Weekly Newsletter

TECHNOLOGY SURVEILLANCE

N° 26-2023   JUN 28TH, 2023

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 Artificial Intelligence could transform the way we understand emotion

An emotion recognition tool - developed by University of the West of Scotland (UWS) academics - could help people with neurodiverse conditions including autism. Traditionally, emotion recognition has been a challenging and complex area of study. However, with recent advancements in vision processing, and low-cost devices, such as wearable electroencephalogram (EEG) and electrocardiogram (ECG) sensors, UWS academics have collaborated to harness the power of these technologies to create artificial intelligence (AI) which can accurately read emotion-related signals from brain and facial analysis.

Professor Naeem Ramzan, Director of the Affective and Human Computing for SMART Environments Research Centre at UWS, said: *"Emotions are a fundamental aspect of the human experience, and understanding the signals that trigger different emotions can have a profound impact on various aspects of our lives. Our recent study has led to the creation of comprehensive data which can be deployed with wearable technology – using multi-sensors and artificial intelligence – to provide a vital tool for emotion recognition. The data also provides a valuable resource for researchers and industry professionals, enabling them to have a greater understanding of emotional triggers, and providing a reference point which could unlock new possibilities for advancements in health and wellbeing, education and security."*

For more information, visit the following link:
https://www.uws.ac.uk/news/ai-could-transform-the-way-we-understand-emotion/

Reference
University of the West of Scotland. (Jun 22, 2023). Artificial Intelligence could transform the way we understand emotion. Recovered Jun 23, 2023, University of the West of Scotland:
https://www.uws.ac.uk/news/ai-could-transform-the-way-we-understand-emotion/

Information source: (University of the West of Scotland, 2023)

1.2   Perovskite solar cells set new world record for power conversion efficiency

Building upon this exciting development, Asst Prof Hou and his team aim to push the boundaries of perovskite solar cell technology even further. Another key area of focus is to improve the stability of perovskite solar cells, as perovskite materials are sensitive to moisture and can degrade over time. Asst Prof Hou commented, *"We are developing a customised accelerating aging methodology to bring this technology from the lab to the fab. One of our next goals is to deliver perovskite solar cells with 25 years of operational stability."*
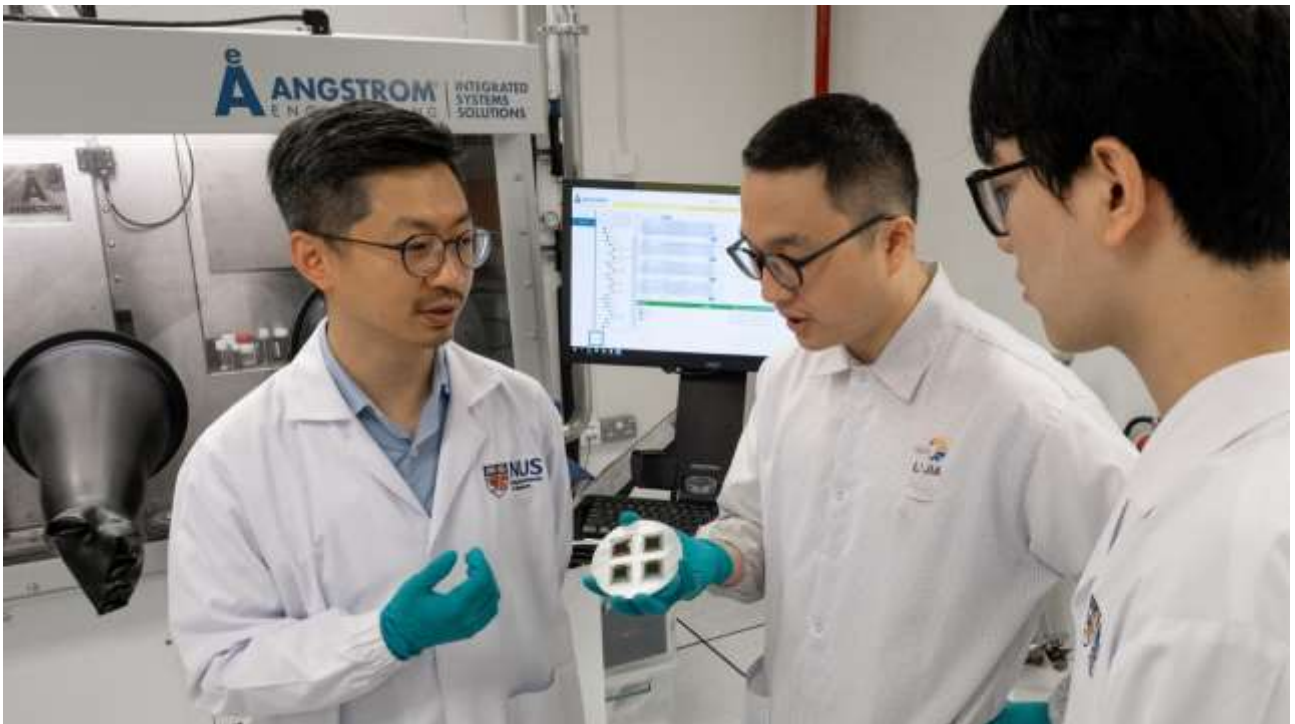
The promising results reported the NUS team marked a pivotal milestone in advancing the commercialisation of a low-cost, efficient, stable perovskite solar cell technology. Credit: National University of Singapore

The team is also working to scale up the solar cells to modules by expanding the dimensions of the perovskite solar cells and demonstrating their viability and effectiveness on a larger scale. *"The insights gained from our current study will serve as a roadmap for developing stable, and eventually, commercially-viable perovskite solar cell products that can serve as sustainable energy solutions to help reduce our reliance on fossil fuels,"* Asst Prof Hou added.

