



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 Can we trust autism information on Tiktok? Not always

Researchers from Drexel University's A.J. Drexel Autism Institute have examined the reach and accuracy of TikTok videos providing informational content about autism and found that most of the information provided does not align with current clinical knowledge.



Credit: Drexel University

Recently published in the Journal of Autism and Developmental Disorders, researchers examined engagement indicators – including views and "likes" – for the TikTok videos associated with the "Autism" hashtag. Two coders independently fact-checked content of the most viewed videos from the #Autism videos as of July 2022, with a focus on videos that provided information on autism as a condition, such as what causes it or how to identify it. Videos were coded as either accurate, inaccurate or "overgeneralization" based on the consistency of the information in the videos with current knowledge on autism. Videos sharing information about personal experience were not coded in this study.

For more information, visit the following link:

<https://drexel.edu/news/archive/2023/October/Can-We-Trust-Autism-Information-on-TikTok>

Reference

Korp, A. (Oct 23, 2023). Can we trust autism information on Tiktok? Not always. Recovered Oct 25, 2023, Drexel University:

<https://drexel.edu/news/archive/2023/October/Can-We-Trust-Autism-Information-on-TikTok>

Information source: (Drexel University, 2023)



1.2 Cobalt-free battery for cleaner, greener power

High-capacity and reliable rechargeable batteries are a critical component of many devices and even modes of transport. They play a key role in the shift to a greener world. A wide variety of elements are used in their production, including cobalt, the production of which contributes to some environmental, economic, and social issues. For the first time, a team including researchers from the University of Tokyo presents a viable alternative to cobalt which in some ways can outperform state-of-the-art battery chemistry. It also survives a large number of recharge cycles, and the underlying theory can be applied to other problems.



*Charged and ready to go. By replacing problematic and scarce cobalt with safer and more abundant elements, the researchers mitigate some issues with current batteries.
Credit: Yamada et al. CC-BY-ND, The University of Tokyo*

The chances are, you are reading this article on a laptop or smartphone, and if not, you probably own at least one of those. Inside either device, and many others, you will find a lithium-ion battery (LIB). For decades now, LIBs have been the standard way of powering portable or mobile electronic devices and machines. As the world transitions from fossil fuels, they are seen as an important step for use in electric cars and home batteries for those with solar panels. But just as batteries have a positive end and a negative end, LIBs have negative points set against their positive ones.

For more information, visit the following link:

https://www.u-tokyo.ac.jp/focus/en/press/z0508_00315.html

Reference

The University of Tokyo (Oct 20, 2023). Cobalt-free battery for cleaner, greener power. Recovered Oct 23, 2023, The University of Tokyo:

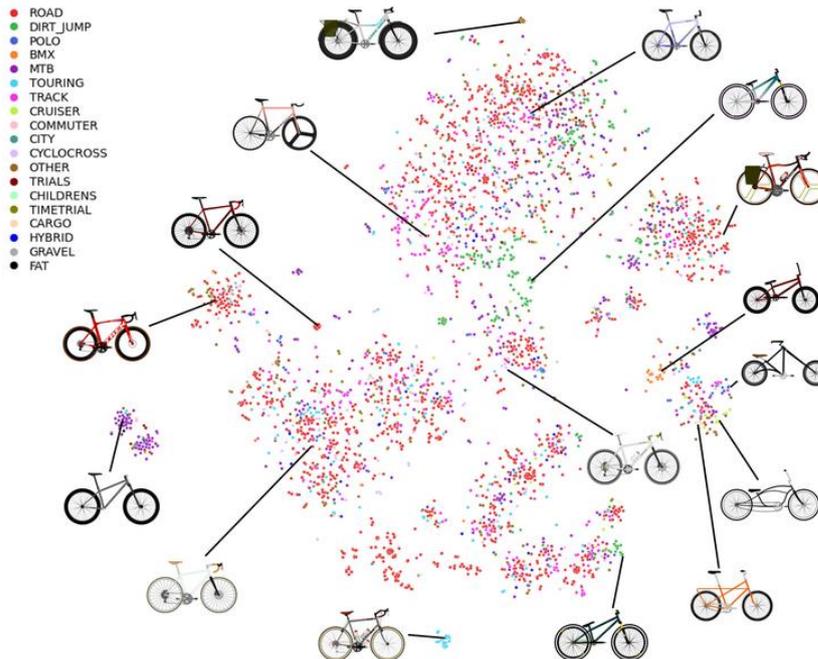
https://www.u-tokyo.ac.jp/focus/en/press/z0508_00315.html

Information source: (The University of Tokyo, 2023)



1.3 To excel at engineering design, generative Artificial Intelligence must learn to innovate

ChatGPT and other deep generative models are proving to be uncanny mimics. These AI supermodels can churn out poems, finish symphonies, and create new videos and images by automatically learning from millions of examples of previous works. These enormously powerful and versatile tools excel at generating new content that resembles everything they've seen before.



MIT engineers trained several AI models on thousands of bicycle frames, sourced from a dataset of full bicycle designs, shown here color-coded by bike style.

Credit: Courtesy of the researchers, Massachusetts Institute of Technology

But as MIT engineers say in a new study, similarity isn't enough if you want to truly innovate in engineering tasks. "Deep generative models (DGMs) are very promising, but also inherently flawed," says study author Lyle Regenwetter, a mechanical engineering graduate student at MIT. "The objective of these models is to mimic a dataset. But as engineers and designers, we often don't want to create a design that's already out there."

For more information, visit the following link:

<https://news.mit.edu/2023/generative-ai-must-innovate-engineering-design-1019>

Reference

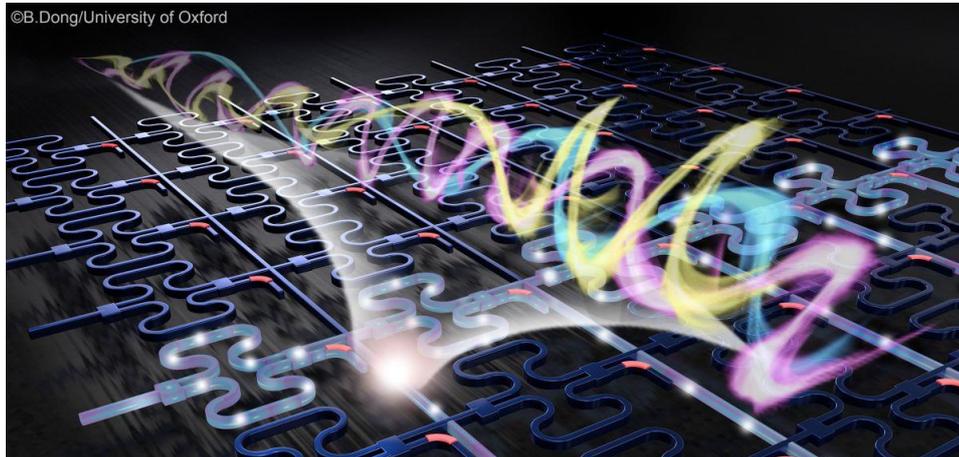
Chu, J. (Oct 19, 2023). To excel at engineering design, generative AI must learn to innovate, study finds. Recovered Oct 23, 2023, Massachusetts Institute of Technology:
<https://news.mit.edu/2023/generative-ai-must-innovate-engineering-design-1019>

Information source: (Massachusetts Institute of Technology, 2023)



1.4 Hardware processing for Artificial Intelligence goes 3D, boosting processing power

Conventional computer chip processing efficiency doubles every 18 months, but the processing power required by modern AI tasks is currently doubling around every 3.5 months. This means that new computing paradigms are urgently needed to cope with the rising demand.



Credit: University of Oxford

One approach is to use light instead of electronics – this allows multiple calculations to be carried out in parallel using different wavelengths to represent different sets of data. In ground-breaking work published in the journal *Nature* in 2021, many of the same authors demonstrated a form of integrated photonic processing chip that could carry out matrix vector multiplication (a crucial task for AI and Machine Learning applications) at speeds far outpacing the fastest electronic approaches. This work resulted in the birth of the photonic AI company, Saliency Labs, a spin-out from the University of Oxford.

For more information, visit the following link:

<https://www.ox.ac.uk/news/2023-10-20-square-cube-hardware-processing-ai-goes-3d-boosting-processing-power>

Reference

University of Oxford. (Oct 20, 2023). Hybrid transistors with silk protein set the stage for integration of biology and microelectronics. Recovered Oct 23, 2023, University of Oxford:

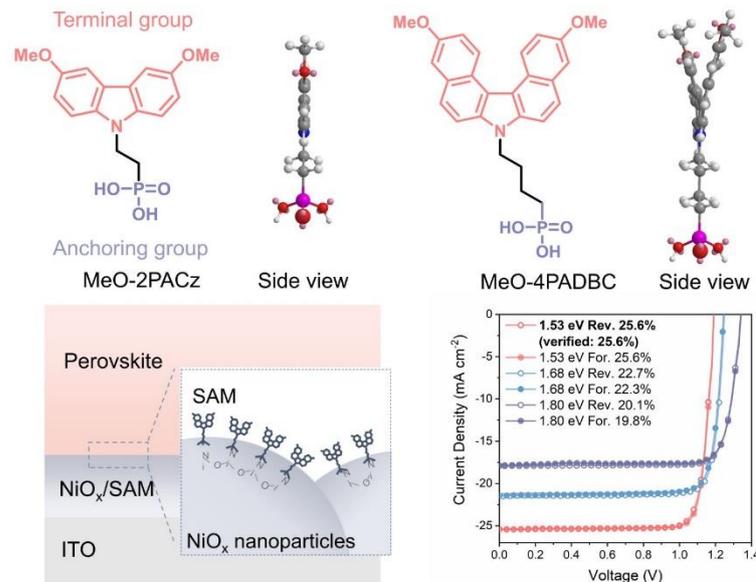
<https://www.ox.ac.uk/news/2023-10-20-square-cube-hardware-processing-ai-goes-3d-boosting-processing-power>

Information source: (University of Oxford, 2023)



1.5 Pivotal breakthrough in adapting perovskite solar cells for renewable energy

A huge step forward in the evolution of perovskite solar cells recorded by researchers at City University of Hong Kong (CityU) will have significant implications for renewable energy development. The CityU innovation paves the way for commercialising perovskite solar cells, bringing us closer to an energy-efficient future powered by sustainable sources.



