



Weekly Newsletter
TECHNOLOGY
SURVEILLANCE

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CONCYTEC



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

I. NEWS

1.1 Tablet-based Artificial Intelligence app measures multiple behavioral indicators to screen for autism

Researchers at Duke University have demonstrated an app driven by Artificial Intelligence that can run on a tablet to accurately screen for autism in children by measuring and weighing a variety of distinct behavioral indicators.



A toddler plays a bubble-popping game as part of a 10-minute tablet app that can greatly aid in screening children for autism.

Credit: Duke University

Called “*SenseToKnow*”, the app delivers scores that evaluate the quality of the data analyzed, the confidence of its results and the probability that the child tested is on the autism spectrum. The results are fully interpretable, meaning that they spell out exactly which of the behavioral indicators led to its conclusions and why. This ability gives health care providers detailed information on what to look for and consider in children referred for full assessments and intervention. “*SenseToKnow*’s” ease of use and lack of hardware limitations, combined with its demonstrated accuracy across sex, ethnicity and race, could help eliminate known disparities in early autism diagnosis and intervention by allowing autism screening to take place in any setting, even in the child’s own home.

For more information, visit the following link:

<https://pratt.duke.edu/about/news/autism-app-2023>

Reference

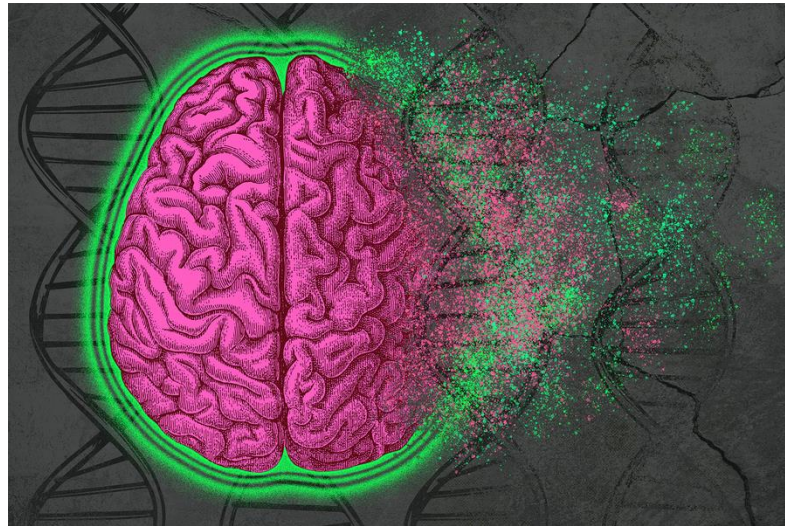
Kingery, K. (Oct 02, 2023). Tablet-based AI app measures multiple behavioral indicators to screen for autism. Recovered Oct 02, 2023, Duke University:
<https://pratt.duke.edu/about/news/autism-app-2023>

Information source: (Duke University, 2023)



1.2 Decoding the complexity of Alzheimer's disease

Alzheimer's disease affects more than 6 million people in the United States, and there are very few FDA-approved treatments that can slow the progression of the disease. In hopes of discovering new targets for potential Alzheimer's treatments, Massachusetts Institute of Technology (MIT) researchers have performed the broadest analysis yet of the genomic, epigenomic, and transcriptomic changes that occur in every cell type in the brains of Alzheimer's patients.



In hopes of discovering new targets for potential Alzheimer's treatments, MIT researchers have performed the broadest analysis yet of the genomic, epigenomic, and transcriptomic changes that occur in every cell type in the brains of Alzheimer's patients.

Credit: Christine Daniloff and José-Luis Olivares, Massachusetts Institute of Technology; iStock

Using more than 2 million cells from more than 400 postmortem brain samples, the researchers analyzed how gene expression is disrupted as Alzheimer's progresses. They also tracked changes in cells' epigenomic modifications, which help to determine which genes are turned on or off in a particular cell. Together, these approaches offer the most detailed picture yet of the genetic and molecular underpinnings of Alzheimer's. The studies were led by Li-Huei Tsai, director of MIT's Picower Institute for Learning and Memory, and Manolis Kellis, a professor of computer science in MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) and a member of the Broad Institute of MIT and Harvard.

For more information, visit the following link:

<https://news.mit.edu/2023/decoding-complexity-alzheimers-disease-0928>

Reference

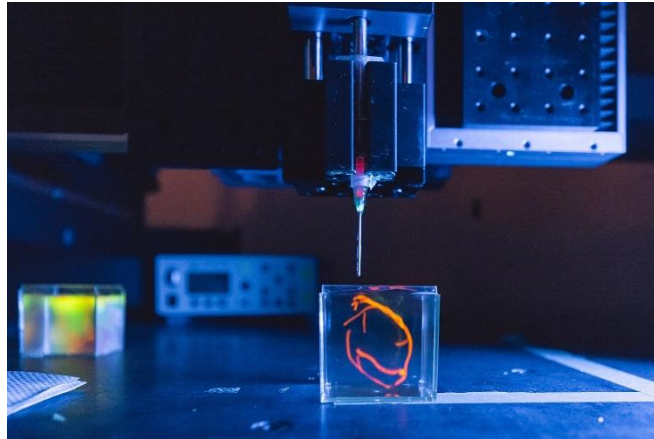
Trafton, A. (Sep 28, 2023). Decoding the complexity of Alzheimer's disease. Recovered Oct 02, 2023, Massachusetts Institute of Technology:
<https://news.mit.edu/2023/decoding-complexity-alzheimers-disease-0928>

Information source: (Massachusetts Institute of Technology, 2023)



1.3 Moonshot effort aims to bioprint a human heart and implant it in a pig

The vision of fabricating bespoke, patient-specific human organs – livers, lungs, kidneys, brain, and, yes, a human heart – has been a tantalizing dream of modern medicine for years, but only recently has stem cell science, the scale of cell production, and 3D bioprinting advanced to a point where the dream is within reach.



*A 3D bioprinter in the Skylar-Scott lab prints a sample of heart tissue in 2022.
Credit: Andrew Brodhead, Stanford University*

Bioprinting is a 3D printing technology that, instead of using plastic or metal, prints living tissues cell by cell. The key development, Skylar-Scott said, is that we can now print cells and blood vessels into those tissues. *“With vasculature comes the ability to make large and thick tissues that can be implanted and survive,”* Skylar-Scott, assistant professor of bioengineering in the Schools of Engineering and Medicine, and principal investigator on the project, said. *“Thus begins the era of organ biofabrication.”*

For more information, visit the following link:

<https://news.stanford.edu/2023/09/28/moonshot-effort-aims-bioprint-human-heart-implant-pig/>

Reference

Myers, A. (Sep 28, 2023). Moonshot effort aims to bioprint a human heart and implant it in a pig. Recovered Oct 02, 2023, Stanford University:

<https://news.stanford.edu/2023/09/28/moonshot-effort-aims-bioprint-human-heart-implant-pig/>

Information source: (Stanford University, 2023)



1.4 Wrist temperature associated with future risk of disease

Continuous wrist temperature monitoring can uncover insights into the potential for future disease risk for ailments like Type 2 diabetes, hypertension, liver disease, kidney failure, and more. These new findings from Perelman School of Medicine researchers, shows that accurate, continued digital monitoring of skin temperature can give deeper medical insights.



Credit: iStock, Jacob Ammentorp Lund, University of Pennsylvania

Previously, disrupted temperature rhythms had only been linked to a handful of conditions, such as metabolic syndrome and diabetes. Now, this research provides insights from a large population, and it indicates a wider spectrum of conditions are associated with poor temperature rhythms, measured in wrist temperature amplitude (the difference between the minimum and maximum temperature over the course of 24 hours).

For more information, visit the following link:

<https://penntoday.upenn.edu/news/penn-medicine-wrist-temperature-associated-future-risk-disease>

Reference

Horvath, E. (Sep 28, 2023). Wrist temperature associated with future risk of disease. Recovered Oct 02, 2023, University of Pennsylvania:

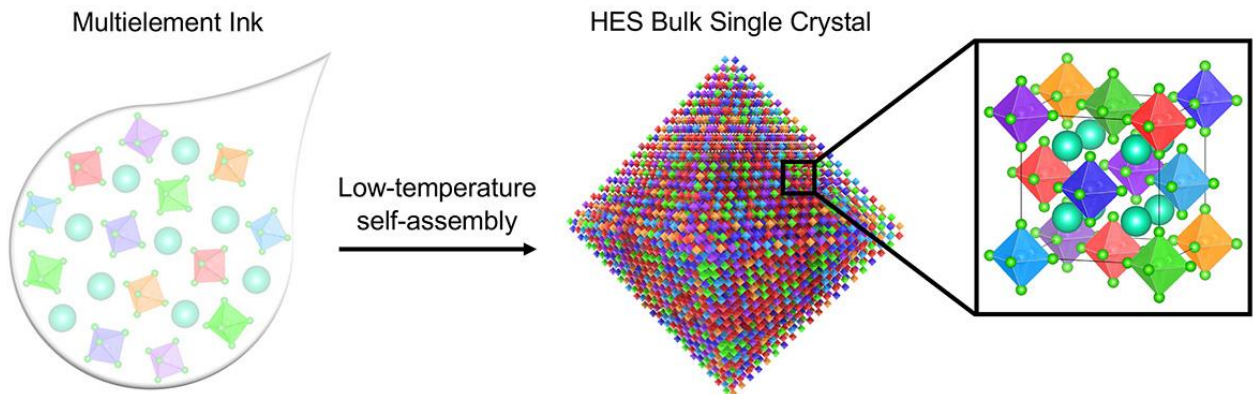
<https://penntoday.upenn.edu/news/penn-medicine-wrist-temperature-associated-future-risk-disease>

Information source: (University of Pennsylvania, 2023)



1.5 Sustainable semiconductors with “*Multielement Ink*”

A new semiconducting material called “*multielement ink*” could make that process significantly less heat-intensive and more sustainable. Developed by researchers from Lawrence Berkeley National Laboratory (Berkeley Lab) and UC Berkeley, “*multielement ink*” is the first “*high-entropy*” semiconductor that can be processed at low temperature or room temperature.