For more information, visit the following link:
https://news.nus.edu.sg/perovskite-solar-cells-set-new-world-record-for-power-conversion-efficiency/

Reference

National University of Singapore. (Jun 22, 2023). Perovskite solar cells invented by NUS scientists set new world record for power conversion efficiency. Recovered Jun 22, 2023, National University of Singapore:
https://news.nus.edu.sg/perovskite-solar-cells-set-new-world-record-for-power-conversion-efficiency/

Information source: (National University of Singapore, 2023)

1.3 Breakthrough innovation could solve temperature issues for source-gated transistors and lead to low-cost, flexible displays

Low-cost, flexible displays that use very little energy could be a step closer, thanks to an innovation from the University of Surrey that solves a problem that has plagued source-gated transistors (SGT).
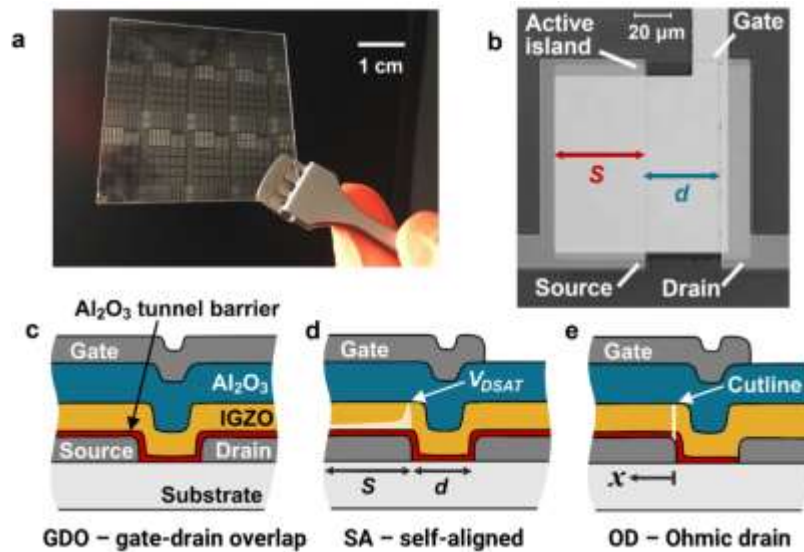
Credit: University of Surrey

A source-gated transistor (SGT) is a special type of transistor that combines two fundamental components of electronics – a thin-film transistor and a carefully engineered metal-semiconductor contact. It has many advantages over traditional transistors, including using less power and being more stable. SGTs are suitable for large-area electronics and are promising candidates to be used in various fields such as medicine, engineering and computing.

For more information, visit the following link:
https://www.surrey.ac.uk/news/breakthrough-innovation-could-solve-temperature-issues-source-gated-transistors-and-lead-low-cost

Reference
Sporea, R. (Jun 22, 2023). Breakthrough innovation could solve temperature issues for source-gated transistors and lead to low-cost, flexible displays. Recovered Jun 23, 2023, Universidad de Surrey:
https://www.surrey.ac.uk/news/breakthrough-innovation-could-solve-temperature-issues-source-gated-transistors-and-lead-low-cost

Information source: (Universidad de Surrey, 2023)

1.4   New 3Dprinting method builds structures with two metals

Taking a cue from the structural complexity of trees and bones, Washington State University engineers have created a way to 3Dprint two types of steel in the same circular layer using two welding machines. The resulting bimetallic material proved 33% to 42% stronger than either metal alone, thanks in part to pressure caused between the metals as they cool together.

Currently, 3D printing with multiple metals in a welding setup requires stopping and changing metal wires. The new method eliminates that pause and puts two or more metals in the same layer while the metals are still hot. *"This method deposits the metals in a circle instead of just in a line. By doing that, it fundamentally departs from what's been possible,"* said Lile Squires, a WSU mechanical engineering doctoral student and the study's first author. *"Going in a circle essentially allows one material to bear hug the other material, which can't happen when printing in a straight line or in sandwiched layers."* The capability to strengthen 3Dprinted metal parts layer-by-layer could give automotive shops new options soon with the ability to quickly create strong, customized steel parts. Bimetallic, torque-resistant axle shafts, for instance, or cost-effective, high-performance brake rotors could be developed.

For more information, visit the following link:
https://news.wsu.edu/press-release/2023/06/22/new-3dprinting-method-builds-structures-with-two-metals/

Reference
Zaske, S. (Jun 22, 2023). New 3Dprinting method builds structures with two metals. Recovered Jun 23, 2023, Washington State University:
https://news.wsu.edu/press-release/2023/06/22/new-3dprinting-method-builds-structures-with-two-metals/

Information source: (Washington State University, 2023)

1.5   Physicists discover a new switch for superconductivity

MIT physicists have identified the key to how one class of superconductors undergoes a nematic transition, and it's in surprising contrast to what many scientists had assumed. The physicists made their discovery studying iron selenide (FeSe), a two-dimensional material that is the highest-temperature iron-based superconductor. The material is known to switch to a superconducting state at temperatures as high as 70 kelvins (close to -300 degrees Fahrenheit). Though still ultracold, this transition temperature is higher than that of most superconducting materials.
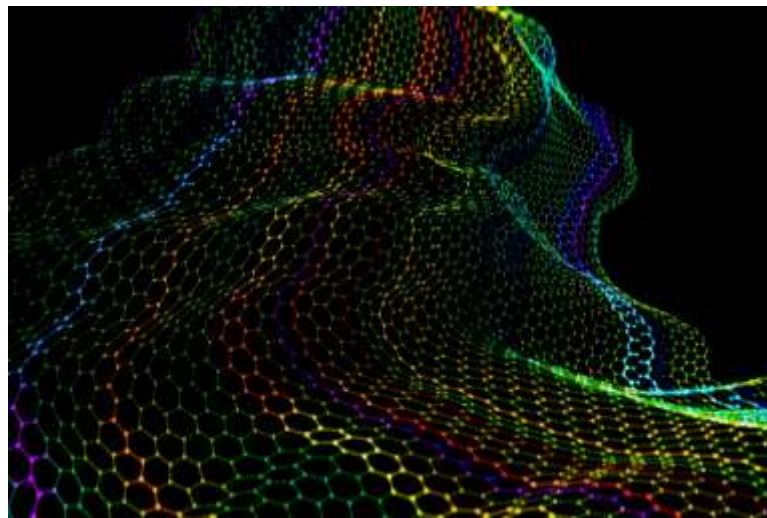
When some ultrathin materials undergo a "nematic transition," their atomic lattice structure stretches in ways that unlock superconductivity (as this conceptual image shows). MIT physicists have identified how this essential nematic switch occurs in one class of superconductors.
Credit: iStock, Massachusetts Institute of Technology

The higher the temperature at which a material can exhibit superconductivity, the more promising it can be for use in the real world, such as for realizing powerful electromagnets for more precise and lightweight MRI machines or high-speed, magnetically levitating trains. For those and other possibilities, scientists will first need to understand what drives a nematic switch in high-temperature superconductors like iron selenide. In other iron-based superconducting materials, scientists have observed that this switch occurs when individual atoms suddenly shift their magnetic spin toward one coordinated, preferred magnetic direction.