Molecular structure of the novel SAM, schematic illustration of SAM deposition method, and photovoltaic performance of SAM-based perovskite solar cells.

Credit: Professor Zhu Zonglong's research group, City University of Hong Kong.

“The implications of this research are far-reaching, and its potential applications could revolutionise the solar energy industry,” said Professor Zhu Zonglong of the Department of Chemistry at CityU, who collaborated with Professor Li Zhong’an at Huazhong University of Science and Technology. Perovskite solar cells are a promising frontier in the solar energy landscape, known for their impressive power conversion efficiency. However, they have one significant drawback: thermal instability, i.e. they don’t tend to perform well when exposed to high temperatures. The team at CityU has engineered a unique type of self-assembled monolayer, or SAM for short, and anchored it on a nickel oxide surface as a charge extraction layer.

For more information, visit the following link:

<https://www.cityu.edu.hk/research/stories/2023/10/20/pivotal-breakthrough-adapting-perovskite-solar-cells-renewable-energy-city-university-hong-kong-published-science>

Reference

City University of Hong Kong (Oct 20, 2023). Pivotal breakthrough in adapting perovskite solar cells for renewable energy at City University of Hong Kong; published in Science. Recovered Oct 23, 2023, City University of Hong Kong:

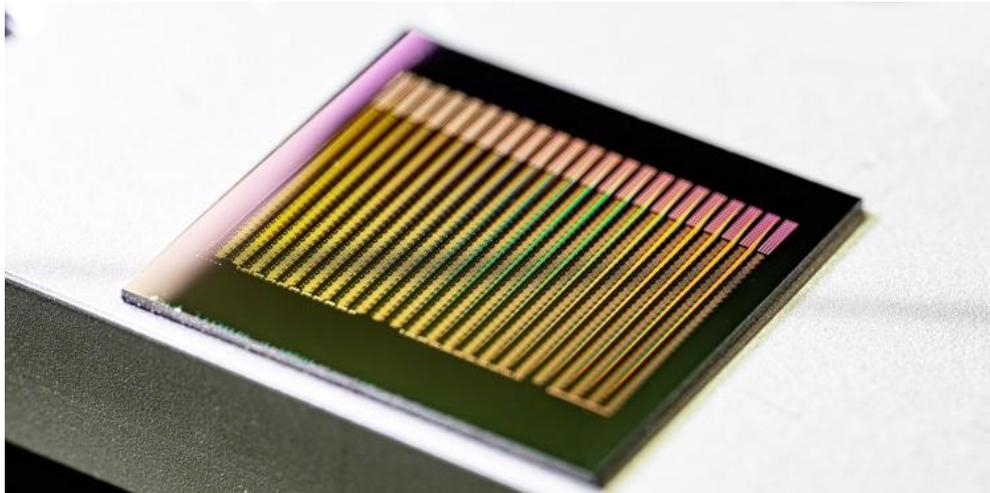
<https://www.cityu.edu.hk/research/stories/2023/10/20/pivotal-breakthrough-adapting-perovskite-solar-cells-renewable-energy-city-university-hong-kong-published-science>

Information source: (City University of Hong Kong, 2023)



1.6 Adaptive optical neural network connects thousands of artificial neurons

Modern computer models – for example for complex, potent AI applications – push traditional digital computer processes to their limits. New types of computing architecture, which emulate the working principles of biological neural networks, hold the promise of faster, more energy-efficient data processing.



The chip contains almost 8,400 functioning artificial neurons from waveguide-coupled phase-change material. The researchers trained this neural network to distinguish between German and English texts on the basis of vowel frequency.

Credit: Jonas Schütte/AG Pernice, University of Münster

A team of researchers has now developed a so-called event-based architecture, using photonic processors with which data are transported and processed by means of light. In a similar way to the brain, this makes possible the continuous adaptation of the connections within the neural network. This changeable connections are the basis for learning processes. For the purposes of the study, a team working at Collaborative Research Centre 1459 (“*Intelligent Matter*”) – headed by physicists Prof. Wolfram Pernice and Prof. Martin Salinga and computer specialist Prof. Benjamin Risse, all from the University of Münster – joined forces with researchers from the Universities of Exeter and Oxford in the UK.

For more information, visit the following link:

<https://www.uni-muenster.de/news/view.php?cmdid=13644>

Reference

University of Münster. (Oct 23, 2023). Adaptive optical neural network connects thousands of artificial neurons. Recovered Oct 24, 2023, University of Münster: <https://www.uni-muenster.de/news/view.php?cmdid=13644>

Information source: (University of Münster, 2023)



1.7 Design and fly world's largest quadcopter drone

Engineers at The University of Manchester have built and flown the world's largest quadcopter drone. The drone, made from a cardboard-like material called foamboard, measures 6.4m (21 ft) corner to corner and weighs 24.5kg – 0.5kg less than the weight limit set by the Civil Aviation Authority.



Credit: The University of Manchester

The innovative design of the drone, dubbed the Giant Foamboard Quadcopter (GFQ), means it is unlike any other in existence. The four arms are formed of a series of hollow box structures and can be easily removed for transportation. There is no record of a purpose-built uncrewed quadcopter (four rotors) of any weight class which is larger than the Manchester vehicle as of the time of writing. The project started as a curiosity-driven venture to inspire students' creativity in design by utilising a suitable alternative low-cost material for lightweight aerospace structures that is more environmentally friendly than the usual carbon fibre.

For more information, visit the following link:

<https://www.manchester.ac.uk/discover/news/manchester-researchers-design-and-fly-worlds-largest-quadcopter-drone/>

Reference

Marsh, J. (Oct 23, 2023). Manchester researchers design and fly world's largest quadcopter drone. Recovered Oct 24, 2023, The University of Manchester:

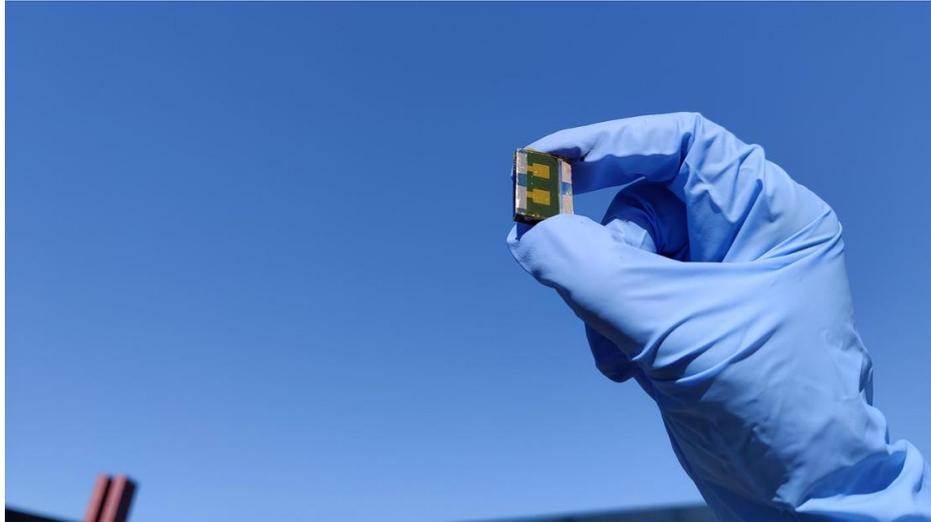
<https://www.manchester.ac.uk/discover/news/manchester-researchers-design-and-fly-worlds-largest-quadcopter-drone/>

Information source: (The University of Manchester, 2023)



1.8 New design solves stability and efficiency of perovskite solar cells

A collaboration between the labs of Michael Grätzel at EPFL and Edward Sargent at Northwestern University, has made a significant leap in designing PSCs with record stability and power-conversion efficiency surpassing 25% addressing two of the most pressing challenges in the solar energy sector. The researchers focused on designing inverted PSCs, which have previously shown promise in terms of operational stability. They introduced a unique, “*conformal self-assembled monolayer on textured substrates*”, which describes a special, single layer of molecules that spontaneously and uniformly coats the irregular surface of a textured substrate.



Credit: Ecole Polytechnique Fédérale de Lausanne

The new design tackles the problem of “*molecular agglomeration*”, which occurs when molecules clump together instead of spreading out evenly. When this happens on the textured surfaces of solar cells, it can seriously affect their performance. To address this, the researchers introduced a special molecule called 3-mercaptopropionic acid (3-MPA) into the solar cells’ self-assembled monolayer formed by a molecular layer of phosphonic acids substituted by carbazole, which selectively extracts the positive charge carriers (“*holes*”) that are produced under illumination in the perovskite films.

For more information, visit the following link:

<https://actu.epfl.ch/news/new-design-solves-stability-and-efficiency-of-pero/>

Reference

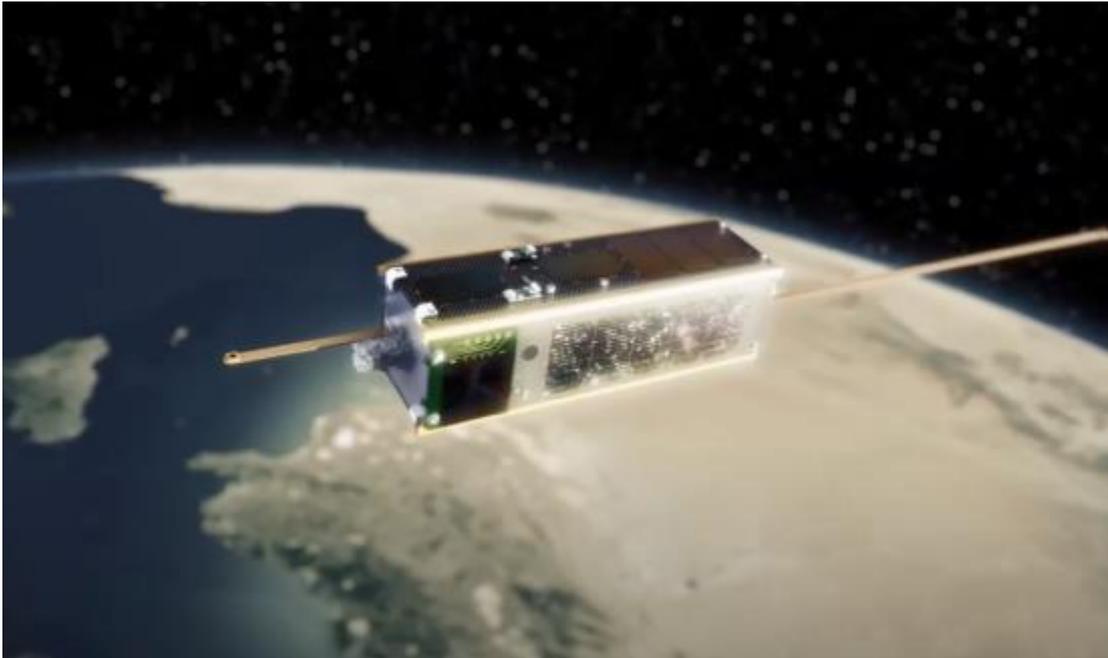
Papageorgiou, N. (Oct 24, 2023). New design solves stability and efficiency of perovskite solar cells. Recovered Oct 24, 2023, Ecole Polytechnique Fédérale de Lausanne: <https://actu.epfl.ch/news/new-design-solves-stability-and-efficiency-of-pero/>

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



1.9 Solar farms in space are possible

It's viable to produce low-cost, lightweight solar panels that can generate energy in space, according to new research from the Universities of Surrey and Swansea. Researchers from the University of Swansea's Centre for Solar Energy Research developed new solar cells from cadmium telluride. The panels cover a larger area, are more lightweight, and provide far greater power than current technology – as well as being relatively cheap to manufacture.