In solution, multielement ink self-assembles at low temperatures into high-entropy semiconductors or halide perovskite single crystals.

Credit: Maria Folgueras, Yuxin Jiang, and Peidong Yang, image courtesy of Nature, Berkeley Lab.

“The traditional way of making semiconductor devices is energy-intensive and one of the major sources of carbon emissions,” said Peidong Yang, the senior author on the study. Yang is a senior faculty scientist in Berkeley Lab’s Materials Sciences Division and professor of chemistry and materials science and engineering at UC Berkeley. “Our new method of making semiconductors could pave the way for a more sustainable semiconductor industry.” The advance takes advantage of two unique families of semiconducting materials: hard alloys made of high-entropy semiconductors; and a soft, flexible material made of crystalline halide perovskites.

For more information, visit the following link:

<https://newscenter.lbl.gov/2023/09/28/accelerating-sustainable-semiconductors-with-multielement-ink/>

Reference

Duque, T. (Sep 28, 2023). Accelerating sustainable semiconductors with “*Multielement Ink*”. Recovered Oct 02, 2023, Lawrence Berkeley National Laboratory:

<https://newscenter.lbl.gov/2023/09/28/accelerating-sustainable-semiconductors-with-multielement-ink/>

Information source: (Lawrence Berkeley National Laboratory, 2023)



1.6 These screen-printed, flexible sensors allow earbuds to record brain activity and exercise levels

A pair of earbuds can be turned into a tool to record the electrical activity of the brain as well as levels of lactate in the body with the addition of two flexible sensors screen-printed onto a stamp-like flexible surface. The sensors can communicate with the earbuds, which then wirelessly transmit the data gathered for visualization and further analysis, either on a smartphone or a laptop. The data can be used for long-term health monitoring and to detect long-term neuro-degenerative conditions.



*The screen-printed, flexible sensors are attached to the earbuds on a flexible, stamp-like surface.
Credit: University of California – San Diego*

The sensors, developed by a multidisciplinary research team of engineers at the University of California San Diego, are a lot less cumbersome than state of the art devices currently used to sense the brain's electrical activity and the body's sweat secretions. They can be used in the real world during exercise, the researchers showed. While in-ear sensing of several physiological parameters is not new, integrating sensing of brain and body signals in a single platform is. The breakthrough was made possible by the combined expertise of biomedical, chemical, electrical, and nano-engineers.

For more information, visit the following link:
<https://today.ucsd.edu/story/NatureBME2023>

Reference

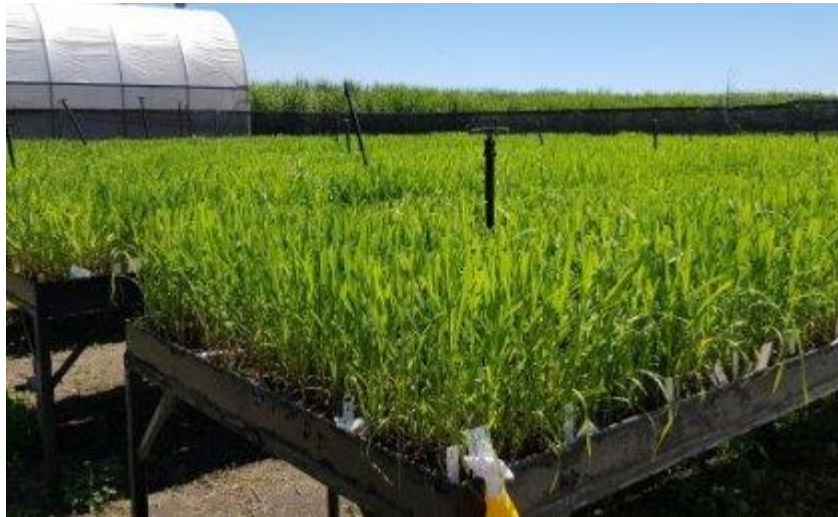
Patringenaru, I. (Sep 28, 2023). These screen-printed, flexible sensors allow earbuds to record brain activity and exercise levels. Recovered Oct 03, 2023, University of California – San Diego:
<https://today.ucsd.edu/story/NatureBME2023>

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



1.7 Genomic selection offers sweet success for cane farmers

Researchers have proven that genomic selection can successfully predict the performance of key sugarcane traits, with the technology set to improve plant breeding outcomes in the crop. The program is the culmination of five years of collaboration between Professor Ben Hayes' team at The University of Queensland and Sugar Research Australia (SRA).



*Researchers say genomic selection technology can help canefarmers increase profits.
Credit: Sugar Research Australia, The University of Queensland*

Professor Hayes said a validation trial confirmed genomic selection could double the rate of gain for key sugarcane traits. *"We investigated the possibility of using genome-wide DNA markers, termed genomic selection, to accelerate gains for the sugarcane traits that determine profit for growers,"* Professor Hayes said. *"We've seen genomic selection technology work in dairy cattle, where it revolutionised the industry – we've seen it in wheat, and now sugarcane."*

For more information, visit the following link:

<https://www.uq.edu.au/news/article/2023/09/genomic-selection-offers-sweet-success-cane-farmers>

Reference

Hayes, B. (Sep 29, 2023). Genomic selection offers sweet success for cane farmers. Recovered Oct 03, 2023, The University of Queensland:
<https://www.uq.edu.au/news/article/2023/09/genomic-selection-offers-sweet-success-cane-farmers>

Information source: (The University of Queensland, 2023)



1.8 Robot changes shape for different uses.

A team at the University of Bristol and based at the Bristol Robotics Laboratory have built a tetrahedron shaped robot with flexible piping known as Tetraflex that can move through small gaps or over challenging terrain. It can also encapsulate fragile objects such as an egg and transport them safely within its soft body.



Robot.

Credit: Peter Wharton, University of Bristol

The findings, published in IEEE Robotics and Automation Letters, show that the Tetraflex robot is capable of locomoting in multiple different ways. This makes the robot potentially useful for mobility in challenging or confined environments such as navigating rubble to reach survivors of an earthquake, performing oil rig inspections or even exploring other planets. The object transport capability demonstrated adds another dimension to potential applications. This could be used to pick up and transport payloads from otherwise inaccessible locations, helping with ecological surveying or in nuclear decommissioning.

For more information, visit the following link:

<https://www.bristol.ac.uk/news/2023/september/robot-changes-shape.html>

Reference

University of Bristol. (Sep 29, 2023). Transformer! New multi-purpose robot changes shape for different uses.

Recovered Oct 03, 2023, University of Bristol:

<https://www.bristol.ac.uk/news/2023/september/robot-changes-shape.html>

Information source: (University of Bristol, 2023)



1.9 Enhancing Artificial Intelligence robustness for more secure and reliable systems

By completely rethinking the way that most Artificial Intelligence (AI) systems protect against attacks, researchers at EPFL's School of Engineering have developed a new training approach to ensure that Machine Learning models, particularly deep neural networks, consistently perform as intended, significantly enhancing their reliability. Effectively replacing a long-standing approach to training based on zero-sum game, the new model employs a continuously adaptive attack strategy to create a more intelligent training scenario.

The results are applicable across a wide range of activities that depend on Artificial Intelligence for classification, such as safeguarding video streaming content, self-driving vehicles, and surveillance. The pioneering research was a close collaboration between the Laboratory for Information and Inference Systems (LIONS) at EPFL's School of Engineering and researchers the University of Pennsylvania (UPenn). In a digital world where the volume of data surpasses human capacity for full oversight, AI systems wield substantial power in making critical decisions. However, these systems are not immune to subtle yet potent attacks. Someone wishing to trick a system can make minuscule changes to input data and cunningly deceive an AI model. Professor Volkan Cevher, with the team at LIONS including PhD student Fabian Latorre, have taken a winning shot at reinforcing security against these attacks.

