



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 New research shows how brain inflammation in children may cause neurological disorders such as autism or schizophrenia

Severe inflammation in early childhood is a clinically known risk factor for developing autism and schizophrenia. Now, for the first time, scientists from the University of Maryland School of Medicine (UMSOM) have discovered that inflammation alters the development of vulnerable brain cells, and this could have mechanistic links to neurodevelopmental disorders. This finding could lead to treatments for many different childhood-onset neurodevelopmental disorders.



Credit: University of Maryland

Using single-cell genomics to study the brains of children who died from inflammatory conditions—such as a bacterial or viral infections or asthma—along with those who died from a sudden accident, researchers from the University of Maryland School of Medicine (UMSOM) led a study that found inflammation in early childhood prevents specific neurons in the cerebellum from maturing completely. The cerebellum is a brain region responsible for motor control and higher cognitive functions used in language, social skills, and emotional regulation.

For more information, visit the following link:

<https://www.medschool.umaryland.edu/news/2023/New-Research-Shows-How-Brain-Inflammation-in-Children-May-Cause-Neurological-Disorders-Such-as-Autism-or-Schizophrenia.html>

Reference

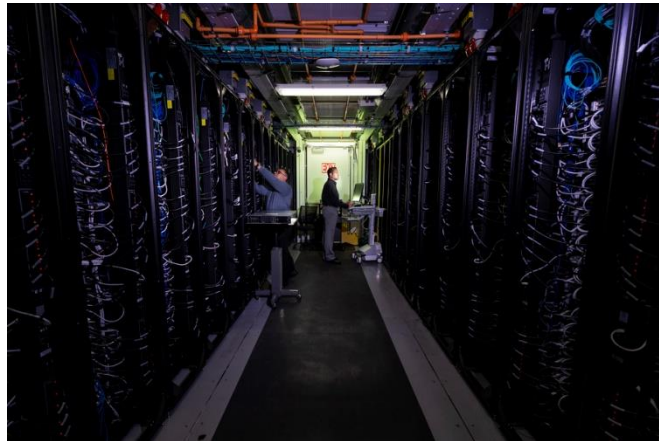
Aungst, H. (Oct 12, 2023). New research shows how brain inflammation in children may cause neurological disorders such as autism or schizophrenia. Recovered Oct 12, 2023, University of Maryland: <https://www.medschool.umaryland.edu/news/2023/New-Research-Shows-How-Brain-Inflammation-in-Children-May-Cause-Neurological-Disorders-Such-as-Autism-or-Schizophrenia.html>

Information source: (University of Maryland, 2023)



1.2 New tools are available to help reduce the energy that Artificial Intelligence models devour

When searching for flights on Google, you may have noticed that each flight's carbon-emission estimate is now presented next to its cost. It's a way to inform customers about their environmental impact, and to let them factor this information into their decision-making. A similar kind of transparency doesn't yet exist for the computing industry, despite its carbon emissions exceeding those of the entire airline industry. Escalating this energy demand are Artificial Intelligence models. Huge, popular models like ChatGPT signal a trend of large-scale Artificial Intelligence, boosting forecasts that predict data centers will draw up to 21 percent of the world's electricity supply by 2030.



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: Glen Cooper, Massachusetts Institute of Technology

The MIT Lincoln Laboratory Supercomputing Center (LLSC) is developing techniques to help data centers reel in energy use. Their techniques range from simple but effective changes, like power-capping hardware, to adopting novel tools that can stop AI training early on. Crucially, they have found that these techniques have a minimal impact on model performance. In the wider picture, their work is mobilizing green-computing research and promoting a culture of transparency.

For more information, visit the following link:

<https://news.mit.edu/2023/new-tools-available-reduce-energy-that-ai-models-devour-1005>

Reference

Foy, K. (Oct 05, 2023). New tools are available to help reduce the energy that AI models devour. Recovered Oct 10, 2023, Massachusetts Institute of Technology:

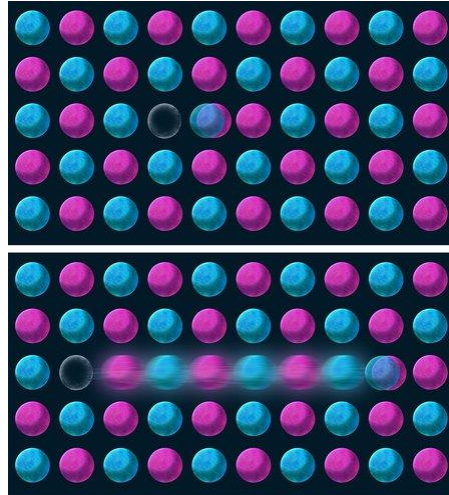
<https://news.mit.edu/2023/new-tools-available-reduce-energy-that-ai-models-devour-1005>

Information source: (Massachusetts Institute of Technology, 2023)



1.3 Magnetically bound excitons

Excitons are a key part of many technologies, including solar panels, photodetectors and sensors, as well as light-emitting diodes found in televisions and digital display screens. In most cases, the exciton pairs are bound by electrical, or electrostatic, forces, also known as Coulomb interactions. Now, in a new study in Nature Physics, Caltech researchers report detecting excitons that are not bound via Coulomb forces but rather by magnetism. This is the first experiment to detect how these so-called Hubbard excitons, named after the late physicist John Hubbard, form in real-time.



In materials known as antiferromagnetic Mott insulators, electrons (orbs) are organized in a lattice structure of atoms such that their spins point up (blue) or down (pink) in an alternating pattern.
Credit: Caltech

The results could have applications in the development of new exciton-related technologies, or excitonics, in which the excitons would be manipulated through their magnetic properties. *"Hubbard excitons and their magnetic binding mechanism demonstrate a drastic departure from the paradigms of traditional excitonics, creating the opportunity to develop a whole ecosystem of novel technologies that are fundamentally unavailable in conventional excitonic systems,"* Mehio says. *"Having excitons and magnetism strongly intertwined in a single material could lead to new technologies that harness both properties."*

For more information, visit the following link:

<https://www.caltech.edu/about/news/physicists-find-evidence-for-magnetically-bound-excitons>

Reference

Clavin, W. (Oct 05, 2023). Physicists find evidence for magnetically bound excitons. Recovered Oct 10, 2023, California Institute of Technology:

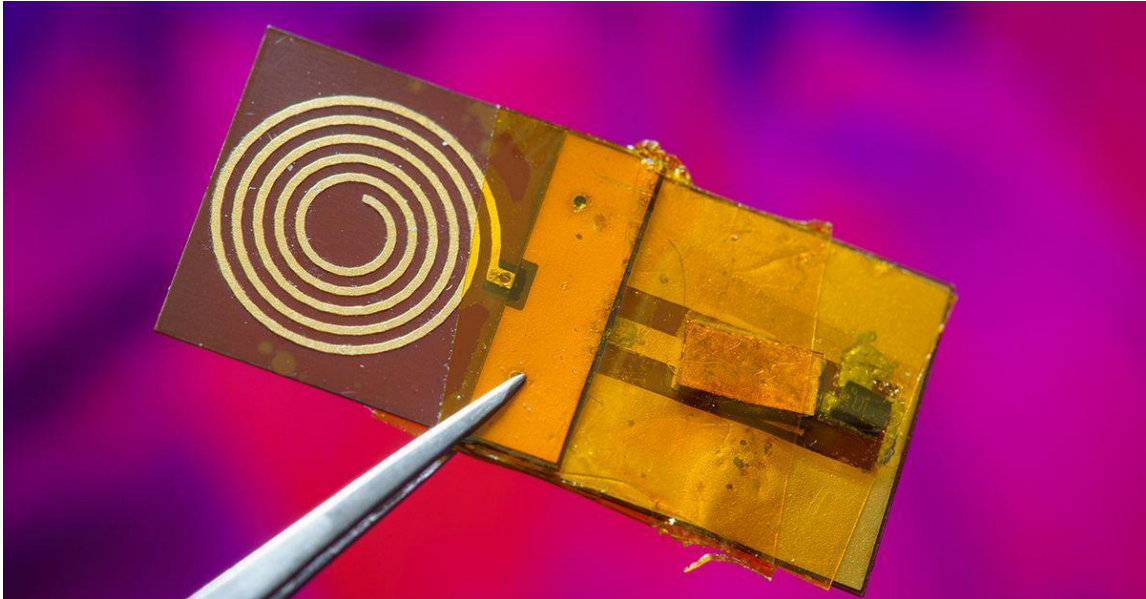
<https://www.caltech.edu/about/news/physicists-find-evidence-for-magnetically-bound-excitons>

Information source: (California Institute of Technology, 2023)



1.4 Wireless, battery-free electronic “Stickers” gauge forces between touching objects

Engineers at the University of California San Diego have developed electronic “stickers” that measure the force exerted by one object upon another. The force stickers are wireless, run without batteries and fit in tight spaces. That makes them versatile for a wide range of applications, from arming robots with a sense of touch to elevating the immersive experience of VR and AR, making biomedical devices smarter, monitoring the safety of industrial equipment, and improving the accuracy and efficiency of inventory management in warehouses.