For more information, visit the following link:
https://news.mit.edu/2023/physicists-discover-new-switch-superconductivity-0622

Reference
Chu, J. (Jun 22, 2023). Physicists discover a new switch for superconductivity. Recovered Jun 23, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/physicists-discover-new-switch-superconductivity-0622

Information source: (Massachusetts Institute of Technology, 2023)

1.6   Using light to make electrons even more energy efficient

The researchers observed a phenomenon called spin-momentum locking. This means, for an electron, the spin state determines the direction of its movement. Being able to not only observe, but also manipulate the movement of the spins opens possibilities for the clever design of materials with electron spins to be optically manipulated. Once a material is magnetized, even optically, it remains that way and does not need external power to maintain its state. This allows spintronics to be very useful, a common use being the more stable and efficient storage of data in computer storage systems. It also has uses in quantum computing, as the quantum property of spins opens new ways of easily performing certain computing tasks, tasks that would take a traditional computer thousands of years to complete.

"A semiconductor is what interacts with light and a ferromagnet is what is magnetic and does stuff with spins. Here we have found something that combines the best of both worlds. It is amazing, because it brings the spintronics people to a place where one can optically control magnetism, and by using spins, it adds another degree of freedom to traditional optical semiconductor devices," said Feldmann. *"It is quite exciting, the interfacing of photonics, electronics, and spintronics, potentially all in one material."*

For more information, visit the following link:
https://news.harvard.edu/gazette/story/2023/06/researchers-use-light-to-make-spins-more-efficient-easier-to-manipulate/

Reference
Subrahmanyam, R. (Jun 26, 2023). Using light to make electrons even more energy efficient. Recovered Jun 26, 2023, The Harvard Gazette:
https://news.harvard.edu/gazette/story/2023/06/researchers-use-light-to-make-spins-more-efficient-easier-to-manipulate/

Information source: (The Harvard Gazette, 2023)

1.7   How AI technology from ETH animates the fire creatures in the latest Pixar movie

The new 3D simulation technology uses artificial intelligence and enables artistic control over the appearance and structures of smoke, fire and fluids. With the help of this AI, smoke clouds, for example, may be used specifically for visual storytelling. The ETH technology can artistically change flames, smoke clouds or fluids in such a way that they support the story.

When the smoke starts to dance: The new 3D simulation technology uses artificial intelligence and enables visual storytelling.
Credit: Simulation and Animation Group, ETH Zurich

This technology does not control the outer form, but the local structures in the smoke. For example, it can compute a spiral pattern on the smoke cloud. It can just as easily apply the style of Van Gogh's painting *"Starry Night"* to the smoke. "Our technology is capable of transferring the structure of any input image to smoke, flames or even fluids," says Barbara Solenthaler. Bunny-like cloud formations can be seen very beautifully in a video from Solenthaler's group.

For more information, visit the following link:
https://ethz.ch/en/news-and-events/eth-news/news/2023/06/how-ai-technology-from-eth-animates-the-fire-creatures-in-the-latest-pixar-cinema-movie.html

Reference
Meyer, F. (Jun 22, 2023). How AI technology from ETH animates the fire creatures in the latest Pixar movie. Recovered Jun 23, 2023, Eidgenössische Technische Hochschule Zürich:

https://ethz.ch/en/news-and-events/eth-news/news/2023/06/how-ai-technology-from-eth-animates-the-fire-creatures-in-the-latest-pixar-cinema-movie.html

Information source: (Eidgenössische Technische Hochschule Zürich, 2023)

1.8   Act now to prevent uncontrolled rise in carbon footprint of computational science

Cambridge scientists have set out principles for how computational science – which powers discoveries from unveiling the mysteries of the universe to developing treatments to fight cancer to improving our understanding of the human genome, but can have a substantial carbon footprint – can be made more environmentally sustainable.

Credit: University of Cambridge

Everyone involved in computational science has a role to play in making the field more sustainable: individual and institutional responsibility is a necessary step to ensure transparency and reduction of greenhouse gas emission. For example, institutions themselves can be key to managing and expanding centralised data infrastructures, and in ensuring that procurement decisions take into account both the manufacturing and operational footprint of hardware purchases. IT teams in high performance computing (HPC) centres can play a key role, both in terms of training and helping scientists monitor the carbon footprint of their work. Principal Investigators can encourage their teams to think about this issue and give access to suitable training. Funding bodies can influence researchers by requiring estimates of carbon footprints to be included in funding applications.

For more information, visit the following link:
https://www.cam.ac.uk/research/news/act-now-to-prevent-uncontrolled-rise-in-carbon-footprint-of-computational-science

Reference

Brierley, C. (Jun 26, 2023). Act now to prevent uncontrolled rise in carbon footprint of computational science. Recovered Jun 26, 2023, University of Cambridge: https://www.cam.ac.uk/research/news/act-now-to-prevent-uncontrolled-rise-in-carbon-footprint-of-computational-science

Information source: (University of Cambridge, 2023)

1.9   Brain mechanism that connects the past and present discovered

In the current study, the researchers asked whether a similar mechanism could aid not only our ability to remember past events, but also our understanding of evolving experience on-the-fly. To explore this question, the researchers used functional magnetic resonance imaging (fMRI) to monitor the brain activity of human participants while they watched a movie or listened to an audio story. The results showed that whenever a scene concludes, specific brain regions 'replay' pertinent preceding scenes necessary for comprehending the current scene.