Credit: University of Surrey

Scientists from the University of Surrey designed instruments that measured their performance in orbit. The satellite itself was designed and built at the Surrey Space Centre in partnership with a team of trainee engineers from the Algerian Space Agency (ASAL). Although the cells' power output became less efficient over time, researchers believe their findings prove that solar power satellites work and could be commercially viable.

For more information, visit the following link:

<https://www.surrey.ac.uk/news/solar-farms-space-are-possible-say-surrey-and-swanseal>

Reference

Underwood, C. (Oct 24, 2023). Solar farms in space are possible, say Surrey and Swansea. Recovered Oct 24, 2023, University of Surrey:

<https://www.surrey.ac.uk/news/solar-farms-space-are-possible-say-surrey-and-swanseal>

Information source: (University of Surrey, 2023)



1.10 Putting the “farm” in solar farm

Scientists with Texas A&M AgriLife seek to make solar energy production and agricultural production more compatible for producers on the landscape. Researchers are actively contributing to the growing body of research focused on agrivoltaics—an innovative technology with the potential to enhance the efficiency and resiliency of sustainable food and agricultural systems while feeding the state’s growing demand for energy.



*Texas A&M AgriLife scientists are contributing to the growing body of research surrounding agrivoltaics, which combines agriculture and solar power production.
Credit: courtesy of Basia Latawiec, The Texas A&M University System*

While Texas leads the nation in energy production, thanks to its diverse reserves of fossil fuels and renewable energy resources, the state’s rapidly expanding population places an ever-growing demand on the electrical power grid. As the term implies, agrivoltaics is a dual land-use system combining agriculture in the form of crop and livestock production with solar power arrays.

For more information, visit the following link:

<https://agrilifetoday.tamu.edu/2023/10/23/putting-the-farm-in-solar-farm/>

Reference

Fuller, S. (Oct 23, 2023). Putting the “farm” in solar farm. Recovered Oct 24, 2023, The Texas A&M University System:

<https://agrilifetoday.tamu.edu/2023/10/23/putting-the-farm-in-solar-farm/>

Information source: (The Texas A&M University System, 2023)



1.11 Security threats in Artificial Intelligences such as ChatGPT

The study, by academics from the University's Department of Computer Science, is the first to demonstrate that Text-to-SQL systems - AI that enables people to search databases by asking questions in plain language and are used throughout a wide range of industries - can be exploited to attack computer systems in the real world.



Credit: The University of Sheffield

Findings from the research have revealed how the AIs can be manipulated to help steal sensitive personal information, tamper with or destroy databases, or bring down services through Denial-of-Service attacks. As part of the study, the Sheffield academics found security vulnerabilities in six commercial AI tools and successfully attacked each one. The researchers found that if they asked each of the AIs specific questions, they produced malicious code. Once executed, the code would leak confidential database information, interrupt a database's normal service, or even destroy it.

For more information, visit the following link:

<https://www.sheffield.ac.uk/news/security-threats-ais-such-chatgpt-revealed-researchers>

Reference

Barton, S. (Oct 24, 2023). Security threats in AIs such as ChatGPT revealed by researchers. Recovered Oct 24, 2023, The University of Sheffield:

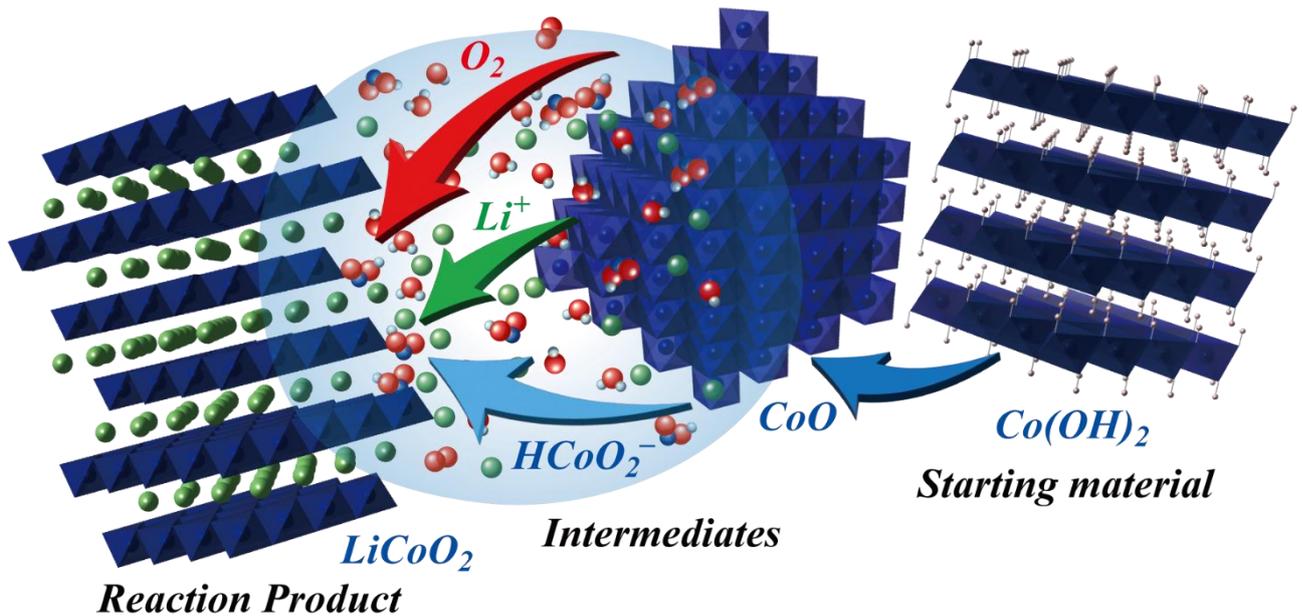
<https://www.sheffield.ac.uk/news/security-threats-ais-such-chatgpt-revealed-researchers>

Information source: (The University of Sheffield, 2023)



1.12 Cathode active materials for lithium-ion batteries could be produced at low temperatures

Layered lithium cobalt oxide, a key component of lithium-ion batteries, has been synthesized at temperatures as low as 300°C and durations as short as 30 minutes. A team of researchers at Hokkaido University and Kobe University, led by Professor Masaki Matsui at Hokkaido University's Faculty of Science, have developed a new method to synthesize lithium cobalt oxide at temperatures as low as 300°C and durations as short as 30 minutes.



*Reaction pathway of the hydroflux process to form layered lithium cobalt oxide ($LiCoO_2$) at 300 °C.
Credit: Hokkaido University*

“Lithium cobalt oxide can typically be synthesized in two forms,” Matsui explains. “One form is layered rocksalt structure, called the high-temperature phase, and the other form is spinel-framework structure, called the low-temperature phase. The layered $LiCoO_2$ is used in Li-ion batteries.”

For more information, visit the following link:

<https://www.global.hokudai.ac.jp/blog/cathode-active-materials-for-lithium-ion-batteries-could-be-produced-at-low-temperatures/>

Reference

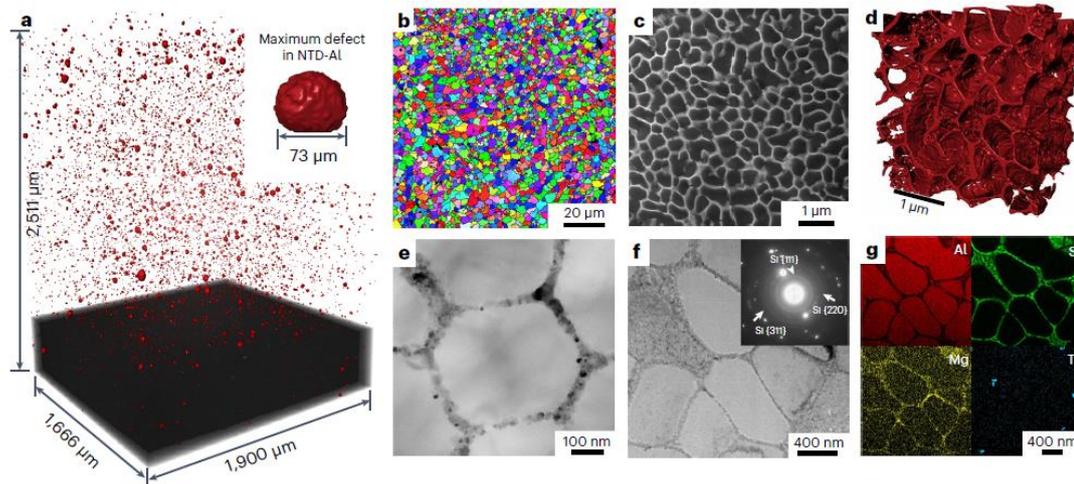
Matsui, M. & Keegan, S. (Oct 24, 2023). Cathode active materials for lithium-ion batteries could be produced at low temperatures. Recovered Oct 24, 2023, Rutgers - Hokkaido University: <https://www.global.hokudai.ac.jp/blog/cathode-active-materials-for-lithium-ion-batteries-could-be-produced-at-low-temperatures/>

Information source: (Hokkaido University, 2023)



1.13 3D-printed aluminium alloy with unprecedented fatigue resistance

Recently, joint research by City University of Hong Kong and Shanghai Jiao Tong University achieved a breakthrough by creating an aluminium alloy with unprecedented fatigue resistance using advanced 3D printing techniques. The new fatigue-resistance strategy can be applied in other 3D-printed alloys to help develop lightweight components with increased load efficiency for various industries.



Credit: Dan, C. et al, source: <https://doi.org/10.1038/s41563-023-01651-9>, City University of Hong Kong

The team used micro-computed tomography to investigate this 3D-printed NTD-Al alloy and found throughout the sample a typical continuous 3D-dual-phase cellular nanostructure, which consisted of a network of solidification cellular structure with an average diameter of about 500 nanometers. The 3D-dual-phase cellular nanostructure acts as a strong volumetric nanocage to prevent localised damaged accumulation, inhibiting fatigue crack initiation.

For more information, visit the following link:

<https://www.cityu.edu.hk/research/stories/2023/10/24/cityu-joint-research-creates-3d-printed-aluminium-alloy-unprecedented-fatigue-resistance>

Reference

City University of Hong Kong. (Oct 24, 2023). CityU joint research creates 3D-printed aluminium alloy with unprecedented fatigue resistance. Recovered Oct 25, 2023, City University of Hong Kong:

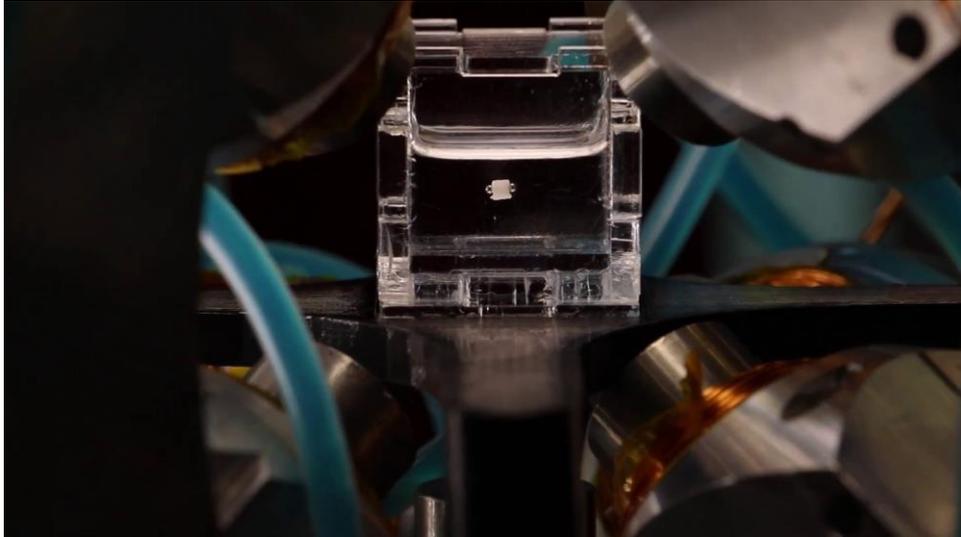
<https://www.cityu.edu.hk/research/stories/2023/10/24/cityu-joint-research-creates-3d-printed-aluminium-alloy-unprecedented-fatigue-resistance>

Information source: (City University of Hong Kong, 2023)



1.14 Breakthrough in collaborative magnetic microrobotics

For the first time ever, researchers at the Surgical Robotics Laboratory of the University of Twente successfully made two microrobots work together to pick up, move and assemble passive objects in 3D environments. This achievement opens new horizons for promising biomedical applications.



Credit: University of Twente

Imagine you need surgery somewhere inside your body. However, the part that needs surgery is very difficult to reach for a surgeon. In the future, a couple of robots smaller than a grain of salt might go into your body and perform the surgery. These microrobots could work together to perform all kinds of complex tasks. “*It’s almost like magic*”, says Franco Piñan Basualdo, corresponding author of the publication. Researchers from the University of Twente successfully exploited two of these one-millimetre-sized magnetic microrobots to perform several operations. Like clockwork, the microrobots were able to pick up, move and assemble cubes. Unique to this achievement is the 3D environment in which the robots performed their tasks.

For more information, visit the following link:

<https://www.utwente.nl/en/news/2023/10/1202472/breakthrough-in-collaborative-magnetic-microrobotics>

Reference

Wesselink, K. (Oct 23, 2023). Breakthrough in collaborative magnetic microrobotics. Recovered Oct 25, 2023, University of Twente:

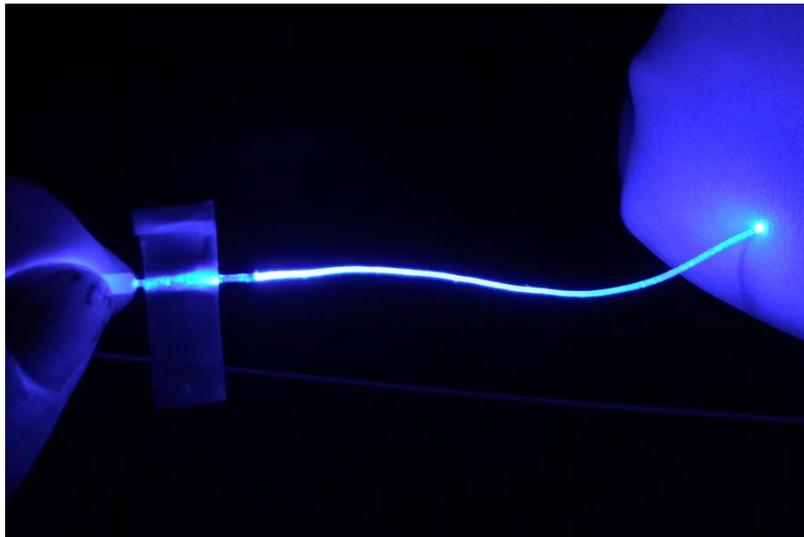
<https://www.utwente.nl/en/news/2023/10/1202472/breakthrough-in-collaborative-magnetic-microrobotics>

Information source: (University of Twente, 2023)



1.15 Soft optical fibers block pain while moving and stretching with the body

Engineers at Massachusetts Institute of Technology have developed soft and implantable fibers that can deliver light to major nerves through the body. When these nerves are genetically manipulated to respond to light, the fibers can send pulses of light to the nerves to inhibit pain. The optical fibers are flexible and stretch with the body.



*MIT engineers have designed a soft hydrogel optical fiber (shown illuminated) that stimulates peripheral nerves, and could help researchers in identifying the origins and treatments for nerve-related pain.
Credit: Massachusetts Institute of Technology*

The new fibers are meant as an experimental tool that can be used by scientists to explore the causes and potential treatments for peripheral nerve disorders in animal models. Peripheral nerve pain can occur when nerves outside the brain and spinal cord are damaged, resulting in tingling, numbness, and pain in affected limbs. Peripheral neuropathy is estimated to affect more than 20 million people in the United States.

For more information, visit the following link:

<https://news.mit.edu/2023/soft-optical-fibers-nerve-related-pain-1019>

Reference

Chu, J. (Oct 19, 2023). Soft optical fibers block pain while moving and stretching with the body. Recovered Oct 25, 2023, Massachusetts Institute of Technology:

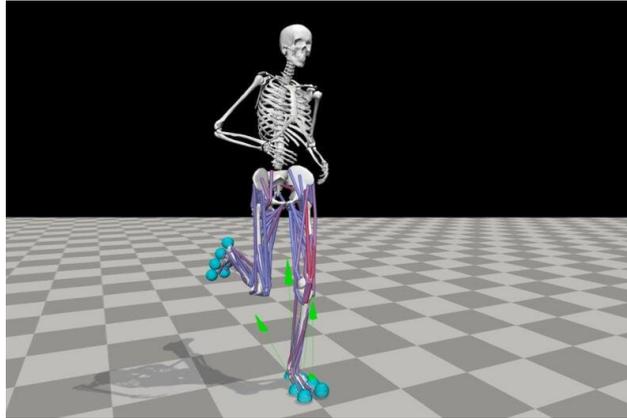
<https://news.mit.edu/2023/soft-optical-fibers-nerve-related-pain-1019>

Information source: (Massachusetts Institute of Technology, 2023)



1.16 Sophisticated human biomechanics from smartphone video

Diseases like arthritis and sports injuries can impair the way people move and engage in life. Computational musculoskeletal analysis can inform better interventions and improve rehab decisions for patients and athletes, but measuring the dynamics and forces at play in human movement requires a lot of time, equipment, and expertise. It's expensive. Though millions across the world might benefit, too often computational motion research is a luxury few patients can afford.



Example of what OpenCap reveals to users, including underlying forces in the musculoskeletal system that result from movement.

Credit: OpenCap, Stanford University

A team of researchers at Stanford University introduces OpenCap, a powerful open-source motion-capture application that uses video from two calibrated iPhones working in tandem to quantify human motion and the underlying forces in the musculoskeletal system. Its creators hope it will become a turning point in human movement analysis, helping to identify movement patterns that increase an athlete's risk of injury or to optimize treatments for individuals with mobility-limiting conditions. OpenCap takes just minutes to compute valuable insights about human movement that used to take days using labs costing \$150,000 – all at less than 1% of the cost.

For more information, visit the following link:

<https://news.stanford.edu/2023/10/19/sophisticated-human-biomechanics-smartphone-video/>

Reference

Myers, A. (Oct 19, 2023). OpenCap: Sophisticated human biomechanics from smartphone video. Recovered Oct 25, 2023, Stanford University:

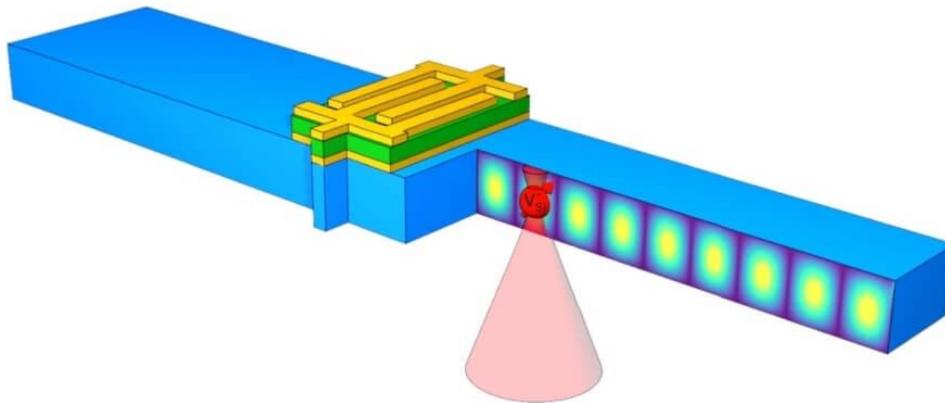
<https://news.stanford.edu/2023/10/19/sophisticated-human-biomechanics-smartphone-video/>

Information source: (Stanford University, 2023)



1.17 Using sound to test devices, control qubits

Researchers at the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS), in collaboration with researchers at the OxideMEMS Lab at Purdue University, have developed a system that uses atomic vacancies in silicon carbide to measure the stability and quality of acoustic resonators. What's more, these vacancies could also be used for acoustically-controlled quantum information processing, providing a new way to manipulate quantum states embedded in this commonly-used material.