*This so-called "force sticker" is a thin, flexible electronic device that measures forces between objects in contact.
Credit: David Baillot, University of California - San Diego Jacobs School of Engineering*

They could be used, for example, in knee implants to measure the forces that implants exert on the joint. Having the ability to sense changes in these forces can be useful for monitoring an implant’s fit, as well as wear and tear. Force stickers could also be placed on the bottom of warehouse packages to measure the weight of their contents, acting as miniature scales for checking inventory.

For more information, visit the following link:

<https://today.ucsd.edu/story/wireless-battery-free-electronic-stickers-gauge-forces-between-touching-objects>

Reference

Labios, L. (Oct 10, 2023). Wireless, battery-free electronic “stickers” gauge forces between touching objects. Recovered Oct 10, 2023, University of California – San Diego:
<https://today.ucsd.edu/story/wireless-battery-free-electronic-stickers-gauge-forces-between-touching-objects>

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



1.5 Artificial Intelligence language models could help diagnose schizophrenia

Scientists at the UCL Queen Square Institute for Neurology have developed new tools, based on Artificial Intelligence language models, that can characterise subtle signatures in the speech of patients diagnosed with schizophrenia.



Credit: University College London

The research, published in PNAS, aims to understand how the automated analysis of language could help doctors and scientists diagnose and assess psychiatric conditions. Currently, psychiatric diagnosis is based almost entirely on talking with patients and those close to them, with only a minimal role for tests such as blood tests and brain scans. However, this lack of precision prevents a richer understanding of the causes of mental illness, and the monitoring of treatment. The researchers asked 26 participants with schizophrenia and 26 control participants to complete two verbal fluency tasks, where they were asked to name as many words as they could either belonging to the category “animals” or starting with the letter “p”, in five minutes. To analyse the answers given by participants, the team used an AI language model that had been trained on vast amounts of internet text to represent the meaning of words in a similar way to humans. They tested whether the words people spontaneously recalled could be predicted by the AI model, and whether this predictability was reduced in patients with schizophrenia.

For more information, visit the following link:

<https://www.ucl.ac.uk/news/2023/oct/ai-language-models-could-help-diagnose-schizophrenia>

Reference

Danby, P. (Oct 09, 2023). AI language models could help diagnose schizophrenia. Recovered Oct 10, 2023, University College London:

<https://www.ucl.ac.uk/news/2023/oct/ai-language-models-could-help-diagnose-schizophrenia>

Information source: (University College London, 2023)



1.6 3D-printed sweat sensor one of world's top healthcare innovations in 2023

A 3D-printed wearable sweat sensor that can detect a variety of health conditions in real time, developed at the University of Hawai'i at Mānoa, Created by Assistant Professor Tyler Ray in the University of Hawai'i Mānoa College of Engineering, the sensor collects and analyzes sweat to provide vital health insights or diagnose serious conditions like cystic fibrosis. The device utilizes 3D-printing technology to pave the way for accessible, convenient and insightful personal health monitoring.



Credit: University of Hawai'i

“As our group seeks to advance health equity through improved access to preventative technologies, it’s gratifying to see our sweat sensor research recognized as a promising innovation,” said Ray. “However, much work remains to fully realize the promise of our platform as our ultimate goal is to pioneer digital health tools that detect conditions early and holistically preserve human health.”

For more information, visit the following link:

<https://www.hawaii.edu/news/2023/10/05/sweat-sensor-top-healthcare-innovation/>

Reference

University of Hawai'i. (Oct 05, 2023). 3D-printed sweat sensor one of world's top healthcare innovations in 2023. Recovered Oct 10, 2023, University of Hawai'i:
<https://www.hawaii.edu/news/2023/10/05/sweat-sensor-top-healthcare-innovation/>

Information source: (University of Hawai'i, 2023)



1.7 These robots helped understand how insects evolved two distinct strategies of flight

Picture a smartphone clad in a casing that's not just for protection but also doubles as a reservoir of electricity, or an electric car where the doors and floorboard store energy to propel it forward. Such technologies may one day be a reality, thanks to recent work by engineers at the University of California San Diego.



This miniature boat is built from a structural supercapacitor—a material that provides both structural support and energy storage capabilities.

Credit: David Baillot, University of California - San Diego Jacobs School of Engineering

The researchers have developed what's called a structural supercapacitor—a device that provides both structural support and energy storage capabilities. Such a device could add more power to electronic gadgets and vehicles without adding extra weight, allowing them to last longer on a single charge. While the concept of structural supercapacitors is not entirely new, it has been a longstanding challenge to create a single device that excels at both bearing mechanical loads and storing electrical energy efficiently. Traditional supercapacitors are great at energy storage but lack the mechanical strength to serve as structural components. On the flip side, structural materials can provide support but fall short when it comes to energy storage.

For more information, visit the following link:

<https://today.ucsd.edu/story/new-energy-storing-material-could-also-be-used-to-build-electronic-gadgets>

Reference

Labios, L. (Oct 05 2023). New energy-storing material could also be used to build electronic gadgets.

Recovered Oct 11, 2023, University of California - San Diego:

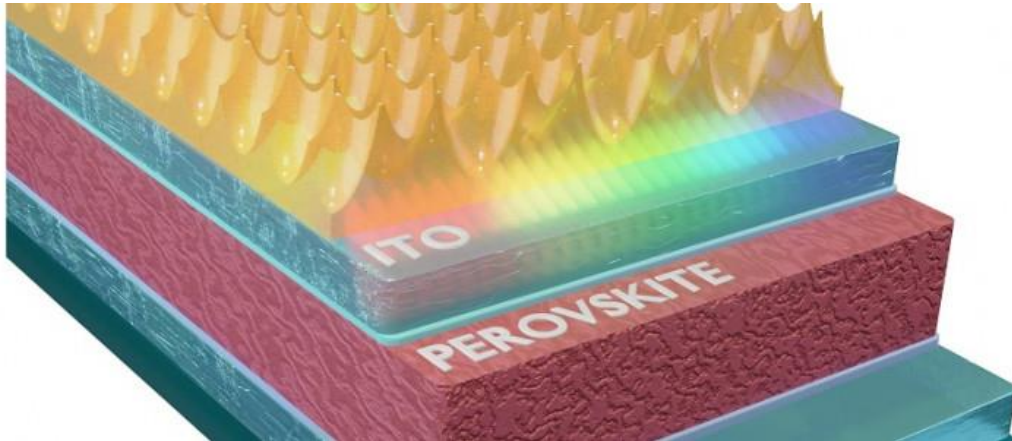
<https://today.ucsd.edu/story/new-energy-storing-material-could-also-be-used-to-build-electronic-gadgets>

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



1.8 New technology of perovskite photovoltaic cells

A team of scientists from the Faculty of Physics at the University of Warsaw and the Fraunhofer Institute for Solar Energy presented perovskite photovoltaic cells with significantly improved optoelectronic properties.



Credit: University of Warsaw

Silicon has been the most commonly used material for producing photovoltaic panels, yet currently cells based on this element are approaching their physical efficiency limits. Therefore, scientists are actively exploring innovative solutions targeted at enhancing cell efficiency and simultaneously enabling cheaper and more environmentally friendly production. Perovskite-based cells meet both of these criteria. Currently, numerous research institutes worldwide are working on improving their efficiency and resistance to atmospheric conditions. One of the challenges they are facing is the integration of perovskite cells with silicon cells while simultaneously reducing losses from reflection and parasitic absorption.

For more information, visit the following link:

<https://en.uw.edu.pl/new-technology-of-perovskite-photovoltaic-cells/>

Reference

University of Warsaw. (Oct 11, 2023). New technology of perovskite photovoltaic cells. Recovered Oct 11, 2023, University of Warsaw:

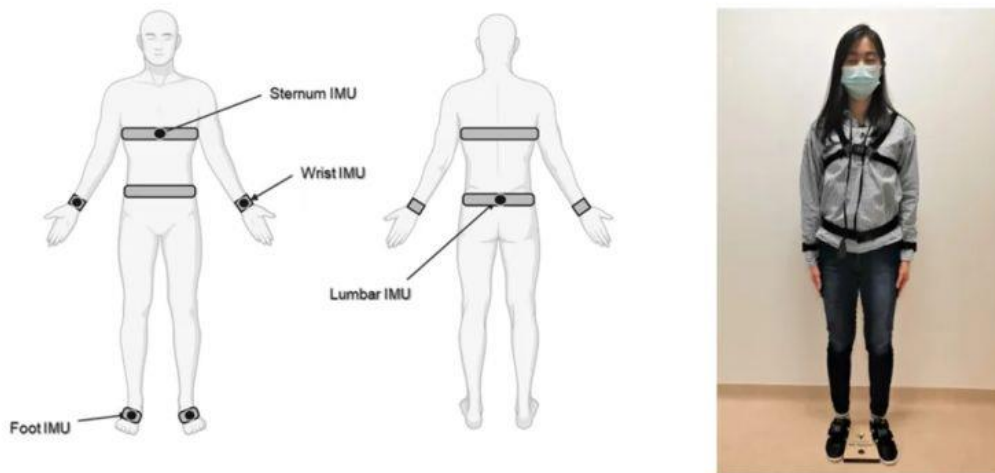
<https://en.uw.edu.pl/new-technology-of-perovskite-photovoltaic-cells/>

Information source: (University of Warsaw, 2023)



1.9 Wearable sensors provide early detection of progression in Parkinson's Disease

A team of researchers from the University of Oxford has shown for the first time that it is possible to track the progression of Parkinson's Disease accurately using specially trained Machine Learning algorithms to analyse data derived from sensor devices worn by patients.



*Wearable sensors provide early detection of progression in Parkinson's Disease
Credit: University of Oxford*

Professor Antoniadis' NeuroMetrology Lab have been carrying out experiments to assess whether sensor devices worn by patients on their trunk, wrists, and feet, combined with Machine Learning, can track the progression of motor symptoms more accurately than traditional rating scales. They and others have previously demonstrated that the analysis of data from wearable devices using Machine Learning algorithms can help with accurate diagnosis. It is already known that these new techniques can be used to discriminate between healthy older adults, individuals with different severity of Parkinson's disease, and individuals with other Parkinsonian-like disorders.

For more information, visit the following link:

<https://www.ox.ac.uk/news/2023-10-11-wearable-sensors-provide-early-detection-progression-parkinson-s-disease>

Reference

University of Oxford. (Oct 11, 2023). Wearable sensors provide early detection of progression in Parkinson's Disease. Recovered Oct 11, 2023, University of Oxford:

<https://www.ox.ac.uk/news/2023-10-11-wearable-sensors-provide-early-detection-progression-parkinson-s-disease>

Information source: (University of Oxford, 2023)



1.10 Making rad maps with robot dogs

Scientists at the Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) are teaching a robotic dog to intelligently hunt out radiological material using a self-contained suite of sensors on its back.



*Spot carries a LAMP system during testing.
Credit: Thor Swift, Berkeley Lab*

"It can take a long time to see improvement in radiological technology like gamma-ray detectors, so we're defining the state-of-the-art by leveraging other sensor types," said Ren Cooper, deputy head of Berkeley Lab's Applied Nuclear Physics (ANP) program. *"It's not just nuclear physics – it's robotics, computer vision, software, and other elements coming together that enable societal benefits."* Those applications include improved nuclear safety by monitoring radioactive sources used at power plants, particle accelerators, or in hospitals; nuclear security and non-proliferation efforts; environmental cleanup and remediation; and emergency response to disasters.

For more information, visit the following link:

<https://newscenter.lbl.gov/2023/10/11/making-rad-maps-with-robot-dogs/>

Reference

Biron, L. (Oct 11 2023). Making rad maps with robot dogs. Recovered Oct 11, 2023, Lawrence Berkeley National Laboratory:

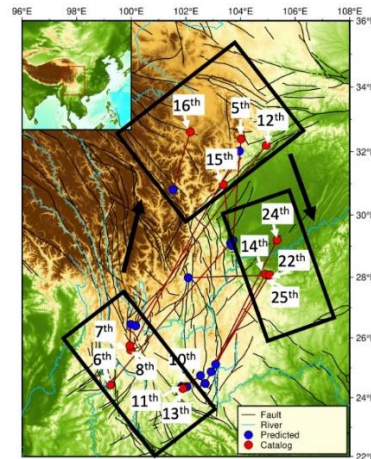
<https://newscenter.lbl.gov/2023/10/11/making-rad-maps-with-robot-dogs/>

Information source: (Lawrence Berkeley National Laboratory, 2023)



1.11 Artificial Intelligence-driven earthquake forecasting shows promise in trials

A new attempt to predict earthquakes with the aid of Artificial Intelligence (AI) has raised hopes that the technology could one day be used to limit earthquakes' impact on lives and economies. Developed by researchers at The University of Texas at Austin, the AI algorithm correctly predicted 70% of earthquakes a week before they happened during a seven-month trial in China.



*This map shows the location in China of the AI-predicted earthquakes (blue dots) joined by a red line to where each actual earthquake happened (red dots). The numbers indicate the week the earthquake occurred. During the 30-week trial, the UT Austin-developed AI missed only one earthquake.
Credit: Yangkang Chen, Jackson School of Geosciences.*

The AI was trained to detect statistical bumps in real-time seismic data that researchers had paired with previous earthquakes. The outcome was a weekly forecast in which the AI successfully predicted 14 earthquakes within about 200 miles of where it estimated they would happen and at almost exactly the calculated strength. It missed one earthquake and gave eight false warnings. It's not yet known if the same approach will work at other locations, but the effort is a milestone in research for AI-driven earthquake forecasting. *"Predicting earthquakes is the holy grail,"* said Sergey Fomel, a professor in UT's Bureau of Economic Geology and a member of the research team. *"We're not yet close to making predictions for anywhere in the world, but what we achieved tells us that what we thought was an impossible problem is solvable in principle."*

For more information, visit the following link:

<https://news.utexas.edu/2023/10/05/ai-driven-earthquake-forecasting-shows-promise-in-trials>

Reference

Panagopulos, C. (Oct 05, 2023). AI-driven earthquake forecasting shows promise in trials. Recovered Oct 11, 2023, The University of Texas at Austin:

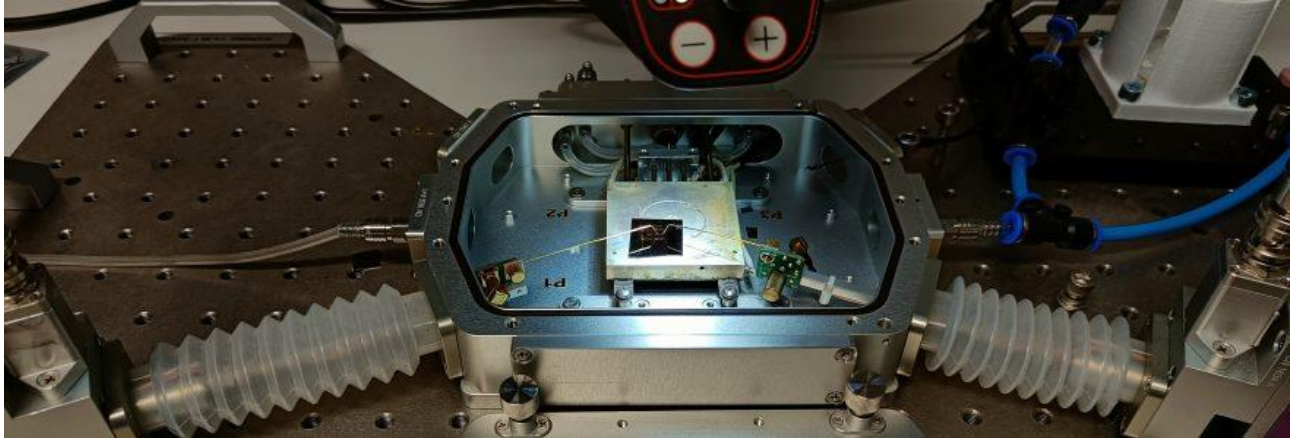
<https://news.utexas.edu/2023/10/05/ai-driven-earthquake-forecasting-shows-promise-in-trials>

Information source: (The University of Texas at Austin, 2023)



1.12 Innovative chemical sensors

Scientists from the University of Warsaw developed a new method for producing chemical sensors built from nanostructured transition metal oxides. The results of their research make a significant contribution in the field of nanomaterial synthesis and sensing technologies.