The study suggests that our brains use replay to bind together relevant pieces of information that are distant in time, to help us make sense of ongoing experiences. Co-lead author, Dr Avital Hahamy (UCL Queen Square Institute of Neurology), said: *"It's fascinating to consider that a mechanism previously associated primarily with spatial navigation in rodents could also underlie humans' ability to grasp narratives."*

For more information, visit the following link:
https://www.ucl.ac.uk/news/2023/jun/brain-mechanism-connects-past-and-present-discovered

Reference
Danby, P. (Jun 27, 2023). Brain mechanism that connects the past and present discovered. Recovered Jun 27, 2023, University College London:
https://www.ucl.ac.uk/news/2023/jun/brain-mechanism-connects-past-and-present-discovered

Information source: (University College London, 2023)

1.10   Octopuses, other cephalopods can adjust to cold by editing their RNA

Because editing changes RNA only temporarily, the researchers suspected these animals use it to acclimate to their environment. For the current study, they focused on the effects of one such factor, temperature, within the nervous system. Temperature matters because it governs the activity of enzymes, which in turn drive chemical reactions crucial to all physiological processes.

Researchers documented an enormous uptick in RNA editing when cuttlefish (above), octopus and squid acclimated to cold water.
Credit: University of Chicago

Like other cephalopods, the California two-spot octopus (Octopus bimaculoides) they studied cannot generate its own body heat to counteract the temperature drops that accompany tides, changes in water depth, and seasons. Follow-up experiments suggested RNA editing may help the animals adapt to gradual changes, but not to rapid ones associated with, for example, traveling from warmer surface water down to cooler depths.

For more information, visit the following link:
https://news.uchicago.edu/story/octopuses-other-cephalopods-can-adjust-cold-editing-their-rna

Reference
Greaves, M. (Jun 22, 2023). Octopuses, other cephalopods can adjust to cold by editing their RNA . Recovered Jun 23, 2023, University of Chicago:
https://news.uchicago.edu/story/octopuses-other-cephalopods-can-adjust-cold-editing-their-rna

Information source: (University of Chicago, 2023)

1.11 Multi-material printer enables quick and easy 3D printing of flexible devices

Scientists from NTU, Panasonic Factory Solutions Asia Pacific Pte. Ltd. (Panasonic), and Singapore Centre for 3D Printing (SC3DP) have developed a new multi-material printer using multi-wavelength high-power lasers, for quick and easy 3D printing of smart, flexible devices.

The multi-material printer works by utilising varying wavelengths of laser, creating thermal and chemical reactions capable of transforming common carbon-based materials (polyimide and graphene oxide) into a new type of highly porous graphene. The resulting structure printed with this new graphene is not only light and conductive, but it can also be printed or coated onto flexible substrates like plastics, glass, gold and fabrics, creating flexible devices. Electronic devices and components have traditionally been comprised of rigid materials such as metals, silicon, and ceramics, but there has been an increasing interest in the creation of flexible wearable electronics that can be bent, twisted, and easily conformed to various surfaces.

For more information, visit the following link:
https://www.ntu.edu.sg/news/detail/multi-material-printer-enables-quick-and-easy-3d-printing-of-flexible-devices

Reference
Nanyang Technological University. (Jun 28, 2023). Multi-material printer enables quick and easy 3D printing of flexible devices. Recovered Jun 28, 2023, Nanyang Technological University:
https://www.ntu.edu.sg/news/detail/multi-material-printer-enables-quick-and-easy-3d-printing-of-flexible-devices

Information source: (Nanyang Technological University, 2023)

1.12   Innovative paper-like, battery-free, AI-enabled sensor for holistic wound monitoring

A recent invention by a team of researchers from the National University of Singapore (NUS) and A*STAR's Institute of Materials Research and Engineering (IMRE), provides a simple, convenient and effective way of monitoring wound recovery so that clinical intervention can be triggered in a timely manner to improve wound care and management.

Credit: National University of Singapore

Currently, wound healing is typically examined visually by a clinician. Wound infections are mostly diagnosed via swabbing followed by a bacteria culture which involves long waiting time and does not provide timely wound diagnosis. This makes accurate prediction of wound healing challenging in the clinical setting. In addition, wound assessment typically requires frequent manual removal of dressing, which elevates the risks of infection and may cause additional pain and trauma for patients. *"To address this challenge, NUS researchers combined our expertise in flexible electronics, artificial intelligence (AI) and sensor data processing with nanosensor capabilities of IMRE researchers to develop an innovative solution that could benefit patients with complex wound conditions,"* said Associate Professor Benjamin Tee from the Department of Materials Science and Engineering under the NUS College of Design and Engineering, and the NUS Institute for Health Innovation & Technology.

For more information, visit the following link:
https://news.nus.edu.sg/innovative-paper-like-battery-free-ai-enabled-sensor-for-holistic-wound-monitoring/

Reference

National University of Singapore (Jun 26, 2023). Innovative paper-like, battery-free, AI-enabled sensor for holistic wound monitoring. Recovered Jun 26, 2023, National University of Singapore:
https://news.nus.edu.sg/innovative-paper-like-battery-free-ai-enabled-sensor-for-holistic-wound-monitoring/

Information source: (National University of Singapore, 2023)

1.13   New vaccine distribution model

Researchers from Weill Cornell Medicine, Cornell's Ithaca campus, Singapore University of Technology and Design, and San Jose State University in California have developed a model for optimizing the dispensing of vaccines during pandemics that uses a new measure of success for such efforts.

The investigators developed a computer model that incorporated supply chain logistics for distributing vaccines from manufacturers to regionalized distribution warehouses and finally to more localized dispensing centers. It included two options for box sizes, the number and scale of dispensing locations, and the number of vaccines administered daily. Using Centers for Disease Control and Prevention data, they calculated how box size (number of doses per box) and the number and capacity of dispensing venues affected the goal of achieving maximum VPDs within larger population groups. The model showed almost 20% more VPDs would have been achieved if COVID-19 vaccines had been delivered into arms within a week of availability in the community, using the maximized distribution strategy, rather than 81 days, as actually happened.