A piezoelectric layer (green) sandwiched between two electrodes (yellow) atop of a silicon carbide acoustic resonator (blue). Acoustic waves generated by the electrodes and piezoelectric layer put mechanical strain on the lattice, which flip the spin of the defect (red). The spin is read out with a laser focused onto the backside of the resonator
Credit: Hu Group, Harvard SEAS

“Silicon carbide, which is the host for both the quantum reporters and the acoustic resonator probe, is a readily available commercial semiconductor that can be used at room temperature,” said Evelyn Hu, the Tarr-Coyne Professor of Applied Physics and of Electrical Engineering and the Robin Li and Melissa Ma Professor of Arts and Sciences, and a senior author of the paper. “As an acoustic resonator probe, this technique in silicon carbide could be used in monitoring the performance of accelerometers, gyroscopes and clocks over their lifetime and, in a quantum scheme, has potential for hybrid quantum memories and quantum networking.”

For more information, visit the following link:

<https://seas.harvard.edu/news/2023/10/using-sound-test-devices-control-qubits>

Reference

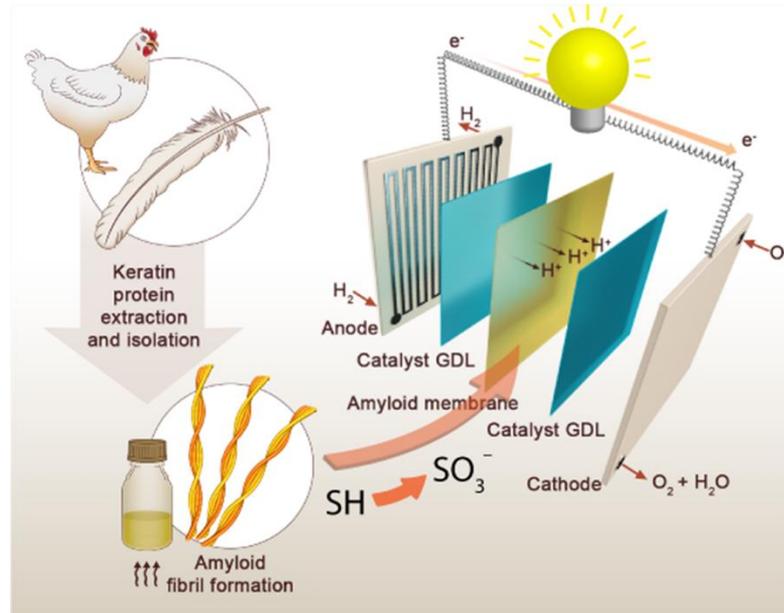
Burrows, L. (Oct 24, 2023). Researchers develop soft-packaged, portable rehabilitation glove. Recovered Oct 25, 2023, Harvard John A. Paulson School of Engineering and Applied Sciences: <https://seas.harvard.edu/news/2023/10/using-sound-test-devices-control-qubits>

Information source: (Harvard John A. Paulson School of Engineering and Applied Sciences, 2023)



1.18 Generating clean electricity with chicken feathers

The food industry generates enormous amounts of waste and by-products, including from poultry production. Each year, some 40 million tonnes of chicken feathers are incinerated. This not only releases large amounts of CO₂, but also produces toxic gases such as sulphur dioxide.



*A sustainable membrane is produced from the keratin in chicken feathers for use in a fuel cell.
Credit: Eidgenössische Technische Hochschule Zürich / Nanyang Technological University Singapore*

Researchers at ETH Zurich and Nanyang Technological University Singapore (NTU) have now found a way to put these feathers to good use. Using a simple and environmentally friendly process, they extract the protein keratin from the feathers and convert it into ultra-fine fibres known as amyloid fibrils. These keratin fibrils go on to be used in the membrane of a fuel cell. Fuel cells generate CO₂-free electricity from hydrogen and oxygen, releasing only heat and water. They could play an important role as a sustainable energy source in the future.

For more information, visit the following link:

<https://ethz.ch/en/news-and-events/eth-news/news/2023/10/generating-clean-electricity-with-chicken-feathers.html>

Reference

Bleich, V. (Oct 20, 2023). Generating clean electricity with chicken feathers. Recovered Oct 25, 2023, Eidgenössische Technische Hochschule Zürich:
<https://ethz.ch/en/news-and-events/eth-news/news/2023/10/generating-clean-electricity-with-chicken-feathers.html>

Information source: (Eidgenössische Technische Hochschule Zürich, 2023)



1.19 Non-invasive deep brain stimulation enhances motor learning

Scientists led by Friedhelm Hummel, who holds the Defitech Chair of Clinical Neuroengineering at EPFL's School of Life Sciences have implemented a novel technique called "*transcranial temporal interference electrical stimulation*" (tTIS) for non-invasive neuromodulation in humans to successfully target deep structures and enhance motor skill learning in healthy older subjects.



Credit: Ecole Polytechnique Fédérale de Lausanne

The scientists combined computational modeling, fMRI studies, and behavioral evaluations, to show, for the first time, that tTIS can specifically modulate an area deep within the brain called the striatum, which is a central processing hub of motor control and learning. Unlike other deep neuromodulation techniques, tTIS was able to reach the striatum without the need for invasive procedures. The scientists applied bursts of electrical pulses in a specific pattern ("*theta burst*") to modulate brain activity in human subjects. This pattern has been shown to induce changes in neural excitability and neuroplastic properties with large potential as an application for cognitive enhancement and neurorehabilitation.

For more information, visit the following link:

<https://news.epfl.ch/news/non-invasive-deep-brain-stimulation-enhances-motor/>

Reference

Papageorgiou, N. (Oct 20, 2023). New AI tool could help predict viral outbreaks. Recovered Oct 25, 2023, Ecole Polytechnique Fédérale de Lausanne:

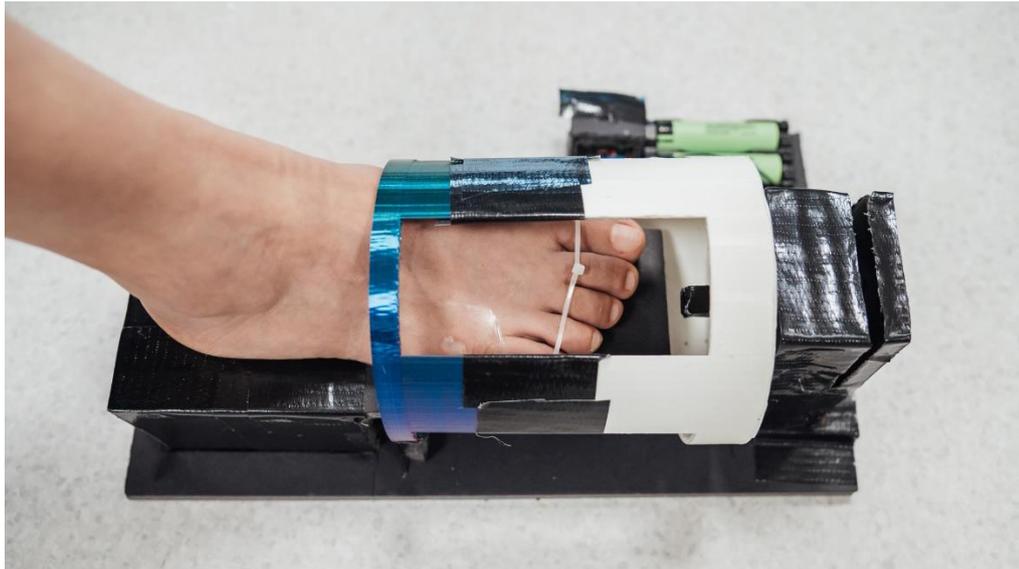
<https://news.epfl.ch/news/non-invasive-deep-brain-stimulation-enhances-motor/>

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



1.20 Innovative magnetic gel that heals diabetic wounds three times faster

Diabetic patients, whose natural wound-healing capabilities are compromised, often develop chronic wounds that are slow to heal. Such non-healing wounds could cause serious infections resulting in painful outcomes such as limb amputation. To address this global healthcare challenge, a team of researchers from the National University of Singapore (NUS) engineered an innovative magnetic wound-healing gel that promises to accelerate the healing of diabetic wounds, reduce the rates of recurrence, and in turn, lower the incidents of limb amputations.



A bandage pre-loaded with magnetic hydrogel is placed on the wound, and an external device is used to accelerate the wound healing process.

Credit: National University of Singapore

While the magnetic wound-healing gel has shown great promise in improving diabetic wound healing, it could also revolutionise the treatment of other complex wound types. *“The magneto-responsive hydrogel, combined with wireless magneto-induced dynamic mechanical stimulation, addresses fundamental challenges in wound healing, such as creating a conducive microenvironment and promoting tissue regeneration,”* said co-first author of the research paper Dr Shou Yufeng, Research Fellow from the Department of Biomedical Engineering at NUS College of Design and Engineering.

For more information, visit the following link:

<https://news.nus.edu.sg/innovative-magnetic-gel-that-heals-diabetic-wounds-three-times-faster/>

Reference

National University of Singapore. (Oct 20, 2023). NUS scientists develop innovative magnetic gel that heals diabetic wounds three times faster. Recovered Oct 25, 2023, National University of Singapore: <https://news.nus.edu.sg/innovative-magnetic-gel-that-heals-diabetic-wounds-three-times-faster/>

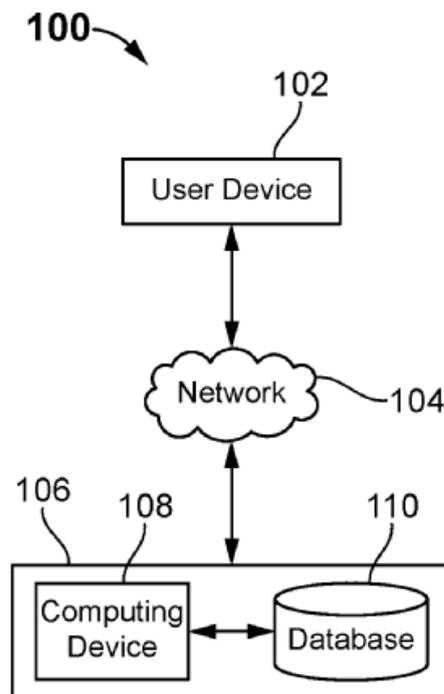
Information source: (National University of Singapore, 2023)



II. PATENTS

2.1. Cloud-based AI-powered entrepreneurship training system and method

A system for providing Artificial Intelligence (AI) powered entrepreneurship training is disclosed. The system comprises a computing device having a processor and a non-transitory memory unit configured to store a set of instructions executable by the processor during each step of training, a database to store a plurality of data related to real-world business portfolio, and a user device to establish interaction between the users during entrepreneurship training.



*Shows a computer-implemented system executed in a network environment for providing Artificial Intelligence (AI) powered entrepreneurship training in an embodiment of the present invention.
Credit: SatyaDeep, S., WIPO IP Portal*

The system further includes a learning-based application platform configured to learn entrepreneurship skills and strengthen communication, and one or more Li-Fi-based devices or sensors connected to an AI-powered cloud assistive system connected to the learning-based application platform to assist users. The system reimages digital information to a tactile surface to assist the visually blind, hearing/speech impaired to touch and perceive the information. Further, the system interchanges transcription/translation modes as per user requirements and provides authentic learning and real-world business access simultaneously.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=US411170793&_cid=P10-LO5SL5-13026-4

Reference

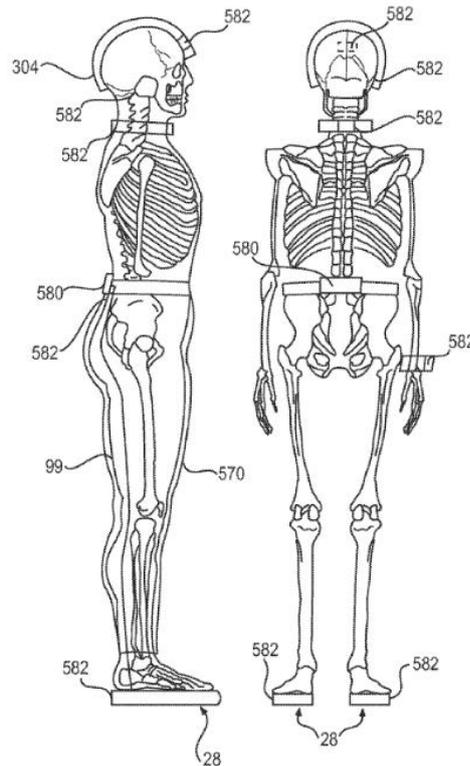
SatyaDeep, S. (Oct 19, 2023). Cloud-based AI-powered entrepreneurship training system and method. Recovered Oct 20, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US411170793&_cid=P10-LO5SL5-13026-4

Information source: (WIPO IP Portal, 2023)



2.2. Smartphone-controlled active configuration of footwear, including with concavely rounded soles

A Big Data Artificial Intelligence computer system is used for medical care connecting to sensor-equipped smartphones of users of footwear. The footwear has smartphone-connected soles with sensors and configurable structures.



*Shows side and back views of a human skeleton to illustrate the potential positions for the smartphone and for sensors on the body or apparel or equipment, including footwear, pants, belt, collar, wristband, earphones, and helmet.
Credit: Edward, G., WIPO IP Portal*

The smartphone is also connected to sensors located on the users' body, including proximate to its center of gravity and/or on the head. The web and/or cloud-based computer system is configured to use the Big Data techniques of Machine Learning in a database compiled from millions of smartphones to perform operations on billions of data sets from the smartphones of the footwear users. The correlations found from the Big Data operations provide solutions to medical problems of the footwear users involving their body structure and/or function. The solutions are implemented by configuring the users' footwear soles, including active configuration, including during running and/or walking to optimize corrections to the structure and/or function of their bodies.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=US411171101&_cid=P10-LO5SL5-13026-4

Reference

Frampton, E. (Oct 19, 2023). Smartphone-controlled active configuration of footwear, including with concavely rounded soles. Recovered Oct 20, 2023, WIPO IP Portal:

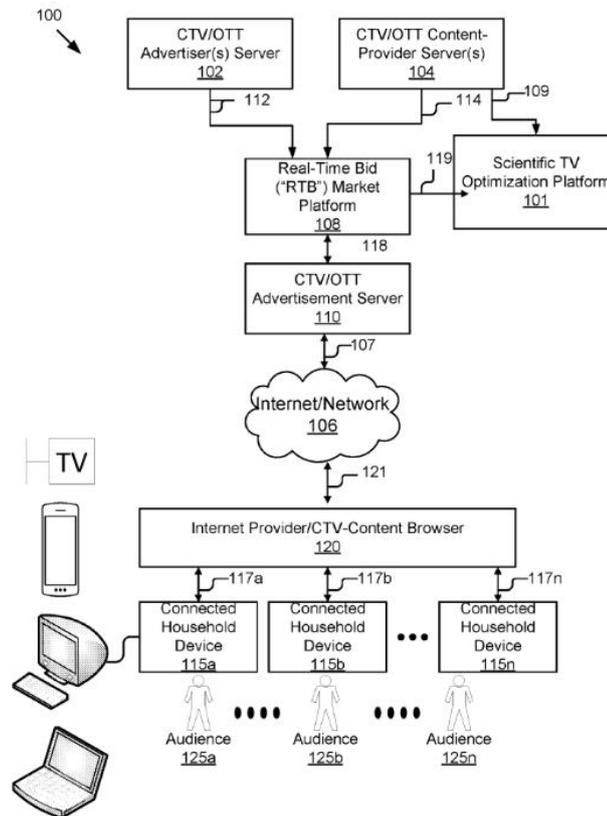
https://patentscope.wipo.int/search/es/detail.jsf?docId=US411171101&_cid=P10-LO5SL5-13026-4

Information source: (WIPO IP Portal, 2023)



2.3. Scientific system and method for optimizing television advertising

A scientific system and methods are disclosed for optimizing television (e.g., “CTV” and “OTT”) advertising and related expenditure to maximize efficiency and return on investment (“ROI”) for advertisers.



Is high-level block diagram, illustrating an example system and example CTV/OTT advertising environment in which the Scientific demand-side platform according to some implementations of the present technology integrates with other systems in the CTV advertising environment and operates.

Credit: Fairchild, J. & Koye, D., WIPO IP Portal

The scientific system comprises an initial-feedback engine that develops and refines creatives or outcomes by creating and using an Artificial Intelligence (AI) engine that creates an initial feedback loop from social media platforms and subsequently uses an intelligent advertisement-selection engine that takes the highest performing advertising on the social media platforms and directs or imports them for connected television or over-the-top advertising. The system includes a performance engine that optimizes performance of the connected television and over-the-top advertising and then moves the winning combination of a creative or outcome resulting from the application inventory, the audience segment, the part of day, the frequency or the like to linear television purchase actions.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=US411172193>

Reference

Fairchild, J. & Koye, D. (Oct 19, 2023). Scientific system and method for optimizing television advertising.

Recovered Oct 20, 2023, WIPO IP Portal:

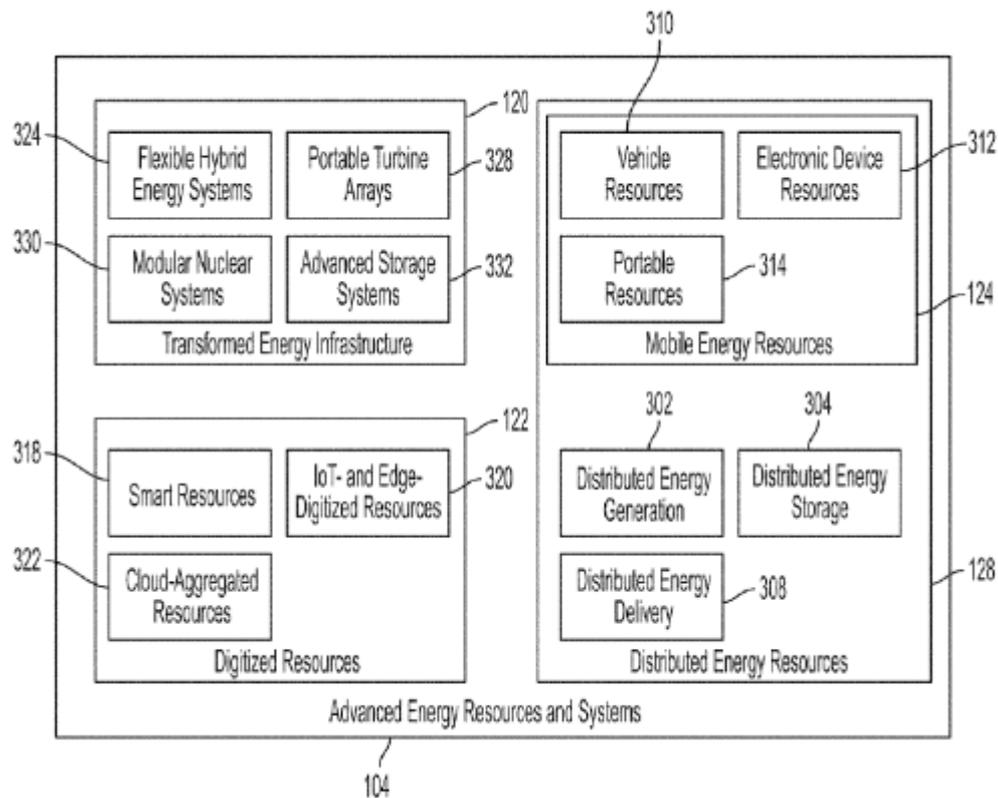
<https://patentscope.wipo.int/search/es/detail.jsf?docId=US411172193>

Information source: (WIPO IP Portal, 2023)



2.4. Intelligent orchestration systems for energy and power management within defined domains

Disclosed herein are AI-based platforms for enabling intelligent orchestration and management of power and energy. In various embodiments, an Artificial Intelligence system that is trained on a set of energy generation, energy storage, energy delivery and/or energy consumption outcomes.