For more information, visit the following link:

<https://news.epfl.ch/news/enhancing-ai-robustness-for-more-secure-and-reliab/>

Reference

Mitchell, M. (Sep 28, 2023). Enhancing AI robustness for more secure and reliable systems. Recovered Oct 03, 2023, Ecole Polytechnique Fédérale de Lausanne:

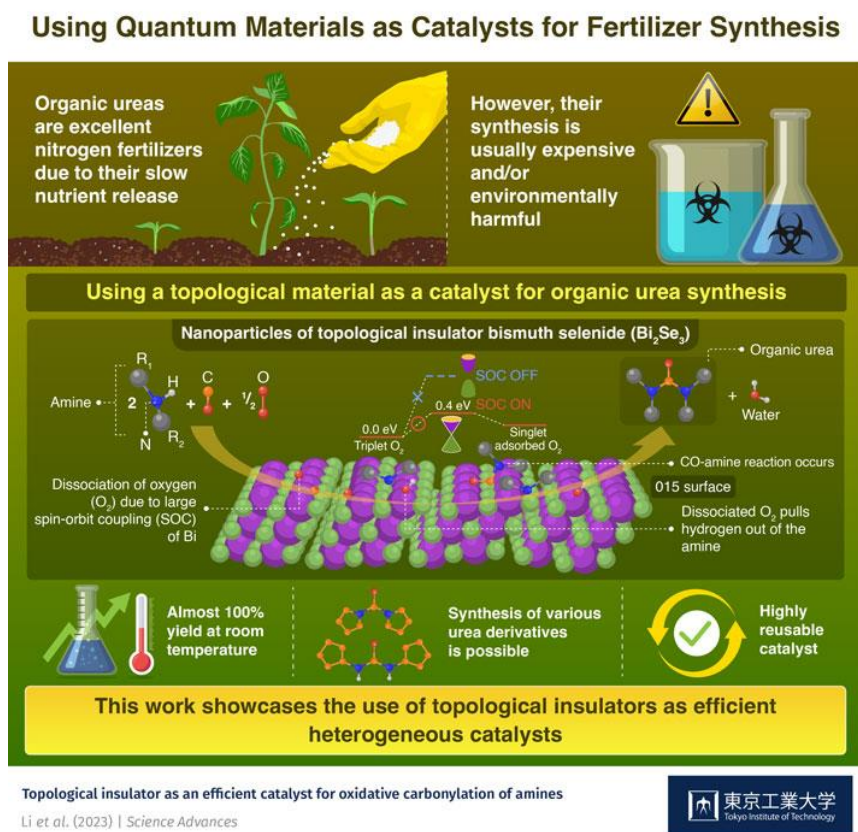
<https://news.epfl.ch/news/enhancing-ai-robustness-for-more-secure-and-reliab/>

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



1.10 Topological insulator catalysts for high-yield room-temperature synthesis of organoureas

The unique quantum properties of bismuth selenide make it a promising catalyst for the synthesis of organic ureas, as demonstrated by scientists at Tokyo Tech. Thanks to its topological surface states, the proposed catalyst exhibits remarkably high catalytic activity and durability when used for the synthesis of various urea derivatives, which are widely utilized as nitrogen fertilizers.



Credit: Tokyo Institute of Technology

Synthetic fertilizers, one of the most important developments in modern agriculture, have enabled many countries to secure a stable food supply. Among them, organic ureas (or organoureas) have become prominent sources of nitrogen for crops. Since these compounds do not dissolve immediately in water, but instead are slowly decomposed by soil microorganisms, they provide a stable and controlled supply of nitrogen, which is crucial for plant growth and function. However, traditional methods to synthesize organoureas are environmentally harmful due to their use of toxic substances, such as phosgene. Although alternative synthesis strategies have been demonstrated, these either rely on expensive and scarce noble metals or employ catalysts that cannot be reused easily.

For more information, visit the following link:

<https://www.titech.ac.jp/english/news/2023/067541>

Reference

Hosono, H. (Sep 28, 2023). Topological insulator catalysts for high-yield room-temperature synthesis of organoureas. Recovered Oct 03, 2023, Tokyo Institute of Technology: <https://www.titech.ac.jp/english/news/2023/067541>

Information source: (Tokyo Institute of Technology, 2023)



1.11 Light-activated acid drives energy-efficient, on-demand release of captured CO₂

Using light instead of heat, researchers at the Department of Energy's Oak Ridge National Laboratory have found a new way to release carbon dioxide, or CO₂, from a solvent used in direct air capture, or DAC, to trap this greenhouse gas. The novel approach paves the way for economically viable separation of CO₂ from the atmosphere.



Credit: Oak Ridge National Laboratory

The on-demand release of carbon dioxide is possible because the long-lived excited state of a novel acid controls the solution's proton concentration using ultraviolet light, creating conditions that lead to CO₂'s energy-efficient release. By contrast, current DAC technologies filter air through an aqueous solution containing a sorbent material, such as an amino acid, that takes up atmospheric CO₂ and holds it. Heating the solvent releases the CO₂ and regenerates the amino acid for recycling. The CO₂ can be either stored or converted into value-added products, such as ethanol, polymers or concrete.

For more information, visit the following link:

<https://www.ornl.gov/news/light-activated-acid-drives-energy-efficient-demand-release-captured-co2>

Reference

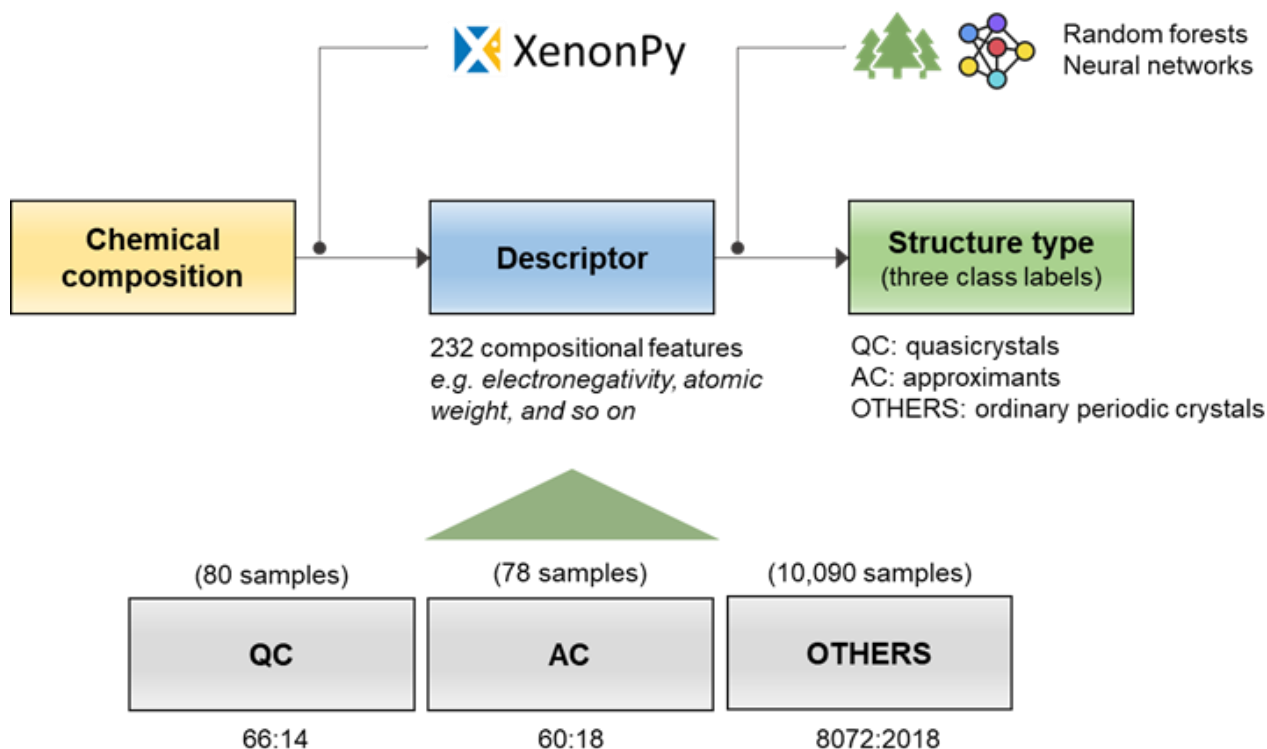
Levy, D. (Sep 28, 2023). Light-activated acid drives energy-efficient, on-demand release of captured CO₂. Recovered Oct 03, 2023, Oak Ridge National Laboratory:
<https://www.ornl.gov/news/light-activated-acid-drives-energy-efficient-demand-release-captured-co2>

Information source: (Oak Ridge National Laboratory, 2023)



1.12 First quasicrystal discovered by Machine Learning algorithm

Quasicrystals are materials that do not have the translational symmetry of ordinary crystals, but have a high degree of order in their atomic arrangement. Since the first quasicrystal was discovered in 1984, approximately 100 thermally stable quasicrystals have been discovered. The discovery of new quasicrystals has led to the discovery of physical properties unique to quasiperiodic structures and new developments in materials science to unravel their mysteries. However, the mechanisms of quasicrystal formation and stabilization are still largely unknown, making the search for new quasicrystals extremely difficult.



*Machine Learning to predict chemical compositions that form quasicrystals.
Credit: Tokyo University of Science*

A research group of the Institute of Statistical Mathematics, Tokyo University of Science, and the University of Tokyo has successfully developed a Machine Learning algorithm to predict the chemical compositions that form thermally stable quasicrystals by learning the patterns of quasicrystals and related materials that have been synthesized to date. Based on the Machine Learning predictions, the group discovered three new quasicrystals. These are the first quasicrystals discovered by Machine Learning algorithms in the 40-year history of quasicrystal research.

For more information, visit the following link:

https://www.tus.ac.jp/en/mediarelations/archive/20230929_4831.html

Reference

Tamura, R. (Sep 29, 2023). First quasicrystal discovered by Machine Learning algorithm. Recovered Oct 03, 2023, Tokyo University of Science:

https://www.tus.ac.jp/en/mediarelations/archive/20230929_4831.html

Information source: (Tokyo University of Science, 2023)



1.13 Revolutionary X-ray microscope unveils sound waves deep within crystals

Scientists developed a groundbreaking technology that allows them to see sound waves and microscopic defects inside crystals, promising insights that connect ultrafast atomic motion to large-scale macroscopic behaviors. Researchers at the Department of Energy's SLAC National Accelerator Laboratory, Stanford University, and Denmark Technical University have designed a cutting-edge X-ray microscope capable of directly observing sound waves at the tiniest of scales – the lattice level within a crystal.



Credit: SLAC National Accelerator Laboratory

These findings, published last week in Proceedings of the National Academy of Sciences, could change the way scientists study ultrafast changes in materials and the resulting properties. The team generated soundwaves in a diamond crystal, then used the new X-ray microscope they developed to directly image the subtle distortions inside the crystalline lattice. They did so at the timescales at which these atomic-scale vibrations naturally occur by leveraging the ultrafast and ultrabright pulses available at SLAC's Linac Coherent Light Source (LCLS). The researchers placed a special X-ray lens along the beam diffracted by the crystalline lattice to filter out the “*perfectly packed*” portion of the crystal and zero in on distortions in the crystal's structure caused by the sound wave and defects.

For more information, visit the following link:

<https://www6.slac.stanford.edu/news/2023-09-28-revolutionary-x-ray-microscope-unveils-sound-waves-deep-within-crystals>

Reference

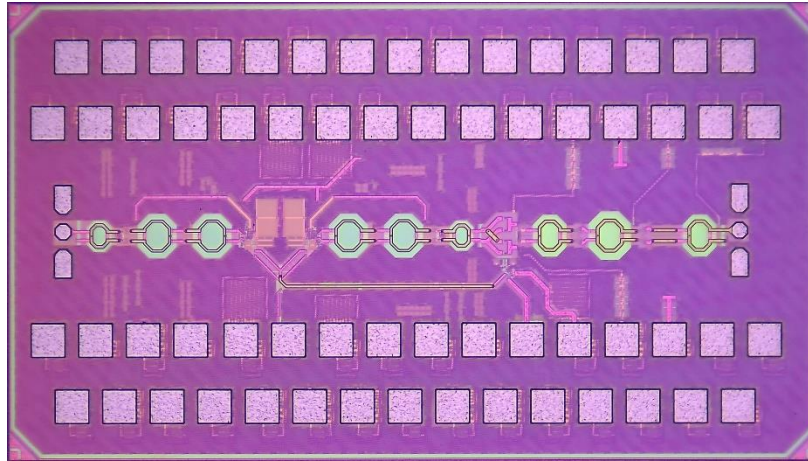
Sundermier, A. (Sep 2, 2023). Revolutionary X-ray microscope unveils sound waves deep within crystals. Recovered Oct 03, 2023, SLAC National Accelerator Laboratory:
<https://www6.slac.stanford.edu/news/2023-09-28-revolutionary-x-ray-microscope-unveils-sound-waves-deep-within-crystals>

Information source: (SLAC National Accelerator Laboratory, 2023)



1.14 “Impossible” millimeter wave sensor has wide potential

Researchers at the University of California, Davis, have developed a proof-of-concept sensor that may usher in a new era for millimeter wave radars. In fact, they call its design a “mission impossible” made possible.



*The new sensor is energy-efficient and cheap to produce.
Credit: University of California - Davis*

Millimeter wave radars send fast-moving electromagnetic waves to targets to analyze their movement, position and speed from the waves bounced back. The benefits of millimeter waves are their natural sensitivity to small-scale movements and their ability to focus on and sense data from microscopic objects. The new sensor uses an innovative millimeter wave radar design to detect vibrations a thousand times smaller, and changes in a target’s position one hundred times smaller, than a strand of human hair, making it better or on par with the world’s most accurate sensors. Yet unlike its peers, this one is the size of a sesame seed, is cheap to produce and features a long battery life.

For more information, visit the following link:

<https://www.ucdavis.edu/curiosity/news/impossible-millimeter-wave-sensor-has-wide-potential>

Reference

Marcure, M. (Oct 02, 2023). “Impossible” millimeter wave sensor has wide potential. Recovered Oct 04, 2023, University of California - Davis:

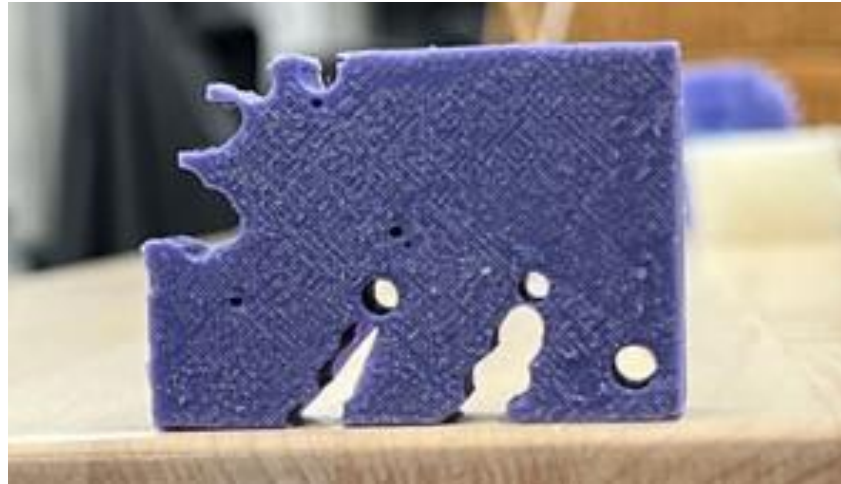
<https://www.ucdavis.edu/curiosity/news/impossible-millimeter-wave-sensor-has-wide-potential>

Information source: (University of California - Davis, 2023)



1.15 Artificial Intelligence designs new robot from scratch in seconds

A team led by Northwestern University researchers has developed the first Artificial Intelligence (AI) to date that can intelligently design robots from scratch.



Credit: Northwestern University

To test the new AI, the researchers gave the system a simple prompt: Design a robot that can walk across a flat surface. While it took nature billions of years to evolve the first walking species, the new algorithm compressed evolution to lightning speed — designing a successfully walking robot in mere seconds. But the AI program is not just fast. It also runs on a lightweight personal computer and designs wholly novel structures from scratch. This stands in sharp contrast to other AI systems, which often require energy-hungry supercomputers and colossally large datasets.

For more information, visit the following link:

<https://news.northwestern.edu/stories/2023/09/instant-evolution-ai-designs-new-robot-from-scratch-in-seconds/?fj=1>

Reference

Morris, A. (Oct 02, 2023). Instant evolution: AI designs new robot from scratch in seconds. Recovered Oct 04, 2023, Northwestern University:

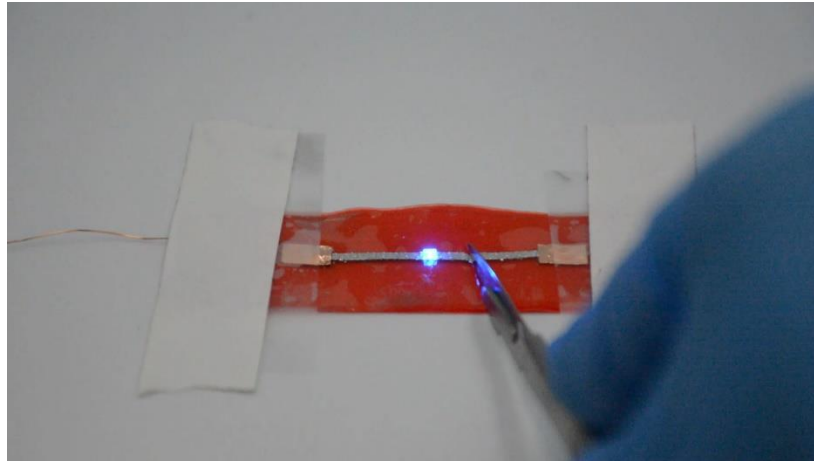
<https://news.northwestern.edu/stories/2023/09/instant-evolution-ai-designs-new-robot-from-scratch-in-seconds/?fj=1>

Information source: (Northwestern University, 2023)



1.16 Novel liquid metal circuits for flexible, self-healing wearables

Imagine a stretchable and durable sensor patch for monitoring the rehabilitation of patients with elbow or knee injuries, or an unbreakable and reliable wearable device that measures a runner's cardiac activities during training to prevent life-threatening injuries. Disruptive innovations in wearable technology are often limited by the electronic circuits – which are usually made of conductive metals that are either stiff or prone to damage - that power these smart devices.



*The new conductive and stretchable “super-material” developed by NUS researchers can heal cracks or cuts almost instantaneously to maintain its electrical conductivity.
Credit: National University of Singapore*

Researchers from the National University of Singapore (NUS) have recently invented a new super flexible, self-healing and highly conductive material suitable for stretchable electronic circuitry. This breakthrough could significantly improve the performance of wearable technologies, soft robotics, smart devices and more. The newly engineered material, called the Bilayer Liquid-Solid Conductor (BiLiSC), can stretch up to a remarkable 22 times its original length without sustaining a significant drop in its electrical conductivity. This electrical-mechano property, which has not been achieved before, enhances the comfort and effectiveness of the human-device interface, and opens up a wide array of opportunities for its use in healthcare wearables and other applications.

For more information, visit the following link:

<https://news.nus.edu.sg/enhancing-stretchable-electronics-novel-liquid-metal-circuits/>

Reference

National University of Singapore (Oct 02, 2023). Enhancing stretchable electronics: NUS researchers develop novel liquid metal circuits for flexible, self-healing wearables. Recovered Oct 04, 2023, National University of Singapore:

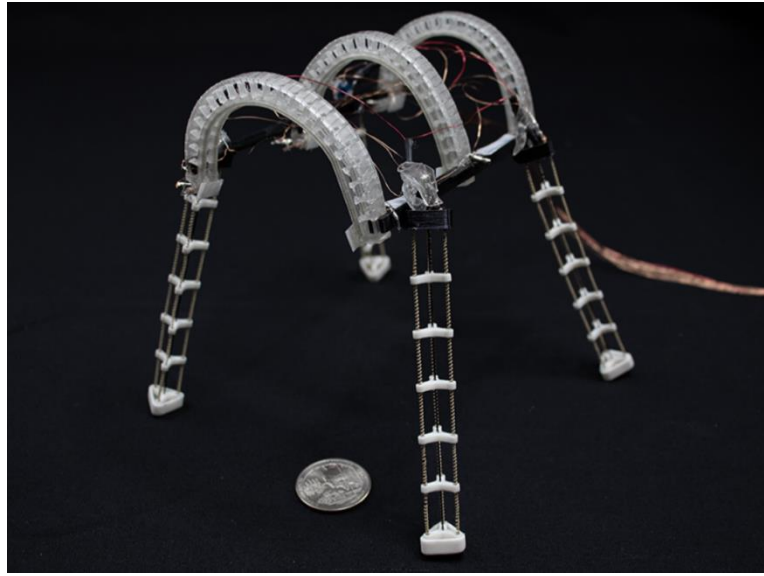
<https://news.nus.edu.sg/enhancing-stretchable-electronics-novel-liquid-metal-circuits/>

Information source: (National University of Singapore, 2023)



1.17 Morphing robots can grip, climb and crawl like insects

Pulling inspiration from the natural world, researchers at Colorado State University have developed a trio of robots that can morph their bodies and legs as needed to better crawl, shimmy or swim over difficult terrain. These new robotic systems are designed to mimic the way biological organisms adapt their shape depending on their life cycle or environment and were developed by a team from the Department of Mechanical Engineering.



Pulling inspiration from the natural world, researchers at Colorado State University have developed a trio of robots that can morph their bodies and legs as needed.
Credit: Colorado State University

The paper outlines three different morphing robotic schemes. The first design is a gripper which can sense and adjust its shape to grasp on to items better. Another is a quadrupedal robot that can flatten itself to crawl through openings or grip a ledge to move across gaps. The final robot is untethered and can change its leg shape and position to effortlessly switch from walking on land to swimming in water. All of three of these systems can morph on demand and the process can be reversed if needed, said Zhao, who led the research team on campus in the Department of Mechanical Engineering.

For more information, visit the following link:

<https://engr.source.colostate.edu/morphing-robots-designed-at-csu-can-grip-climb-and-crawl-like-insects/>

Reference

Rhoten, J. (Oct 02, 2023). Morphing robots designed at CSU can grip, climb and crawl like insects. Recovered Oct 04, 2023, Colorado State University:

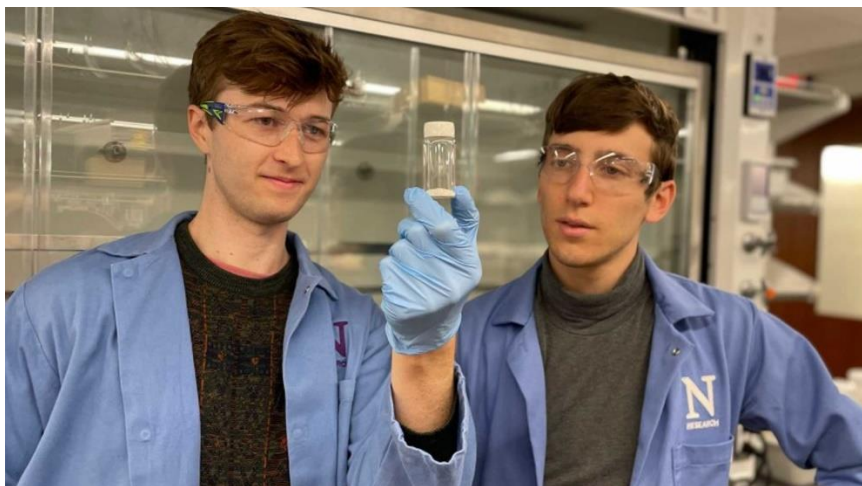
<https://engr.source.colostate.edu/morphing-robots-designed-at-csu-can-grip-climb-and-crawl-like-insects/>

Information source: (Colorado State University, 2023)



1.18 Pulling carbon dioxide straight from the air

Even as the world slowly begins to decarbonize industrial processes, achieving lower concentrations of atmospheric carbon requires technologies that remove existing carbon dioxide from the atmosphere — rather than just prevent the creation of it.



*John Hegarty and Ben Shindel with new ions to facilitate carbon capture.
Credit: Northwestern University*

Typical carbon capture catches CO₂ directly from the source of a carbon-intensive process. Ambient carbon capture, or “direct air capture” (DAC) on the other hand, can take carbon out of typical environmental conditions and serves as one weapon in the battle against climate change, particularly as reliance on fossil fuels begins to decrease and with it, the need for point-of-source carbon capture. New research from Northwestern University shows a novel approach to capture carbon from ambient environmental conditions that looks at the relationship between water and carbon dioxide in systems to inform the “moisture-swing” technique, which captures CO₂ at low humidities and releases it at high humidities. The approach incorporates innovative kinetic methodologies and a diversity of ions, enabling carbon removal from virtually anywhere.

For more information, visit the following link:

<https://www.mccormick.northwestern.edu/news/articles/2023/10/pulling-carbon-dioxide-straight-from-the-air/>

Reference

Reynolds, W. (Oct 03, 2023). Pulling carbon dioxide straight from the air. Recovered Oct 04, 2023, Northwestern University:

<https://www.mccormick.northwestern.edu/news/articles/2023/10/pulling-carbon-dioxide-straight-from-the-air/>

Information source: (Northwestern University, 2023)



1.19 Artificial Intelligence copilot enhances human precision for safer aviation

Imagine you're in an airplane with two pilots, one human and one computer. Both have their “hands” on the controllers, but they're always looking out for different things. If they're both paying attention to the same thing, the human gets to steer. But if the human gets distracted or misses something, the computer quickly takes over. Meet the Air-Guardian, a system developed by researchers at the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL). As modern pilots grapple with an onslaught of information from multiple monitors, especially during critical moments, Air-Guardian acts as a proactive copilot; a partnership between human and machine, rooted in understanding attention.



Researchers at the University of Washington have now created MilliMobile, a tiny, self-driving robot powered only by surrounding light or radio waves. It's about the size of a penny and can run indefinitely on harvested energy
Credit: Massachusetts Institute of Technology

But how does it determine attention, exactly? For humans, it uses eye-tracking, and for the neural system, it relies on something called “saliency maps,” which pinpoint where attention is directed. The maps serve as visual guides highlighting key regions within an image, aiding in grasping and deciphering the behavior of intricate algorithms. Air-Guardian identifies early signs of potential risks through these attention markers, instead of only intervening during safety breaches like traditional autopilot systems.

For more information, visit the following link:

<https://news.mit.edu/2023/ai-co-pilot-enhances-human-precision-safer-aviation-1003>

Reference

Gordon, R. (Oct 03, 2023). AI copilot enhances human precision for safer aviation. Recovered Oct 04, 2023, Massachusetts Institute of Technology:

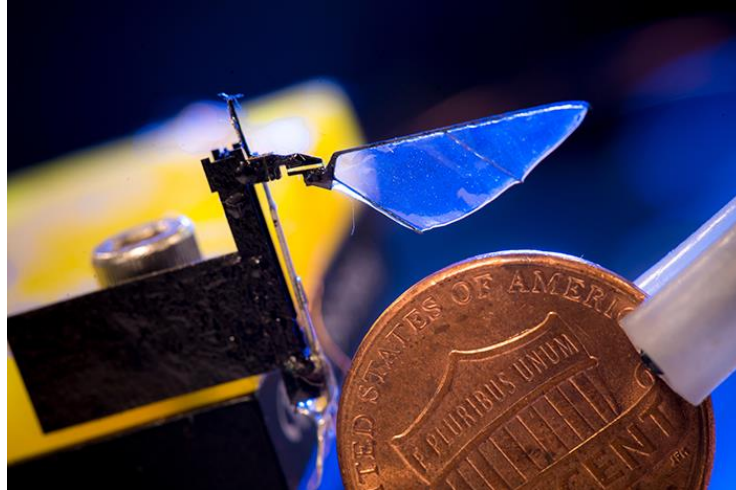
<https://news.mit.edu/2023/ai-co-pilot-enhances-human-precision-safer-aviation-1003>

Information source: (Massachusetts Institute of Technology, 2023)



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

Robots built by engineers at the University of California San Diego helped achieve a major breakthrough in understanding how insect flight evolved. The study is a result of a six-year long collaboration between roboticists at UC San Diego and biophysicists at the Georgia Institute of Technology.