For more information, visit the following link:
https://news.cornell.edu/stories/2023/06/international-team-develops-new-vaccine-distribution-model

Reference
Langille, J. (Jun 29, 2023). International team develops new vaccine distribution model. Recovered Jun 29, 2023, Cornell University:
https://news.cornell.edu/stories/2023/06/international-team-develops-new-vaccine-distribution-model

Information source: (Cornell University, 2023)

1.14   A novel method for squeezing molecules together could significantly reduce chemical manufacturing waste

The production of chemicals accounts for 40% of all energy currently used in manufacturing, and the process also results in toxic solvent waste that pollutes the environment and poses health risks to humans and animals. A newly published study in the journal Science details a novel mechanochemistry method that has the ability to manufacture chemicals without those deleterious effects.

Credit: iStock, University of Pennsylvania

Researchers with the Nanoscience Initiative at the Advanced Science Research Center at the CUNY Graduate Center, Penn, and the University of California-Merced took a unique approach that advances the opportunity to use mechanochemistry in large-scale production. The technique uses organic chemistry and nanotechnology to push molecules together and create chemicals without the use of costly solvents that pollute the environment. The research team's findings have major implications for numerous manufacturing sectors, including the production of pharmaceuticals and materials for a variety of medical and industrial purposes.

For more information, visit the following link:
https://penntoday.upenn.edu/news/novel-method-squeezing-molecules-together-could-significantly-reduce-chemical-manufacturing

Reference
University of Pennsylvania (Jun 22, 2023). A novel method for squeezing molecules together could significantly reduce chemical manufacturing waste. Recovered Jun 23, 2023, University of Pennsylvania:
https://penntoday.upenn.edu/news/novel-method-squeezing-molecules-together-could-significantly-reduce-chemical-manufacturing

Information source: (University of Pennsylvania, 2023)

1.15   Tsinghua researchers developed flexible, see-through camera for integration with AR devices

A research team at Tsinghua University has created a promising see-through camera that can be seamlessly integrated with existing augmented reality (AR) devices. The camera, which allows light to pass through while capturing images, offers potential applications in various fields.

Researchers have developed a new-form camera that imaging without blocking all the light. Their LightguideCam employs the lightguide as an imaging relay element, which allows the object light to be reflected onto the sensor while maintaining an almost transparent window
Credit: Tsinghua University

Conventional camera technology relies on opaque devices with multiple layers of lenses, resulting in limitations in versatility and potential applications. In contrast, the newly developed camera overcomes these constraints by enabling the passage of light. This breakthrough opens up the possibility for future visual sensing systems to seamlessly integrate into their surroundings, becoming imperceptible to users. The team successfully demonstrated a prototype named LightguideCam, utilizing a commercial AR lightguide integrated into AR glasses. Although the incorporation of multiple reflective mirrors expanded the eye-box for AR displays, it introduced complex artifacts in the imaging process. To overcome this, the researchers developed an equivalent imaging model and proposed a compressive reconstruction algorithm.

For more information, visit the following link:
https://www.tsinghua.edu.cn/en/info/1245/12285.htm

Reference

Han, L. (Jun 23, 2023). Tsinghua researchers developed flexible, see-through camera for integration with AR devices. Recovered Jun 23, 2023, Tsinghua University: https://www.tsinghua.edu.cn/en/info/1245/12285.htm

Information source: (Tsinghua University, 2023)

1.16   Unprecedented window into human embryonic development

The new model has over 70% efficiency—in other words, the stem cells aggregate correctly over roughly 70% of the time. As noted by the authors, there are some limitations to the strategy, and it is challenging to benchmark some findings against the natural embryo itself. Berna Sozen, professors of genetics at Yale School of Medicine, hopes to continue to work on the models so that they become more standardized in the future.
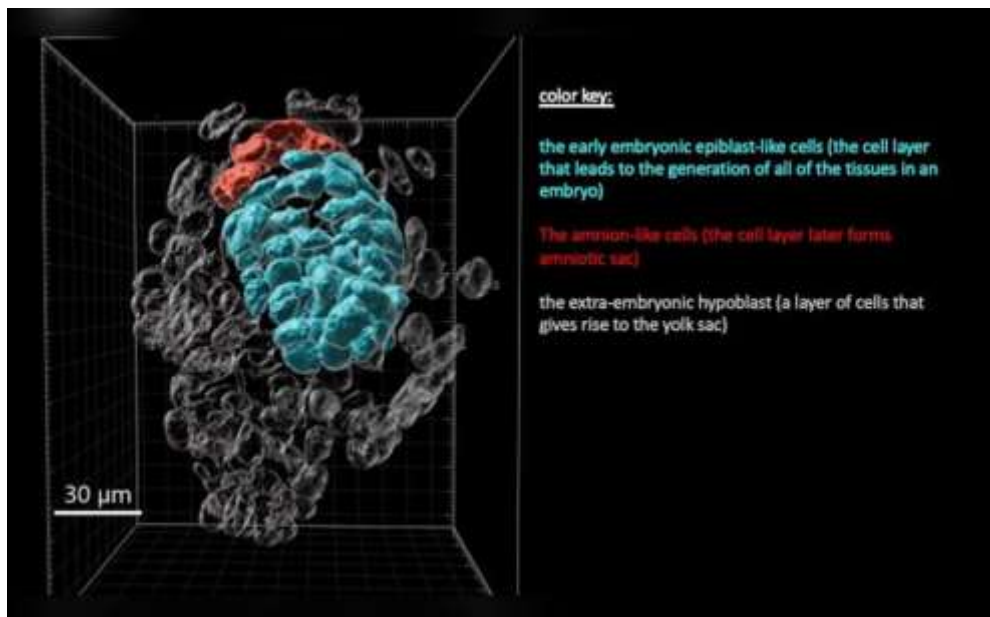
MIcroscopic image of embryo model.
Credit: Monique Pedroza, Ipek Gassaloglu, Berna Sozen, University of Yale

The team believes the models will transform scientists' knowledge around human developmental biology. In their latest publication, the team explored some of the molecular paths underlying human gastrulation onset. In future studies, they hope to delve even deeper into the developmental pathways, including whether pregnancy loss and congenital disorders may stem from failures during gastrulation stages. Sozen believes her model can be used to look at some of these disorders and learn more about what is going awry. *"Previous model systems have been able to look at this, but our model is unique because it has this extra tissue that allows us to analyze a bit deeper,"* she says.