Is a schematic diagram that presents more detail on distributed energy generation systems, according to some embodiments.

Credit: Cella, C. & Cardno, A., WIPO IP Portal

Wherein the Artificial Intelligence system is configured to analyze a data set of current energy generation, current energy storage, current energy delivery and/or current energy consumption information and provide a recommendation including at least one operating parameter that satisfies both of a mobile entity energy demand or a fixed location energy demand in a defined domain. In some embodiments, the operating parameter indicates a generation instruction for a set of energy generation resources, a storage instruction for a set of energy storage resources, a delivery instruction for a set of energy delivery resources, and/or a consumption instruction for a set of entities that consume energy.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=US411169157&_cid=P10-LO5SL5-13026-2

Reference

Cella, C. & Cardno, A. (Oct 19, 2023). Intelligent orchestration systems for energy and power management within defined domains. Recovered Oct 20, 2023, WIPO IP Portal:

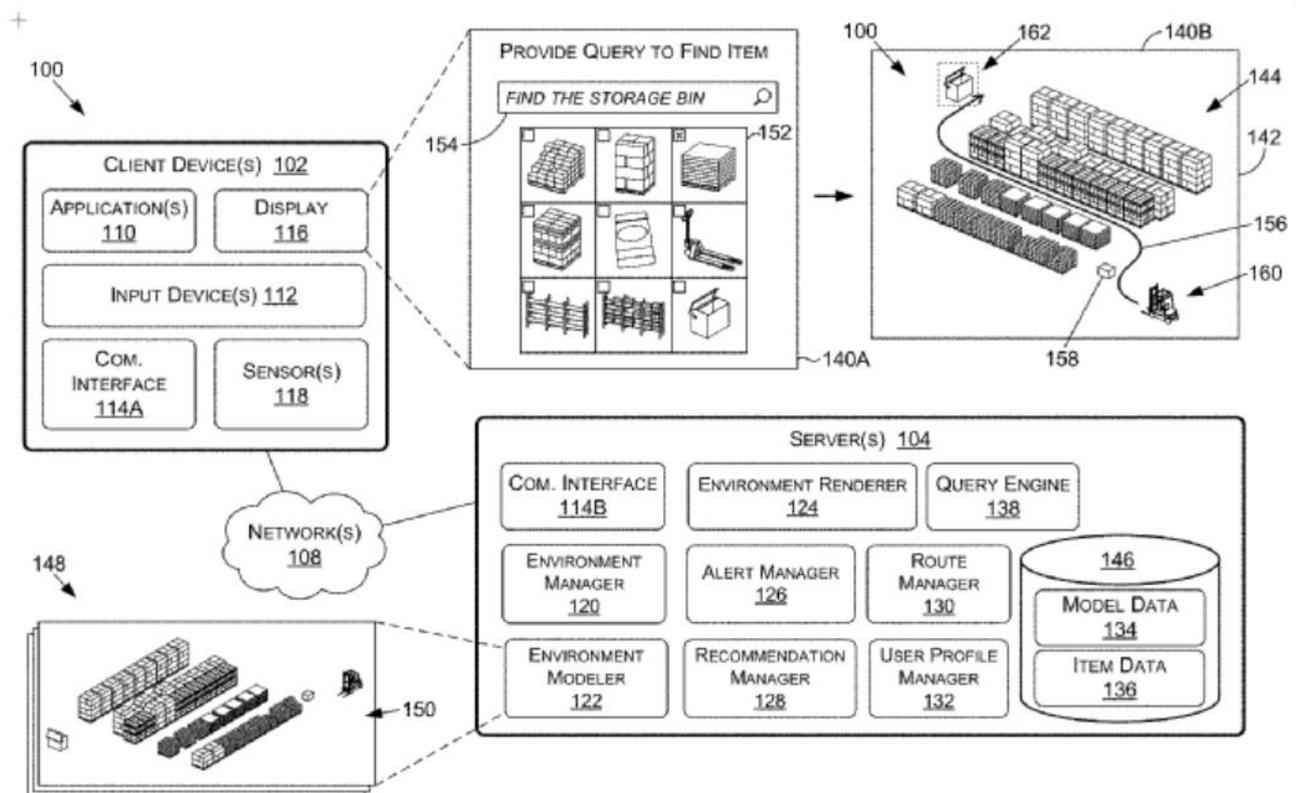
https://patentscope.wipo.int/search/es/detail.jsf?docId=US411169157&_cid=P10-LO5SL5-13026-2

Information source: (WIPO IP Portal, 2023)



2.5. Artificial Intelligence based system and method for automatically monitoring the health of one or more users.

In various examples, a 3D representation of an environment may be generated from sensor data, with objects being detected in the environment using the sensor data and stored as items that can be tracked and located within the 3D representation.



Is an example system diagram of an item tracking and locating system, in accordance with at least some embodiments of the present disclosure.

Credit: Ganju, S.; Mentovich, E.; Foco, M. & Oleynikova, E., WIPO IP Portal

The 3D representation of the environment and item information may be used to determine (e.g., identify or predict) a location or position of an item within the 3D representation and/or recommend a storage location for the item within the 3D representation. Using a determined location or position, one or more routes to the location through the 3D representation may be determined. Data corresponding to a determined route may be provided to a user and/or device. User preferences, permissions, roles, feedback, historical item data, and/or other data associated with a user may be used to further enhance various aspects of the disclosure.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=US411170458&_cid=P10-LO7EJC-05086-1

Reference

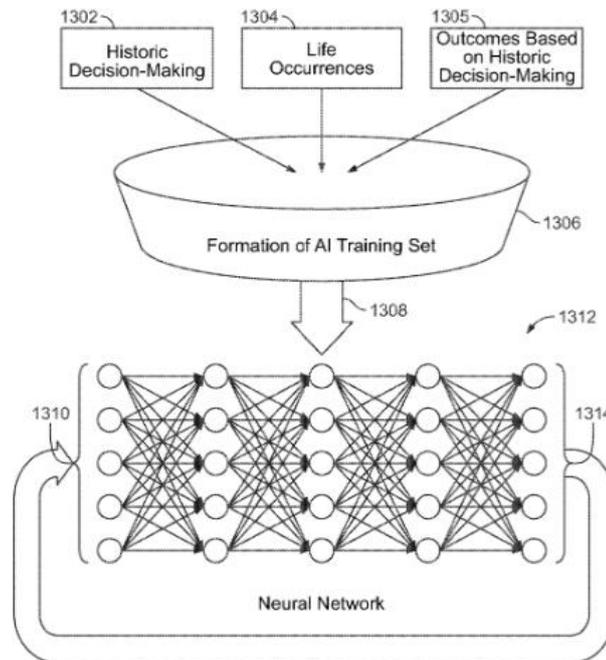
Ganju, S.; Mentovich, E.; Foco, M. & Oleynikova, E. (Oct 19, 2023). Artificial Intelligence based system and method for automatically monitoring the health of one or more users. Recovered Oct 20, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=US411170458&_cid=P10-LO7EJC-05086-1

Information source: (WIPO IP Portal, 2023)



2.6. Artificial Intelligence-powered legacy scenarios for use within a mobile application

A system for condensing user communications relating to a topic is provided. The system may include a processor and a non-transitory memory. The processor may: designate a topic of user interest; retrieve legacy communications; and remove duplicative communications.



*Shows formation of a training set and neural network in accordance with the principles of the disclosure.
Credit: Yannam, R.; Thomas, P.; Zhao, S.; Chillara, S.; Jhaveri, R.; Strug, R.; Schultz, K. & Shah, P., Espacenet Patent Search*

The processor may form a topic-centric training set for a neural network. The topic-centric training set may be based on the legacy communications, legacy intelligence, and the plurality of outcomes and may be delimited by an analysis of the database. The processor may synthesize the neural network using the topic-centric training set in order to assign individual weights to each of a plurality of nodes in the neural network. In response to a selection of the topic of user interest, the processor may generate a plurality of user options based on the neural network. The system may include a display in order to prompt the user to select one of the options.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088307719/publication/US2023334251A1?q=artificial%20intelligence>

Reference

Yannam, R.; Thomas, P.; Zhao, S.; Chillara, S.; Jhaveri, R.; Strug, R.; Schultz, K. & Shah, P. (Oct 19, 2023). Artificial Intelligence (AI)-powered legacy scenarios for use within a mobile application. Recovered Oct 20, 2023, Espacenet Patent Search:

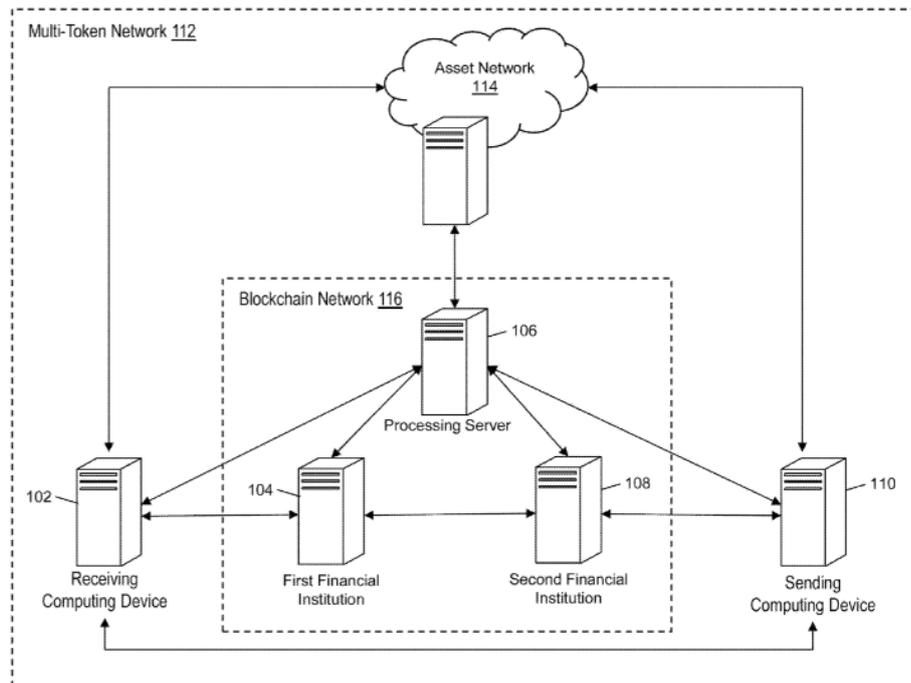
<https://worldwide.espacenet.com/patent/search/family/088307719/publication/US2023334251A1?q=artificial%20intelligence>

Information source: (Espacenet Patent Search, 2023)



2.7. Method and system of transaction settlement and smart contract access using guarantee tokens

A method for transaction settlement using guarantee tokens includes: receiving a transaction request from a first financial institution including a receiving party digital address, a digital token issued by the first financial institution to the receiving party digital address, a sending party address, an asset network identification, and an asset identification.



