



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 Study explores how changing autism traits are linked to mental health conditions

A long-term study by UC Davis Health researchers sheds new light on the relationship between autism traits and mental health in middle childhood.



Credit: University of California – Davis Health

“Our findings suggest that different aspects of a child’s development may affect each other over time,” explained Einat Waizbard-Bartov, a doctoral researcher in developmental psychology at the UC Davis MIND Institute and the lead author on the paper. *“Core autism traits and mental health challenges likely interact throughout development.”* A key finding was that a reduction in restrictive and repetitive behaviors during elementary school was linked to the emergence of mental health challenges, lending support to the idea that these behaviors may benefit autistic individuals. An increase in social-communication difficulties during this time was also linked to anxiety and other mental health challenges.

For more information, visit the following link:

<https://health.ucdavis.edu/news/headlines/study-explores-how-changing-autism-traits-are-linked-to-mental-health-conditions/2023/10>

Reference

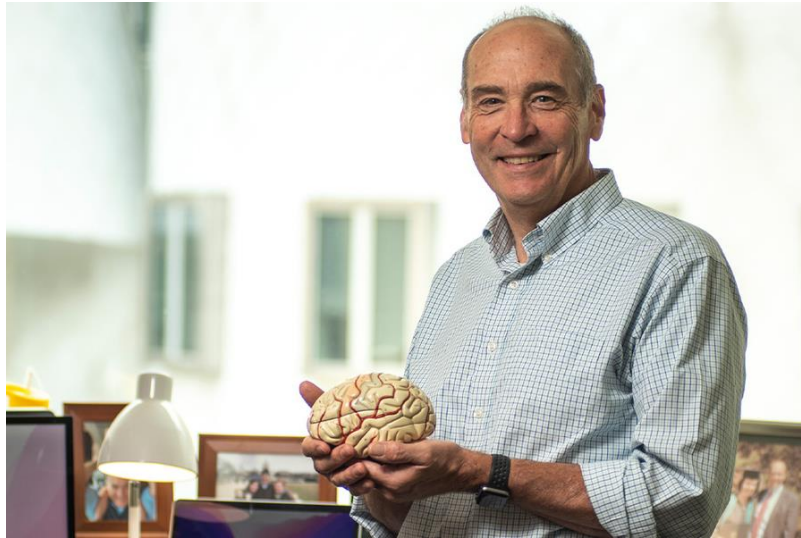
Russ, M. (Oct 12, 2023). Study explores how changing autism traits are linked to mental health conditions. Recovered Oct 16, 2023, University of California – Davis Health: <https://health.ucdavis.edu/news/headlines/study-explores-how-changing-autism-traits-are-linked-to-mental-health-conditions/2023/10>

Information source: (University of California – Davis Health, 2023)



1.2 Retraining the brain for better vision

This need for the brain to learn to see fully was demonstrated decades ago, in experiments with young animals with a patch placed over one eye. When the patch was removed, researchers discovered a severe visual impairment through the eye that had been patched. *“The retina was fine,”* he says. *“The problem was that it had been mis-wired in the brain, so that these connections didn't mature normally.”*



*At the Lincoln Laboratory Supercomputing Center, researchers are making changes to cut down on energy use. One of their techniques can reduce the energy of training AI models by 80%.
Credit: David Sella, Massachusetts Institute of Technology Corporate Relations*

The finding raised fascinating scientific questions, Bear says. How have the brain's synaptic connections been modified? What triggers these modifications? And how might those connections recover? *“Today we can trace the whole path that goes from poor-quality visual experience to poor quality-of-vision and visual impairment in the brain,”* he says. Research has demonstrated that the condition is triggered by replacing well-correlated activity in the retinas with retinal noise. *“That type of activity weakly activates a particular neurotransmitter receptor in the brain called an NMDA receptor, which triggers the modification of synapses that causes those synapses to get weaker,”* he says.

For more information, visit the following link:

<https://news.mit.edu/2023/mark-bear-retraining-brain-for-better-vision-1012>

Reference

Bender, E. (Oct 12, 2023). Retraining the brain for better vision. Recovered Oct 16, 2023, Massachusetts Institute of Technology:

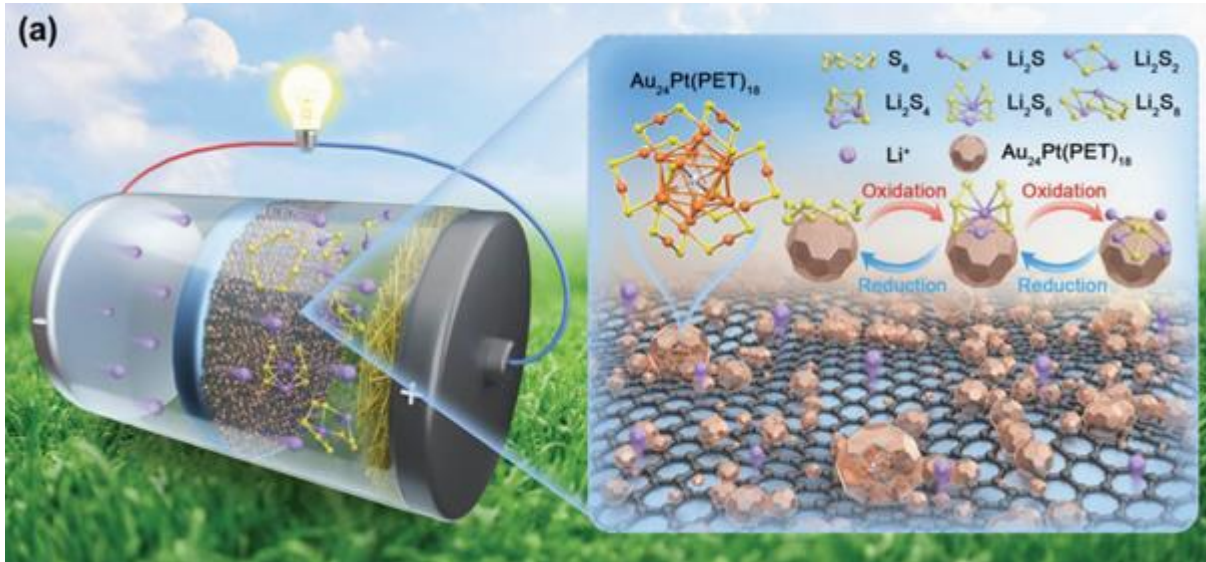
<https://news.mit.edu/2023/mark-bear-retraining-brain-for-better-vision-1012>

Information source: (Massachusetts Institute of Technology, 2023)



1.3 Metal nanoclusters for stable lithium-sulfur batteries

Metal nanocluster/graphene nanosheet composite-based battery separator addresses key challenges faced by lithium—sulfur batteries, opening doors to their commercialization



*Schematic of a Li—S battery with $Au_{24}Pt(PET)_{18}@G$ -modified battery separator for a lithium-sulfur battery.
Credit: University College London*

The demand for efficient energy storage systems is ever increasing, especially due to the recent emergence of intermittent renewable energy and the adoption of electric vehicles. In this regard, lithium—sulfur batteries (LSBs), which can store three to five times more energy than traditional lithium-ion batteries, have emerged as a promising solution. LSBs use lithium as the anode and sulfur as the cathode, but this combination poses challenges. One significant issue is the "shuttle effect," in which intermediate lithium polysulfide (LiPS) species formed during cycling migrate between the anode and cathode, resulting in capacity fading, low life cycle, and poor rate performance. Other problems include the expansion of the sulfur cathode during lithium-ion absorption and the formation of insulating lithium—sulfur species and lithium dendrites during battery operation. While various strategies, such as cathode composites, electrolyte additives, and solid-state electrolytes, have been employed to address these challenges, they involve trade-offs and considerations that limit further development of LSBs.

For more information, visit the following link:

https://www.tus.ac.jp/en/mediarelations/archive/20231010_5384.html

Reference

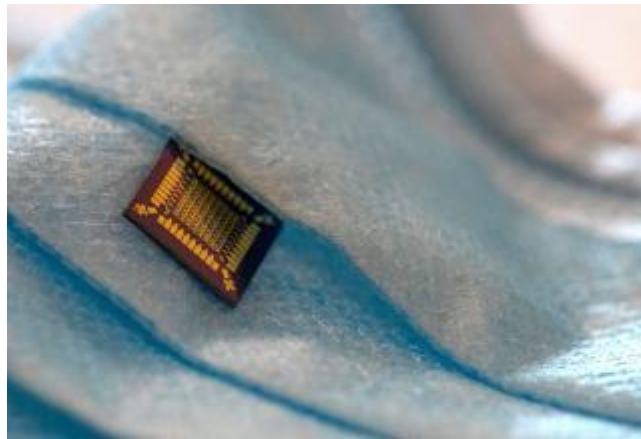
Danby, P. (Oct 12, 2023). Revolutionizing energy storage: metal nanoclusters for stable lithium-sulfur batteries. Recovered Oct 16, 2023, Tokyo University of Science: https://www.tus.ac.jp/en/mediarelations/archive/20231010_5384.html

Information source: (Tokyo University of Science, 2023)



1.4 Hybrid transistors with silk protein set the stage for integration of biology and microelectronics

Researchers create microprocessor-scale transistors that can detect and respond to biological states and the environment



Credit: Tufts University

Your phone may have more than 15 billion tiny transistors packed into its microprocessor chips. The transistors are made of silicon, metals like gold and copper, and insulators that together take an electric current and convert it to 1s and 0s to communicate information and store it. The transistor materials are inorganic, basically derived from rock and metal. But what if you could make these fundamental electronic components part biological, able to respond directly to the environment and change like living tissue? This is what a team at Tufts University Silklab did when they created transistors replacing the insulating material with biological silk. They reported their findings in *Advanced Materials*. Silk fibroin—the structural protein of silk fibers—can be precisely deposited onto surfaces and easily modified with other chemical and biological molecules to change its properties. Silk functionalized in this manner can pick up and detect a wide range of components from the body or environment.

For more information, visit the following link:

<https://now.tufts.edu/2023/10/12/hybrid-transistors-silk-protein-set-stage-integration-biology-and-microelectronics>

Reference

Silver, M. (Oct 12, 2023). Hybrid transistors with silk protein set the stage for integration of biology and microelectronics. Recovered Oct 16, 2023, Tufts University:

<https://now.tufts.edu/2023/10/12/hybrid-transistors-silk-protein-set-stage-integration-biology-and-microelectronics>

Information source: (Tufts University, 2023)



1.5 Human body movements may enable automated emotion recognition

An individual may bring their hands to their face when feeling sad or jump into the air when feeling happy. Human body movements convey emotions, which plays a crucial role in everyday communication, according to a team led by Penn State researchers. Combining computing, psychology and performing arts, the researchers developed an annotated human movement dataset that may improve the ability of Artificial Intelligence to recognize the emotions expressed through body language.



This image, featured on the cover of the journal Patterns in reference to a paper published by a Penn State research team, illustrates a person mid-jump in a representation of joyous emotion. Human body movements convey emotions and play a role in everyday communication.

Credit: James Z. Wang, Chenyan Wu, HstrongART/iStock. All Rights Reserved.

According to Wang, distinguished professor in the College of Information Systems and Technology, augmenting machines' understanding of bodily expressed emotion may help enhance communication between assistive robots and children or elderly users; provide psychiatric professionals with quantitative diagnostic and prognostic assistance; and bolster safety by preventing mishaps in human-machine interactions. *"In this work, we introduced a novel paradigm for bodily expressed emotion understanding that incorporates motor element analysis,"* Wang said. *"Our approach leverages deep neural networks — a type of Artificial Intelligence — to recognize motor elements, which are subsequently used as intermediate features for emotion recognition."*

For more information, visit the following link:

<https://www.psu.edu/news/information-sciences-and-technology/story/human-body-movements-may-enable-automated-emotion/>

Reference

Fetzer, M. (Oct 13, 2023). Human body movements may enable automated emotion recognition, researchers say. Recovered Oct 17, 2023, The Pennsylvania State University: <https://www.psu.edu/news/information-sciences-and-technology/story/human-body-movements-may-enable-automated-emotion/>

Information source: (The Pennsylvania State University, 2023)



1.6 Critical vulnerabilities within major Large Language Models

Large Language Models (LLMs) such as ChatGPT and Bard have taken the world by storm this year, with companies investing millions to develop these AI tools, and some leading AI chatbots being valued in the billions. These LLMs, which are increasingly used within AI chatbots, scrape the entire Internet of information to learn and to inform answers that they provide to user-specified requests, known as “prompts”.



Credit: Lancaster University

However, computer scientists from the AI security start-up Mindgard and Lancaster University in the UK have demonstrated that chunks of these LLMs can be copied in less than a week for as little as \$50, and the information gained can be used to launch targeted attacks. The researchers warn that attackers exploiting these vulnerabilities could reveal private confidential information, bypass guardrails, provide incorrect answers, or stage further targeted attacks.

For more information, visit the following link:

<https://www.lancaster.ac.uk/security-lancaster/about/news/ai-researchers-expose-critical-vulnerabilities-within-major-llms>

Reference

Lancaster University. (Oct 13, 2023). AI researchers expose critical vulnerabilities within major LLMs.

Recovered Oct 17, 2023, Lancaster University:

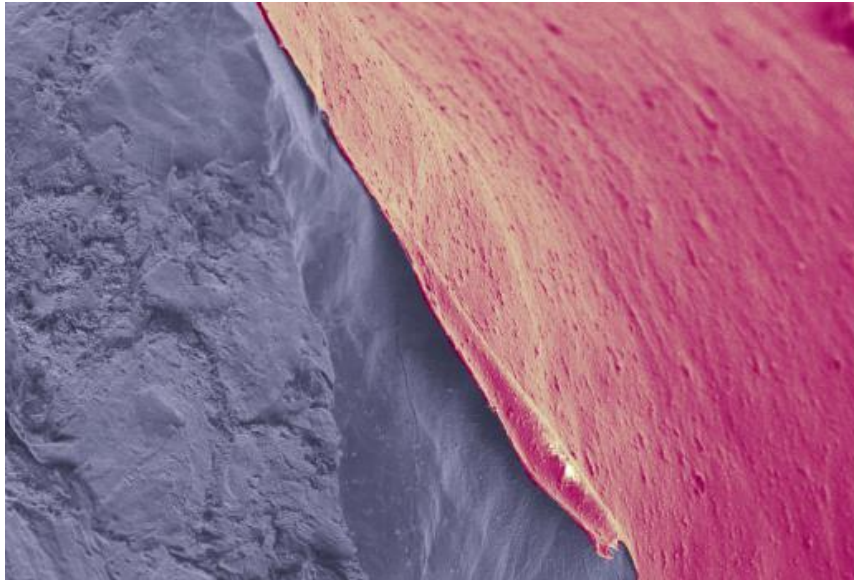
<https://www.lancaster.ac.uk/security-lancaster/about/news/ai-researchers-expose-critical-vulnerabilities-within-major-llms>

Information source: (Lancaster University, 2023)



1.7 Smaller, lighter lithium-sulphur battery lowers costs and improves recycling options

Researchers at Monash University have developed a new lithium-sulphur battery design with a nanoporous polymer-coated lithium foil anode that reduces the amount of lithium required in a single battery.



*SEM image of nanoporous polymer-coated lithium.
Credit: Monash University*

With the transition to renewable energies a global mission, the need for more sustainable energy storage solutions is becoming critical. In their recent paper PhD student Declan McNamara, Professor Matthew Hill, and Professor Mainak Majumder of Monash Engineering, with Dr Makhdokht Shaibani of RMIT University, outline how applying the nanoporous polymer directly onto the lithium foil anode has created a new battery design that uses less lithium, has more energy per unit volume, lasts longer and will be half the price of lithium-ion batteries. Lithium-sulphur (Li-S) batteries are an emerging energy storage technology that utilise metallic lithium and sulphur to deliver more energy per gram than lithium ion batteries. While the Li-S batteries are highly efficient, the process of finding, extracting and transporting lithium leaves a significant environmental footprint, so using as little lithium as possible remains important.

For more information, visit the following link:

<https://www.monash.edu/news/articles/smaller,-lighter-lithium-sulphur-battery-lowers-costs-and-improves-recycling-options>

Reference

Monash University. (Oct 13, 2023). Smaller, lighter lithium-sulphur battery lowers costs and improves recycling options. Recovered Oct 17, 2023, Monash University:

<https://www.monash.edu/news/articles/smaller,-lighter-lithium-sulphur-battery-lowers-costs-and-improves-recycling-options>

Information source: (Monash University, 2023)



1.8 Building AI for scientific discovery using tech behind ChatGPT

While ChatGPT deals in words and sentences, the team's AI will learn from numerical data and physics simulations from across scientific fields to aid scientists in modelling everything from supergiant stars to the Earth's climate.



Credit: University of Cambridge

The idea behind Polymathic AI *“is similar to how it’s easier to learn a new language when you already know five languages,”* said Ho. Starting with a large, pre-trained model, known as a foundation model, can be both faster and more accurate than building a scientific model from scratch. That can be true even if the training data isn’t obviously relevant to the problem at hand. *“It’s been difficult to carry out academic research on full-scale foundation models due to the scale of computing power required,”* said co-investigator Miles Cranmer, from Cambridge’s Department of Applied Mathematics and Theoretical Physics and Institute of Astronomy.

For more information, visit the following link:

<https://www.cam.ac.uk/research/news/scientists-begin-building-ai-for-scientific-discovery-using-tech-behind-chatgpt>

Reference

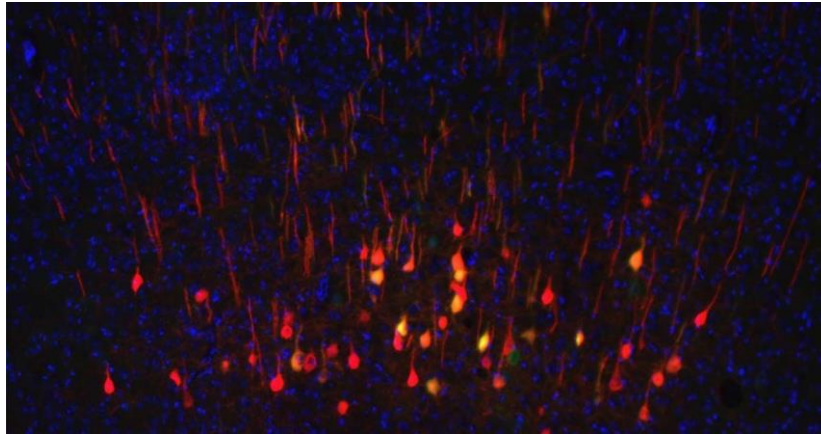
Collins, S. (Oct 13, 2023). Scientists begin building AI for scientific discovery using tech behind ChatGPT. Recovered Oct 17, 2023, University of Cambridge:
<https://www.cam.ac.uk/research/news/scientists-begin-building-ai-for-scientific-discovery-using-tech-behind-chatgpt>

Information source: (University of Cambridge, 2023)



1.9 New biomarker predicts whether neurons will regenerate

Findings could help scientists develop regenerative therapies for spinal cord injuries and other neurological conditions. Neurons, the main cells that make up our brain and spinal cord, are among the slowest cells to regenerate after an injury, and many neurons fail to regenerate entirely. While scientists have made progress in understanding neuronal regeneration, it remains unknown why some neurons regenerate and others do not.



*Neurons, shown here in red and yellow, are some of the slowest cells to regenerate after injury. In this section of a mouse brain, yellow neurons are regenerating while red neurons are non-regenerating.
Credit: University of California - San Diego*

Using single-cell RNA sequencing, a method that determines which genes are activated in individual cells, researchers from University of California San Diego School of Medicine have identified a new biomarker that can be used to predict whether or not neurons will regenerate after an injury. Testing their discovery in mice, they found that the biomarker was consistently reliable in neurons across the nervous system and at different developmental stages.

For more information, visit the following link:

<https://today.ucsd.edu/story/new-biomarker-predicts-whether-neurons-will-regenerate>

Reference

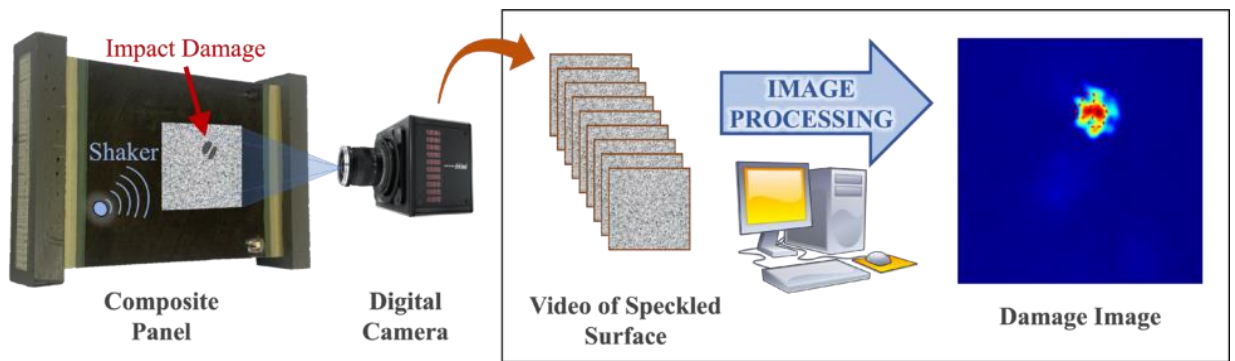
Martin, M. (Oct 16, 2023). New biomarker predicts whether neurons will regenerate. Recovered Oct 17, 2023, University of California – San Diego:
<https://today.ucsd.edu/story/new-biomarker-predicts-whether-neurons-will-regenerate>

Information source: (University of California – San Diego, 2023)



1.10 Revealing hidden damage with cameras to improve aircraft safety

Visual inspection is the oldest form of inspection, originating from the early days of the railroad. Usually, this process involves trained personnel who look over the aircraft for small dents and cracks. However, visual inspection is subjective, time-consuming, and cannot confidently detect damage in all cases. Structural health monitoring (SHM) offers a solution to mitigate these issues.