For more information, visit the following link:
https://medicine.yale.edu/news-article/new-model-provides-unprecedented-window-into-human-embryonic-development/

Reference
Sozen, B. & Zachary, S. (Jun 27, 2023). New model provides unprecedented window into human embryonic development. Recovered Jun 27, 2023, University of Yale:

https://medicine.yale.edu/news-article/new-model-provides-unprecedented-window-into-human-embryonic-development/
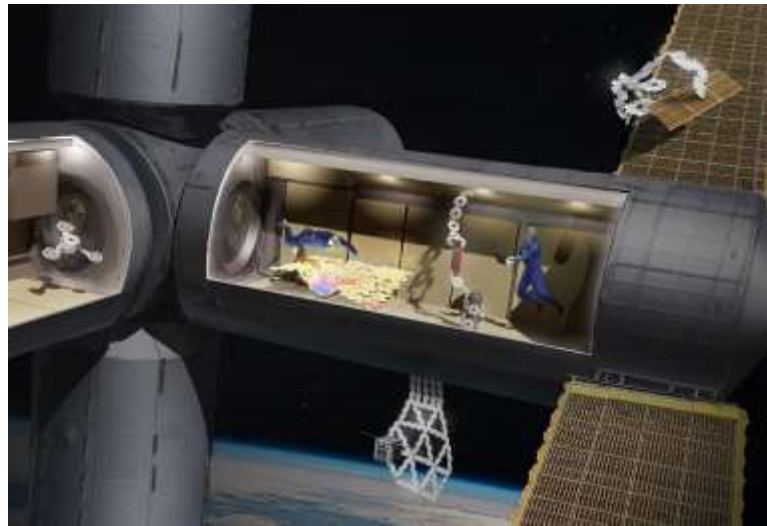
Information source: (University of Yale, 2023)

1.17   A polygon shapeshifting robot for space travel

By combining inspiration from the digital world of polygon meshing and the biological world of swarm behavior, the Mori3 robot can morph from 2D triangles into almost any 3D object.

Credit: Christoph Belke & Raphaël Galeuchet; Ecole Polytechnique Fédérale de Lausanne

The individual modules of the Mori3 robot are triangular in shape. The modules easily join together to create polygons of different sizes and configurations in a process known as polygon meshing. *"We have shown that polygon meshing is a viable robotic strategy,"* says Christoph Belke, a Post-doctoral researcher in robotics at EPFL. To achieve this, the team had to push the boundaries of various aspects of robotics, including the mechanical and electronic design, computer systems and engineering. *"We had to rethink the way we understand robotics," explains Belke. "These robots can change their own shape, attach to each other, communicate and reconfigure to form functional and articulated structures."* This proof of concept is a success as Mori3 robots are good at doing the three things that robots should be able to do: moving around, handling and transporting objects, and interacting with users.

For more information, visit the following link:
https://news.epfl.ch/news/mori3-a-polygon-shapeshifting-robot-for-space-tr-2/

Reference
Michael, D. & Geneux, V. (Jun 23, 2023). Mori3: a polygon shapeshifting robot for space travel. Recovered Jun 23, 2023, Ecole Polytechnique Fédérale de Lausanne (EPFL): https://news.epfl.ch/news/mori3-a-polygon-shapeshifting-robot-for-space-tr-2/

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

1.18   Gene blocks spillover of avian flu to humans

A key human gene has been shown to prevent most strains of bird flu from causing infection in people. The gene, known as BTN3A3, is commonly expressed in our airways. It offers a vital human defence against avian flu, with most strains of the virus unable to get past its defences. Understanding the genetic make-up of currently circulating avian flu strains may offer one of the best lines of defence against widespread human transmission, experts say. The ability to identify strains which are resistant to the effects of BTN3A3 could help to assess the risk of a potential pandemic in humans.

Credit: Wayne Marinovich/Getty Images, The University of Edinburgh

Scientists compared hundreds of human genes for their ability to restrict either human seasonal viruses or avian flu viruses. The study showed that BTN3A3 was able to block the replication of avian flu in human cells. In contrast, seasonal human flu viruses, which infect the population regularly, are resistant to BTN3A3, meaning it cannot successfully block them. The team also looked at avian flu viruses that occasionally do infect humans. For example H7N9, which since 2013 has infected more than 1,500 individuals with a 40 per cent case fatality rate. Researchers were able to show that avian flu viruses like H7N9 have a genetic mutation that allows them to escape the blocking effects of the BTN3A3 gene.

For more information, visit the following link:
https://www.ed.ac.uk/news/2023/gene-blocks-spillover-of-avian-flu-to-humans

Reference
The University of Edinburgh (Jun 28, 2023). Gene blocks spillover of avian flu to humans. Recovered   Jun   28,   2023,   The   University   of   Edinburgh: https://www.ed.ac.uk/news/2023/gene-blocks-spillover-of-avian-flu-to-humans

Information source: (The University of Edinburgh, 2023)

1.19   Scientists use exotic stars to tune into hum from cosmic symphony

Astrophysicists including a University of Michigan researcher have found evidence for gravitational waves that oscillate with periods of years to decades, according to a set of papers published in *The Astrophysical Journal Letters*. The researchers made the discovery using large radio telescopes to observe a collection of cosmic clocks, exotic stars called pulsars, in our galaxy.

