a student's access to an on-line instructional system in a reliable manner.



*Illustrates in slightly more detail the combination of a student's computer display and a hardware verification component.*

*Credit: Dama, B.; Shastri, K.; Pathak, S.; Shastri, A. & Dalal, S., WIPO IP Portal*

The system is based upon each subscribed student having a unique hardware verification component that interacts with verification codes displayed on their computer monitor to permit access to the on-line instructional system in the first instance, as well as to individual lesson modules forming the instructional system. The actual program/lesson module attempting to be accessed is not "live" until verification by a combination of the hardware component, installed software, and on-line system is established. If the proper verification code is not displayed, or a particular hardware verification component cannot properly decode the displayed image, the student is denied access.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023172668>

### Reference

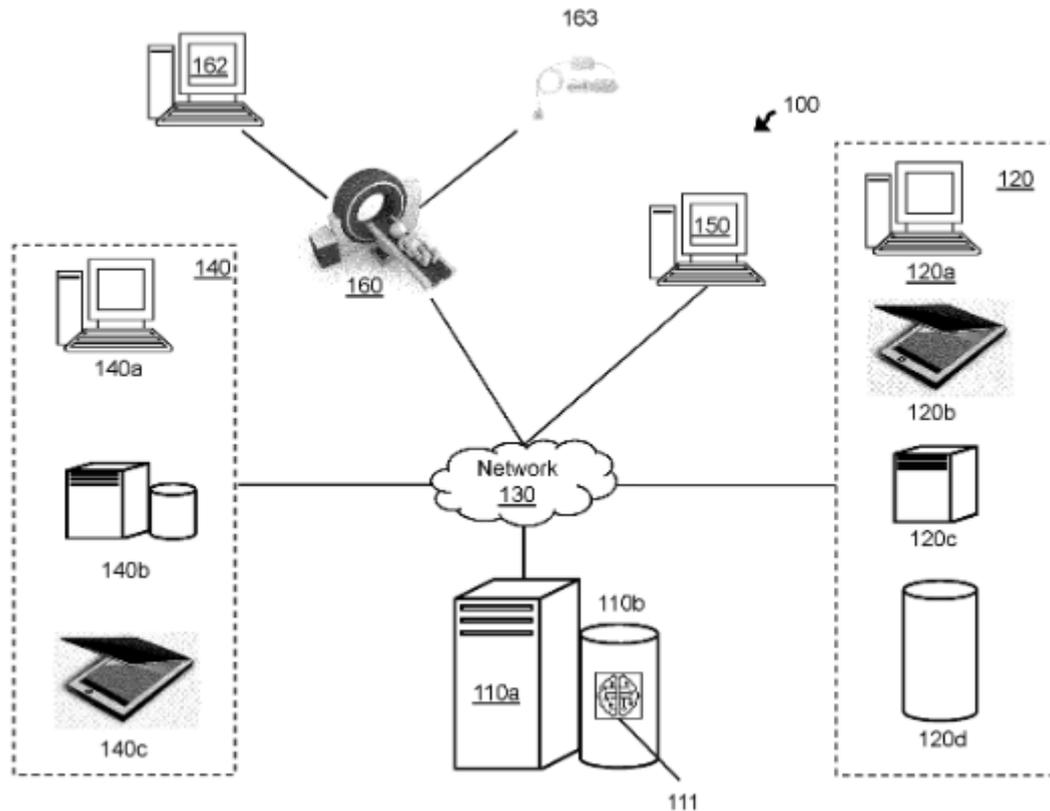
Dama, B.; Shastri, K.; Pathak, S.; Shastri, A. & Dalal, S. (Sep 14, 2023). Authentication and security protocols for on-line instructional system. Recovered Sep 15, 2023, WIPO IP Portal:  
<https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023172668>

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



### 2.3. Generative motion modeling using external and internal anatomy information

Provided herein are methods and systems to train and execute a motion model that uses artificial intelligence methodologies (e.g., deep-learning) to learn and predict location of a patient's internal structures.



*Illustrates components of an artificial intelligence motion modeling system, according to an embodiment.  
Credit: Paysan, P.; Savjani, R. & Scheib, S., WIPO IP Portal*

A method comprises receiving respiratory data of a patient from an electronic sensor in addition to a medical image, such as kV image; executing an artificial intelligence model using the respiratory data and predicting deformation data for at least one internal structure of the patient, wherein the artificial intelligence model is trained in accordance with a training dataset comprising a set of participants, their corresponding respiratory data, and their corresponding deformation data; and outputting the predicted deformation data.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023169976>

#### Reference

Paysan, P.; Savjani, R. & Scheib, S. (Sep 14, 2023). Generative motion modeling using external and internal anatomy information. Recovered Sep 15, 2023, WIPO IP Portal:

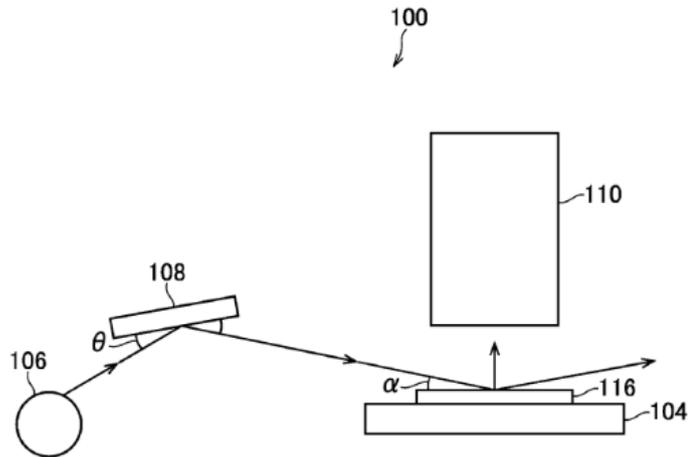
<https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023169976>

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



## 2.4. Total reflection x-ray fluorescence spectrometer and estimation method

Provided are a total reflection X-ray fluorescence spectrometer and an estimation method which are capable of easily and quickly estimating whether contamination exists on a substrate through use of a Machine Learning device.



*Is a diagram for schematically illustrating a hardware configuration of a total reflection X-ray fluorescence spectrometer.*

*Credit: Kikuta, S. & Doi, M., WIPO IP Portal*

The total reflection X-ray fluorescence spectrometer includes: a spectrum acquisition unit configured to acquire a spectrum; and a learning unit which includes an estimation unit configured to generate estimation data on an element contained in contamination on a surface of a substrate in response to input of the spectrum, and for which learning by the estimation unit has been executed based on teacher data including the spectrum for learning and data on the element contained in the contamination on the surface of the substrate which has been used to acquire the spectrum for learning and the estimation data generated when the spectrum for learning is input to the estimation unit.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=US407341055>

### Reference

Kikuta, S. & Doi, M. (Sep 14, 2023). Total reflection x-ray fluorescence spectrometer and estimation method.

Recovered Sep 15, 2023, WIPO IP Portal:

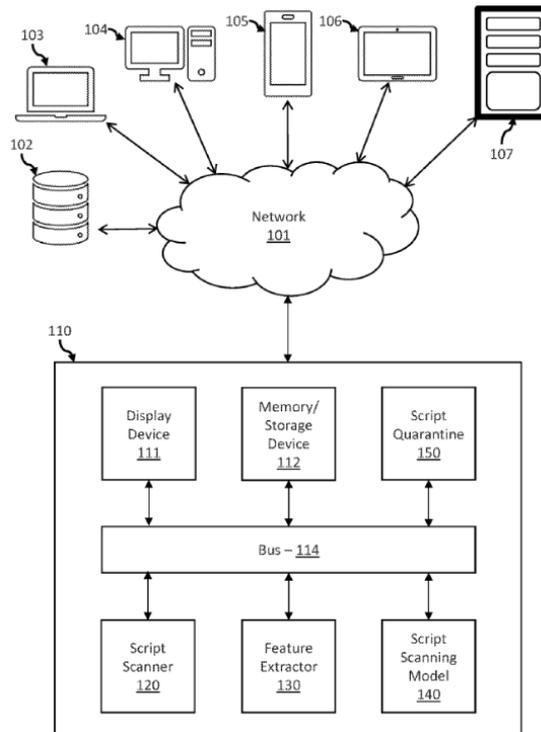
<https://patentscope.wipo.int/search/es/detail.jsf?docId=US407341055>

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



## 2.5. Computer-based systems configured for automated computer script analysis and malware detection and methods thereof

Systems and methods enable automated and scalable obfuscation detection in programming scripts, including processing devices that receive software programming scripts and a symbol set. The processing devices determine a frequency of each symbol and an average frequency of the symbols in the script text. The processing devices determine a normal score of each symbol based on the frequency of each symbol and the average frequency to create a symbol feature for each symbol including the normal score.



*Show one or more schematic flow diagrams, certain computer-based architectures, and/or screenshots of various specialized graphical user interfaces which are illustrative of some exemplary aspects of at least some embodiments of the present disclosure.*

*Credit: Saberidokht, B.; Marbouti, F. & Fletcher, S., WIPO IP Portal*

The processing devices utilize an obfuscation Machine Learning model including a classifier for binary obfuscation classification to detect obfuscation in the script based on the symbol features. The processing devices cause to display an alert indicting an obfuscated software programming script on a screen of a computing device associated with an administrative user to recommend security analysis of the software programming script based on the binary obfuscation classification.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=US407342218>

### Reference

Saberidokht, B.; Marbouti, F. & Fletcher, S. (Sep 14, 2023). Computer-based systems configured for automated computer script analysis and malware detection and methods thereof. Recovered Sep 15, 2023, WIPO IP Portal:

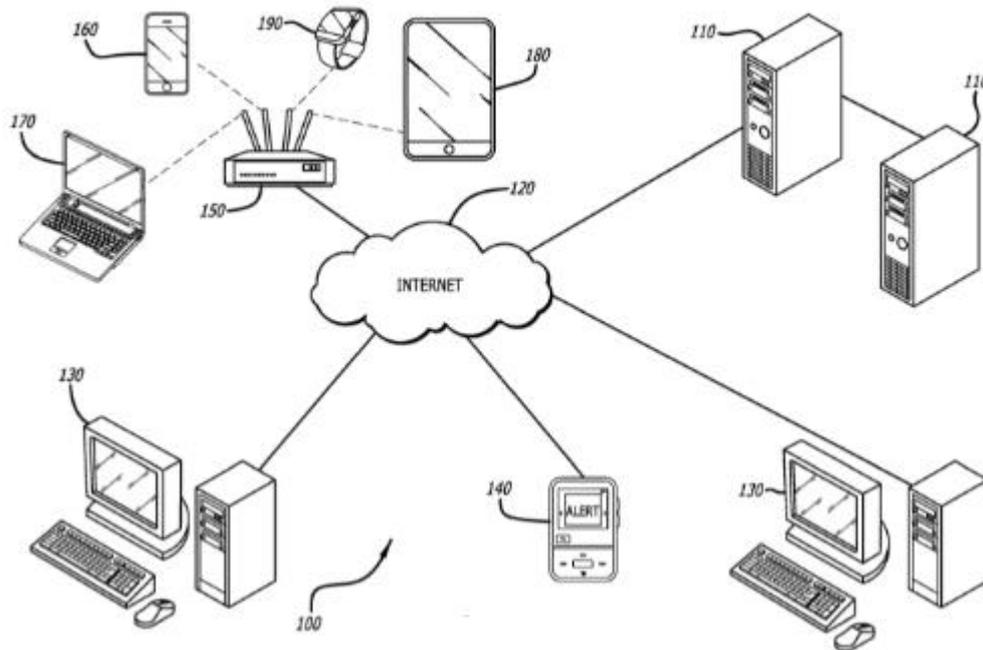
<https://patentscope.wipo.int/search/es/detail.jsf?docId=US407342218>

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



## 2.6. Self-aware cryptocurrency wallets

Systems, methods, and devices described herein can configure a cryptocurrency wallet or other blockchain-based account to be self-aware and alert the owner of the wallet to one or more potentially fraudulent situations occurring with at least one account they own.



*Is a conceptual diagram of a self-aware wallet system in accordance with various embodiments of the disclosure.  
Credit: Agrawal, S.; Guyot, C. & Drake, E., Espacenet Patent Search*

The wallet may be a hardware-based cryptocurrency wallet or may be a blockchain-based account operating by an external financial institution that allows for the management of cryptocurrency assets. The self-aware wallet can be configured to track all relevant previously known and/or approved transactions associated with a user's private cryptocurrency key. A subsequent scan on one or more blockchains is performed to detect new transactions associated with the user's private key. If a newly detected blockchain transaction is not in the list of previously known or approved user transactions, a potential compromise may be occurring. Once detected, the wallet can generate a notification to the user alerting them to the issue.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/087932055/publication/US2023289806A1?q=blockchain>

### Reference

Agrawal, S.; Guyot, C. & Drake, E. (Sep 14, 2023). Self-aware cryptocurrency wallets. Recovered Sep 15, 2023, Espacenet Patent Search:

<https://worldwide.espacenet.com/patent/search/family/087932055/publication/US2023289806A1?q=blockchain>

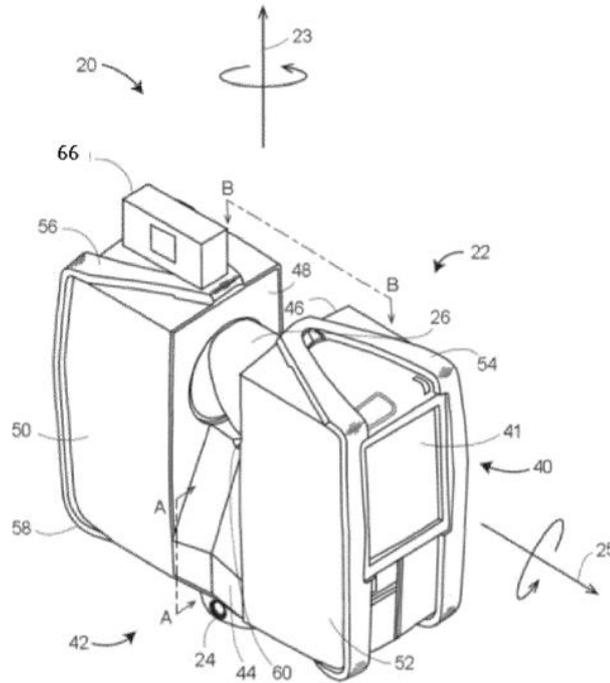
**Information source:** (Espacenet Patent Search, 2023)





## 2.8. Software camera view lock allowing editing of drawing without any shift in the view

A software camera lock is provided. A first image is displayed as a 3D image, wherein a semi-transparent second image overlays the first image.



*Perspective view of a laser scanner in accordance with an embodiment of the invention;  
Credit: Brown, M. & White, D., Espacenet Patent Search*

A software camera is inserted at a fixed location in the 3D image, wherein the software camera provides a field-of-view (FOV) displaying a portion of the 3D image, the FOV displaying a first reference in the FOV, the second image displaying a second reference that represents first reference and comprising an object. Software camera is locked in FOV using a lock software camera mode. A model is inserted in first image to match a location of the object in second image, wherein locking the software camera in the FOV causes the FOV of the first image to be maintained in place as the model is being moved in the first image to match the location of the object in second image.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/085556327/publication/EP4246184A1?q=3D>

### Reference

Brown, M. & White, D. (Sep 20, 2023). Software camera view lock allowing editing of drawing without any shift in the view. Recovered Sep 20, 2023, Espacenet Patent Search:

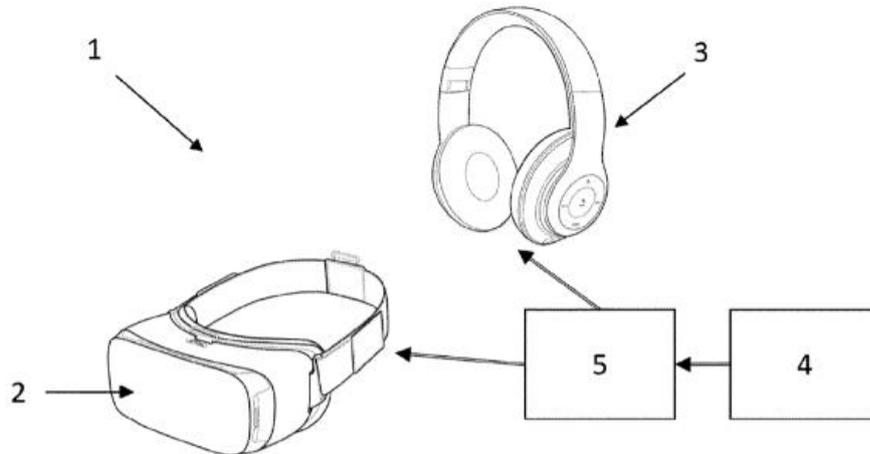
<https://worldwide.espacenet.com/patent/search/family/085556327/publication/EP4246184A1?q=3D>

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



## 2.9. Therapeutic system for the implementation of a therapeutic method for pain relief

The invention concerns a therapeutic system for the implementation of a therapeutic method for pain relief, comprising a virtual reality head mounted device having at least a head-mounted display and stereo headphones; said system comprising at least a storage medium and a controlling unit of the virtual reality head mounted device, wherein at least a first, a second and a third therapeutic components are stored on the storage medium.



*Schematic diagram of a transducer housing assembly in communication with a processor and a display means according to one embodiment of the present invention.  
Credit: Cotty, M., Espacenet Patent Search*

Wherein: a. said first therapeutic component comprises an immersive video stream intended to generate a virtual reality environment in which a patient has to be immersed; b. said second therapeutic component comprises a first soundtrack comprising a first and a second successive sequences of binaural beats, the beats frequencies differences being different from one binaural beats sequence to the other; c. said third therapeutic component comprises a second soundtrack comprising a spoken hypnosis script; and wherein, following the reception of a trigger instruction of the therapeutic method, said controlling unit is configured to simultaneously stream the first, the second and the third therapeutic components through the virtual reality head mounted device.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/081327751/publication/EP4245346A1?q=virtual%20reality>

### Reference

Cotty, M. (Sep 20, 2023). Therapeutic system for the implementation of a therapeutic method for pain relief. Recovered Sep 20, 2023, Espacenet Patent Search:

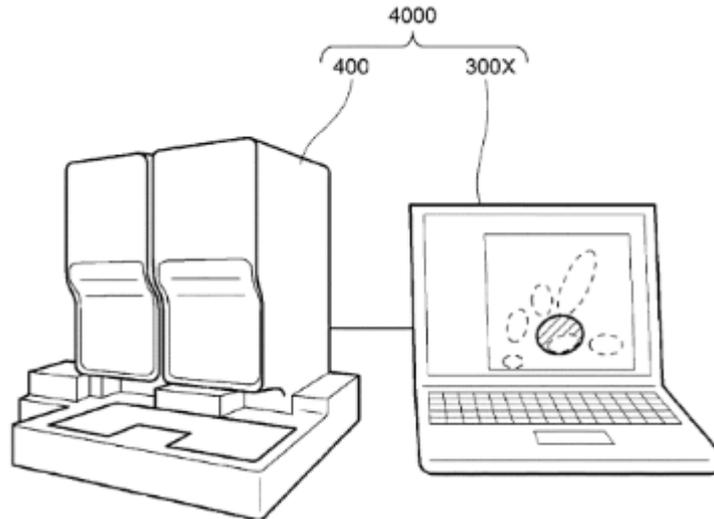
<https://worldwide.espacenet.com/patent/search/family/081327751/publication/EP4245346A1?q=virtual%20reality>

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



## 2.10. Measurement device and analysis method

Disclosed is a measurement device for analyzing a cell contained in a specimen, comprising: a chamber for preparing a measurement sample in which the cell is stained with first and second fluorescent dyes contained in a reagent supplied from at least one reagent container; a liquid feeding section for feeding the reagent from the reagent container to the chamber via a liquid feeding tube provided between the reagent container and the chamber.



*Perspective view showing an analysis system according to a first embodiment of the present invention.*

*Credit: Mizukami, T.; Kimura, K.; Hamada, Y.; Toya, Y.; Nakanishi, N.; Nagai, T.; Kuze, M. & Tanaka, H., Espacenet Patent Search*

And a detection section that acquires first and second signals each corresponding to fluorescence of a first wavelength and fluorescence of a second wavelength emitted from the cell stained with the first and second fluorescent dyes in response to irradiation of the measurement sample flowing in a flow cell with light; and an analysis section that analyzes the cell on the basis of the first and second signals.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/085601539/publication/EP4246120A1?q=machine%20learning>

### Reference

Mizukami, T.; Kimura, K.; Hamada, Y.; Toya, Y.; Nakanishi, N.; Nagai, T.; Kuze, M. & Tanaka, H. (Sep 20, 2023). Measurement device and analysis method. Recovered Sep 20, 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/085601539/publication/EP4246120A1?q=machine%20learning>

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