*A digital camera records a video of the surface of the damaged test panel. Using image processing, evidence of the subsurface damage is extracted and organized into a single damage image.
Credit: North Carolina State University*

To extract the motion from a video of the structure, distinct surface features need to be recorded. For this, an artificial speckle pattern is either adhered or painted onto the surface, containing many small, distinct dots. By recording the surface, a video of the speckle motion reveals the surface movement. Our simple technique for locating damage is based on the premise that damaged areas will vibrate more than healthy regions because waves become trapped within damage boundaries and are amplified. This phenomenon, called resonance, will occur only at specific wave frequencies.

For more information, visit the following link:

<https://news.ncsu.edu/2023/10/seeing-the-invisible-revealing-hidden-damage-with-cameras-to-improve-aircraft-safety/>

Reference

Abbott, B. & Yuan, F. (Oct 17, 2023). Seeing the invisible: revealing hidden damage with cameras to improve aircraft safety. Recovered Oct 17, 2023, North Carolina State University:

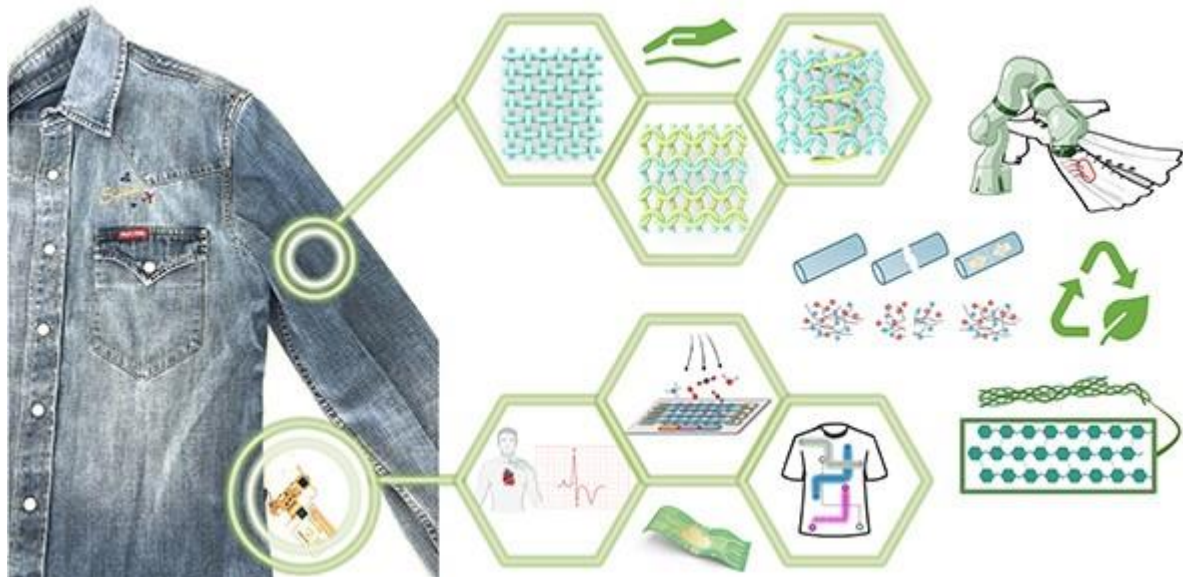
<https://news.ncsu.edu/2023/10/seeing-the-invisible-revealing-hidden-damage-with-cameras-to-improve-aircraft-safety/>

Information source: (North Carolina State University, 2023)



1.11 Innovative wearable e-textiles fit for a sustainable circular economy

If electronic textiles (e-textiles) are to have a sustainable future and at scale, then a transition is needed to unlock innovative wearable e-textiles that fit a sustainable circular economy – adopting what has been termed as the 4R design concept: repair; recycle; replace; reduce.



*Illustration showing the 4R design concept: repair; recycle; replace; reduce.
Credit: Dr. Harvey Shi, University of Cambridge*

E-textiles are worn close to and/or against the surface of the skin, with applications in healthcare, gaming, athletic training and environmental monitoring. Thanks to embedded electronic components, e-textiles can store and harvest energy, sense, display, actuate and compute. The research team proposes the 4R e-textile design concept (repair; recycle; replace; reduce) alongside innovations in materials selection and biofabrication-inspired processing – a revolutionary approach that uses additive manufacturing processes to produce biomaterials, devices, cells and tissues. The aim is to reach sustainable growth and balance economic returns/scalable commercialisation with “*environmental consciousness*”, at a time when consumers are actively aligning their purchasing behaviours with sustainability goals.

For more information, visit the following link:

<http://www.eng.cam.ac.uk/news/innovative-wearable-e-textiles-fit-sustainable-circular-economy>

Reference

Biron, L. (Oct 16, 2023). Innovative wearable e-textiles fit for a sustainable circular economy. Recovered Oct 17, 2023, University of Cambridge:

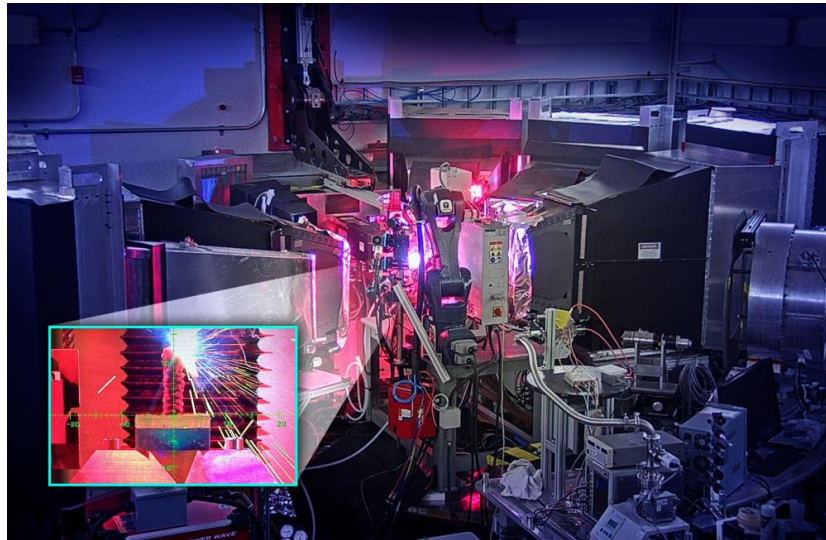
<http://www.eng.cam.ac.uk/news/innovative-wearable-e-textiles-fit-sustainable-circular-economy>

Information source: (University of Cambridge, 2023)



1.12 Neutrons see stress in 3D-printed parts, advancing additive manufacturing

ORNL scientists have developed OpeN-AM, a 3D printing platform that can measure evolving residual stress during manufacturing using the VULCAN beamline at ORNL's Spallation Neutron Source, or SNS, a Department of Energy Office of Science user facility. When combined with infrared imaging and computer modeling, this system enables unprecedented insight into material behavior during manufacturing.



The OpeN-AM experimental platform, installed at the VULCAN instrument at ORNL's Spallation Neutron Source, features a robotic arm that prints layers of molten metal to create complex shapes. This allows scientists to study 3D printed welds microscopically.

Credit: Jill Hemman, ORNL/U.S. Dept. of Energy

In this case, they used low-temperature transformation, or LTT, steel, physically measuring how atoms move in response to stress, whether it's temperature or load, using the OpeN-Am platform. Residual stresses are stresses that remain even after a load or the cause of the stress is removed; they can deform a material or, worse, cause it to fail prematurely. Such stresses are a major challenge for fabricating accurate components with desirable properties and performance.

For more information, visit the following link:

<https://www.ornl.gov/news/neutrons-see-stress-3d-printed-parts-advancing-additive-manufacturing>

Reference

Tomlin, E. (Oct 16, 2023). Neutrons see stress in 3D-printed parts, advancing additive manufacturing. Recovered Oct 18, 2023, Rutgers - Oak Ridge National Laboratory:

<https://www.ornl.gov/news/neutrons-see-stress-3d-printed-parts-advancing-additive-manufacturing>

Information source: (Oak Ridge National Laboratory, 2023)



1.13 Tiny memory cell withstands extreme temperatures

Materials scientists at Kiel University and the Fraunhofer Institute for Silicon Technology (ISIT) in Itzehoe have cleared another hurdle in the development and structuring of new materials for next-generation semiconductor devices, such as novel memory cells. They have shown that ferroelectric aluminium scandium nitride can be scaled down to a few nanometres and can store different states, making it suitable as a nanoswitch.

They have also shown that aluminium scandium nitride is a particularly stable and powerful semiconductor material for current technologies based on silicon, silicon carbide and gallium nitride. Unlike today's microelectronics, the material can withstand extreme temperatures of up to 1,000 degrees Celsius. This opens up applications such as information storage or sensors for combustion processes in engines or turbines, in the chemical industry or in the steel industry. Today, high-performance chips and microelectronic components can be found in every computer, car and industrial plant. Stable and energy-efficient microelectronics are the technical basis for the digitalisation of industry and society, a sustainable energy supply or modern medical technology. But today's computer chips operate on very low voltages of just 1-2 volts - at higher voltages they would break down.

For more information, visit the following link:

<https://www.uni-kiel.de/en/details/news/251-halbleiter>

Reference

Fichtner, S. (Oct 16, 2023). Tiny memory cell withstands extreme temperatures. Recovered Oct 18, 2023, Kiel University:

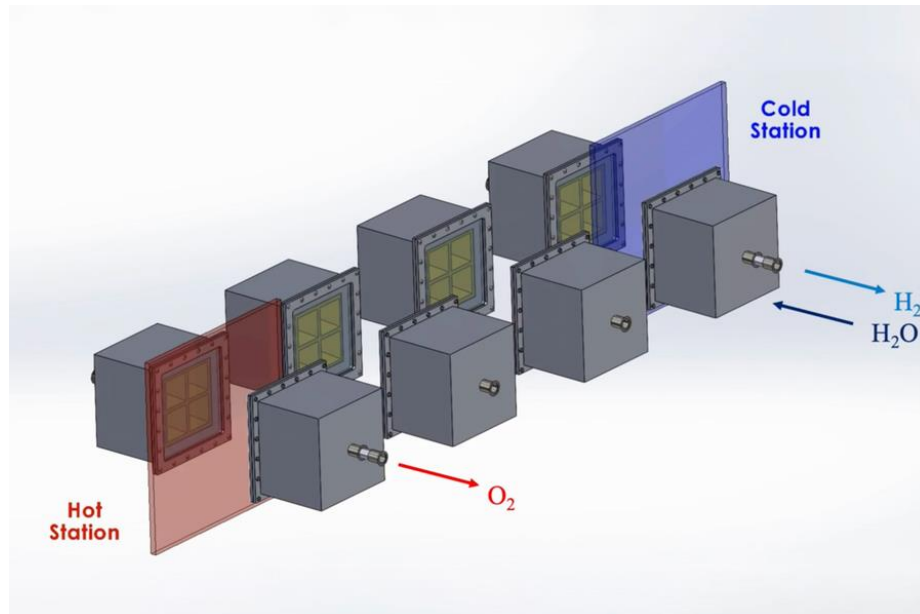
<https://www.uni-kiel.de/en/details/news/251-halbleiter>

Information source: (Kiel University, 2023)



1.14 Design would harness 40% of the sun's heat to produce clean hydrogen fuel

MIT engineers aim to produce totally green, carbon-free hydrogen fuel with a new, train-like system of reactors that is driven solely by the sun. The engineers lay out the conceptual design for a system that can efficiently produce “*solar thermochemical hydrogen*.” The system harnesses the sun's heat to directly split water and generate hydrogen — a clean fuel that can power long-distance trucks, ships, and planes, while in the process emitting no greenhouse gas emissions.



MIT engineers have developed a design for a system that efficiently harnesses the sun's heat to split water and generate hydrogen.

Credit: courtesy of the researchers, Massachusetts Institute of Technology

Today, hydrogen is largely produced through processes that involve natural gas and other fossil fuels, making the otherwise green fuel more of a “grey” energy source when considered from the start of its production to its end use. In contrast, solar thermochemical hydrogen, or STCH, offers a totally emissions-free alternative, as it relies entirely on renewable solar energy to drive hydrogen production. But so far, existing STCH designs have limited efficiency: Only about 7% of incoming sunlight is used to make hydrogen. The results so far have been low-yield and high-cost.

For more information, visit the following link:

<https://news.mit.edu/2023/mit-design-harness-suns-heat-produce-clean-hydrogen-fuel-1016>

Reference

Chu, J. (Oct 16, 2023). MIT design would harness 40 percent of the sun's heat to produce clean hydrogen fuel. Recovered Oct 18, 2023, Massachusetts Institute of Technology:

<https://news.mit.edu/2023/mit-design-harness-suns-heat-produce-clean-hydrogen-fuel-1016>

Information source: (Massachusetts Institute of Technology, 2023)



1.15 A DEEPer dive into Artificial Intelligence

Machine Learning techniques give scientists faster returns of high-quality organ images. When an algorithm-driven microscopy technique developed in 2021 (and able to run on a fraction of the images earlier techniques required) isn't fast enough, what do you do? Dive DEEPer, and square it. At least, that was the solution used by Dushan Wadduwage, John Harvard Distinguished Science Fellow at the FAS Center for Advanced Imaging. Scientists have worked for decades to image the depths of a living brain. They first tried fluorescence microscopy, a century-old technique that relies on fluorescent molecules and light. However, the wavelengths weren't long enough and they scattered before they reached an appreciable distance.

The results are comparable in quality to images produced by point-scanning two-photon microscopy. Yet they can be produced with just hundreds of images, rather than to the hundreds of thousands typically needed for point-scanning. With the new technique, Wadduwage's group was able to look as far as 300 microns deep into live mouse brains. Still, Wadduwage has more ideas for boosting the capabilities of DEEP-squared, including improving instrument design to acquire data faster. He said DEEP-squared exemplifies cross-disciplinary cooperation, as will any future innovations on the technology.

For more information, visit the following link:

<https://news.harvard.edu/gazette/story/2023/10/a-deeper-squared-dive-into-ai/>

Reference

Wadduwage, D. (Oct 16, 2023). A DEEPer (squared) dive into AI. Recovered Oct 18, 2023, The Harvard Gazette:

<https://news.harvard.edu/gazette/story/2023/10/a-deeper-squared-dive-into-ai/>

Information source: (The Harvard Gazzete, 2023)



1.16 Developing novel deep learning technologies for medical image classification

Deep learning technologies can assist in medical image classification, such as helping identify variations of brain diseases or cancers based on CT scans. However, traditional deep-learning approaches are challenging to interpret and often require significant amounts of annotated data. Additionally, handling high-resolution medical images is challenging due to limited computer and memory resources.



Credit: Texas A&M University College of Engineering

Self-supervised learning is a new Machine Learning model that enables machines to learn from unprecedented, unlabeled data without human supervision, with the potential to dramatically reduce the costs of human labeling. In addition, his algorithm can make deep models interpretable and improve the training by sampling from the multiple CT scans of a patient for computation. *“Since reading many slices, or images, of a CT scan is time-consuming and costly, we expect our system to be able to quickly flag slices with critical findings, bringing early attention to important data that can save time during diagnostics for radiologists,”* said Yang. *“Our system could also provide a second opinion with radiologists’ style interpretations for less experienced residents or trainees.”*

For more information, visit the following link:

<https://engineering.tamu.edu/news/2023/10/developing-novel-deep-learning-technologies-for-medical-image-classification.html>

Reference

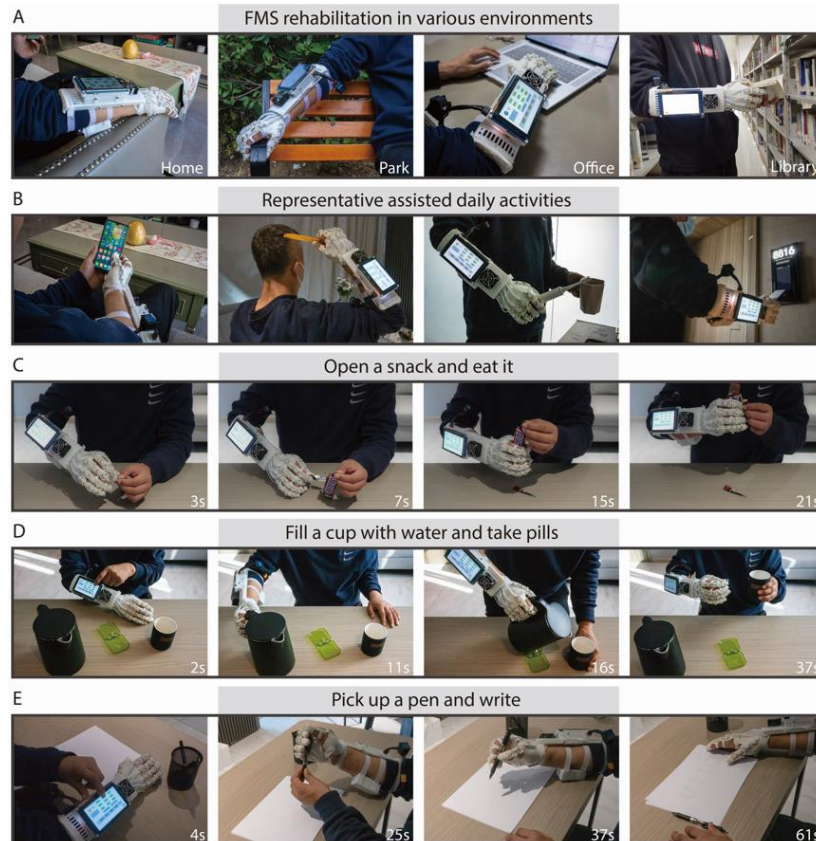
Revels, M. (Oct 17, 2023). Developing novel deep learning technologies for medical image classification. Recovered Oct 18, 2023, Texas A&M University College of Engineering: <https://engineering.tamu.edu/news/2023/10/developing-novel-deep-learning-technologies-for-medical-image-classification.html>

Information source: (Texas A&M University College of Engineering, 2023)



1.17 Soft-packaged, portable rehabilitation glove

Researchers from the University of Science and Technology of China (USTC) of the Chinese Academy of Sciences (CAS) have proposed a soft-packaged and portable rehabilitation glove with fine movement training. It is expected to serve the fine motor rehabilitation and daily living assistance of tens of millions of patients with hand dysfunction around the world.



*Multi-scene application and life assistance function of flexible rehabilitation glove robot.
Credit: University of Science and Technology of China*

Patients with hand dysfunction can recover hand function through repeated and continuous hand movement training. Soft-packaged rehabilitation gloves have the advantages of lightweight body and flexible movement. However, because the flexible body is prone to large deformation, which is not conducive to motion perception, and gloves are not conducive to portability, most of the existing soft-packaged rehabilitation gloves can only achieve rehabilitation movement based on open loop control. This makes the precise rehabilitation of fine motor skills of the hand still challenging. In this study, the researchers designed a bionic finger sleeve structure that integrates smooth movement and accurate perception by integrating 15 bending sensors and 10 shape-memory-alloy actuators.

For more information, visit the following link:

https://english.cas.cn/newsroom/research_news/tech/202310/t20231016_379827.shtml

Reference

Yuan, L. (Oct 17, 2023). Researchers develop soft-packaged, portable rehabilitation glove. Recovered Oct 18, 2023, Chinese Academy of Sciences:

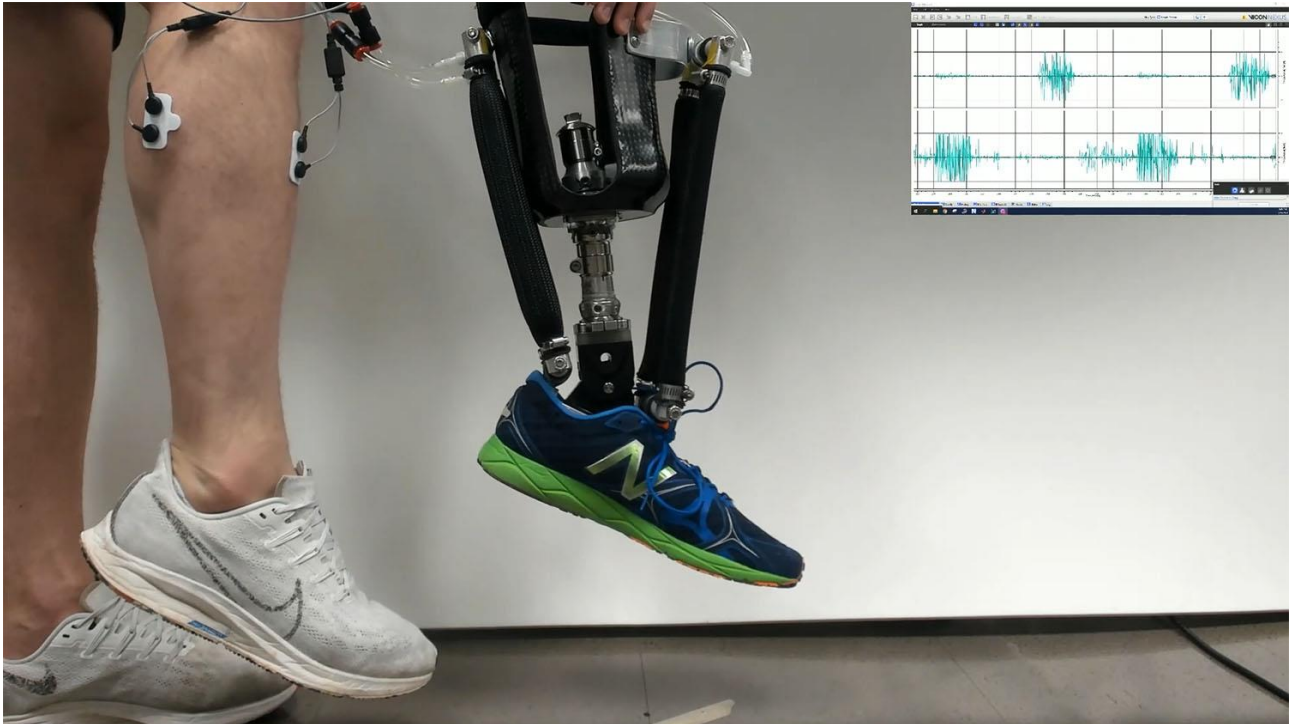
https://english.cas.cn/newsroom/research_news/tech/202310/t20231016_379827.shtml

Information source: (Chinese Academy of Sciences, 2023)



1.18 Robotic prosthetic ankles improve “natural” movement, stability

Robotic prosthetic ankles that are controlled by nerve impulses allow amputees to move more “naturally,” improving their stability, according to a new study from North Carolina State University and the University of North Carolina at Chapel Hill. “This work focused on “postural control,” which is surprisingly complicated,” says Helen Huang, corresponding author of the study and the Jackson Family Distinguished Professor in the Joint Department of Biomedical Engineering at NC State and UNC.



*Demonstration of the robotic prosthetic ankle. Electromyographic sensors (on calf at left) capture electrical activity generated by muscles when they are flexed.
Credit: North Carolina State University*

“Basically, when we are standing still, our bodies are constantly making adjustments in order to keep us stable. For example, if someone bumps into us when we are standing in line, our legs make a wide range of movements that we are not even necessarily aware of in order to keep us upright. We work with people who have lower limb amputations, and they tell us that achieving this sort of stability with prosthetic devices is a significant challenge. And this study demonstrates that robotic prosthetic ankles which are controlled using electromyographic (EMG) signals are exceptionally good at allowing users to achieve this natural stability.” EMG signals are the electrical signals recorded from an individual’s muscles.

For more information, visit the following link:

<https://news.ncsu.edu/2023/10/robotic-ankles-move-naturally>

Reference

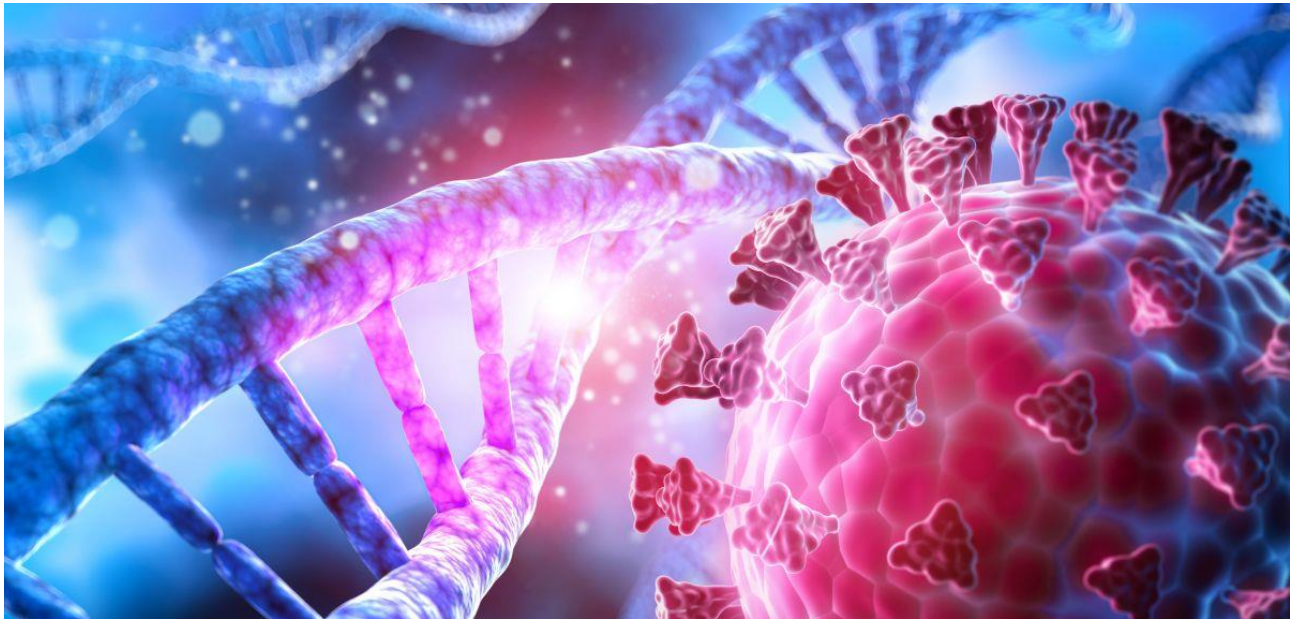
Huang, H.; Fleming, A. & Shipman, M. (Oct 18, 2023). Robotic prosthetic ankles improve “natural” movement, stability. Recovered Oct 18, 2023, North Carolina State University: <https://news.ncsu.edu/2023/10/robotic-ankles-move-naturally>

Information source: (North Carolina State University, 2023)



1.19 New Artificial Intelligence tool could help predict viral outbreaks

The model, named EVEscape, works by predicting the likelihood that a viral mutation will enable it to escape immune responses, for instance by preventing antibodies from binding. EVEscape's underlying framework combines a deep-learning model of evolutionary viral sequences with detailed biological and structural information about the virus. In combination, this enables EVEscape to make predictions about the variants most likely to occur as the virus evolves.



Credit: University of Oxford

Crucially, the model can anticipate new viral variants before they emerge, solely using information available at the start of an outbreak. This approach could facilitate more effective preventative action, and the design of vaccines which target variants of concern before they become prevalent.

For more information, visit the following link:

<https://www.ox.ac.uk/news/2023-10-19-new-ai-tool-could-help-predict-viral-outbreaks>

Reference

University of Oxford. (Oct 19, 2023). New AI tool could help predict viral outbreaks. Recovered Oct 19, 2023, University of Oxford:

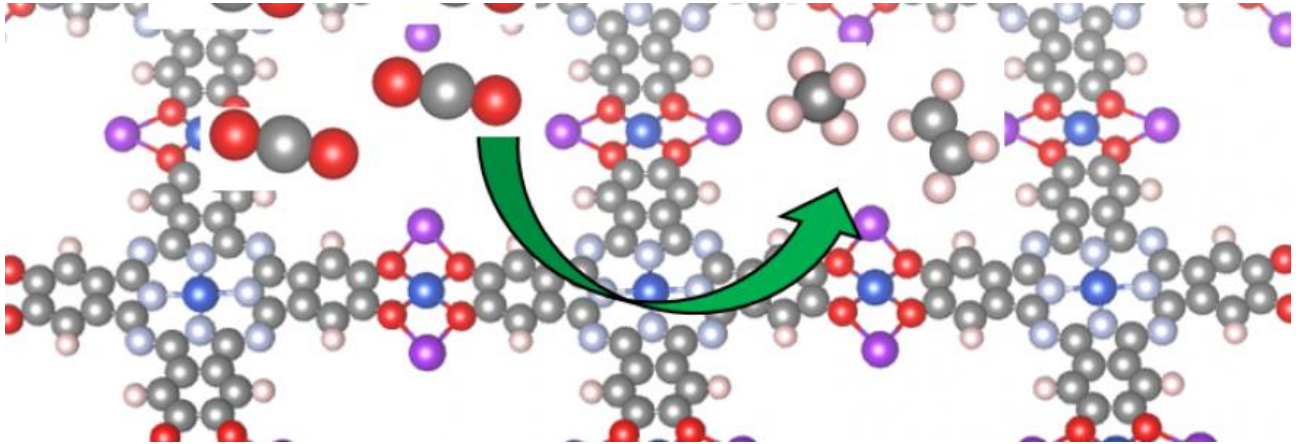
<https://www.ox.ac.uk/news/2023-10-19-new-ai-tool-could-help-predict-viral-outbreaks>

Information source: (University of Oxford, 2023)



1.20 A way to reduce carbone dioxide

A team of scientists from the Centre of New Technologies of the University of Warsaw, and the California Institute of Technology presented two-dimensional metal-organic frameworks with significantly improved methane and ethylene formation yield.



Credit: University of Warsaw

Electrocatalytic conversion of carbon dioxide into valuable chemicals such as methane, ethylene, and ethanol is a significant process regarding environment-friendly energy production. Scientific research proves that metallic copper remains the best electrocatalyst. However, its efficiency is limited. Scientists are looking for other solutions that enable cheaper and more green chemical reactions. A team of researchers from the University of Warsaw and the California Institute of Technology have proposed to use two-dimensional metal-organic frameworks in this regard. The frameworks are the materials formed from metal ions or inorganic clusters connected by rigid organic connectors.

For more information, visit the following link:

<https://en.uw.edu.pl/a-way-to-reduce-co2/>

Reference

University of Warsaw. (Oct 20, 2023). A way to reduce carbone dioxide. Recovered Oct 20, 2023,

University of Warsaw:

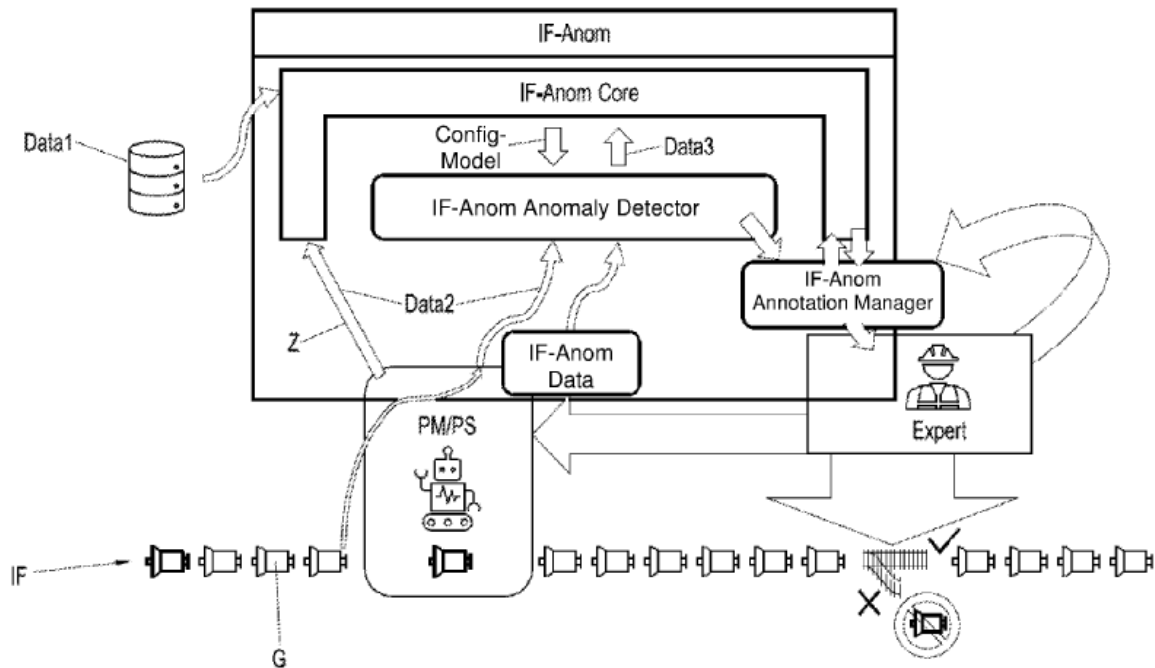
<https://en.uw.edu.pl/a-way-to-reduce-co2/>

Information source: (University of Warsaw, 2023)

II. PATENTS

2.1. Artificial Intelligence-based anomaly detection and prediction

A system for rendering an explanation output for users regarding an anomaly predicted by an anomaly detection module on the basis of high frequency sensor data or values derived therefrom in an industrial production process.



*Shows a first exemplary embodiment of an anomaly detection module.
Credit: Thewes, N. & Schneider, G., WIPO IP Portal*

Wherein the anomaly detection module predicts the anomalies when the anomaly detection module classifies sensor data or ranges of sensor data that describe a state of a machine, a component, and/or a product of the production process as different from the data that are normally expected, wherein the system is configured to send an optimized explanation mask as a rendering of the explanation output for a user, wherein the user can identify which sensor data, ranges of sensor data, or values derived therefrom are responsible for the anomaly predicted by the anomaly detection module based on the optimized explanation mask.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=US410562055&_cid=P21-LNP2AL-82445-1

Reference

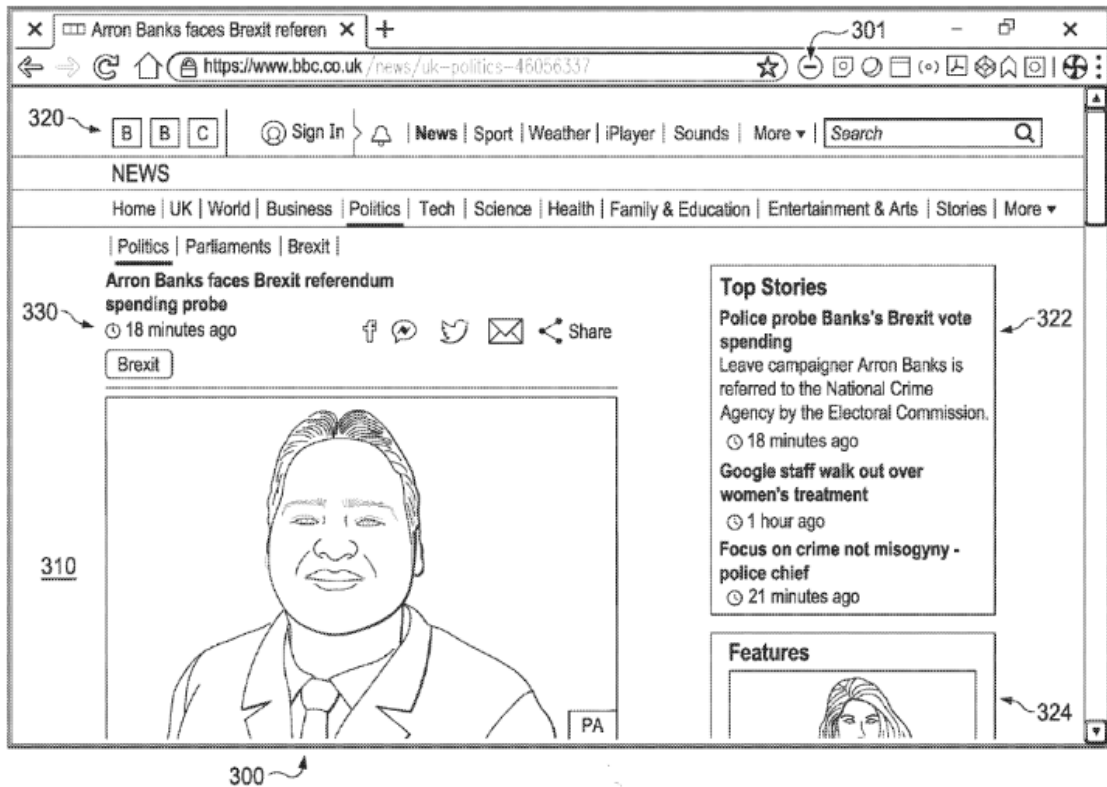
Thewes, N. & Schneider, G. (Oct 12, 2023). Artificial Intelligence-based anomaly detection and prediction. Recovered Oct 13, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US410562055&_cid=P21-LNP2AL-82445-1

Information source: (WIPO IP Portal, 2023)



2.2. Real-time in-context smart summarizer

A summarizer can be invoked by a user to summarize content. Once started, the summarizer can examine the content, determine a main body of the content, extract texts from the main body, concatenate the texts into a text block, and make a call to an Artificial Intelligence (AI) platform.



*Depict diagrammatic representations of screenshots showing a summarizer running within a browser application according to some embodiments.
Credit: Edward, G., WIPO IP Portal*

The call can contain the text block and specify a user-configurable summarization range for summarizing the text block. The AI platform is operable to generate a sentiment of the text block and a summary of the text block in the summarization range and return them to the summarizer. The summarizer, in turn, can instruct an application on the user device to generate a window or page for displaying the sentiment and the summary in the summarization range on the user device, in real time and in context of the content that the user is viewing, reading, or listening.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=US410562015&_cid=P21-LNP2AL-82445-1

Reference

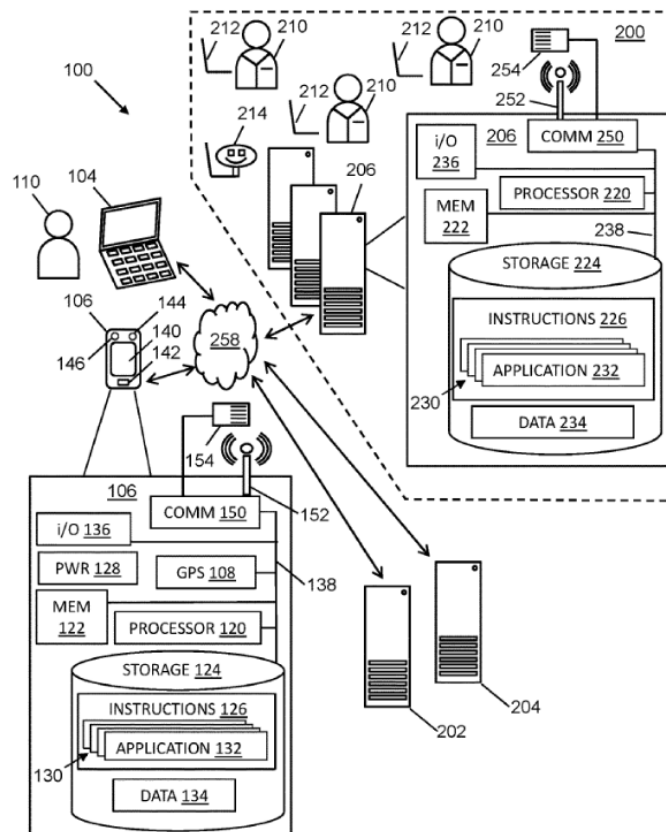
Edward, G. (Oct 12, 2023). Real-time in-context smart summarizer. Recovered Oct 13, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=US410562015&_cid=P21-LNP2AL-82445-1

Information source: (WIPO IP Portal, 2023)



2.3. System for applying an Artificial Intelligence engine in real-time to affect course corrections and influence outcomes

A system for applying an Artificial Intelligence engine to affect course corrections and influence outcomes of a meeting may include a network interconnecting a facilitator device, a teammate participant device, and a computing system operating a recurrent neural network.



*Illustrates an facilitator system, and environment thereof, according to at least one embodiment.
Credit: Raghavan, S., WIPO IP Portal*

The facilitator device may receive parameters of a meeting including one or more of a meeting start time, a meeting location, a meeting duration, a meeting topic, and a list of teammate participant names. The teammate participant device may be a binary meeting score indicating if the meeting was either productive or not productive. The computing system may correlate the meeting score with the meeting parameters to create parameter scores. As scores are stored in the memory of the computing system, over time, the recurrent neural network may transform the parameter scores into parameter suggestions which may be conveyed to a meeting facilitator in real time.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=US410562214&_cid=P21-LNP2AL-82445-1

Reference

Raghavan, S. (Oct 12, 2023). System for applying an Artificial Intelligence engine in real-time to affect course corrections and influence outcomes. Recovered Oct 13, 2023, WIPO IP Portal:

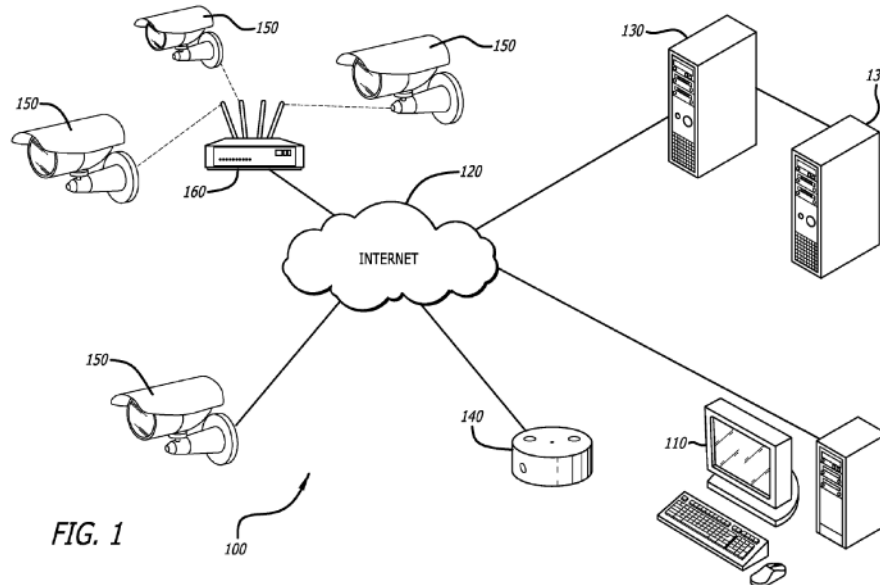
https://patentscope.wipo.int/search/es/detail.jsf?docId=US410562214&_cid=P21-LNP2AL-82445-1

Information source: (WIPO IP Portal, 2023)



2.4. Data collection and classifier training in edge video devices

A digital video camera architecture for updating an object identification and tracking model deployed with the camera is disclosed. The invention comprises optics, a processor, a memory, and an Artificial Intelligence logic which may further comprise artificial neural networks. The architecture may identify objects according to the confidence threshold of a model.



Is a conceptual illustration of a video image data processing system in accordance with an embodiment of the disclosure.

Credit: Kah, D.; Zhong, Q.; Xiong, S. & Hirano, T., WIPO IP Portal

The confidence threshold may be monitored over time, and the model may be updated if the confidence threshold drops below an acceptable level. The data for retraining is ideally generated substantially internal to the camera. A classifier is generated to process the entire field data set stored on the camera to create a field data subset also stored on the camera. The field data subset may be run through the model to generate cases that may be used in further monitoring, training, and updating of the model. Classifiers may also be generated for images in different domains (e.g., lighting, weather, surveillance area, indoor, outdoor, urban, rural, etc.). These classifiers can be used to train the model to accurately identify objects and features independent of the domain of origin of the image being evaluated.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023187458&_cid=P21-LNOPTM-87427-1

Reference

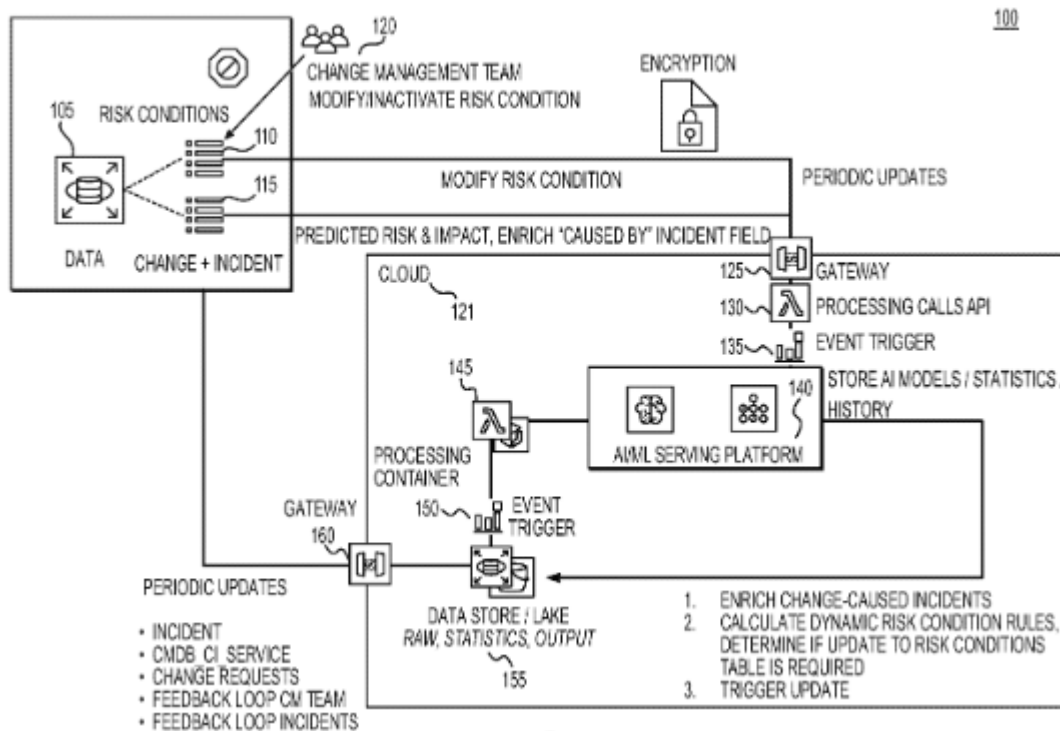
Kah, D.; Zhong, Q.; Xiong, S. & Hirano, T. (Oct 12, 2023). Data collection and classifier training in edge video devices. Recovered Oct 13, 2023, WIPO IP Portal:

https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023187458&_cid=P21-LNOPTM-87427-1

Information source: (WIPO IP Portal, 2023)

2.5. Systems and methods for identifying and resolving incidents in a system using an Artificial Intelligence model

A method for identifying and handling related incidents using a machine-learning based model, includes, performing by one or more processors, operations including: clustering a sub-group of incident records from among a plurality of incident records using the machine-learning based model based on a rolling time window and a number of records in the sub-group of incident records; creating a problem record based on the clustered incident records.



Depicts an exemplary system overview for using Artificial Intelligence to predict and troubleshoot incidents in a system, according to one or more embodiments.

Credit: Duma, G.; Sparke, G.; Wynkoop, A. & Shukla, S., WIPO IP Portal

Populating the problem record with information related to the clustered incident records; linking the clustered incident records to the problem record; providing a notification that the problem record has been created; receiving a resolution for the problem record; and updating, based on the resolution, the machine-learning based model to learn an association between extracted features of the resolution and extracted features of the clustered incident records.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023196471>

Reference

Duma, G.; Sparke, G.; Wynkoop, A. & Shukla, S. (Oct 12, 2023). Systems and methods for identifying and resolving incidents in a system using an Artificial Intelligence model. Recovered Oct 13, 2023, WIPO IP Portal:

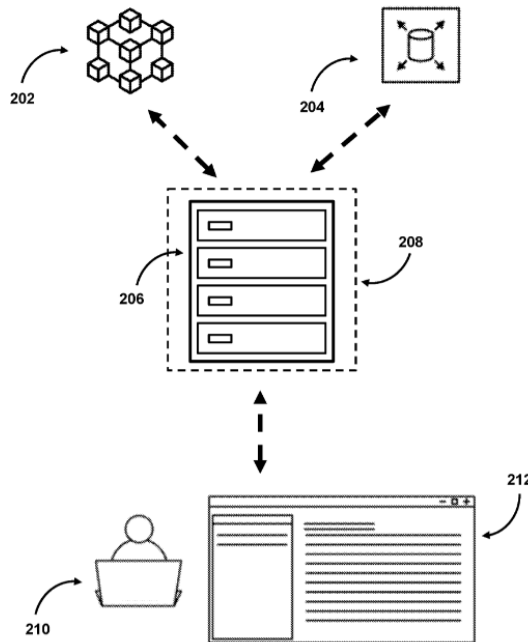
<https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023196471>

Information source: (WIPO IP Portal, 2023)



2.6. Systems and methods for identifying patterns in Blockchain activities

Systems and methods for identifying patterns in Blockchain activities based on multi-modal data using Artificial Intelligence models that compensate for training data featuring a high proportion of missing data points. For example, the system may receive Blockchain activity record data for a plurality of Blockchain accounts involving a plurality of Blockchain accounts.



*Shows an illustrative diagram for an intelligence service, in accordance with one or more embodiments.
Credit: Illum, J.; Gronager, M.; Curran, P.; Tuxen, J. & Deshpande, S., Espacenet Patent Search*

The system may input the data into an Artificial Intelligence model, wherein the Artificial Intelligence model is trained to identify serial relationships of related Blockchain activities corresponding to inputted target Blockchain activities based on proportions of digital assets at subsets of Blockchain accounts of the plurality of Blockchain accounts. The system may receive an output from the Artificial Intelligence model. The system may generate for display, in a user interface, a visualization of the target Blockchain activity based on the output.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088238991/publication/US2023328098A1?q=artificial%20intelligence>

Reference

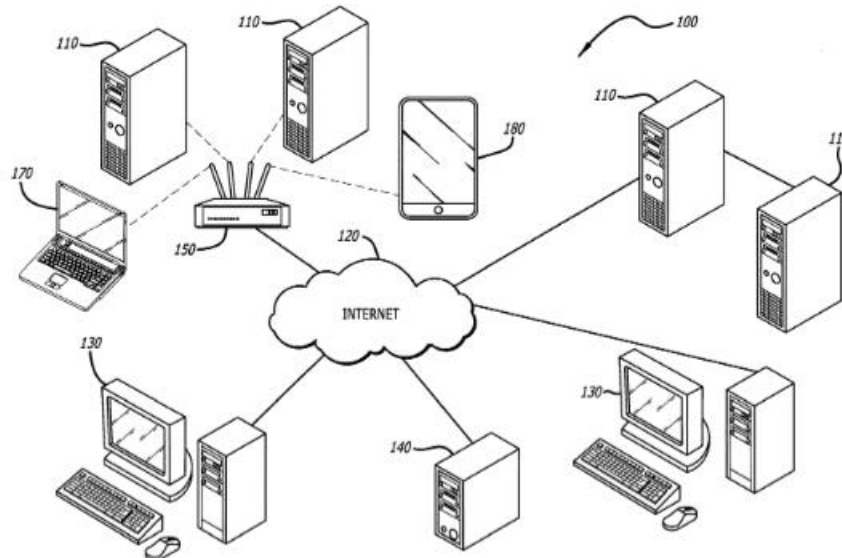
Illum, J.; Gronager, M.; Curran, P.; Tuxen, J. & Deshpande, S. (Oct 12, 2023). Systems and methods for identifying patterns in Blockchain activities. Recovered Oct 13, 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/088238991/publication/US2023328098A1?q=artificial%20intelligence>

Information source: (Espacenet Patent Search, 2023)



2.7. Hiding proof-of-space in Blockchain systems

Blockchain systems operate over a network of computing devices. Proof-of-space Blockchain consensus systems utilize data (called plots) stored in storage devices across the computing devices within the network. These storage devices are utilized to generate and store proof-of-space consensus data.



Is a conceptual diagram of a proof-of-space consensus Blockchain network in accordance with an embodiment of the disclosure.

Credit: Agrawal, S. & Guyot, C., Espacenet Patent Search

This data is then accessed at a later time to respond to challenges issued across the Blockchain network. The owner of a plot may wish to sell a plot to another miner. If the seller is a bad-faith actor, they may retain copies of the secret key(s) and use them to continue mining the plot along with the buyer. To prevent these attacks, it may be desirable to submit a challenge response block where the proof-of-space is not visible as part of the challenge response. This may be done by replacing the proof-of-space with a proof-of-knowledge.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088238908/publication/US2023327890A1?q=Blockchain>

Reference

Agrawal, S. & Guyot, C. (Oct 12, 2023). Hiding proof-of-space in Blockchain systems. Recovered Oct 13 2023, Espacenet Patent Search:

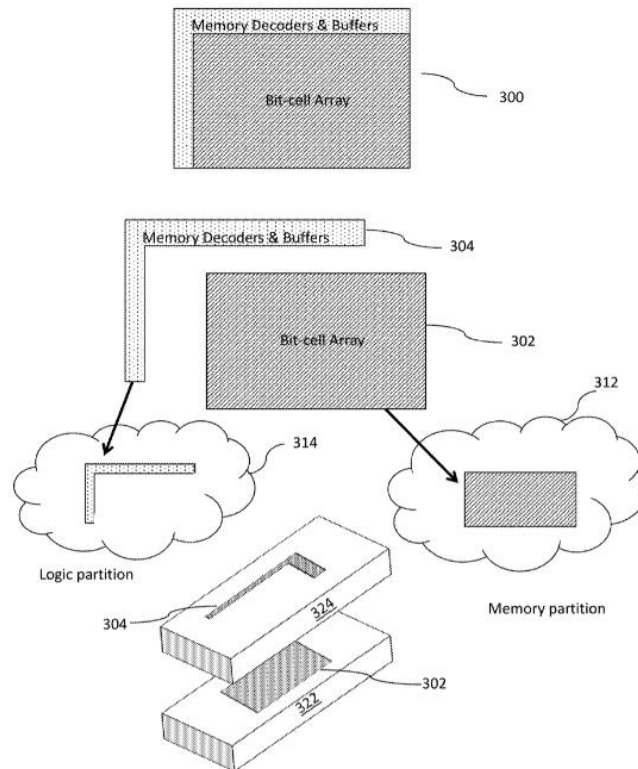
<https://worldwide.espacenet.com/patent/search/family/088238908/publication/US2023327890A1?q=Blockchain>

Information source: (Espacenet Patent Search, 2023)



2.8. Design automation methods for 3D integrated circuits and devices

A method of designing a 3D Integrated Circuit including: partitioning at least one design into at least two levels, a first level and a second level; levels connection pads between the first level and the second level.



Is an exemplary drawing illustration of placement of a memory block split into core bit-cell array and its decoding and driving logic.

Credit: Or-Bach, Z. & Wurman, Z., Espacenet Patent Search

Providing placement data of the second level; performing a placement of the first level using a placer executed by a computer, where the placement of the first level is based on the placement of the levels connection pads, where the placer is part of a Computer Aided Design (CAD) tool, where the first level includes first routing layers; performing a routing of the first level by routing layers using a router executed by a computer, where the router is a part of the CAD tool or a part of another CAD tool, where at least one metal routing layer is in-between the first level first transistors and the second level second transistors.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088239438/publication/US2023325572A1?q=3d>

Reference

Or-Bach, Z. & Wurman, Z. (Oct 12, 2023). Design automation methods for 3D integrated circuits and devices.

Recovered Oct 16, 2023, Espacenet Patent Search:

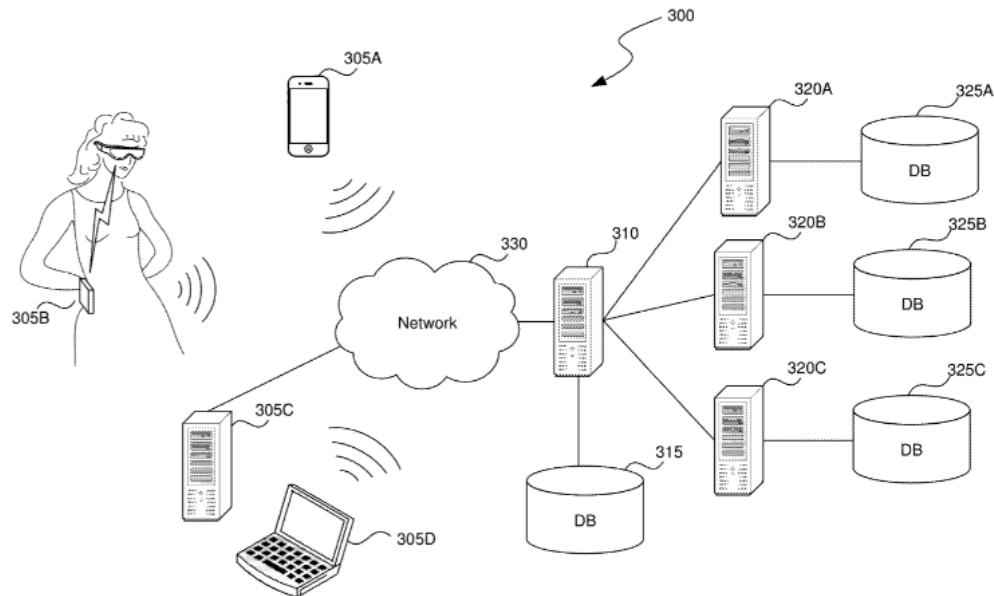
<https://worldwide.espacenet.com/patent/search/family/088239438/publication/US2023325572A1?q=3d>

Information source: (Espacenet Patent Search, 2023)



2.9. Virtual keyboard selections using multiple input modalities

Aspects of the present disclosure are directed to triggering virtual keyboard selections using multiple input modalities. An interface manager can display an interface, such as a virtual keyboard, to a user in an artificial reality environment. Implementations of the interface manager can track user eye gaze input and user hand input (e.g., hand or finger motion).



Is a block diagram illustrating an overview of an environment in which some implementations of the present technology can operate.

Credit: Faucher, A.; Pla I Conesa, P.; Rosas, D. & Aschenbach, N., Espacenet Patent Search

The interface manager can resolve a character selection on the virtual keyboard according to the tracked user gaze input based on detection that the user's hand motion meets a trigger criteria. For example, the interface manager can: detect that the tracked user hand motion meets the trigger criteria at a given point in time; and resolve a selection from the virtual keyboard (e.g., selection of a displayed character) according to the tracked user gaze on the virtual keyboard at the given point in time.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/086286236/publication/US2023324997A1?q=virtual%20reality>

Reference

Faucher, A.; Pla I Conesa, P.; Rosas, D. & Aschenbach, N. (Oct 12, 2023). Virtual keyboard selections using multiple input modalities. Recovered Oct 16, 2023, Espacenet Patent Search:

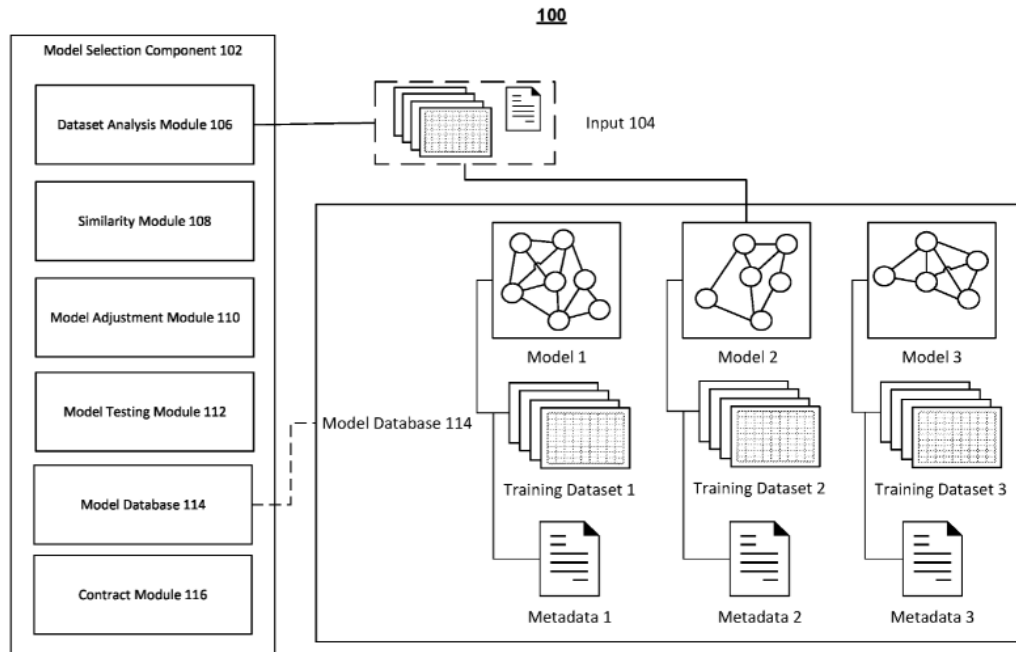
<https://worldwide.espacenet.com/patent/search/family/086286236/publication/US2023324997A1?q=virtual%20reality>

Information source: (Espacenet Patent Search, 2023)



2.10. Systems and methods for repurposing a Machine Learning model

Disclosed herein are systems and method for repurposing a Machine Learning model. An exemplary method includes: receiving a first training dataset; determining an input portion and an output portion in an entry of the first training dataset.



*Is a block diagram illustrating a system for repurposing a Machine Learning model.
Credit: Ulasen, S.; Tormasov, A.; Bell, S. & Protasov, S., Espacenet Patent Search*

Comparing the first training dataset to a second training dataset used to train a Machine Learning model, wherein the comparing includes determining a similarity score between the input portion and the output portion of the first training dataset and an input portion and an output portion of the second training dataset; in response to determining that the similarity score is greater than a threshold similarity score, re-training the Machine Learning model using the first training dataset; and executing the retrained Machine Learning model on an input value to generate an output value corresponding to the first training dataset.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088239460/publication/US2023325717A1?q=machine%20learning>

Reference

Ulasen, S.; Tormasov, A.; Bell, S. & Protasov, S. (Oct 12, 2023). Systems and methods for repurposing a Machine Learning model. Recovered Oct 16, 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/088239460/publication/US2023325717A1?q=machine%20learning>

Information source: (Espacenet Patent Search, 2023)