Credit: University of Warsaw

The researchers from the UW's Faculties of Chemistry and Physics have proposed a one-step synthesis of nanowires (structures resembling human hair in appearance but with a diameter 1,000 times smaller) built from metal oxides. For this purpose, they used block copolymers that act as a "scaffold" forming the structure of the obtained nanomaterials. This method simplifies the previously used multi-step process of obtaining such nanostructures. It involves a one-step self-organisation of the block copolymer in solution in the presence of inorganic salt directly during the deposition of the material on the substrate.

For more information, visit the following link:

<https://en.uw.edu.pl/innovative-chemical-sensors/>

Reference

University of Warsaw. (Oct 11, 2023). Innovative chemical sensors. Recovered Oct 11, 2023, University of Warsaw:

<https://en.uw.edu.pl/innovative-chemical-sensors/>

Information source: (University of Warsaw, 2023)



1.13 Plastic use in agriculture must be reduced

Demokritou, Henry Rutgers Chair and Professor at the Rutgers School of Public Health, said researchers suggest more sustainable approaches to using plastics in agriculture, like collecting, reusing and recycling plastics. When it is not possible to take this approach, *“biodegradable and nontoxic bioplastics rather than petroleum-based plastics should be used to ensure complete biodegradation.”*



Credit: Rutgers - The State University of New Jersey

While plastics play a crucial role in modern agricultural practices, serving various functions such as mulch films, nets, storage bins, and helping to increase the amount of food that is produced while decreasing the ecological resources used by controlling weeds and pests, preserving soil moisture, regulating temperature and improving nutrient uptake and plant growth, their extensive use has led to significant waste. The consequences on human and environmental health are also poorly understood.

For more information, visit the following link:

<https://www.rutgers.edu/news/plastic-use-agriculture-must-be-reduced-according-new-research>

Reference

Edelstein, M. (Oct 11, 2023). Plastic use in agriculture must be reduced, according to new research. Recovered Oct 11, 2023, Rutgers - The State University of New Jersey:

<https://www.rutgers.edu/news/plastic-use-agriculture-must-be-reduced-according-new-research>

Information source: (Rutgers - The State University of New Jersey, 2023)



1.14 Bio-nose that smells for real

The toddler game “got your nose!” brings gales of laughter as we pretend to snatch the facial feature. But a real-life ability to transport the sense of smell elsewhere—and even enhance it beyond normal human limits—could help in activities ranging from cooking to sniffing out chemical hazards to tracking the location of a lost person.



Credit: University of Maryland Institute for Advanced Computer Studies

Now, a UMD research team’s ambitious “*bio-nose*” project aims to create a portable, biologically based device capable of identifying odors in the built environment, backed by a four-year, \$2 million grant from the National Science Foundation. “*If we had handheld devices that could recognize complex odors, a lot of things would be possible,*” says Elisabeth Smela, a professor of mechanical engineering who is leading the project. “*There are applications in food, wine, perfumes, medical diagnostics, homeland security, agriculture, mold detection and more.*”

For more information, visit the following link:

<https://www.umiacs.umd.edu/about-us/news/umd-researchers-are-creating-bio-nose-smells-real>.

Reference

University of Maryland Institute for Advanced Computer Studies. (Oct 11, 2023). “*Impossible*” millimeter wave sensor has wide potential. Recovered Oct 12, 2023, University of Maryland Institute for Advanced Computer Studies:

<https://www.umiacs.umd.edu/about-us/news/umd-researchers-are-creating-bio-nose-smells-real>

Information source: (University of Maryland Institute for Advanced Computer Studies, 2023)



1.15 Device to combat kidney failure in newborns

Before a baby is born, doctors hope for a safe delivery, and parents hope for a healthy child. Unfortunately, conditions such as kidney failure can only be detected after birth and require immediate treatment. These patients need peritoneal dialysis to help regulate kidney function, and although lifesaving, this treatment can lead to fluid leakage and requires a lengthy healing process.



Credit: Texas A&M University College of Engineering

A team of six students in the Department of Biomedical Engineering at Texas A&M University designed custom dialysis cuffs and a T-shaped applicator sleeve to improve the peritoneal dialysis process. The team called Rapid Cuff is sponsored by Texas Children's Hospital (TCH) and advised by Dr. Daniel Alge, associate professor in the biomedical engineering department, and his brother Dr. Joseph Alge, previously with TCH and currently a pediatric nephrologist at Arkansas Children's Hospital.

For more information, visit the following link:

<https://engineering.tamu.edu/news/2023/10/aggies-develop-device-to-combat-kidney-failure-in-newborns.html>

Reference

Satterlee, K. (Oct 12, 2023). Aggies develop device to combat kidney failure in newborns. Recovered Oct 12, 2023, Texas A&M University College of Engineering:

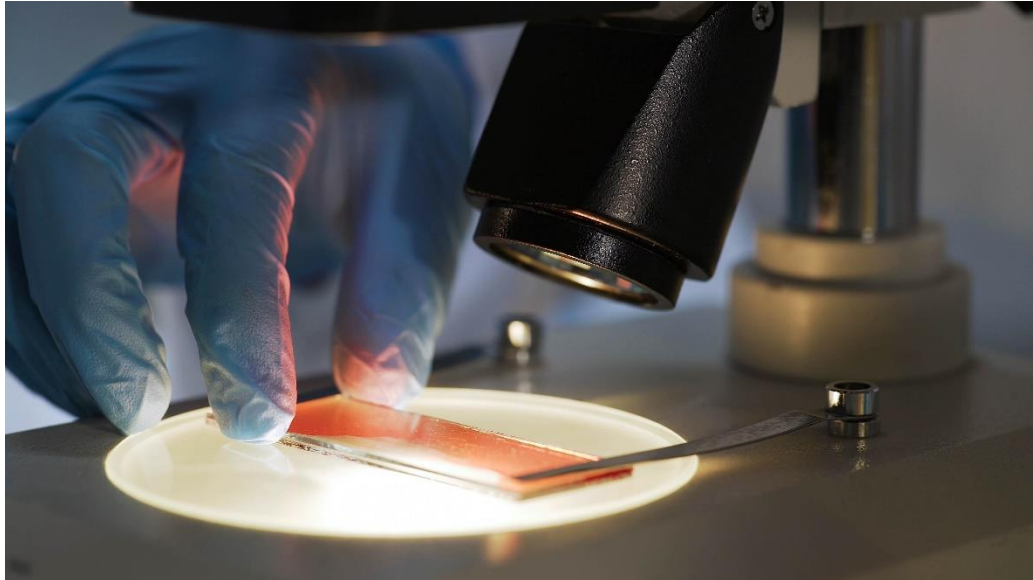
<https://engineering.tamu.edu/news/2023/10/aggies-develop-device-to-combat-kidney-failure-in-newborns.html>

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



1.16 Breakthrough “nanobody” technology

Birmingham researchers created antibody fragments called nanobodies to help scientists understand more about platelet disorders such as bleeding or thrombosis. Researchers led by Professor Steve Watson and Dr Eleya Martin from the Institute of Cardiovascular Sciences at the University of Birmingham have delivered a breakthrough for thrombosis researchers, by producing the first binding molecules (ligands) of defined composition to make platelets clump together in a predictable way.



Credit: University of Birmingham

The nanobodies can be used to develop validated clinical assays for testing patients with platelet disorders such as bleeding or thrombosis, and as research tools to study platelet activation. Professor Watson said: *“Nanobodies have the same properties as antibodies but have several inherent advantages for platelet researchers. They are smaller, which makes them more suitable for cross-linking, and this size, coupled with their stability and high affinity for platelet receptors, makes them ideal reagents for receptor imaging.”*

For more information, visit the following link:

<https://www.birmingham.ac.uk/news/2023/birmingham-platelet-group-delivers-breakthrough-nanobody-technology>.

Reference

Watson, S.; Martin, E. & Poulter, N. (Oct 12, 2023). Birmingham platelet group delivers breakthrough “nanobody” technology. Recovered Oct 12, 2023, University of Birmingham:

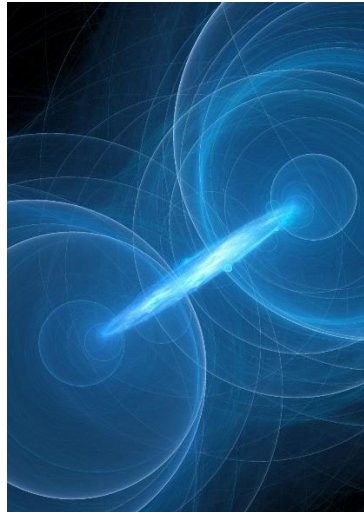
<https://www.birmingham.ac.uk/news/2023/birmingham-platelet-group-delivers-breakthrough-nanobody-technology>

Information source: (University of Birmingham, 2023)



1.17 Self-correcting quantum computers within reach?

Quantum computers promise to reach speeds and efficiencies impossible for even the fastest supercomputers of today. Yet the technology hasn't seen much scale-up and commercialization largely due to its inability to self-correct. Quantum computers, unlike classical ones, cannot correct errors by copying encoded data over and over. Scientists had to find another way. Leading the Harvard team is quantum optics expert Mikhail Lukin, the Joshua and Beth Friedman University Professor in physics and co-director of the Harvard Quantum Initiative. Also involved was the group of Markus Greiner, the George Vasmer Leverett Professor of Physics.



Credit: The Harvard Gazette

An effort spanning the last several years, the Harvard platform is built on an array of very cold, laser-trapped rubidium atoms. Each atom acts as a bit — or a “qubit” as it’s called in the quantum world — which can perform extremely fast calculations. The team’s chief innovation is configuring their “neutral atom array” to be able to dynamically change its layout by moving and connecting atoms — this is called “entangling” in physics parlance — mid-computation. Operations that entangle pairs of atoms, called two-qubit logic gates, are units of computing power.

For more information, visit the following link:

<https://news.harvard.edu/gazette/story/2023/10/self-correcting-quantum-computers-within-reach-error-correction-entanglement/>

Reference

Manning, A. (Oct 11, 2023). Self-correcting quantum computers within reach?. Recovered Oct 12, 2023, The Harvard Gazette:

<https://news.harvard.edu/gazette/story/2023/10/self-correcting-quantum-computers-within-reach-error-correction-entanglement/>

Information source: (The Harvard Gazette, 2023)



1.18 New catalyst could provide liquid hydrogen fuel of the future

Researchers at Lund University in Sweden are investigating a car fuel comprised of a liquid that is converted to hydrogen by a solid catalyst. The used liquid is then emptied from the tank and charged with hydrogen, after which it can be used again in a circular system that is free from greenhouse gas emissions. In two research articles, Lund researchers have demonstrated that the method works, and while it is still basic research, it has the potential to become an efficient energy-storage system in the future.



A car is refueled with a liquid containing hydrogen. The fuel passes through the catalytic converter, where hydrogen is released into a fuel cell. When the hydrogen runs out, it is drained and filled with new liquid at the gas station.
Credit: Lund University

“Our catalyst is one of the most efficient around, at least if you look at publicly available research,” says Ola Wendt, professor at the Department of Chemistry at Lund University, and one of the authors. Finding alternative ways of producing, storing and transforming energy in order to reduce carbon dioxide emissions from fossil fuels is necessary to reduce the impact on the climate. One way involves much-talked-about hydrogen gas, which many see as a future solution for energy storage. Nature stores energy in chemical bonds, and hydrogen contains the highest energy density in relation to its weight.

For more information, visit the following link:

<https://www.lunduniversity.lu.se/article/new-catalyst-could-provide-liquid-hydrogen-fuel-future>

Reference

Wendt, O. (Oct 12, 2023). New catalyst could provide liquid hydrogen fuel of the future. Recovered Oct 12, 2023, Lund University:

<https://www.lunduniversity.lu.se/article/new-catalyst-could-provide-liquid-hydrogen-fuel-future>

Information source: (Lund University, 2023)



1.19 Study advances understanding of Visual Recognition Memory

Because figuring out what is new and what is familiar in what we see is such a critically important ability for prioritizing our attention, neuroscientists have spent decades trying to figure out how our brains are typically so good at it. Along the way they've made key observations that seem outright contradictory, but a new study shows that the mystifying measures are really two sides of the same coin, paving the way for a long-sought understanding of "Visual Recognition Memory" (VRM).



It's often critical that we filter out what's familiar in a scene so we notice what's new (like a burglar trying to break in). In a new study, MIT neuroscientists made progress in figuring out how the brain implements the needed ability: Visual Recognition Memory.

Credit: AdobeStock, Massachusetts Institute of Technology

VRM is the ability to quickly recognize the familiar things in scenes, which can then be de-prioritized so that we can focus on the new things that might be more important in a given moment. Imagine you walk into your home office one evening to respond to an urgent, late email. There you see all the usual furniture and equipment - and a burglar. VRM helps ensure that you'd focus on the burglar, not your book shelves or your desk lamp.

For more information, visit the following link:

<https://news.mit.edu/2023/study-advances-understanding-visual-recognition-memory-1011>

Reference

Orenstein, D. (Oct 11, 2023). Study advances understanding of Visual Recognition Memory. Recovered Oct 12, 2023, Massachusetts Institute of Technology:

<https://news.mit.edu/2023/study-advances-understanding-visual-recognition-memory-1011>

Information source: (Massachusetts Institute of Technology, 2023)



1.20 New cyber algorithm shuts down malicious robotic attack

Australian researchers have designed an algorithm that can intercept a man-in-the-middle (MitM) cyberattack on an unmanned military robot and shut it down in seconds.



*The GVR-Bot used in the experiment by UniSA and Charles Sturt AI researchers.
Credit: Australian University*

In an experiment using deep learning neural networks to simulate the behaviour of the human brain, Artificial Intelligence experts from Charles Sturt University and the University of South Australia (UniSA) trained the robot's operating system to learn the signature of a MitM eavesdropping cyberattack. This is where attackers interrupt an existing conversation or data transfer. The algorithm, tested in real time on a replica of a United States army combat ground vehicle, was 99% successful in preventing a malicious attack. False positive rates of less than 2% validated the system, demonstrating its effectiveness.

For more information, visit the following link:

<https://www.unisa.edu.au/media-centre/Releases/2023/new-cyber-algorithm-shuts-down-malicious-robotic-attack>

Reference

Reynolds, W. (Oct 12, 2023). New cyber algorithm shuts down malicious robotic attack. Recovered Oct 12, 2023, Australian University:

<https://www.unisa.edu.au/media-centre/Releases/2023/new-cyber-algorithm-shuts-down-malicious-robotic-attack>

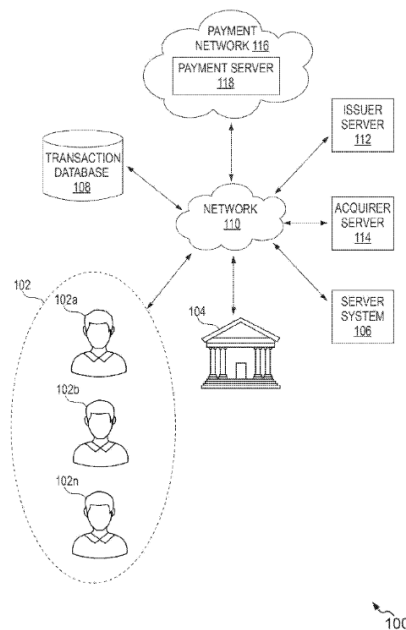
Information source: (Australian University, 2023)



II. PATENTS

2.1. Artificial Intelligence based methods and systems for detecting common points of purchase compromised merchants

Embodiments provide methods and systems for detecting common points of purchase (CPP) compromised merchants. The method performed by a server system includes accessing historical payment transaction data, associated with fraudulent payment transactions from a transaction database. The method includes defining a base graph based on the historical payment transaction data.



Illustrates an exemplary representation of an environment related to at least some embodiments of the present disclosure

Credit: Ranjan, R.; Powar, S.; Syngal, S.; Katyal, Y.; Pant, N. & Das, D., WIPO IP Portal

During each iteration, the method includes generating a sub-graph based on the base graph and determining blame scores assigned to a set of merchants involved in the sub-graph based on prior fraud probabilities associated with the set of merchants calculated in a previous iteration. During each iteration, the method also includes calculating posterior fraud probabilities at current iteration associated with the set of merchants based on the blame scores and a CPP model. The method, includes determining CPP compromise scores associated with a plurality of merchants based on final posterior fraud probabilities of the plurality of merchants at final iteration.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023192473&_cid=P21-LNOPTM-87427-1

Reference

Ranjan, R.; Powar, S.; Syngal, S.; Katyal, Y.; Pant, N. & Das, D. (Oct 05, 2023). Artificial Intelligence based methods and systems for detecting common points of purchase compromised merchants. Recovered Oct 06, 2023, WIPO IP Portal:

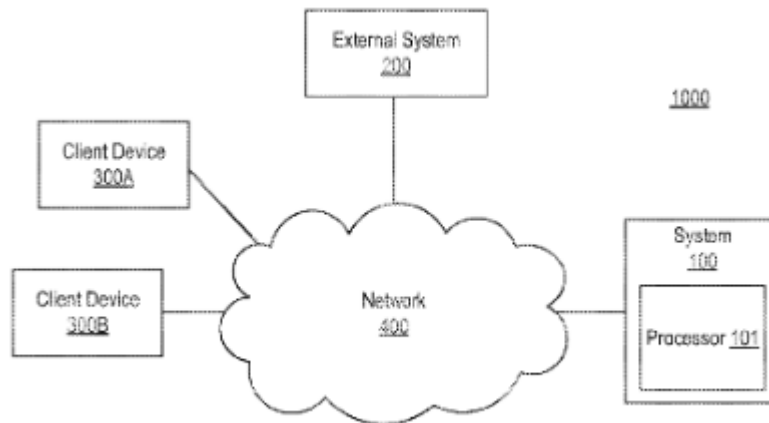
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023192473&_cid=P21-LNOPTM-87427-1

Information source: (WIPO IP Portal, 2023)



2.2. Generation and implementation of a configurable measurement platform using Artificial Intelligence and Machine Learning based techniques

According to examples, a system for using Artificial Intelligence (AI) and Machine Learning (ML) techniques to generate and implement a configurable measurement platform is described. The system may include a processor and a memory storing instructions.



Illustrates a block diagram of a system environment, including a system, that may be implemented to utilize Artificial Intelligence (AI) and Machine Learning (ML) techniques to generate and implement a configurable measurement platform.

Credit: Zolla, A.; Bulach, M.; Sharma, A.; Bravo, C.; Szili, A.; Winn, M. & Smirnov, D., WIPO IP Portal

The processor, when executing the instructions, may cause the system to access information associated with one or more events occurring on a platform with event activity, log and analyze the one or more events to generate measurement data associated with the event activity, and generate a metric associated with the measurement data. The processor, when executing the instructions, may then generate a computed metric value associated with the metric utilizing the measurement data, implement a platform computation utilizing the computed metric value, and facilitate a decision associated with the platform based on the platform computation.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023192263&_cid=P21-LNOPTM-87427-1

Reference

Zolla, A.; Bulach, M.; Sharma, A.; Bravo, C.; Szili, A.; Winn, M. & Smirnov, D. (Oct 05, 2023). Generation and implementation of a configurable measurement platform using Artificial Intelligence (AI) and Machine Learning (ML) based techniques. Recovered Oct 06, 2023, WIPO IP Portal:

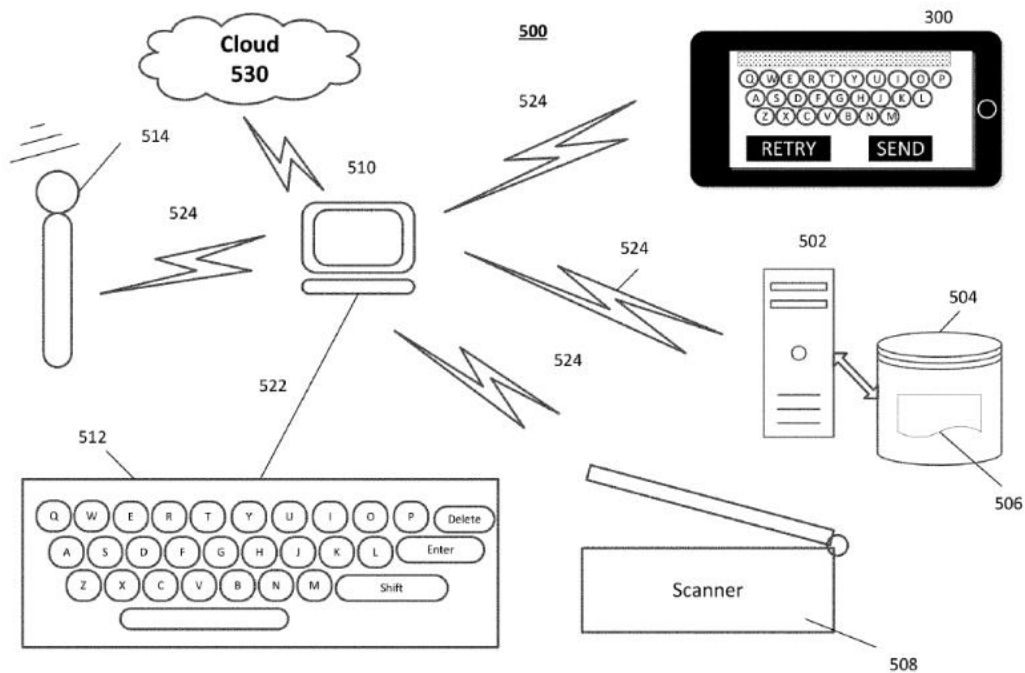
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023192263&_cid=P21-LNOPTM-87427-1

Information source: (WIPO IP Portal, 2023)



2.3. System and method for handwriting generation

A system and computer readable storage medium for automated handwriting generation, including a text input device for inputting a text query having at least one textual word string, an image input device for inputting a handwriting sample with characters in a writing style of a user, and a computer implemented deep learning transformer model including an encoder network and a decoder network in which each are a hybrid of convolution and multi-head self-attention networks.



*Is a system diagram for an exemplary handwriting generation system.
Credit: Bhunia, A.; Khan, S.; Cholakkal, H.; Anwer, R.; Khan, F., WIPO IP Portal*

The encoder produces a sequence of style feature embeddings from the input handwriting sample. The decoder takes the sequence of style feature embeddings in order to convert the at least one textual word string into a generated handwritten image having substantially same writing style as the handwriting sample. An output device to output the generated handwriting image.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=US406590002&_cid=P21-LNOPTM-87427-1

Reference

Bhunia, A.; Khan, S.; Cholakkal, H.; Anwer, R.; Khan, F. (Oct 05, 2023). System and method for handwriting generation. Recovered Oct 06, 2023, WIPO IP Portal:

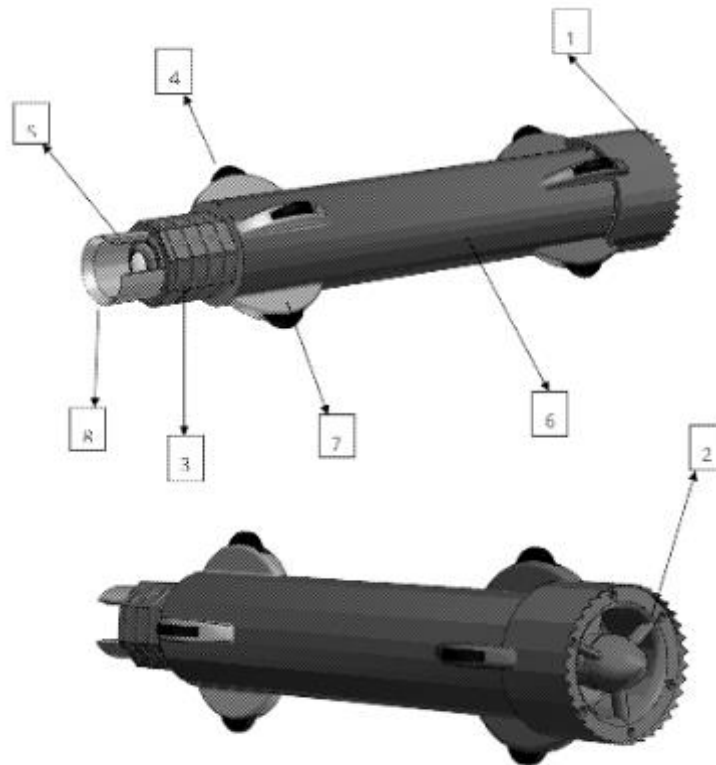
https://patentscope.wipo.int/search/es/detail.jsf?docId=US406590002&_cid=P21-LNOPTM-87427-1

Information source: (WIPO IP Portal, 2023)



2.4. Systems and methods for wellbore investigation and log-interpretation via self-propelling wireless robotic wellbore logging tool

A method for wellbore investigation and log-interpretation via a self-propelling wireless robotic wellbore logging tool, includes the steps of, transporting the self-propelling wireless robotic wellbore logging tool wirelessly inside a wellbore of any dimension via an autonomous robot.



*Illustrates a general representation of a robotic logging tool, according to an embodiment of the invention
Credit: Lahkar, N.; Goswami, R. & Barman, A., WIPO IP Portal*

Collecting logging data in real-time; storing the logging data in a memory capsule for data exchange facilities to further retrieve onto a processing device; releasing the self-propelling wireless robotic wellbore logging tool to a surface using buoyancy or wellbore pressure for energy efficiency; transferring the logging data collected via the self-propelling wireless robotic wellbore logging tool to a subsurface control station via wellbore fluids using an underwater communication technique; and, analysing the logging data using artificial intelligence for quicker interpretation.

For more information, visit the following link:

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

Reference

Lahkar, N.; Goswami, R. & Barman, A. (Oct 05, 2023). Electronic device and control method thereof. Recovered Oct 06, 2023, WIPO IP Portal:

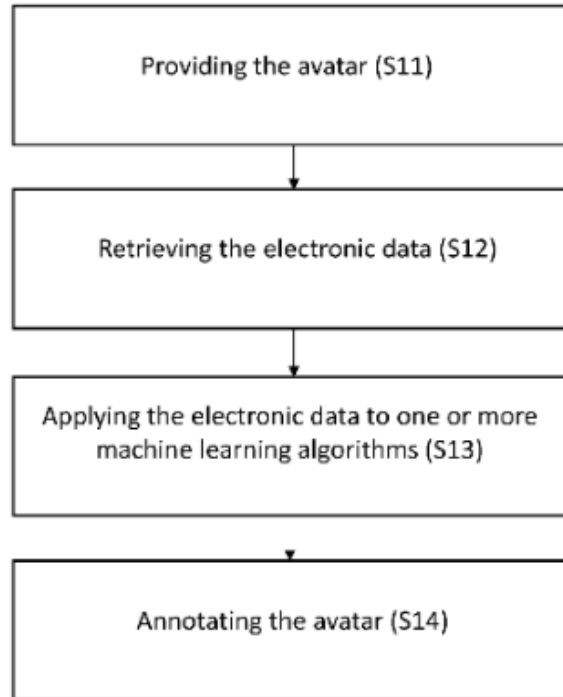
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023187458&_cid=P21-LNOPTM-87427-1

Information source: (WIPO IP Portal, 2023)



2.5. A computer implemented method of generating an avatar

There is provided a computer-implemented method of annotating an avatar representative of a human body with medical information associated with a patient, the method performed by a computer including a hardware processor.



*Schematically depicts a computer-implemented method of assigning medical information to an avatar representative of a human body performed by a computer including a hardware processor according to an exemplary embodiment
Credit: Moodley, D., WIPO IP Portal*

The method comprising: providing, by the hardware processor, the avatar; retrieving, by the hardware processor, electronic data from a Blockchain, the electronic data describing the medical information; applying the electronic data, by the hardware processor, to one or more Machine Learning algorithms trained to associate the medical information with a body part from amongst a plurality of body parts of the human body; and annotating, by the hardware processor, the avatar with the medical information at a location of the associated body part.

For more information, visit the following link:

https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023178462&_cid=P21-LNBSSQ-73179-7

Reference

Moodley, D. (Oct 05, 2023). A computer implemented method of generating an avatar. Recovered Oct 06, 2023, WIPO IP Portal:

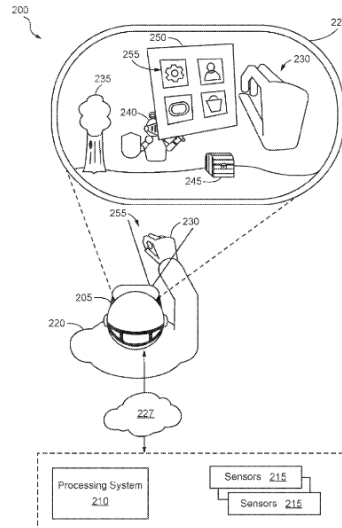
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023178462&_cid=P21-LNBSSQ-73179-7

Information source: (WIPO IP Portal, 2023)



2.6. Attention-based content visualization for an Extended Reality Environment

Techniques for adaptively visualizing content in an artificial environment based on the attention of a user. In one particular aspect, a computer-implemented method is provided that includes obtaining input data from a user.



An illustration depicting an example Extended Reality system that presents and controls user interface elements within an Extended Reality environment in accordance with various embodiments.

Credit: Zhang, T., Espacenet Patent Search

Inferring content that is of interest to the user based on features gathered from the user's attention in the input data, identifying virtual content data based on the content that is of interest to the user, determining modifications to be applied to the virtual content data based on relevancy, applying the modifications to the virtual content data to generate a final format for the virtual content data, and rendering virtual content in the Extended Reality Environment displayed to the user based on the final format for the virtual content data. The virtual content rendered from relevant virtual content data is more prominently displayed as compared to the virtual content rendered from semi-relevant and non-relevant virtual content data.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/086099776/publication/WO2023192254A1?q=artificial%20intelligence>

Reference

Zhang, T. (Oct 05, 2023). Attention-based content visualization for an Extended Reality Environment. Recovered Oct 06, 2023, Espacenet Patent Search:

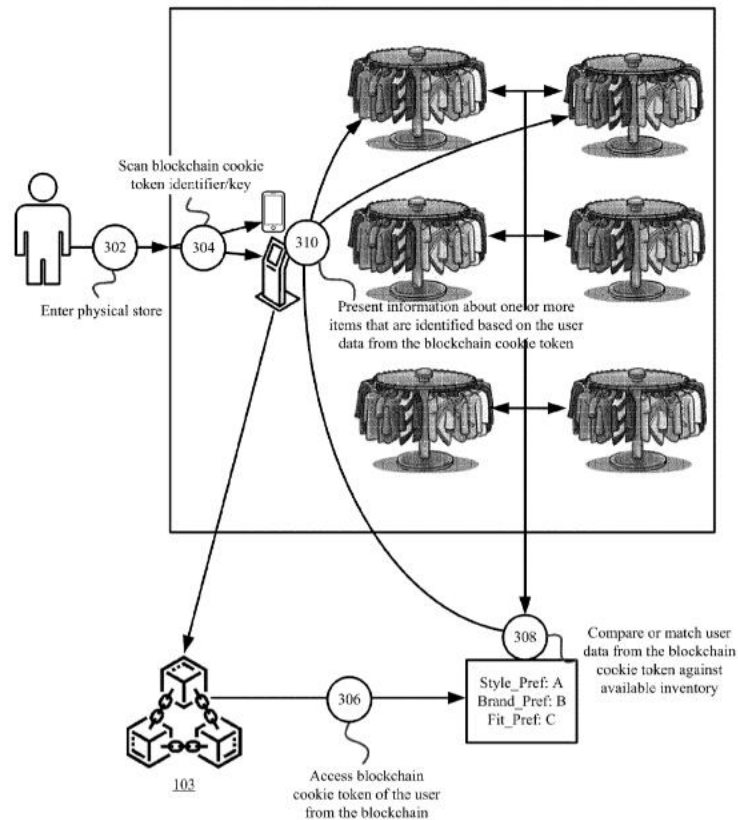
<https://worldwide.espacenet.com/patent/search/family/086099776/publication/WO2023192254A1?q=artificial%20intelligence>

Information source: (Espacenet Patent Search, 2023)



2.7. Systems and methods for Blockchain-based tracking and selective access to user data

Disclosed is a Blockchain cookie token for tracking user data compiled from different merchants on the Blockchain, and for providing virtual and physical merchants selective access to the user data via the Blockchain. Each Blockchain cookie token may be generated for a different user, and may be accessed using a different key.



Illustrates an example of using a Blockchain cookie token at a physical store location in accordance with some embodiments presented herein.

Credit: Deuskar, R., Espacenet Patent Search

The key may be provided to different network sites. A first set of user data, derived from tracked activity of the particular user at a first network site, may be entered into the token. The first set of user data provided by the first network site may be accessed at a different second network site using the key, and the second network site may customize content that is presented to the user based on one or more content of the second network site having attributes that match the first set of user data entered in the token.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088194413/publication/US2023315907A1?q=blockchain>

Reference

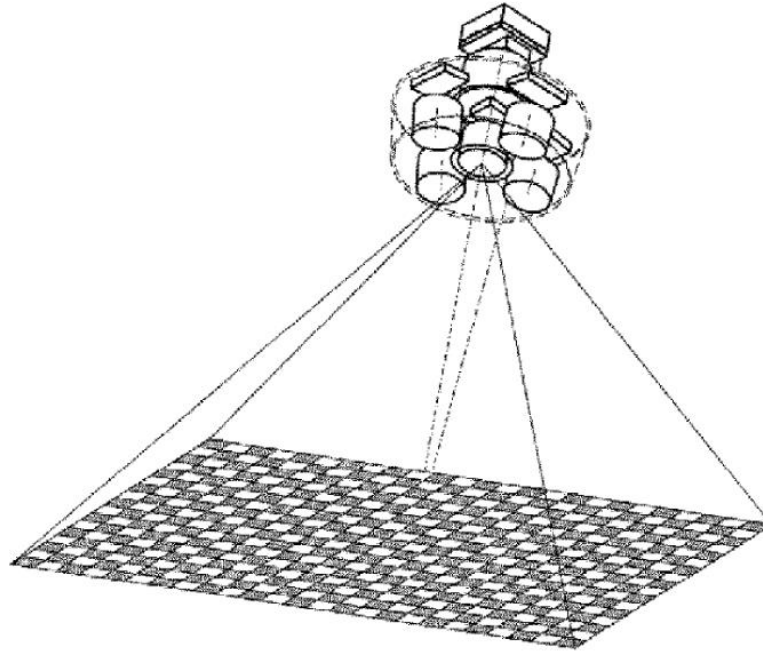
Deuskar, R. (Oct 05, 2023). Systems and methods for Blockchain-based tracking and selective access to user data. Recovered Oct 06 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/088194413/publication/US2023315907A1?q=blockchain>

Information source: (Espacenet Patent Search, 2023)



2.8. Intraoral 3D scanning device for projecting a high-density light pattern

The present disclosure relates to systems and methods for generating a digital representation of a three-dimensional (3D) object. In particular, the disclosure relates to a dental scanning system for acquiring images of the object and for generating the digital representation of the object.



Shows a perspective view of a scan unit comprising a projector unit and four cameras, wherein the projector unit is configured for projecting a light pattern.

Credit: Kjær, R.; Öjelund, H.; Dideriksen, Karsten B. & Mottelson, I., Espacenet Patent Search

One embodiment relates to a dental scanning system for scanning a dental object, comprising an intraoral 3D scanning device comprising at least one projector unit configured to project a light pattern along a projector optical axis, the light pattern comprising a plurality of pattern features; one or more cameras having at least partly overlapping fields of view along different camera optical axes (and along the projector optical axis), each of the cameras comprising an image sensor, wherein the system further comprises one or more processors configured to generate a digital three-dimensional representation of the dental object based on triangulation.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/085980803/publication/WO2023187181A1?q=3d>

Reference

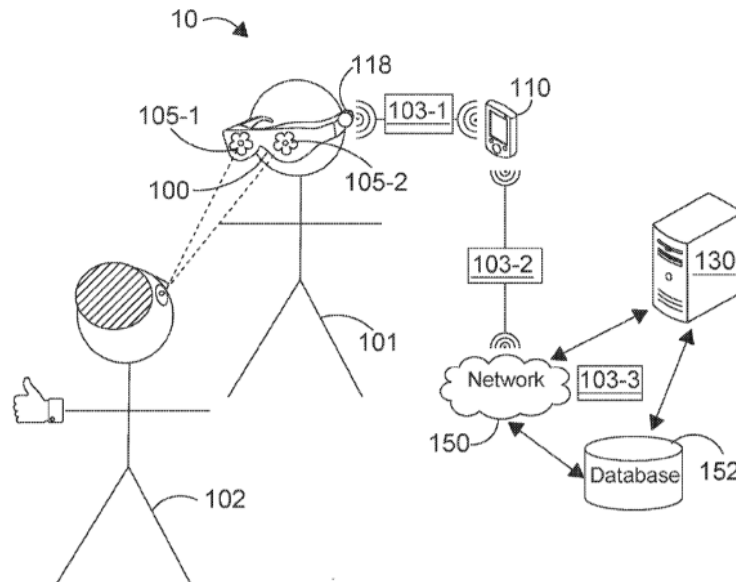
Kjær, R.; Öjelund, H.; Dideriksen, Karsten B. & Mottelson, I. (Oct 05, 2023). Intraoral 3D scanning device for projecting a high-density light pattern. Recovered Oct 06, 2023, Espacenet Patent Search: <https://worldwide.espacenet.com/patent/search/family/085980803/publication/WO2023187181A1?q=3d>

Information source: (Espacenet Patent Search, 2023)



2.9. Smart glasses with enhanced optical structures for Augmented Reality applications

A wearable device for Augmented Reality applications including an image generation engine to generate multiple light rays forming an image, and an eyepiece including a display to project the image to a user for an Augmented Reality application, is provided.



Illustrates an architecture for the use of a smart glass with enhanced structures for augmented reality /virtual reality (AR/VR), according to some embodiments.

Credit: Silverstein, B. & Kelly, K., Espacenet Patent Search

The eyepiece includes a planar waveguide configured to transmit the light rays from the image generation engine. The wearable device also includes at least one optical element configured to couple the light rays into, and to provide the light rays from, the planar waveguide and through an eyebox limiting a volume that includes a pupil of the user, and a user-functional portion of the eyepiece including the at least one optical element, the user-functional portion shaped according to a pre-selected format that is aesthetically appealing to an onlooker when the immersive reality device is worn by a user.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/086286195/publication/WO2023192656A1?q=virtual%20reality>

Reference

Silverstein, B. & Kelly, K. (Oct 05, 2023). Smart glasses with enhanced optical structures for Augmented Reality applications. Recovered Oct 10, 2023, Espacenet Patent Search:

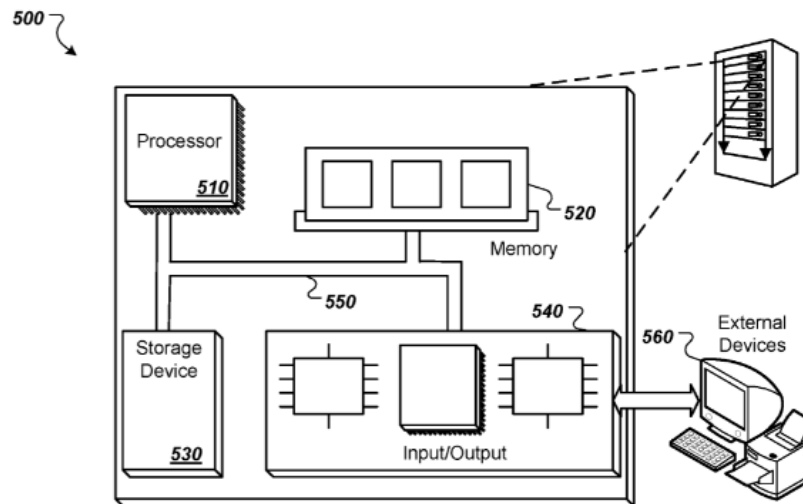
<https://worldwide.espacenet.com/patent/search/family/086286195/publication/WO2023192656A1?q=virtual%20reality>

Information source: (Espacenet Patent Search, 2023)



2.10. Transfer Machine Learning for attribute prediction

Methods, systems, and apparatus, including computer programs encoded on a computer storage medium, for using transfer Machine Learning to predict attributes are described. In one aspect, a method includes receiving, from a client device of a user, a digital component request that includes at least input contextual information for a display environment in which a selected digital component will be displayed.



*Is a block diagram of an example computer system.
Credit: Huang, W. & Mayorov, A., Espacenet Patent Search*

The contextual information is converted into input data that includes input feature values for a transfer Machine Learning model trained to output predictions of user attributes of users based on feature values for features representing display environments. The transfer Machine Learning model is trained using training data for subscriber users obtained from a data pipeline associated with electronic resources to which the subscriber users are subscribed and adapted to predict user attributes of non-subscribing users viewing electronic resources to which the non-subscribing users are not subscribed.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/081595643/publication/WO2023191811A1?q=machine%20learning>

Reference

Huang, W. & Mayorov, A. (Oct 05, 2023). Transfer Machine Learning for attribute prediction. Recovered Oct 10, 2023, Espacenet Patent Search:

<https://worldwide.espacenet.com/patent/search/family/081595643/publication/WO2023191811A1?q=machine%20learning>

Information source: (Espacenet Patent Search, 2023)