The Green Bank Telescope in West Virginia was part of the group of telescopes to observe pulsars, an ultra-dense remnant of a massive star's core following its demise in a supernova explosion, to find evidence for low frequency gravitational waves.
Credit: Jay Young for Green Bank Observatory, University of Michigan

Gravitational-wave signals from these gigantic binaries are expected to overlap, like voices in a crowd or instruments in an orchestra, producing an overall background *"hum"* that imprints a unique pattern in pulsar timing data. This pattern is what NANOGrav scientists have been seeking for almost 20 years. In its suite of newly published papers, NANOGrav demonstrates evidence for this gravitational-wave background. Detailed analysis of the background hum is already providing insights into how supermassive black holes grow and merge. Given the strength of the signal NANOGrav sees, the population of extremely massive black hole binaries in the Universe must number in the hundreds of thousands, perhaps even millions.

For more information, visit the following link:
https://news.umich.edu/scientists-use-exotic-stars-to-tune-into-hum-from-cosmic-symphony/

Reference
Sherburne, M. (Jun 28, 2023). Scientists use exotic stars to tune into hum from cosmic symphony. Recovered Jun 28, 2023, University of Michigan: https://news.umich.edu/scientists-use-exotic-stars-to-tune-into-hum-from-cosmic-symphony/

Information source: (University of Michigan, 2023)

1.20   Researchers make a quantum computing leap with a magnetic twist

Quantum computing could revolutionize our world. For specific and crucial tasks, it promises to be exponentially faster than the zero-or-one binary technology that underlies today's machines, from supercomputers in laboratories to smartphones in our pockets. But developing quantum computers hinges on building a stable network of qubits — or quantum bits — to store information, access it and perform computations.
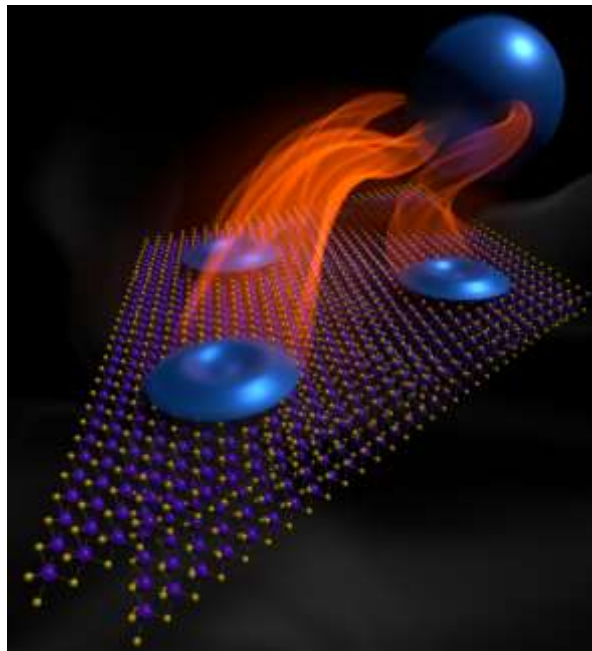
Credit: University of Washington

A team led by scientists and engineers at the University of Washington has announced a significant advancement in this quest. In a pair of papers published June 14 in Nature and June 22 in Science, they report that, in experiments with flakes of semiconductor materials — each only a single layer of atoms thick — they detected signatures of *"fractional quantum anomalous Hall"* (FQAH) states. The team's discoveries mark a first and promising step in constructing a type of fault-tolerant qubit because FQAH states can host anyons — strange *"quasiparticles"* that have only a fraction of an electron's charge. Some types of anyons can be used to make what are called *"topologically protected"* qubits, which are stable against any small, local disturbances.

For more information, visit the following link:
https://www.washington.edu/news/2023/06/27/fqah-states/

Reference
Urton, J. (Jun 27, 2023). Researchers make a quantum computing leap with a magnetic twist. Recovered Jun 27, 2023, University of Washington:
https://www.washington.edu/news/2023/06/27/fqah-states/

Information source: (University of Washington, 2023)

II. PATENTS

2.1. Systems and methods for improved operations of ski lifts

Systems and methods for improved operations of ski lifts increase skier safety at on-boarding and off-boarding locations by providing an always-on, always-alert system that "watches" these locations, identifies developing problem situations, and initiates mitigation actions. One or more video cameras feed live video to a video processing module.
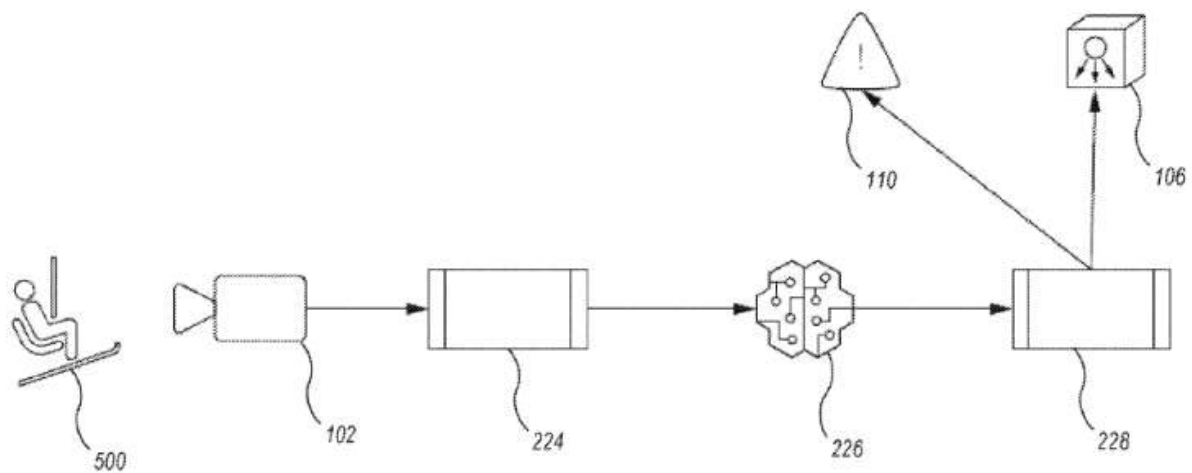
Is a block diagram illustrating a flow of operations between various elements of an example system for improved operations of ski lifts, according to one example embodiment.
Credit: Scott, B., WIPO IP Portal

The video processing module feeds resulting sequences of images to an artificial intelligence (AI) engine. The AI engine makes an inference regarding existence of a potential problem situation based on the sequence of images. This inference is fed to an inference processing module, which determines if the inference processing module should send an alert or interact with the lift motor controller to slow or stop the lift.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US399950919&_cid=P22-LJOEMS-85498-18

Reference
Scott, B. (Jun 22, 2023). Systems and methods for improved operations of ski lifts. Recovered Jun 22, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US399950919&_cid=P22-LJOEMS-85498-18

Information source: (WIPO IP Portal, 2023)

2.2. Identifying suspicious behavior based on patterns of digital identification documents

A computer-implemented method, system and computer program product for identifying suspicious behavior. Requests to provide digital identification (ID) document(s) to a computing device of a verifier by a computing device of a consumer based on a validation context are detected.
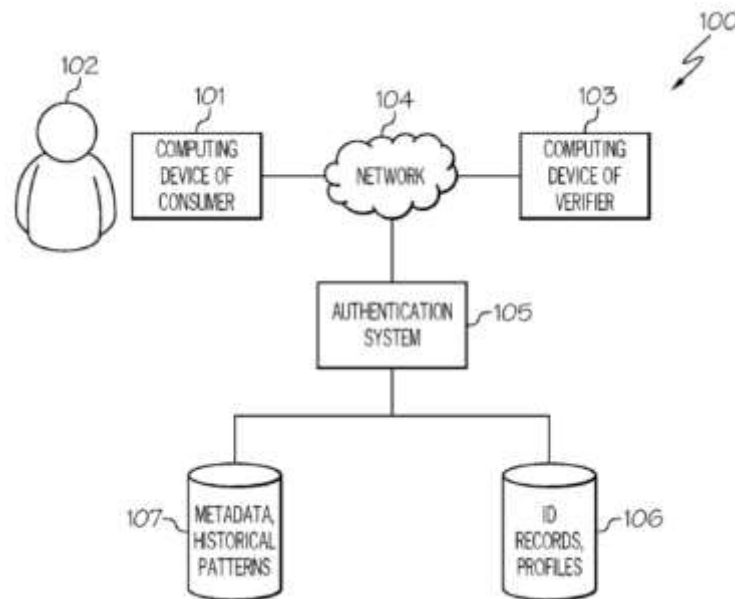
Illustrates a communication system for practicing the principles of the present disclosure in accordance with an embodiment of the present disclosure.
Credit: WIPO IP Portal

Responses to such requests are also detected in which the computing device of the consumer provides digital ID document(s) to the computing device of the verifier. A score is then generated corresponding to a likelihood of fraud in the transaction involving the consumer and the verifier using an artificial intelligence model based on the validation context, the digital ID document(s) requested to be provided by the computing device of the consumer and the digital ID document(s) provided to the computing device of the verifier. The computing device of the verifier may then be informed that there is evidence of fraud based on a value of the score.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US399955601&_cid=P22-LJOEMS-85498-17

Reference
Malinowski, J.; Balasubramanian, S.; Vasudevan, C; van den Boer, G.; Lawless, T. & Greenlee, G. (Jun 22, 2023). Identifying suspicious behavior based on patterns of digital identification documents. Recovered Jun 22, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US399955601&_cid=P22-LJOEMS-85498-17

Information source: (WIPO IP Portal, 2023)

2.3. Audiovisual content access facilitation system and method incorporating artificial intelligence

A system for facilitating access to audiovisual content in which a content obtaining unit is configured to obtain a content source (e.g., a computer-readable file containing audiovisual content of a conference, lecture, or entertainment program); a descriptor obtaining unit is configured to obtain one or more descriptors (e.g., topic and speaker taxonomies and attributes associated with the content); a conversion unit configured to convert content of the content source from a format less efficient for categorization (e.g., video with audio) to a format more efficient for categorization (e.g., a textual transcription of the audio and/or a textual description of the video); a categorization unit configured to categorize the converted content into at least two categories based on the one or more descriptors (e.g., into one or more topics, and/or one or more speakers); and a presentation unit configured to present a category selection interface (e.g., an actionable table of contents) based on the at least two categories.

In preferred embodiments, the conversion unit utilizes an artificial intelligence conversion algorithm, a transcription algorithm, a description algorithm, and/or user interaction. Further in preferred embodiments, the categorization unit utilizes an artificial intelligence categorization algorithm, a topic extraction algorithm, a speaker diarization algorithm, a semantic web technology algorithm, and/or user interaction.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US399958829&_cid=P22-LJOEMS-85498-15

Reference
Paul, J.; Glen, S.; Paul, R. & Puscar, M. (Jun 22, 2023). Audiovisual content access facilitation system and method incorporating artificial intelligence. Recovered Jun 22, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US399958829&_cid=P22-LJOEMS-85498-15

Information source: (WIPO IP Portal, 2023)

2.4.   System and method for real-time identification of dissatisfaction data

Various methods, apparatuses/systems, and media for automatic real-time identification of dissatisfaction data are disclosed. A receiver receives real-time stream of call transcript data generated during a call or a chat between a customer and an agent.
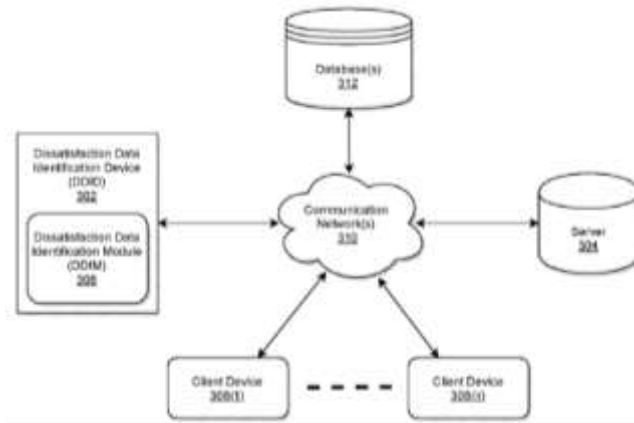
Illustrates a system diagram for implementing a platform and language agnostic dissatisfaction data identification device having a platform and language agnostic dissatisfaction data identification module in accordance with an exemplary embodiment. Credit: Tanuku, S.; Ray, M.; Brinda, R.; