Weekly Newsletter

TECHNOLOGY SURVEILLANCE

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   Researchers use Artificial Intelligence to predict challenging behaviors common in profound autism

Using Artificial Intelligence tools to analyze years of biomedical data, researchers at Rensselaer Polytechnic Institute have discovered a possible connection between sleep, gastrointestinal health, and two potentially harmful behaviors often associated with profound autism: self-injury and aggression.

Credit: Rensselaer Polytechnic Institute

People with profound autism often need around-the-clock care. Additionally, it is not uncommon for them to exhibit self-injurious and aggressive behaviors, which present safety concerns for themselves and their caretakers. *"Avoiding or mitigating challenging behaviors has the potential to improve the lives of people with autism. This work has the potential to one day help caretakers predict when these challenging behaviors are more likely, helping them better plan activities and ensure everyone's well-being,"* said Juergen Hahn, Ph.D., senior author of the new study and head of Rensselaer's biomedical engineering department.

For more information, visit the following link:
https://news.rpi.edu/content/2023/11/06/ai-predict-challenging-behaviors-profound-autism

Reference
Rensselaer Polytechnic Institute. (Nov 06, 2023). Researchers use AI to predict challenging behaviors common in profound autism. Recovered Nov 09, 2023, Rensselaer Polytechnic Institute: https://news.rpi.edu/content/2023/11/06/ai-predict-challenging-behaviors-profound-autism

Information source: (Rensselaer Polytechnic Institute, 2023)

1.2   Using language to give robots a better grasp of an open-ended world

Imagine you're visiting a friend abroad, and you look inside their fridge to see what would make for a great breakfast. Many of the items initially appear foreign to you, with each one encased in unfamiliar packaging and containers. Despite these visual distinctions, you begin to understand what each one is used for and pick them up as needed.
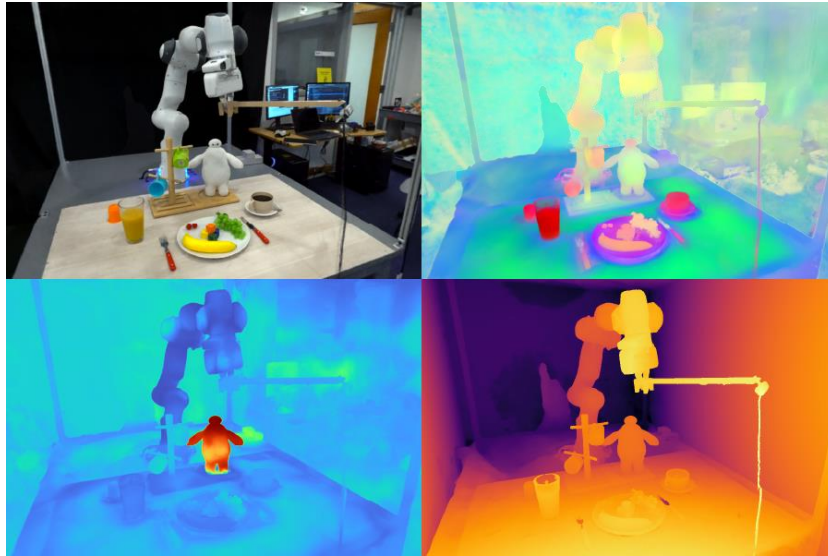
Feature Fields for Robotic Manipulation (F3RM) enables robots to interpret open-ended text prompts using natural language, helping the machines manipulate unfamiliar objects.
Credit: Images courtesy of the researchers, Massachusetts Institute of Technology

Inspired by humans' ability to handle unfamiliar objects, a group from MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) designed Feature Fields for Robotic Manipulation (F3RM), a system that blends 2D images with foundation model features into 3D scenes to help robots identify and grasp nearby items. F3RM can interpret open-ended language prompts from humans, making the method helpful in real-world environments that contain thousands of objects, like warehouses and households.

For more information, visit the following link:
https://news.mit.edu/2023/using-language-give-robots-better-grasp-open-ended-world-1102

Reference
Shipps, A. (Nov 02, 2023). Using language to give robots a better grasp of an open-ended world. Recovered Nov 03, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/using-language-give-robots-better-grasp-open-ended-world-1102

Information source: (Massachusetts Institute of Technology, 2023)

1.3   Artificial Intelligence trained to identify least green homes

A new *"deep learning"* model trained by researchers from Cambridge University's Department of Architecture promises to make it far easier, faster and cheaper to identify these high priority problem properties and develop strategies to improve their green credentials.

High Contribution   Low Contribution
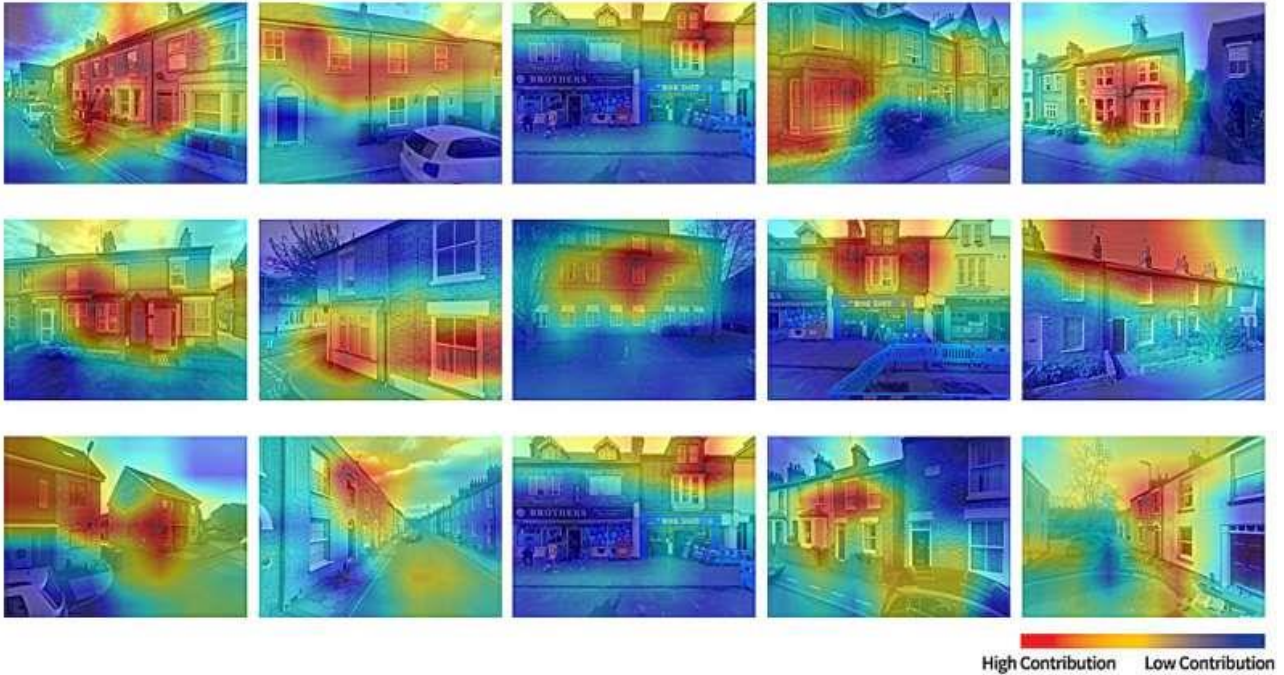
Credit: University of Cambridge

Houses can be *"hard to decarbonize (HtD)"* for various reasons including their age, structure, location, social-economic barriers and availability of data. Policymakers have tended to focus mostly on generic buildings or specific hard-to-decarbonise technologies but the study, could help to change this. Maoran Sun, an urban researcher and data scientist, and his PhD supervisor Dr Ronita Bardhan (Selwyn College), who leads Cambridge's Sustainable Design Group, show that their AI model can classify HtD houses with 90% precision and expect this to rise as they add more data, work which is already underway.

For more information, visit the following link:
https://www.cam.ac.uk/research/news/ai-trained-to-identify-least-green-homes-by-cambridge-researchers

Reference
Almeroth, T. (Nov 02, 2023). AI trained to identify least green homes by Cambridge researchers. Recovered Nov 03, 2023, University of Cambridge:
https://www.cam.ac.uk/research/news/ai-trained-to-identify-least-green-homes-by-cambridge-researchers

Information source: (University of Cambridge, 2023)

1.4   Creating efficient transparent p-type conductors

Transparent conductors are essential for many devices, such as touch screens and solar cells. Copper iodide (CuI) can conduct electricity while staying see-through but is not as good as some other materials. Researchers from the University of Twente managed to improve the conductivity of CuI while keeping 75% of its transparency. By adding a tiny bit of sulphur, their new material moves us one step closer to fully transparent electronic devices.
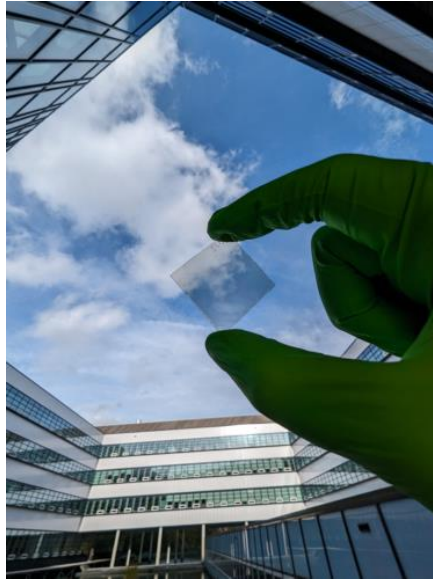
Credit: University of Twente

There are two types of transparent conductors: p-type and n-type. The combination of both types makes it possible to create fully transparent devices. This can include innovations like see-through smartphones and, windows with incorporated translucent solar panels thereby blending aesthetics and functionality. But, so far, the p-types are falling short in terms of conductivity when compared to their n-type counterparts.

For more information, visit the following link:
https://www.utwente.nl/en/news/2023/11/1219803/creating-efficient-transparent-p-type-conductors

Reference
Wesselink, K. (Nov 02, 2023). Creating efficient transparent p-type conductors. Recovered Nov 03, 2023, University of Twente:
https://www.utwente.nl/en/news/2023/11/1219803/creating-efficient-transparent-p-type-conductors

Information source: (University of Twente, 2023)

1.5   Why do batteries sometimes catch fire and explode?

The chances of that happening are actually pretty slim: Some analysts say that gasoline vehicles are nearly 30 times more likely to catch fire than electric vehicles. But recent news of EVs catching fire while parked have left many consumers – and researchers – scratching their heads over how these rare events could possibly happen. Researchers have long known that high electric currents can lead to *"thermal runaway"* – a chain reaction that can cause a battery to overheat, catch fire, and explode. But without a reliable method to measure currents inside a resting battery, it has not been clear why some batteries go into thermal runaway, even when an EV is parked.

Crédito: Nrqemi/iStock, University of California - Berkeley

Now, by using an imaging technique called *"operando X-ray microtomography,"* scientists at Lawrence Berkeley National Laboratory (Berkeley Lab) and UC Berkeley have shown that the presence of large local currents inside batteries at rest after fast charging could be one of the causes behind thermal runaway. Their findings were reported in the journal ACS Nano.

For more information, visit the following link:
https://chemistry.berkeley.edu/news/why-do-batteries-sometimes-catch-fire-and-explode

Reference
Duque, T. (Nov 02, 2023). Why do batteries sometimes catch fire and explode?. Recovered Nov 03, 2023, University of California - Berkeley:
https://chemistry.berkeley.edu/news/why-do-batteries-sometimes-catch-fire-and-explode

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

1.6   Photo battery achieves competitive voltage

Networked intelligent devices and sensors can improve the energy efficiency of consumer products and buildings by monitoring their consumption in real time. Miniature devices like these being developed under the concept of the Internet of Things require energy sources that are as compact as possible in order to function autonomously. Monolithically integrated batteries that simultaneously generate, convert, and store energy in a single system could be used for this purpose.
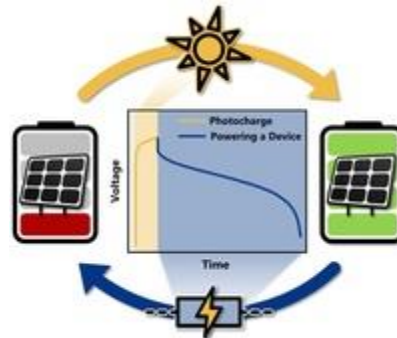
The monolithically integrated photo battery made of organic materials achieves a discharge potential of 3.6 volts.
Credit: Robin Wessling, University of Freiburg

A team of scientists at the University of Freiburg's Cluster of Excellence Living, Adaptive, and Energy-Autonomous Materials Systems (livMatS) has developed a monolithically integrated photo battery consisting of an organic polymer-based battery and a multi-junction organic solar cell. The battery, presented by Rodrigo Delgado Andrés and Dr. Uli Würfel, University Freiburg, and Robin Wessling and Prof. Dr. Birgit Esser, University of Ulm, is the first monolithically integrated photo battery made of organic materials to achieve a discharge potential of 3.6 volts. It is thus among the first systems of this kind capable of powering miniature devices.

For more information, visit the following link:
https://kommunikation.uni-freiburg.de/pm-en/press-releases-2023/photo-battery-achieves-competitive-voltage

Reference
University of Freiburg. (Nov 03, 2023). Photo battery achieves competitive voltage. Recovered Nov 03, 2023, University of Freiburg:
https://kommunikation.uni-freiburg.de/pm-en/press-releases-2023/photo-battery-achieves-competitive-voltage

Information source: (University of Freiburg, 2023)

1.7   Solid-state thermal transistor for better heat management

A team of researchers from UCLA has unveiled a first-of-its-kind stable and fully solid-state thermal transistor that uses an electric field to control a semiconductor device's heat movement.
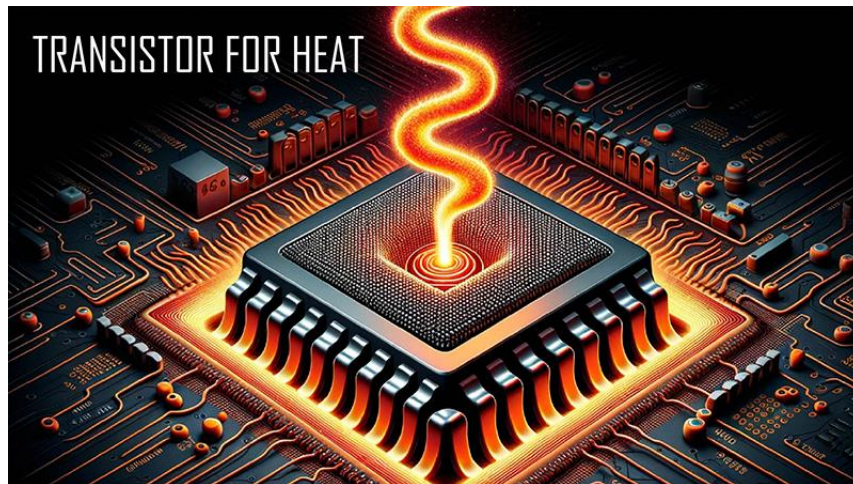
Illustration of a UCLA-developed solid-state thermal transistor using an electric field to control heat movement.
Credit: H-Lab, UCLA Samueli School of Engineering

With top speed and performance, the transistor could open new frontiers in heat management of computer chips through an atomic-level design and molecular engineering. The advance could also further the understanding of how heat is regulated in the human body. *"The precision control of how heat flows through materials has been a long-held but elusive dream for physicists and engineers,"* said the study's co-author Yongjie Hu, a professor of mechanical and aerospace engineering at the UCLA Samueli School of Engineering. *"This new design principle takes a big leap toward that, as it manages the heat movement with the on-off switching of an electric field, just like how it has been done with electrical transistors for decades."*

For more information, visit the following link:
https://news.umich.edu/new-phone-case-provides-workaround-for-inaccessible-touch-screens/

Reference
UCLA Samueli School of Engineering. (Nov 02, 2023). UCLA Researchers develop solid-state thermal transistor for better heat management. Recovered Nov 09, 2023, UCLA Samueli School of Engineering: https://news.umich.edu/new-phone-case-provides-workaround-for-inaccessible-touch-screens/

Information source: (UCLA Samueli School of Engineering, 2023)

1.8   Preventing catastrophic failure in lithium ion batteries

A team of ANSTO scientists, led by Prof Vanessa Peterson, used neutron scattering techniques to understand the formation of harmful lithium structures in rechargeable lithium ion batteries (LIBs).
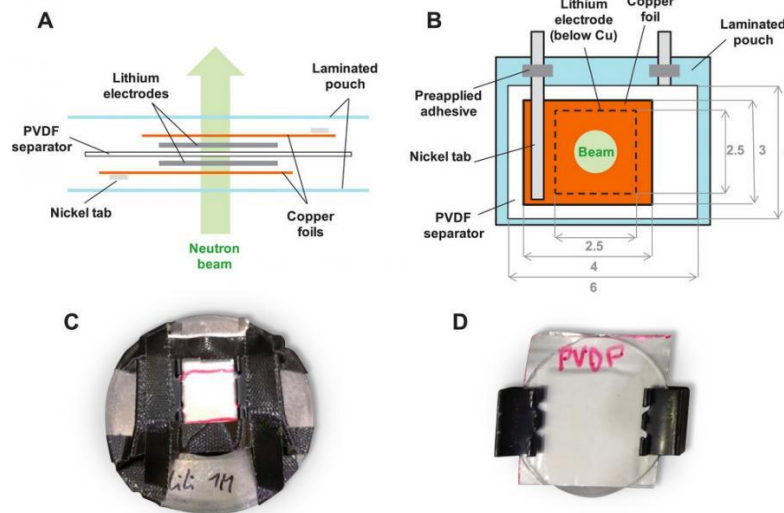
In situ cell construction.
Credit: Australian Nuclear Science and Technology Organisation

Despite being found in most portable electronics and electric vehicles, the energy capacity of LIBs falls short of that required by many next-generation technologies. Although replacing the common electrodes in these batteries with pure lithium metal can help the battery store much more energy, lithium microstructures that form at the lithium surface can create short-circuits, and lead to catastrophic battery failure. *"We used small-angle and ultra-small-angle neutron scattering (SANS and USANS) techniques with our Quokka and Kookaburra instruments at the Australian Centre for Neutron Scattering to study these complex lithium structures,"* said Prof Peterson.

For more information, visit the following link:
https://www.ansto.gov.au/news/preventing-catastrophic-failure-lithium-ion-batteries

Reference
Peterson, V.; Gilbert, E. & Mata, J. (Nov 03, 2023). Preventing catastrophic failure in lithium ion batteries. Recovered Nov 09, 2023, Australian Nuclear Science and Technology Organisation: https://www.ansto.gov.au/news/preventing-catastrophic-failure-lithium-ion-batteries

Information source: (Australian Nuclear Science and Technology Organisation, 2023)

1.9 Powered by Artificial Intelligence, new system makes human-to-robot communication more seamless

Software developed by Brown researchers can translate expressive and complex plain-worded instructions into behaviors a robot can carry out, all without needing thousands of hours of training data.

Advances in so-called large language models that run on Artificial Intelligence are giving navigation robots, like Boston Dynamic's Spot, newfound powers of understanding and reasoning.
Credit: Nick Dentamaro, Brown University

Advances in so-called large language models that run on Artificial Intelligence, however, are changing this. Giving robots newfound powers of understanding and reasoning are not only helping make experiments like this achievable but have computer scientists excited about transferring this type of success to environments outside of labs, such as people's homes and major cities and towns around the world. For the past year, researchers at Brown University's Humans to Robots Laboratory have been working on a system with this kind of potential. The research marks an important contribution toward more seamless communications between humans and robots, the scientists say, because the sometimes convoluted ways humans naturally communicate with each other usually pose problems when expressed to robots, often resulting in incorrect actions or a long planning lag.

For more information, visit the following link:
https://www.brown.edu/news/2023-11-06/human-robot-communication

Reference
Siliezar, J. (Nov 06, 2023). Powered by A.I., new system makes human-to-robot communication more seamless. Recovered Nov 09, 2023, Brown University:
https://www.brown.edu/news/2023-11-06/human-robot-communication

Information source: (Brown University, 2023)

1.10   Autonomous electrochemistry robot

Beckman researchers developed a cost-friendly, customizable, electrochemistry robot called the Electrolab to perform autonomous experiments in the laboratory. The Electrolab will be used to explore next-generation energy storage materials and chemical reactions that promote alternative and sustainable energy.
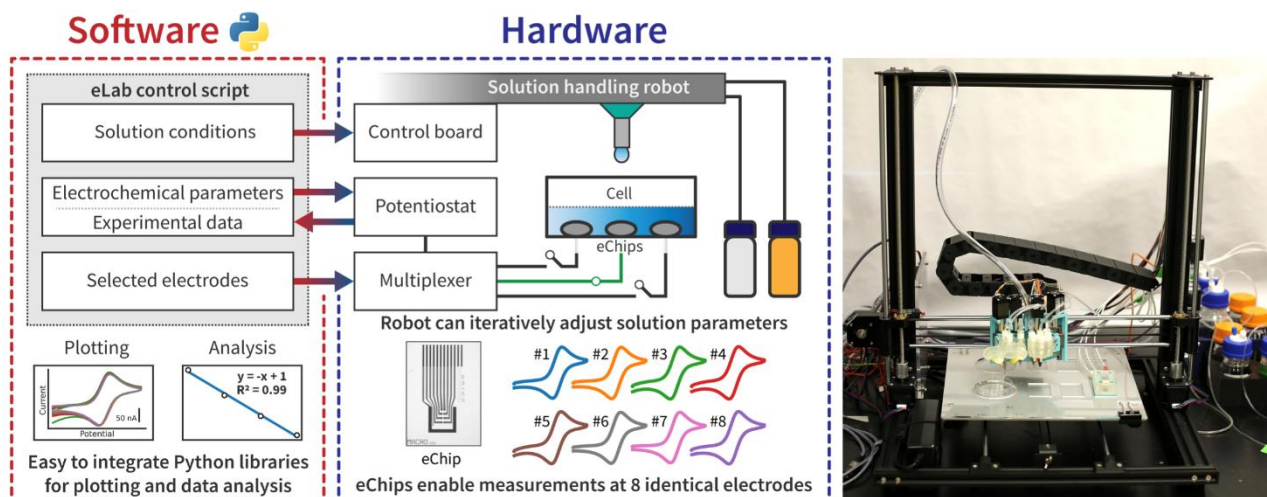
Left: Schematic diagram of the Electrolab's software and hardware components. Right: Photograph of the Electrolab. From "The Electrolab: An open source modular platform for automated characterization of redox-active electrolytes." by Oh et al. 2023, Oct 10. Device.
Credit: University of Illinois Urbana-Champaign

"We hope the Electrolab will allow new discoveries in energy storage while helping us share knowledge and data with other electrochemists — and non-electrochemists! We want them to be able to try things they couldn't before," said Joaquín Rodríguez-López, a professor in the Department of Chemistry at the University of Illinois Urbana-Champaign. There are two main components of the Electrolab: hardware and software. The hardware consists of a standard 3D printer frame that was transformed into a solution-handling robot; microfabricated electrode arrays, or eChips; and electrochemical hardware. The frame allows the robot to move around within a designated area above electrochemical cells to dispense different liquids. The eChips measure electrical current which is necessary for understanding the electrochemical measurements.

For more information, visit the following link:
https://beckman.illinois.edu/about/news/article/2023/11/06/lightening-the-load-beckman-researchers-develop-autonomous-electrochemistry-robot

Reference
Bello, E. (Nov 06, 2023). Lightening the load: Beckman researchers develop autonomous electrochemistry robot. Recovered Nov 09, 2023, University of Illinois Urbana-Champaign:
https://beckman.illinois.edu/about/news/article/2023/11/06/lightening-the-load-beckman-researchers-develop-autonomous-electrochemistry-robot

Information source: (University of Illinois Urbana-Champaign, 2023)

1.11   Nanoparticle quasicrystal constructed with DNA

Nanoengineers have created a quasicrystal—a scientifically intriguing and technologically promising material structure—from nanoparticles using DNA, the molecule that encodes life. The team, led by researchers at Northwestern University, the University of Michigan and the Center for Cooperative Research in Biomaterials in San Sebastian, Spain.
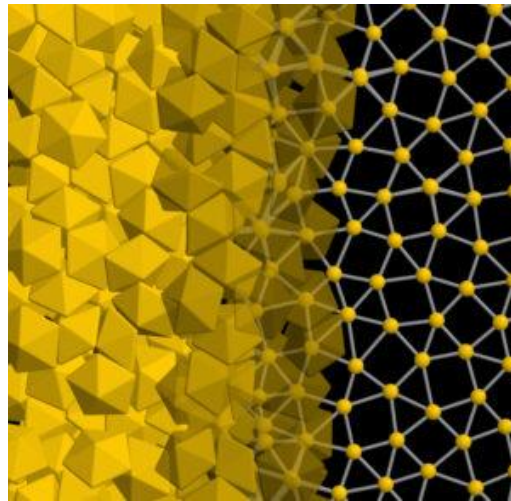
The simulation shows the decahedra packing together into a quasicrystalline structure on the left, with a diagram of the structure on the right.
Credit: Glotzer group, University of Michigan.

Unlike ordinary crystals, which are defined by a repeating structure, the patterns in quasicrystals don't repeat. Quasicrystals built from atoms can have exceptional properties—for example, absorbing heat and light differently, exhibiting unusual electronic properties such as conducting electricity without resistance, or their surfaces are very hard or very slippery. Engineers studying nanoscale assembly often view nanoparticles as a kind of 'designer atom,' which provides a new level of control over synthetic materials. One of the challenges is directing particles to assemble into desired structures with useful qualities, and in building this first DNA-assembled quasicrystal, the team entered a new frontier in nanomaterial design.

For more information, visit the following link:
https://news.umich.edu/nanoparticle-quasicrystal-constructed-with-dna/

Reference
McAlpine, K. (Nov 02, 2023). Nanoparticle quasicrystal constructed with DNA. Recovered Nov 09, 2023, Massachusetts Institute of Technology:
https://news.umich.edu/nanoparticle-quasicrystal-constructed-with-dna/

Information source: (Massachusetts Institute of Technology, 2023)

1.12   Advances in soft robotics usher in a new era of scientific analysis

The researchers developed a soft robot prototype, named *"Rhombot"*, which is a biomimetic – meaning it uses concepts from nature to solve complex problems.

"Rhombot".
Credit: Courtesy of Carnegie Mellon University, The Ohio State University

The Rhombot was modeled after a genus of echinoderms called Pleurocystites. Echinoderms generally refer to invertebrates like starfish, sea cucumbers and sand dollars that possess distinct internal skeletons, but the Pleurocystites are extinct organisms that have a flattened body with two large feeding appendages that move along the seafloor. According to Ausich, a professor of earth sciences at The Ohio State University, the creators of Rhombot began by mimicking the special connective tissue echinoderms have and setting up various theoretical and physical simulations for the Rhombot to successfully move across a contact-rich surface meant to represent an ancient, hard seafloor.

For more information, visit the following link:
https://news.osu.edu/advances-in-soft-robotics-usher-in-a-new-era-of-scientific-analysis/

Reference
Woodall, T. (Nov 06, 2023). Advances in soft robotics usher in a new era of scientific analysis. Recovered Nov 09, 2023, The Ohio State University:
https://news.osu.edu/advances-in-soft-robotics-usher-in-a-new-era-of-scientific-analysis/

Information source: (The Ohio State University, 2023)

1.13   New method for electronic-to-multi-ionic signal transmission

Recently, joint research by City University of Hong Kong and Shanghai Jiao Tong University achieved a breakthrough by creating an aluminium alloy with unprecedented fatigue resistance using advanced 3D printing techniques. The new fatigue-resistance strategy can be applied in other 3D-printed alloys to help develop lightweight components with increased load efficiency for various industries.
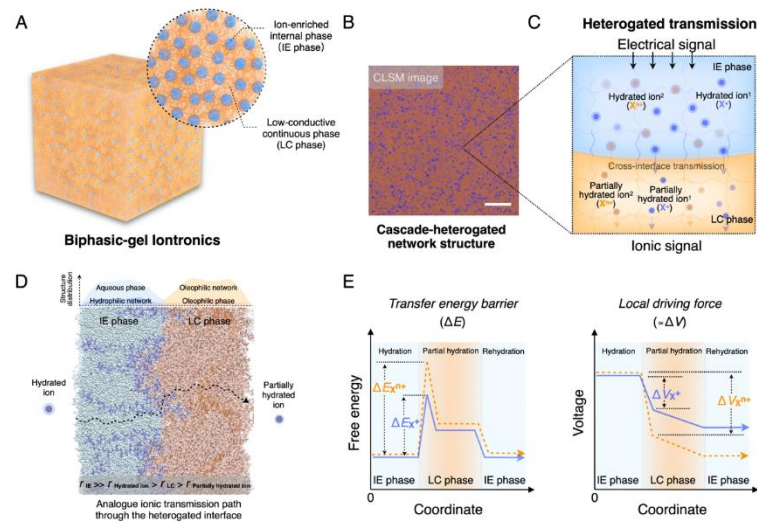
Heterogeneous structures and cross-interface ion transmission of cascade-heterogated biphasic-gel iontronics.
Credit: Wen Liping, Chinese Academy of Sciences

Electronic and iontronic devices have attracted considerable attention as they bridge the communication gap between abiotic and biotic interfaces, finding crucial applications in neural electrodes, neuroprosthetics, and smart implantable devices. However, due to monotonous and single electronic/ionic signals that cannot match more biocompatible information, state-of-the-art electronics and iontronics have been limited. Sophisticated recognition and precise control of diverse bioionic signals in artificial devices for complex biological environments have thus remained a significant challenge.

For more information, visit the following link:
https://english.cas.cn/newsroom/research_news/chem/202311/t20231103_552993.shtml

Reference
Zhang, N. (Nov 07, 2023). Scientists develop new method for electronic-to-multi-ionic signal transmission. Recovered Nov 10, 2023, Chinese Academy of Sciences:
https://english.cas.cn/newsroom/research_news/chem/202311/t20231103_552993.shtml

Information source: (Chinese Academy of Sciences, 2023)

1.14   A centimeter-scale quadruped leverages curved-crease origami

Centimeter-scale walking and crawling robots are in demand both for their ability to explore tight or cluttered environments and for their low fabrication costs. Now, pulling from origami-inspired construction, researchers led by Cynthia Sung, Gabel Family Term Assistant Professor in the School of Engineering and Applied Science's Mechanical Engineering and Applied Mechanics (MEAM) Department, have crafted a more simplified approach to the design and fabrication of these robots.
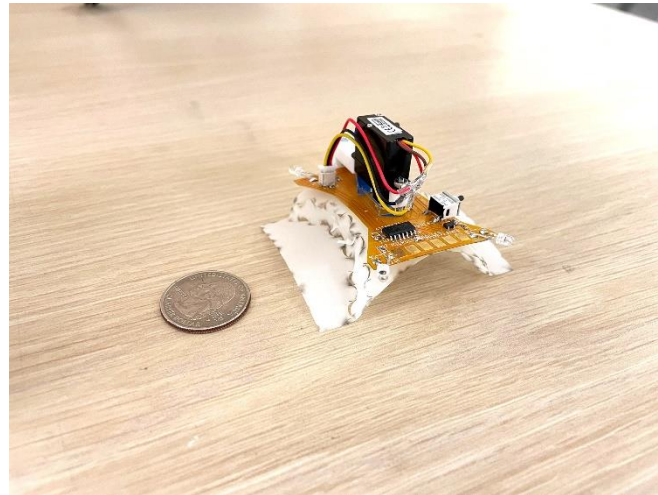
Credit: Sung Lab, University of Pennsylvania

Known as CurveQuad, this centimeter-scale quadruped leverages curved-crease origami to self-fold, unfold, crawl, and steer, all using a single motor. The curved creases in this technique have interesting mechanical properties as compared to more commonly used straight crease designs because they induce bending in a folded sheet. Energy, stored in the folding of creases and in the bending of panels, allows for controlled, reversible, and complex motions using fewer actuators.

For more information, visit the following link:
https://penntoday.upenn.edu/news/centimeter-scale-quadruped-leverages-curved-crease-origami

Reference
University of Pennsylvania. (Nov 07, 2023). A centimeter-scale quadruped leverages curved-crease origami. Recovered Nov 10, 2023, University of Pennsylvania:
https://penntoday.upenn.edu/news/centimeter-scale-quadruped-leverages-curved-crease-origami

Information source: (University of Pennsylvania, 2023)

1.15   Trap electrons in a 3D crystal

Physicists at Massachusetts Institute of Technology have successfully trapped electrons in a pure crystal. It is the first time that scientists have achieved an electronic flat band in a three-dimensional material. With some chemical manipulation, the researchers also showed they could transform the crystal into a superconductor — a material that conducts electricity with zero resistance.
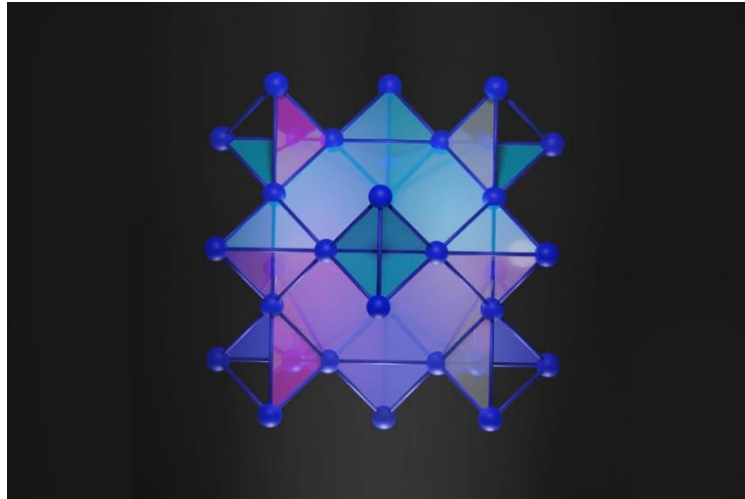
MIT physicists have trapped electrons in a pure crystal, marking the first achievement of an electronic flat band in a three-dimensional material.
Credit: Massachusetts Institute of Technology

The electrons' trapped state is possible thanks to the crystal's atomic geometry. The crystal, which the physicists synthesized, has an arrangement of atoms that resembles the woven patterns in *"kagome",* the Japanese art of basket-weaving. In this specific geometry, the researchers found that rather than jumping between atoms, electrons were *"caged",* and settled into the same band of energy. The researchers say that this flat-band state can be realized with virtually any combination of atoms — as long as they are arranged in this kagome-inspired 3D geometry.

For more information, visit the following link:
https://news.mit.edu/2023/physicists-trap-electrons-3d-crystal-first-time-1108

Reference
Chu, J. (Nov 08, 2023). Physicists trap electrons in a 3D crystal for the first time. Recovered Nov 10, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/physicists-trap-electrons-3d-crystal-first-time-1108

Information source: (Massachusetts Institute of Technology, 2023)

1.16   Staying online in the high speed tube of the future

In the two-meter steel tube of the Hyperloop, standard wireless radio signals would bounce repeatedly off the walls to create a very noisy environment with high interference. Combined with the speed of the pod, this would make it very difficult to maintain a good connection. Instead, Amin and his colleagues proposed the use of intelligent reflecting surfaces (IRSs) to direct the wireless radio signal as a beam to a receiver on the pod.
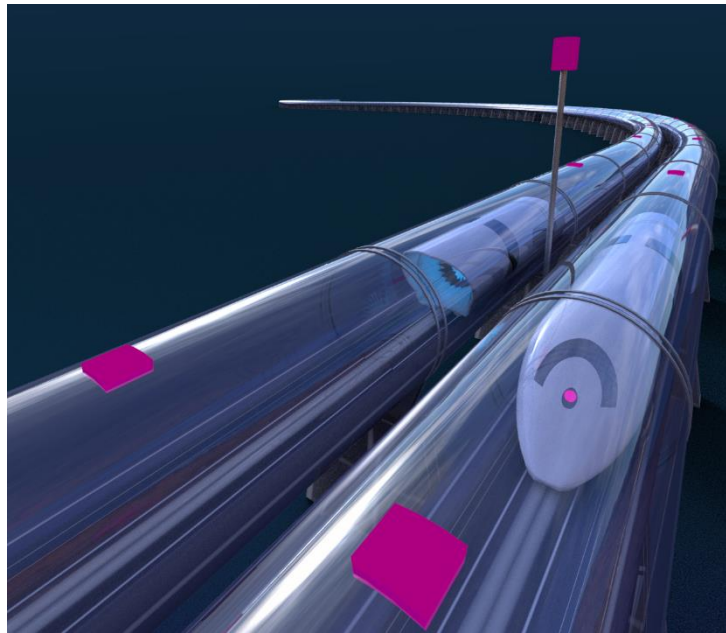
The Hyperloop is a superfast train that travels within a vacuum tube at up to 1000 km per hour. KAUST researchers have designed a communications system that will allow passengers to stay connected while they travel.
Credit: Heno Hwang, King Abdullah University of Science and Technology

"The biggest challenge was figuring out how to keep the radio signal strong and steady while trying to hit a fast-moving target in a metal tube. The IRS achieves this by being able to rapidly adjust its reflection direction electrically with no moving parts," says Hedhly. IRSs are based on thin compact metamaterials that can precisely manipulate radio waves; in this case the reflection angle from a wireless source toward the oncoming Hyperloop pod. By combing IRSs with a series of wireless base stations along the tube linked by an optical fiber backbone network and a central active control system, simulations show that the system can maintain strong connection at Hyperloop speeds of more than 1,000 kilometers per hour.

For more information, visit the following link:
https://discovery.kaust.edu.sa/en/article/22981/staying-online-in-the-high-speed-tube-of-the-future/

Reference
Hedhly, W. & Amin, O. (Nov 08, 2023). Staying online in the high speed tube of the future. Recovered Nov 10, 2023, King Abdullah University of Science and Technology:
https://discovery.kaust.edu.sa/en/article/22981/staying-online-in-the-high-speed-tube-of-the-future/

Information source: (King Abdullah University of Science and Technology, 2023)

1.17   Should Artificial Intelligence read your college essay? It's complicated

The team recruited a cohort of real admissions officers to read a sample of these essays. The professionals scored the essays for evidence of seven traits that colleges might want to see in incoming freshmen. They included intrinsic motivation ("Running track is so much more than a sport to me") and what the researchers call "prosocial purpose," or the willingness to help others ("Helping children realize their hidden talents is one of the most rewarding experiences I have ever had"). The team also trained undergraduate students to identify evidence of those traits in the essays based on existing theories and research on personal qualities.

Credit: University of Colorado Boulder

The researchers fed those insights into a series of AI platforms called large language models to train them to identify evidence of personal qualities going beyond simple word spotting. Afterward, when the AI platforms read new essays, their results largely lined up with the judgements of the human readers. The AI also seemed to assign beneficial personal qualities evenly across applicants from all demographic backgrounds—although, echoing previous findings, female writers were slightly more likely to demonstrate prosocial purpose than males.

For more information, visit the following link:
https://www.colorado.edu/today/2023/11/08/should-ai-read-your-college-essay-its-complicated

Reference
Strain, D. (Nov 08, 2023). Should AI read your college essay? It's complicated. Recovered Nov 09, 2023, University of Colorado Boulder:
https://www.colorado.edu/today/2023/11/08/should-ai-read-your-college-essay-its-complicated

Information source: (University of Colorado Boulder, 2023)

1.18   Electric vehicles are driven less than gas cars

A new study from researchers at the George Washington University suggests that emissions savings from electric vehicles (EV) might be overestimated. The assumption among modelers and regulatory bodies like the Environmental Protection Agency (EPA) has been that EV owners drive their cars about the same number of miles as owners of gas vehicles.

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

"People often assume that buying an EV is good for the environment, and it generally is, but the impacts scale with mileage," said John Helveston, study co-author and assistant professor of engineering management and systems engineering at GW. *"Our study shows that the current generation of EV owners aren't using them as much as gas cars. For maximum impact, we need the highest-mileage drivers behind the wheel of EVs rather than low-mileage drivers."* Because EVs generally have lower emissions over their lifetime, replacing a higher-mileage gasoline vehicle with an EV results in larger emissions savings, all else being equal.

For more information, visit the following link:
https://gwtoday.gwu.edu/new-study-finds-electric-vehicles-are-driven-less-gas-cars

Reference
The George Washington University. (Nov 08, 2023). New study finds electric vehicles are driven less than gas cars. Recovered Nov 10, 2023, The George Washington University: https://gwtoday.gwu.edu/new-study-finds-electric-vehicles-are-driven-less-gas-cars

Information source: (The George Washington University, 2023)

1.19   Machine Learning gives users *"superhuman"* ability to open and control tools in Virtual Reality

Researchers have developed a Virtual Reality application where a range of 3D modelling tools can be opened and controlled using just the movement of a user's hand. The researchers, from the University of Cambridge, used Machine Learning to develop *"HotGestures"* – analogous to the hot keys used in many desktop applications. HotGestures give users the ability to build figures and shapes in Virtual Reality without ever having to interact with a menu, helping them stay focused on a task without breaking their train of thought.

The idea of being able to open and control tools in Virtual Reality has been a movie trope for decades, but the researchers say that this is the first time such a *"superhuman"* ability has been made possible. Virtual Reality (VR) and related applications have been touted as game-changers for years, but outside of gaming, their promise has not fully materialised. *"Users gain some qualities when using VR, but very few people want to use it for an extended period of time,"* said Professor Per Ola Kristensson from Cambridge's Department of Engineering, who led the research. *"Beyond the visual fatigue and ergonomic issues, VR isn't really offering anything you can't get in the real world."*

For more information, visit the following link:
https://www.cam.ac.uk/research/news/machine-learning-gives-users-superhuman-ability-to-open-and-control-tools-in-virtual-reality

Reference
Collins, S. (Nov 08, 2023). Machine Learning gives users *"superhuman"* ability to open and control tools in Virtual Reality. Recovered Nov 10, 2023, University of Cambridge:
https://www.cam.ac.uk/research/news/machine-learning-gives-users-superhuman-ability-to-open-and-control-tools-in-virtual-reality

Information source: (University of Cambridge, 2023)

1.20   Secret to longer lasting batteries might be in how soap works

Researchers found that one of the most promising electrolytes for designing longer lasting lithium batteries has complex nanostructures that act like micelle structures do in soaped water. Localized high-concentration electrolytes were engineered by scientists at Idaho National Laboratory and Pacific Northwest National Laboratory to address this challenge. They are made by mixing a high concentration of salt in solvent with another liquid called a diluent, which makes the electrolyte flow better so that the power of the battery can be maintained.
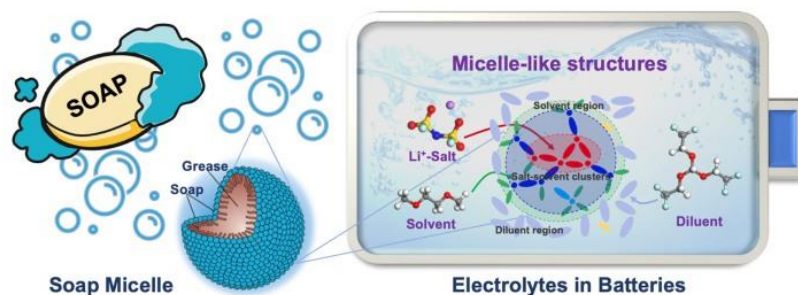
Researchers show that one of the most promising substances for designing longer lasting lithium batteries form micelle-like structures like they do in soap.
Credit: National University of Singapore

So far, in lab tests, this new type of electrolyte has shown promising results, but how it works and why has never been fully understood — putting a cap on how effective it can be and how it can be better developed. This is what the new study helps to address. *"The paper provides a unified theory to why this electrolyte works better and the key understanding of it came by finding that micelle-like structures form within this electrolyte — like they do with soap,"* said Bin Li, a senior scientist at Oak Ridge National Laboratory who worked on the study while at Idaho National Laboratory. *"Here we see that the role of the soap or surfactant is played by the solvent that binds both the diluent and the salt, wrapping itself around the higher concentration salt in the center of the micelle."*

For more information, visit the following link:
https://www.brown.edu/news/2023-11-08/micelle-structures

Reference
Siliezar, J. (Nov 08, 2023). The secret to longer lasting batteries might be in how soap works, new study says. Recovered Nov 10, 2023, Brown University:
https://www.brown.edu/news/2023-11-08/micelle-structures

Information source: (Brown University, 2023)

II. PATENTS

2.1. Automatically generating training data of a time series of sensor data

Assistance device for automatically generating training data of a time series of sensor data, further on called temporal sensor data, applied to train an Artificial Intelligence system used for detecting anomalous behavior of a technical system, including a processor configured to perform - obtaining historical temporal sensor data.
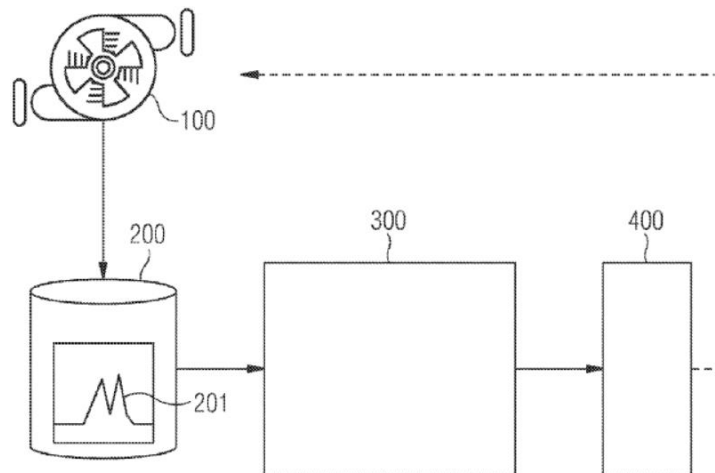
Schematically illustrates an application scenario for automatically generating training data.
Credit: Günnemann-Gholizadeh, N. & Galabov, F., WIPO IP Portal

Dividing the historical temporal sensor data into a temporal sequence of segments and assigning one segment type out of several different segment types to each segment, iteratively for each segment, determining a neighborhood pattern of segment types, determining the most frequently occurring neighborhood pattern from all determined neighborhood patterns as reference pattern for normal operation of the technical system, - selecting a subsequence of segments out of the historical temporal sensor data, which is ordered according to the reference pattern, and - outputting the subsequence of segments for applying as training data.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US411170793&_cid=P10-LO5SL5-13026-4

Reference
Günnemann-Gholizadeh, N. & Galabov, F. (Nov 02, 2023). Automatically generating training data of a time series of sensor data. Recovered Nov 02, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US411170793&_cid=P10-LO5SL5-13026-4

Information source: (WIPO IP Portal, 2023)

2.2.   Smart camera system for monitoring remote assets

A camera system for monitoring remote assets comprises: a sealed housing including an electrical housing, a bottom part, and a top part, the top part and bottom part located at opposite ends of the electrical housing; one or more cameras positioned within the top part to have a field of view external of the top part.
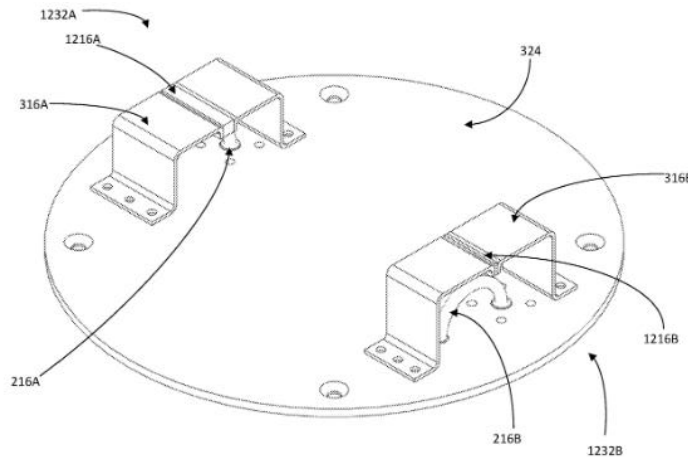
Shows two antennas and respective capacitive loaded loops (CLLs) mounted upon antenna platform.
Credit: Tata Nardini, F.; Pearson, M.; Pereira, N.; Esmati, Z.; Raltcheva, M. & Liao, Ch., WIPO IP Portal

One or more processors within the sealed housing; a communications unit within the sealed housing for enabling wireless data communication with an external gateway device; a communications antenna; and a first power source receiving chamber. The one or more cameras are configmed to capture one or more images. The one or more processors may include an Artificial Intelligence (Al) processor configured to apply an Al model to determine a likelihood of a hazard to be present in the one or more images, and to generate a signal indicating detection of the hazard.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023205837&_cid=P22-LOYK9A-49340-1

Reference
Tata Nardini, F.; Pearson, M.; Pereira, N.; Esmati, Z.; Raltcheva, M. & Liao, Ch. (Nov 02, 2023). Smart camera system for monitoring remote assets. Recovered Nov 02, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023205837&_cid=P22-LOYK9A-49340-1

Information source: (WIPO IP Portal, 2023)

2.3.   Systems and methods for Artificial Intelligence-based image analysis for detection and characterization of lesions

Presented herein are systems and methods that provide for improved detection and characterization of lesions within a subject via automated analysis of nuclear medicine images, such as positron emission tomography (PET) and single photon emission computed tomography (SPECT) images.
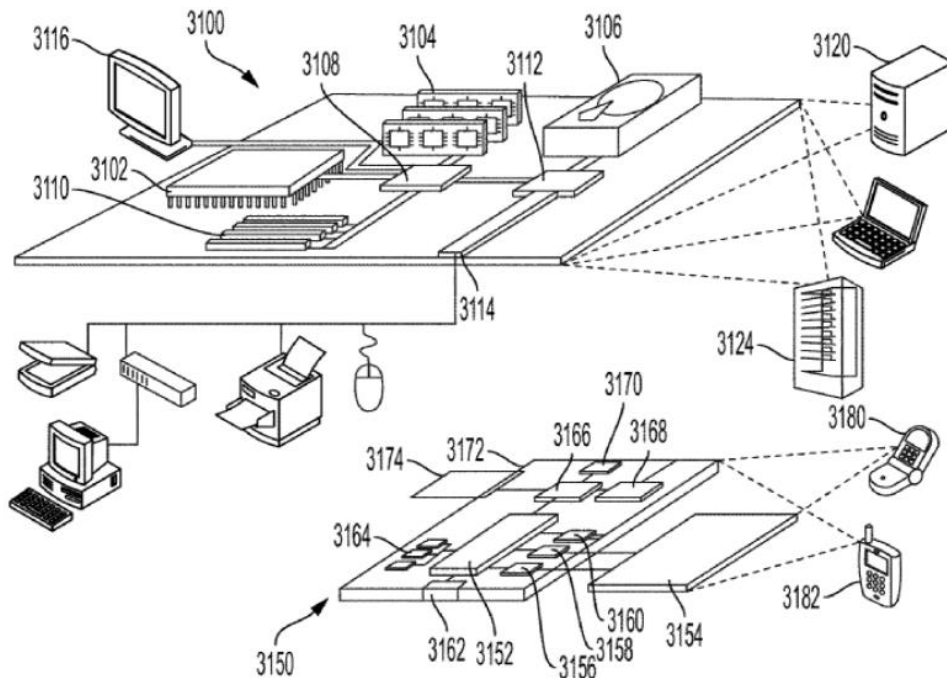
Block diagram of an example computing device and an example mobile computing device used in certain embodiments.
Credit: Brynolfsson, J.; Johnsson, K.; Sahlstedt, H. & Andreas, J., WIPO IP Portal

In particular, in certain embodiments, the approaches described herein leverage Artificial Intelligence (AI) to detect regions of 3D nuclear medicine images corresponding to hotspots that represent potential cancerous lesions in the subject. The Machine Learning modules may be used not only to detect presence and locations of such regions within an image, but also to segment the region corresponding to the lesion and/or classify such hotspots based on the likelihood that they are indicative of a true, underlying cancerous lesion. This AI-based lesion detection, segmentation, and classification can provide a basis for further characterization of lesions, overall tumor burden, and estimation of disease severity and risk.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US412499033

Reference
Brynolfsson, J.; Johnsson, K.; Sahlstedt, H. & Andreas, J. (Nov 02, 2023). Systems and methods for Artificial Intelligence-based image analysis for detection and characterization of lesions. Recovered Nov 02, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US412499033

Information source: (WIPO IP Portal, 2023)

2.4.   Method of performing communication load balancing with multi-teacher reinforcement learning, and an apparatus for the same

A server may be provided to obtain a load balancing Artificial Intelligence (AI) model for a plurality of base stations in a communication system.
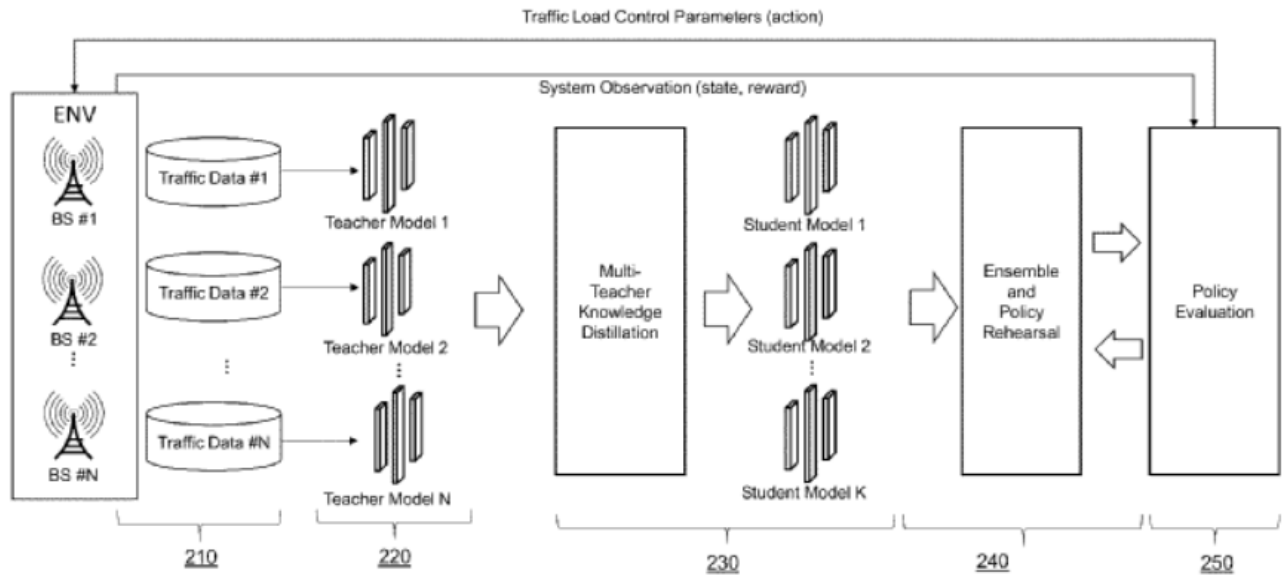
Diagram illustrating a method for generating a control policy for performing traffic load balancing according to embodiments of the present disclosure.
Credit: Kang, J.; Chen, X.; Hu, Ch.; Wang, J.; Lewis, G. & Liu, X., WIPO IP Portal

The server may obtain teacher models based on traffic data sets collected from the base stations, respectively; perform a policy rehearsal process including obtaining student models based on knowledge distillation from the teacher models, obtaining an ensemble student model by ensembling the student models, and obtaining a policy model by interacting with the ensemble student mode; provide the policy model to each of the base stations for a policy evaluation of the policy model; and based on a training continue signal being received from at least one of the base stations as a result of the policy evaluation, update the ensemble student model and the policy model by performing the policy rehearsal process on the student models.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US412501331&_cid=P22-LOYK9A-49340-1

Reference
Kang, J.; Chen, X.; Hu, Ch.; Wang, J.; Lewis, G. & Liu, X. (Nov 02, 2023). Method of performing communication load balancing with multi-teacher reinforcement learning, and an apparatus for the same. Recovered Nov 02, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US412501331&_cid=P22-LOYK9A-49340-1

Information source: (WIPO IP Portal, 2023)

2.5.   Training Artificial Intelligence models for radiation therapy

Disclosed herein are systems and methods for iteratively training Artificial Intelligence models using reinforcement learning techniques. With each iteration, a training agent applies a random radiation therapy treatment attribute corresponding to the radiation therapy treatment attribute associated with previously performed radiation therapy treatments when an epsilon value indicative of a likelihood of exploration and exploitation training of the Artificial Intelligence model satisfies a threshold.
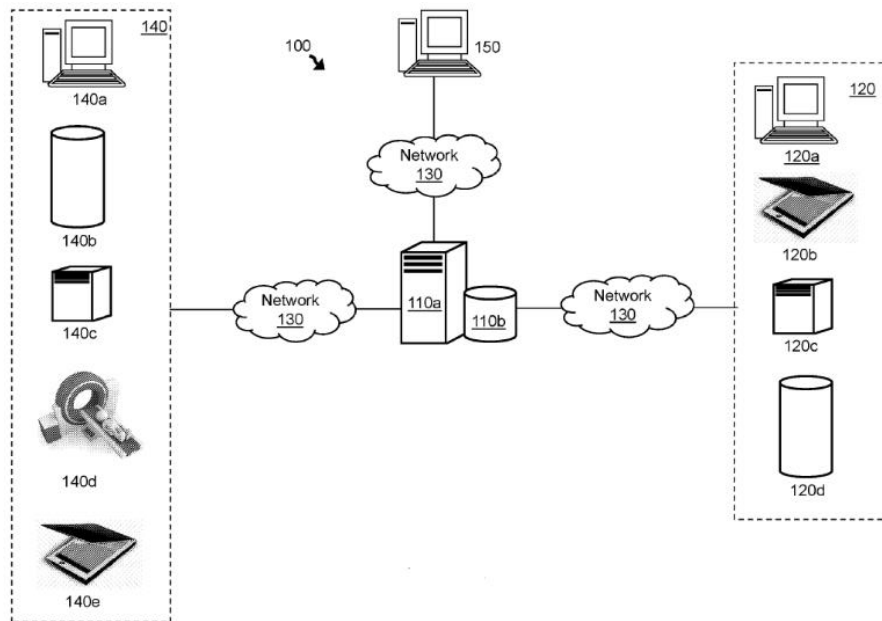
Illustrates components of an AI-enabled RTTP optimization system, according to an embodiment.
Credit: Basiri, S.; Hakala, M.; Kuusela, E. & Czeizler, E., WIPO IP Portal

When the epsilon value does not satisfy the threshold, the agent generates, using an existing policy, a first predicted radiation therapy treatment attribute, and generates, using a predefined model, a second predicted radiation therapy treatment attribute. The agent applies one of the first predicted radiation therapy treatment attribute or the second predicted radiation therapy treatment attribute that is associated with a higher reward. The agent iteratively repeats training the Artificial Intelligence model until the existing policy satisfies an accuracy threshold.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US412494209

Reference
Basiri, S.; Hakala, M.; Kuusela, E. & Czeizler, E. (Nov 02, 2023). Training Artificial Intelligence models for radiation therapy. Recovered Nov 02, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US412494209

Information source: (WIPO IP Portal, 2023)

2.6.   Optimized vehicle-to-everything (V2X) messaging

Systems and techniques are described for providing optimized vehicle-to-everything (V2X) safety messages over a wide area network (Uu) interface. For example, method for wireless communications may include receiving, by a network device, one or more first messages from one or more vehicles.
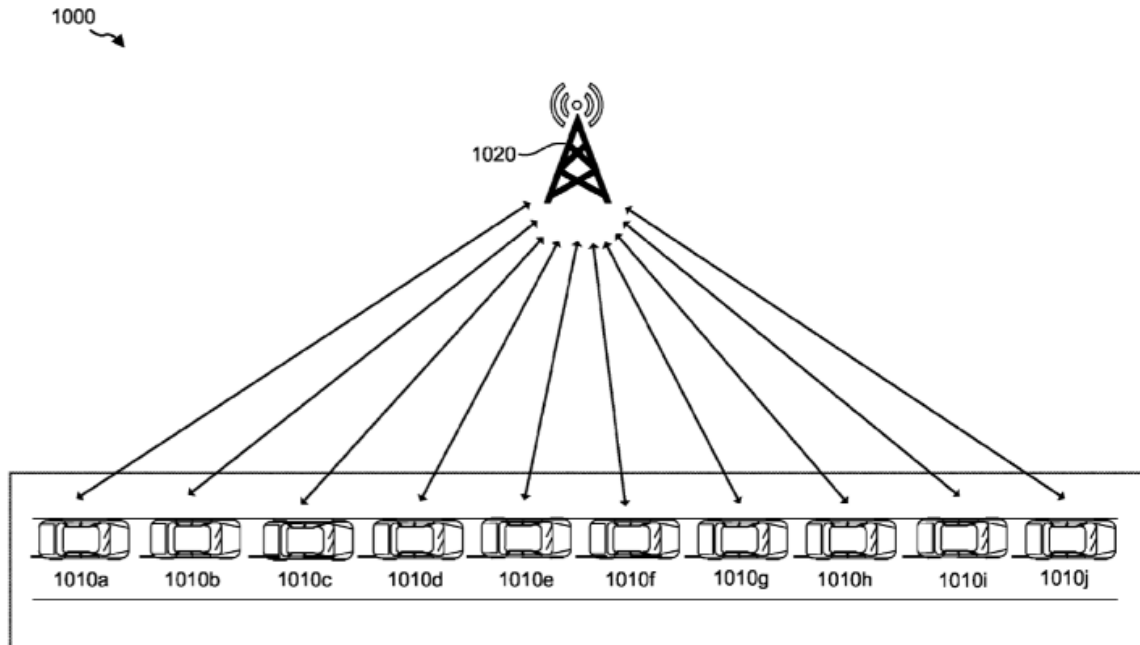
Diagram illustrating an example system including a network entity broadcasting messages to V2X enabled vehicles, in accordance with some aspects of the present disclosure.
Credit: Shuman, M.; Das, S.; Nekoui, M. & Veerepalli, S., Espacenet Patent Search

Each of the first message(s) includes vehicle information associated with a respective vehicle of the vehicle(s). The method may include determining, at the network device, one or more recipient vehicles for one or more second messages based on at least a portion of the vehicle information from the first message(s) and characteristics associated with a respective recipient vehicle of the recipient vehicle(s). The method may include transmitting, at the network device, the second message(s) to the recipient vehicle(s).

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086185149/publication/WO2023212466A1?q=artificial%20intelligence

Reference
Shuman, M.; Das, S.; Nekoui, M. & Veerepalli, S. (Nov 02, 2023). Optimized vehicle-to-everything (V2X) messaging. Recovered Nov 03, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086185149/publication/WO2023212466A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.7. Methods, architectures, apparatuses and systems for decentralized data control and access management

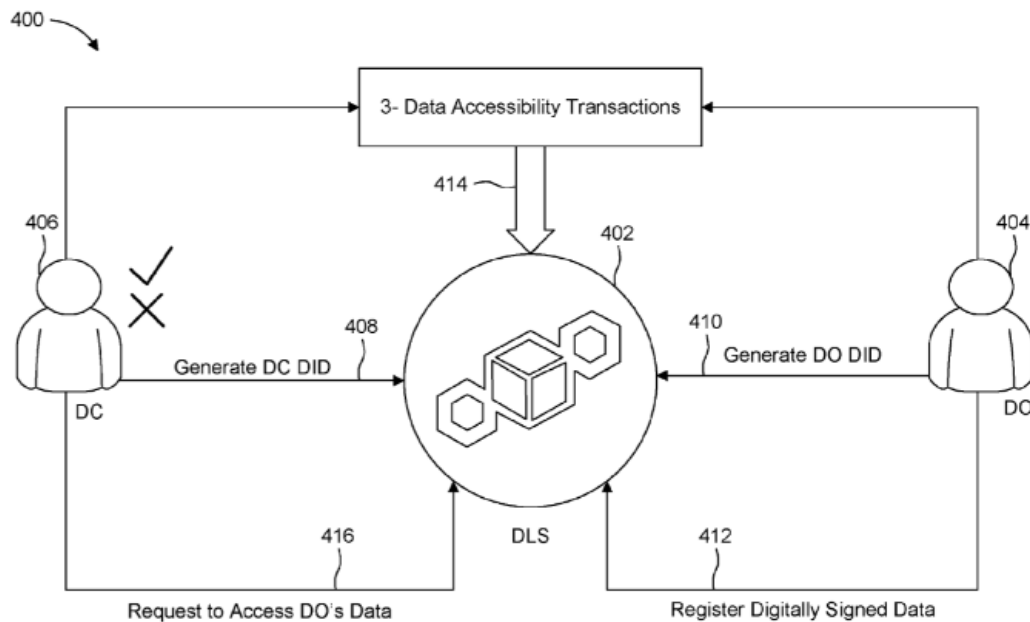Procedures, methods, architectures, apparatuses, systems, devices, and computer program products for decentralized data control and access management. For example, a data owner may perform a subscription procedure to obtain verification credentials and an index (e.g., address, identifier) to public data control and access information.

A system diagram illustrating an example of a data control system in a decentralized scheme.
Credit: Fathalla, E.; Wang, Ch.; Li, X.; Gazda, R.; Roy, M. & Starsinic, M., Espacenet Patent Search

The data owner may perform a registration procedure to register ownership of data using the public data control and access information. The public data control and access information may include a public key. The public key is paired with a private trapdoor key to form a key pair. The data owner and a data consumer may perform an access procedure to grant access to registered data. For example, the registration procedure may verify collisions between a token hash, a data hash, and a data owner hash based on use of the key pair.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086424740/publication/WO2023212051A1?q=blockchain

Reference
Fathalla, E.; Wang, Ch.; Li, X.; Gazda, R.; Roy, M. & Starsinic, M. (Nov 02, 2023). Methods, architectures, apparatuses and systems for decentralized data control and access management. Recovered Nov 03 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086424740/publication/WO2023212051A1?q=blockchain

Information source: (Espacenet Patent Search, 2023)

2.8.   System and method for providing a social media shopping experience

Disclosed are a system and process of providing social networking purchasing processes. A method includes receiving, from a posting entity and at the social networking entity, a posting or a submission of a text, an image or a video.
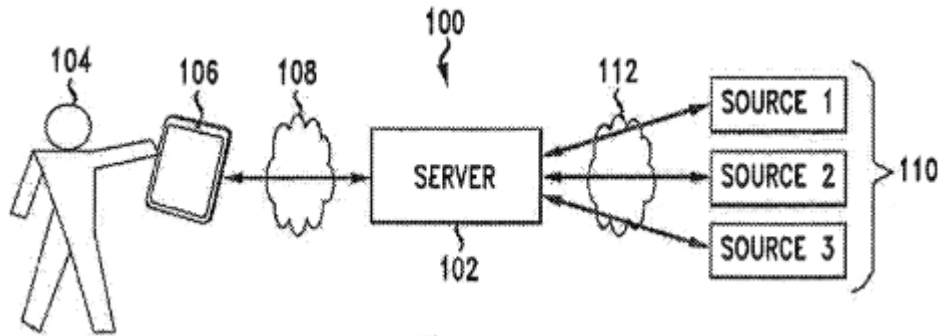
Illustrates a system architecture.
Credit: Isaacson, T. & Durham, R., Espacenet Patent Search

When the submission is associated with a product within a product catalog of the posting entity, the social networking entity presents in a newsfeed of users or otherwise on the social networking entity, the text, image or video with an associated option to buy. The option to buy might be presented through a messenger application or as the user browses the posting. When there is a correlation between the posting and the product catalog, and when the user makes a purchase of the product, the user is not transitioned away from the social networking entity. Initiating a payment process occurs within the social networking entity.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/088512379/publication/US2023351474A1?q=3d

Reference
Isaacson, T. & Durham, R. (Nov 02, 2023). System and method for providing a social media shopping experience. Recovered Nov 03, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/088512379/publication/US2023351474A1?q=3d

Information source: (Espacenet Patent Search, 2023)

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

Aspects of the disclosed technology generally relate to the field of education and entertainment technology and in particular, to Augmented Reality (AR) technology and edible element-based interactive reading systems and methods.
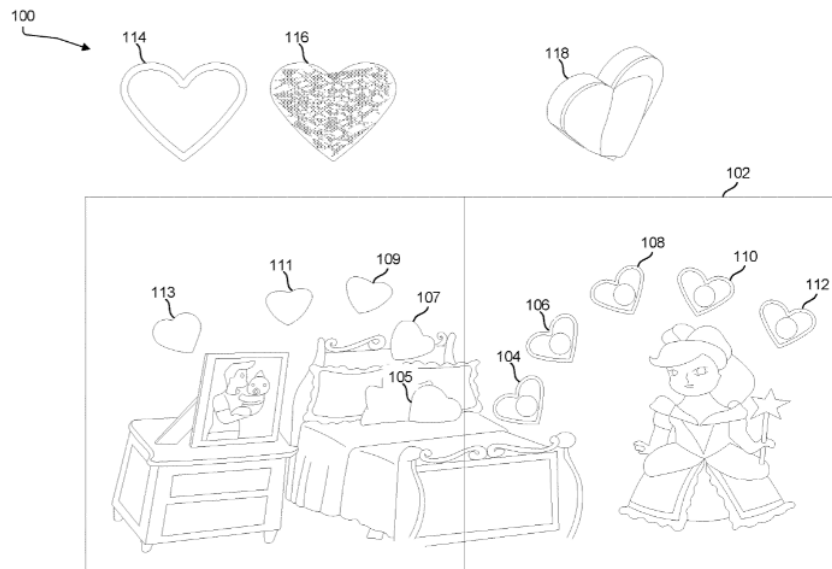
Example edible element reading system, according to some aspects of the disclosed technology.
Credit: García, J., Espacenet Patent Search

A process of the disclosed technology can include steps for launching an AR software application stored on an electronic device, wherein the AR software application is configured to interact with a book comprising one or more Augmented Reality (AR) markers and one or more edible elements embedded within the pages of the book and generating, based on the one or more AR markers, one or more AR characters, wherein the one or more AR characters are overlayed over the book. The process can further include steps for generating an animated reaction of the one or more AR characters when the one or more edible elements are removed.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/088512415/publication/US2023351707A1?q=virtual%20reality

Reference
García, J. (Nov 02, 2023). Method and apparatus for man-machine interaction based on story scene, device and medium. Recovered Nov 03, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/088512415/publication/US2023351707A1?q=virtual%20reality

Information source: (Espacenet Patent Search, 2023)

2.10.   Merchant selection model for dynamic management of add-ons for delivery service orders

Systems and method for dynamically managing add-on orders within a delivery service application. For example, a computer-implemented method includes obtaining data indicative of a primary order request. The method includes selecting, ranking, and displaying menu items for add-on orders associated with a primary order.

Example geographic areas containing candidate merchants according to example embodiments.
Credit: Cornacchia, R.; Demiralp, E.; Kilcioglu, C.; Rowe, K.; Sun, Z.; Sundaresan, V.; Tayade, A. & Wie, J.,
Espacenet Patent Search

The method includes obtaining user data provided by a user through a user interface associated with a delivery service application. The method includes determining, in response to obtaining the user data, that the primary order request is eligible for an add-on order. The method includes determining merchants for the add-on order. The selected merchants can be determined from a plurality of candidate merchants based at least in part on analysis of merchant-specific data relative to the user data indicative of the primary order request. The method includes updating the user interface to display data associated with the one or more selected merchants for the add-on order.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/088512388/publication/US2023351477A1?q=machine%20learning

Reference
Cornacchia, R.; Demiralp, E.; Kilcioglu, C.; Rowe, K.; Sun, Z.; Sundaresan, V.; Tayade, A. & Wie, J. (Nov 02, 2023). Merchant selection model for dynamic management of add-ons for delivery service orders. Recovered Nov 03, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/088512388/publication/US2023351477A1?q=machine%20learning

Information source: (Espacenet Patent Search, 2023)