*Researchers led by Nick Gravish, a faculty member in the UC San Diego Department of Mechanical and Aerospace Engineering, built a small flapper robot that operates in air.
Credit: Erik Jepsen, University of California - San Diego*

The findings focus on how the two different modes of flight evolved in insects. Most insects use their brains to activate their flight muscles each wingstroke, just like we activate the muscles in our legs every stride we take. This is called synchronous flight. But some insects, such as mosquitoes, are able to flap their wings without their nervous system commanding each wingstroke. Instead, the muscles of these animals automatically activate when they are stretched. This is called asynchronous flight. Asynchronous flight is common in some of the insects in the four major insect groups, allowing them to flap their wings at great speeds, allowing some mosquitoes to flap their wings more than 800 times a second, for example.

For more information, visit the following link:

<https://today.ucsd.edu/story/these-robots-helped-understand-how-insects-evolved-two-distinct-strategies-of-flight>

Reference

Patringenaru, I. (Oct 04 2023). These robots helped understand how insects evolved two distinct strategies of flight. Recovered Oct 04, 2023, University of California - San Diego:

<https://today.ucsd.edu/story/these-robots-helped-understand-how-insects-evolved-two-distinct-strategies-of-flight>

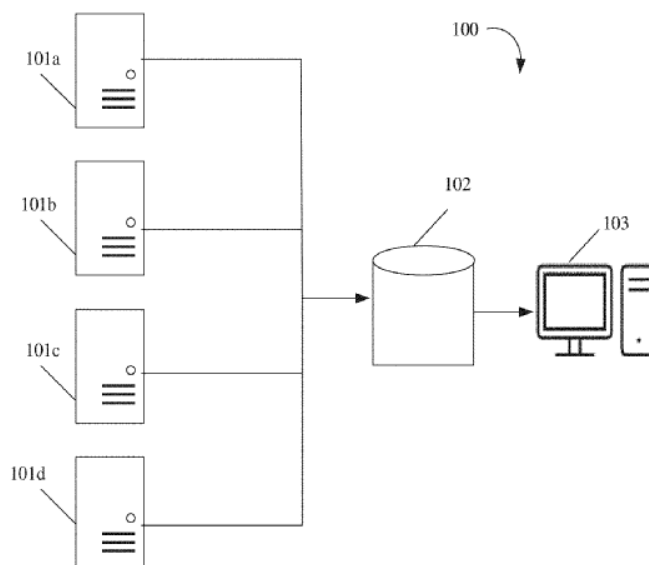
Information source: (University of California - San Diego, 2023)



II. PATENTS

2.1. Method and system for contextual sentiment analysis of competitor referenced texts

Disclosed herein is method and system for contextual sentiment analysis of competitor referenced texts. The method comprises obtaining, by a system a plurality of texts and a lexicon comprising keywords indicating a competitor entity and a target entity. Further, identifying texts from the plurality of texts including the keywords.



*Shows an environment illustrating contextual sentiment analysis of competitor referenced texts, in accordance with some embodiments of the present disclosure.
Credit: Malik et. al., WIPO IP Portal*

Furthermore, determining a pattern from a plurality of patterns in the texts using Artificial Intelligence (AI) models. Furthermore, identifying a placement of the competitor entity and the target entity in the texts using the AI models. Furthermore, determining for each of the texts, a tonality score indicating a tone towards the target entity based on the placement of the target entity and the pattern. Furthermore, determining a sentiment for each of the texts based on the tonality score. Finally, notifying the sentiment towards the target entity on a notification unit.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=US408986907>

Reference

Malik et. al. (Sep 28, 2023). Method and system for contextual sentiment analysis of competitor referenced texts. Recovered Sep 29, 2023, WIPO IP Portal:

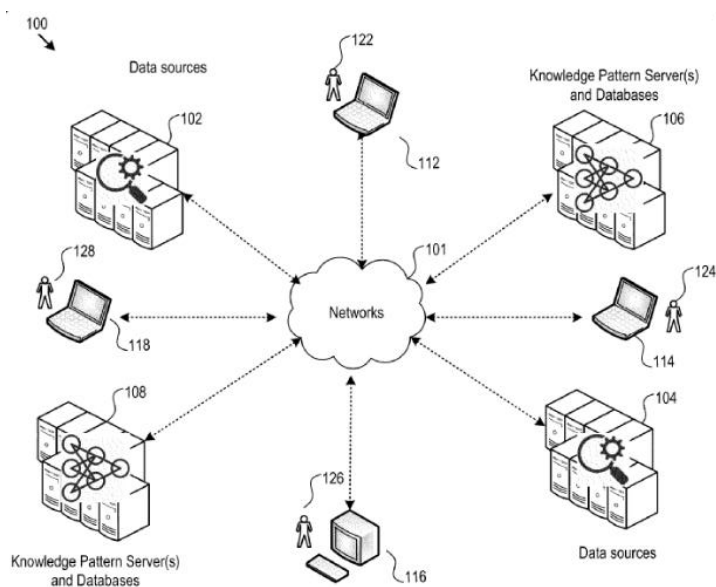
<https://patentscope.wipo.int/search/es/detail.jsf?docId=US408986907>

Information source: (WIPO IP Portal, 2023)



2.2. Stateful, real-time, interactive, and predictive knowledge pattern machine

This disclosure describes a knowledge pattern machine that is distinct from and goes beyond a traditional artificially intelligent predictive knowledge system employing simple domain-specific numerical regression models. Rather than generating purely quantitative projections within a static set of parameters and data, the disclosed pattern machine uses various layers of Artificial Intelligence to recognize and derive dynamically evolving predictive patterns and correlations among quantitative and/or qualitative information pertaining to one or multiple domains.



Illustrates an example computer network platform for implementing a stateful, real-time, and predictive knowledge pattern machine.

Credit: Tappin, I., WIPO IP Portal

The pattern machine extracts knowledge items, including various signals, events, properties, and correlations therebetween, and predicts future trends and evolvments of relating knowledge items to automatically and intelligently answer user queries. The generated predictive answers are rendered as reports updated in real-time without user interference as the underlying data sources evolve over time and are sharable among different users at various levels. The various knowledge items are timestamped and used to further yield a stateful pattern machine.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=US408986728>

Reference

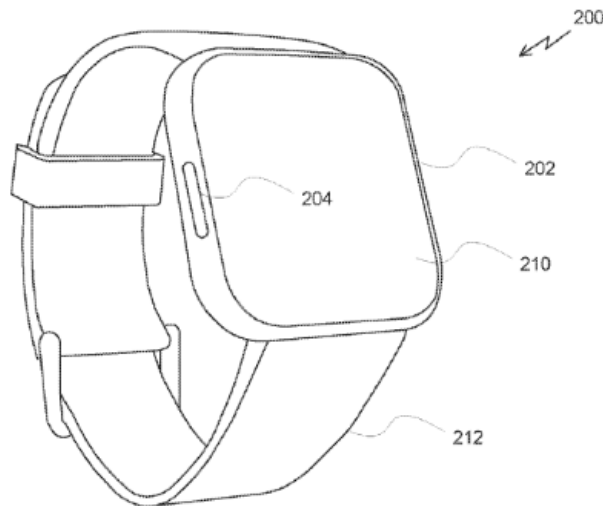
Tappin, I. (Sep 28, 2023). Stateful, real-time, interactive, and predictive knowledge pattern machine. Recovered Sep 29, 2023, WIPO IP Portal:
<https://patentscope.wipo.int/search/es/detail.jsf?docId=US408986728>

Information source: (WIPO IP Portal, 2023)



2.3. Systems and methods for predicting health outcomes

A system and method are disclosed for predicting short term health outcomes based on data collected by a wearable device such as an activity tracker or a smart watch. Artificial Intelligence (AI) algorithms are configured to process an input vector that includes monitored parameter data collected by the wearable device as well as embedding data obtained from health records corresponding to a user account registered to the wearable device.



*Illustrate a wearable device, in accordance with some examples.
Credit: Zhi, N.; Wohlman, S.; Xu, A.; Berns, R. & Bhan, R., WIPO IP Portal*

In particular, a framework is defined that includes a random forest model configured to classify a user based on the monitored parameter data and embedding data. Based on a positive health outcome classification, a minimum value is assigned to a health index value for the user or, based on a negative health outcome classification, a gradient boosting machine is configured to generate the health index value. Various operations can be performed based on the assigned health index value for the user.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=US408987659>

Reference

Zhi, N.; Wohlman, S.; Xu, A.; Berns, R. & Bhan, R. (Sep 28, 2023). Systems and methods for predicting health outcomes. Recovered Sep 29, 2023, WIPO IP Portal:

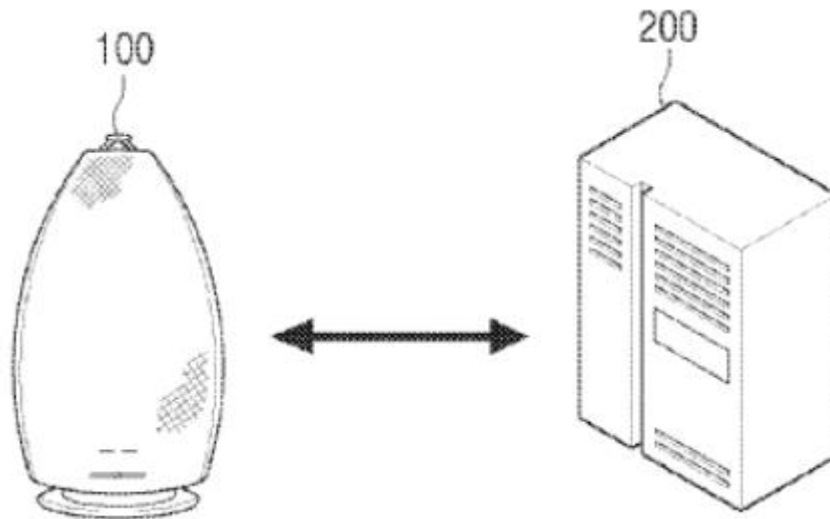
<https://patentscope.wipo.int/search/es/detail.jsf?docId=US408987659>

Information source: (WIPO IP Portal, 2023)



2.4. Electronic device and control method thereof

Disclosed is an electronic device. The electronic device comprises: a microphone comprising circuitry; a speaker comprising circuitry; and a processor electrically connected to the microphone and speaker, wherein the processor, when a first user's voice is input through the microphone, identifies a user who uttered the first user's voice and provides a first response sound, which is obtained by inputting the first user's voice to an Artificial Intelligence model learned through an Artificial Intelligence algorithm.



Is a view illustrating an electronic system which provides a response sound to a user's voice.

Credit: Choi, H.; Ko, H.; Kim, J.; Kim, H. & Hwang, I., WIPO IP Portal

Through the speaker, and when a second user's voice is input through the microphone, identifies a user who uttered the second user's voice, and if the user who uttered the first user's voice is the same as the user who uttered the second user's voice, provides a second response sound, which is obtained by inputting the second user's voice and utterance history information to the Artificial Intelligence model, through the speaker. In particular, at least some of the methods of providing a response sound to a user's voice may use an Artificial Intelligence model learned in accordance with at least one of a Machine Learning, neural network, or Deep Learning algorithm.

For more information, visit the following link:

<https://patentscope.wipo.int/search/es/detail.jsf?docId=US408986193>

Reference

Choi, H.; Ko, H.; Kim, J.; Kim, H. & Hwang, I. (Sep 28, 2023). Electronic device and control method thereof. Recovered Sep 29, 2023, WIPO IP Portal:

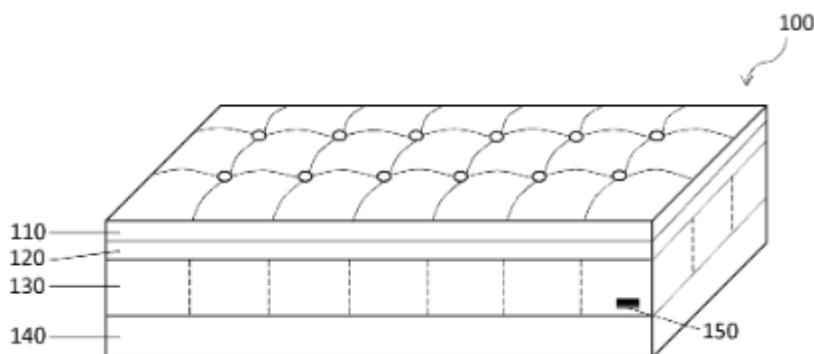
<https://patentscope.wipo.int/search/es/detail.jsf?docId=US408986193>

Information source: (WIPO IP Portal, 2023)



2.5. Smart mattress

A personalized, interactive, and flexible sleeping posture correction system is provided for use in a large-area bedding article including a mattress such that sleeping posture related data such as different pressure points.



Is a schematic structural diagram of an audio processing system based on Artificial Intelligence according to an embodiment of this application.

Credit: Kui, P. & Cheung, M., WIPO IP Portal

And change in the pressure distribution over a sleeping cycle can be measured and processed whilst certain adjustment to one or more parameters of the bedding article in response to an instantaneous sleeping posture of a user is executed either automatically by the present system incorporated with Artificial Intelligence or by the user according to his/her preference of response action(s). The system also incorporates a sleeping posture image capturing module for capturing the preceding and instantaneous sleeping postures of the user to enhance the accuracy of the posture prediction and provide more information for the user prior to making a response action decision.

For more information, visit the following link:

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

Reference

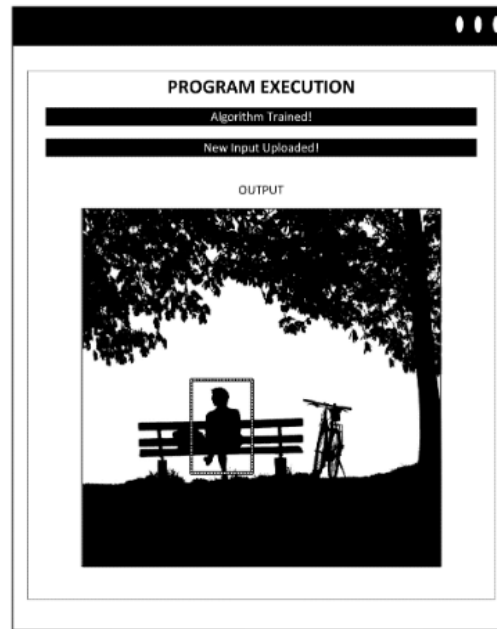
Kui, P. & Cheung, M. (Sep 28, 2023). Smart mattress. Recovered Sep 29, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023178462&_cid=P21-LNBSSQ-73179-7

Information source: (WIPO IP Portal, 2023)



2.6. Systems and methods for provisioning Artificial Intelligence resources

Disclosed herein are systems and method for provisioning Artificial Intelligence resources. A method may receive an input training dataset and an indication of a task to perform using the input training dataset and may determine a size of the input dataset and a content type of an entry in the input training dataset.



*Is a diagram of a user interface that displays an output of a trained Artificial Intelligence algorithm.
Credit: Ulasen, S.; Tormasov, A.; Bell, S. & Protasov, S., Espacenet Patent Search*

The method may identify, from a plurality of computing resources, at least one computing resource to accommodate the size and the content type associated with the input training dataset and may identify attributes of the input training dataset. The method may select, from a plurality of Artificial Intelligence models, and train and execute, on the at least one computing device, an Artificial Intelligence model that is configured to perform the task.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088096106/publication/US2023306307A1?q=artificial%20intelligence>

Reference

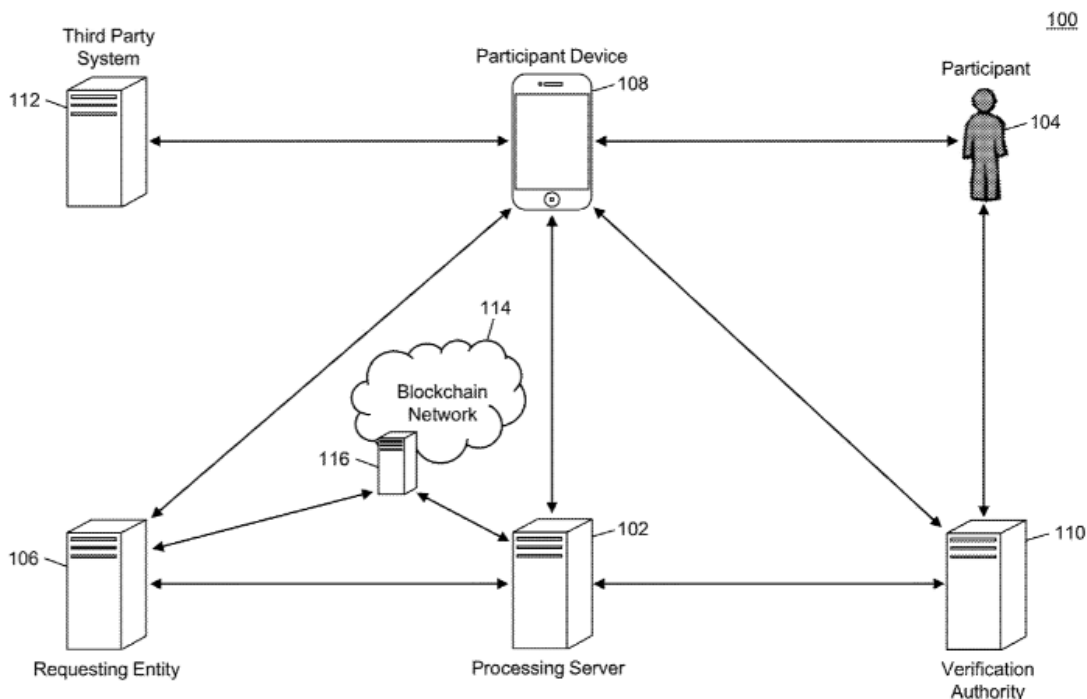
Ulasen, S.; Tormasov, A.; Bell, S. & Protasov, S. (Sep 28, 2023). Systems and methods for provisioning Artificial Intelligence resources. Recovered Sep 29, 2023, Espacenet Patent Search:

<https://worldwide.espacenet.com/patent/search/family/088096106/publication/US2023306307A1?q=artificial%20intelligence>

Information source: (Espacenet Patent Search, 2023)

2.7. Method and system for establishing digital identity in international trade

A method for establishing a digital identity includes: receiving, by a receiver of a processing server, at least an identification value from a first computing system; identifying, by a processor of the processing server, a verification authority based on the identification value.



Is a block diagram illustrating a high level system architecture for establishing a digital identity in accordance with exemplary embodiments.

Credit: Murphy, A., Espacenet Patent Search

Transmitting, by a transmitter of the processing server, at least the identification value to a second computing system, where the second computing system is associated with the identified verification authority; receiving, by the receiver of the processing server, a positive verification indicating authenticity of the identification value; standardizing, by the processor of the processing server, the identification value; and publishing, by the transmitter of the processing server, the standardized identification value using a third computing system.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088096018/publication/US2023306443A1?q=Blockchain>

Reference

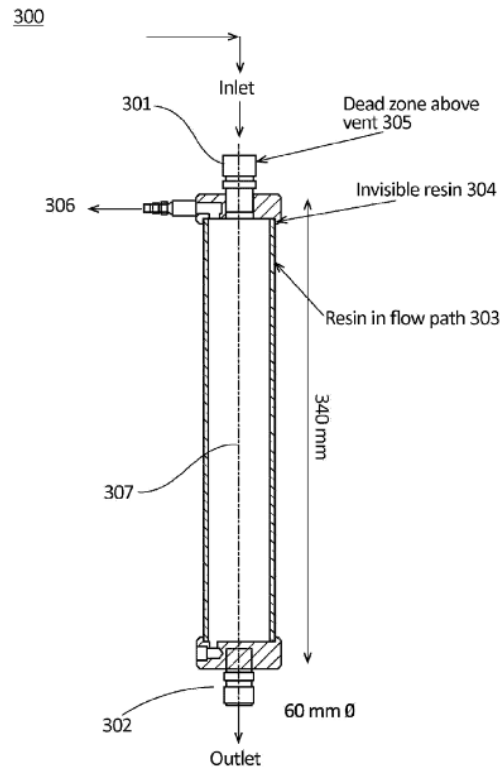
Murphy, A. (Sep 28, 2023). Method and system for establishing digital identity in international trade. Recovered Sep 29 2023, Espacenet Patent Search:
<https://worldwide.espacenet.com/patent/search/family/088096018/publication/US2023306443A1?q=Blockchain>

Information source: (Espacenet Patent Search, 2023)



2.8. Three dimensional printing process flow management and support systems

The technology described herein provides methods and devices to manage process flows and support systems for 3D printing. The technology provides methods and devices for separating contaminants in 3D printing fluids.



Is a side view of one embodiment of a vertical material separator.

Credit: Wanha, K.; Fernandez, J.; Cottiss, E.; Shi, K.; Lehman, D.; Potempa, E.; Garayev, E.; Hedrick, J.; Flynn, M.; Hildner, M. & Walker, D., Espacenet Patent Search

The technology provides methods and devices for aligning projectors with six degrees of freedom in 3D printers. The technology provides methods and devices to cause the flow of an immiscible liquid under an interface with liquid resin in a 3D printer liquid vat to be laminar, of proper height, and of appropriate flow rate to remove heat. The technology provides methods and devices to provide feedback loops for a three-dimensional printing process that uses a flow of oil under a liquid resin to control heat in the printing process.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088101787/publication/WO2023183310A2?q=3d>

Reference

Wanha, K.; Fernandez, J.; Cottiss, E.; Shi, K.; Lehman, D.; Potempa, E.; Garayev, E.; Hedrick, J.; Flynn, M.; Hildner, M. & Walker, D. (Sep 28, 2023). Three dimensional printing process flow management and support systems. Recovered Oct 02, 2023, Espacenet Patent Search:

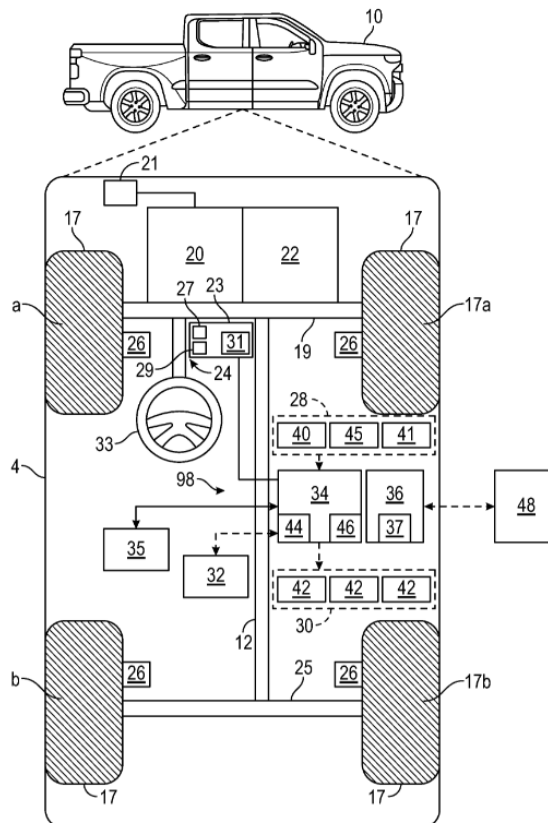
<https://worldwide.espacenet.com/patent/search/family/088101787/publication/WO2023183310A2?q=3d>

Information source: (Espacenet Patent Search, 2023)



2.9. System and method for social networking using an Augmented Reality display

A method for social networking using a multi-focal plane Augmented Reality display of a host vehicle includes receiving social-networking data from a remote device. The social-networking data includes information about at least one social interest of a remote user of the remote device. The remote device is located within a viewable area of a vehicle user of the host vehicle.



Is a block diagram depicting an embodiment of a vehicle including a system for social networking using a multi-focal plane Augmented Reality display.

Credit: Szczerba, J.; Weiss, J.; Chang, K. & Seder, T., Espacenet Patent Search

The method further includes determining whether at least one social interest of the remote user matches a vehicle-user social interest of the vehicle user of the host vehicle using the social-networking data. The method further includes transmitting a command signal to the multi-focal plane Augmented Reality display of the host vehicle to display a virtual image on the multi-focal plane Augmented Reality display.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/087930537/publication/US2023306692A1?q=virtual%20reality>

Reference

Szczerba, J.; Weiss, J.; Chang, K. & Seder, T. (Sep 28, 2023). System and method for social networking using an Augmented Reality display. Recovered Oct 02, 2023, Espacenet Patent Search:

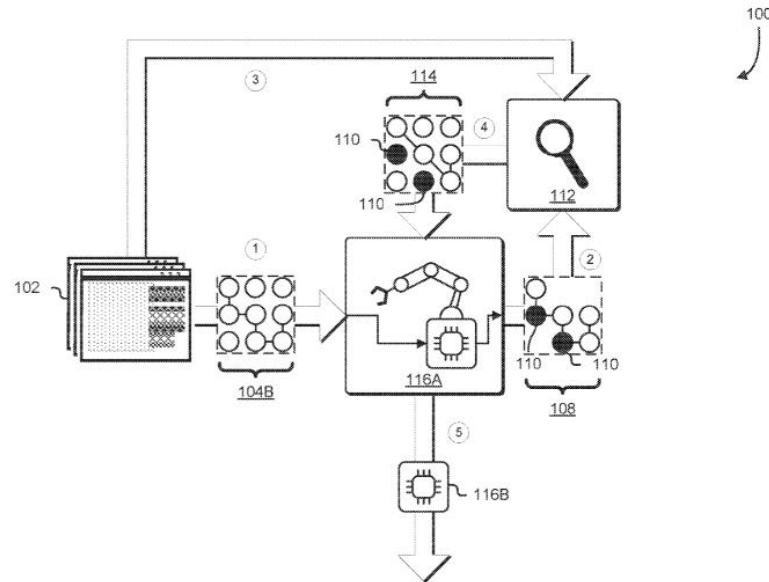
<https://worldwide.espacenet.com/patent/search/family/087930537/publication/US2023306692A1?q=virtual%20reality>

Information source: (Espacenet Patent Search, 2023)



2.10. Training web-element predictors using negative-example sampling

A first set of objects is obtained, where an object of the first set of objects is assigned a classification. A first dataset is generated based at least in part on the first set of objects, where the first dataset includes a value corresponding to at least one characteristic of the object and a label corresponding to the classification.



Illustrates an example of re-training web-element predictors in accordance with an embodiment.

Credit: Magureanu, S. & Risuleo, R., Espacenet Patent Search

A Machine Learning model is trained to classify objects using the first dataset as training input. A set of predictions that includes incorrect predictions for a second set of objects is generated using the Machine Learning model. A second dataset that includes negative-examples that correspond to the incorrect predictions is generated. The Machine Learning model is retrained using the second dataset as training input.

For more information, visit the following link:

<https://worldwide.espacenet.com/patent/search/family/088095884/publication/US2023306071A1?q=machine%20learning>

Reference

Magureanu, S. & Risuleo, R. (Sep 28, 2023). Training web-element predictors using negative-example sampling. Recovered Oct 02, 2023, Espacenet Patent Search:

<https://worldwide.espacenet.com/patent/search/family/088095884/publication/US2023306071A1?q=machine%20learning>

Information source: (Espacenet Patent Search, 2023)