Is a block diagram illustrating a high-level system architecture for transaction settlement and smart contract access using guarantee tokens in accordance with exemplary embodiments.

Credit: Fernandes, M.; Duris, O.; Goyal, R.; Maity, A. & Etheridge, M., Espacenet Patent Search

Generating a guarantee token against the digital token; generating an asset request transaction including the guarantee token, the receiving party digital address, the sending party digital address, and the asset identification; transmitting the asset request transaction to the asset network; receiving an asset transaction from the asset network including the asset, the receiving party digital address, and the sending party digital address; generating an asset transfer transaction including the receiving party digital address, the sending party digital address, and the asset identification; and transmitting the asset transaction to the receiving party digital address.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/086329392/publication/WO2023200945A1?q=Blockchain>

Reference

Fernandes, M.; Duris, O.; Goyal, R.; Maity, A. & Etheridge, M. (Oct 19, 2023). Method and system of transaction settlement and smart contract access using guarantee tokens. Recovered Oct 20 2023, Espacenet Patent Search:

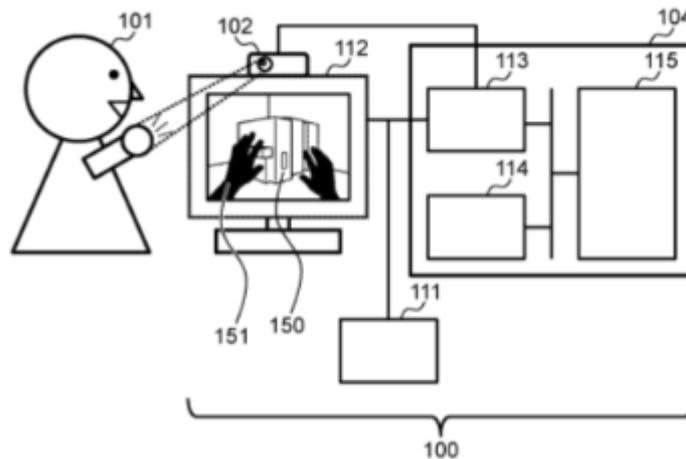
<https://worldwide.espacenet.com/patent/search/family/086329392/publication/WO2023200945A1?q=Blockchain>

Information source: (Espacenet Patent Search, 2023)



2.8. Work support system and work support method

An arithmetic apparatus displays a 3D work-target object in a 3D coordinate space on a display device, and receives a motion signal that is a signal representing a motion measured by any one of sensor units. When receiving the motion signal, the arithmetic apparatus identifies the measured motion based on the motion signal.



*Shows a configuration example of an entire system according to the first embodiment.
Credit: Numata, T.; Tajima, K.; Mitani, K. & Nakamura, T., Espacenet Patent Search*

When the identified motion is a motion regarding a spatial shift that is a shift of a viewpoint in the 3D coordinate space of a user, the arithmetic apparatus shifts the viewpoint in the 3D coordinate space of the user in accordance with the identified motion. When the identified motion is a hand motion regarding a work movement with respect to a work target, the arithmetic apparatus outputs output information including information representing the work movement in accordance with the identified motion.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088307773/publication/US2023333661A1?q=3d>

Reference

Numata, T.; Tajima, K.; Mitani, K. & Nakamura, T. (Oct 19, 2023). Work support system and work support method. Recovered Oct 23, 2023, Espacenet Patent Search:

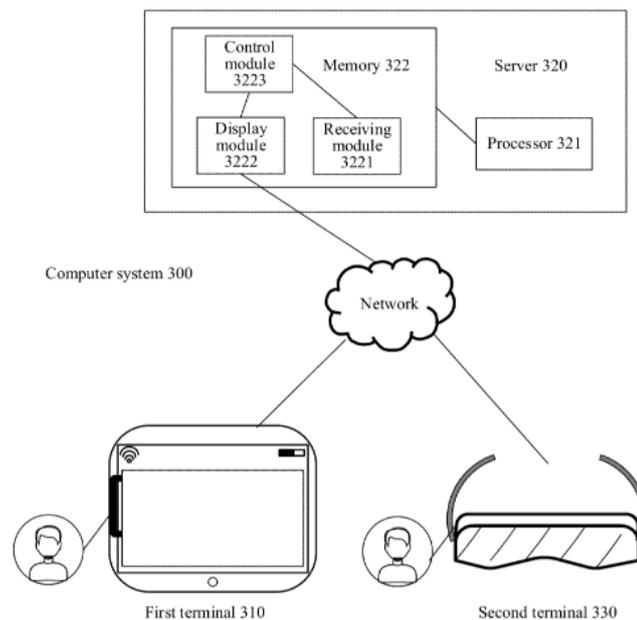
<https://worldwide.espacenet.com/patent/search/family/088307773/publication/US2023333661A1?q=3d>

Information source: (Espacenet Patent Search, 2023)



2.9. Method and apparatus for man-machine interaction based on story scene, device and medium

This application discloses a method for human-machine interaction based on a story scene performed by a terminal with a camera. The method includes the following steps: acquiring a real video stream collected by the camera, displaying an AR video stream based on the real video stream, changing a display content of the AR video stream in response to an interaction operation, and completing a reasoning task corresponding to the story scene based on the changed display content.



*Illustrates a structural block diagram of a computer system according to an exemplary embodiment of this application.
Credit: Dong, G., Espacenet Patent Search*

Since an AR background region is obtained by processing a background region in the real video stream and an AR character region is obtained by processing and replacing a foreground character region in the real video stream, a very immersive visual effect can be provided without requiring physical clothing, props and paper scripts, thus achieving a better visual experience while reducing the consumption of physical resources.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088308823/publication/US2023330541A1?q=virtual%20reality>

Reference

Dong, G. (Oct 19, 2023). Method and apparatus for man-machine interaction based on story scene, device and medium. Recovered Oct 23, 2023, Espacenet Patent Search:

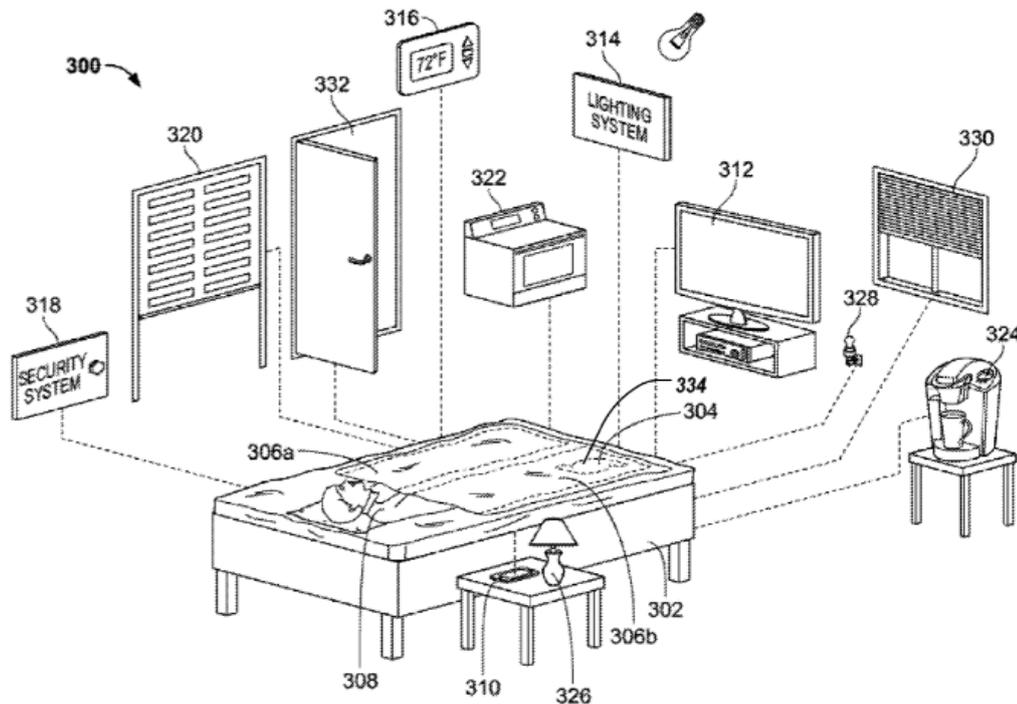
<https://worldwide.espacenet.com/patent/search/family/088308823/publication/US2023330541A1?q=virtual%20reality>

Information source: (Espacenet Patent Search, 2023)



2.10. Detecting and preventing sleepwalking events

A bed system detects and prevents user sleepwalking events. The system includes a sensor and computer system to receive data from the sensor during the user's sleep session, provide, as input to a sleep state classifier.



*Shows an example environment including a bed in communication with devices located in and around a home.
Credit: Garcia, G. & Shcherbakov, Y., Espacenet Patent Search*

A first portion of the data, the sleep state classifier using a Machine Learning model to determine the user's sleep states, receive, as output, a sleep state classification for the user, provide, as input to a bed exit detection classifier, a second portion of the sensor data, the bed exit detection classifier using a Machine Learning model to determine when the user exits the bed, receive, as output, a bed exit detection classification for the user, determine whether (i) the sleep state classification satisfies a first threshold condition and (ii) the bed exit detection classification satisfies a second threshold condition, generate, based on the determination, a probability of a sleepwalking event for the user.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/086286558/publication/US2023329583A1?q=machine%20learning>

Reference

Garcia, G. & Shcherbakov, Y. (Oct 19, 2023). Detecting and preventing sleepwalking events. Recovered Oct 23, 2023, Espacenet Patent Search:

<https://worldwide.espacenet.com/patent/search/family/086286558/publication/US2023329583A1?q=machine%20learning>

Information source: (Espacenet Patent Search, 2023)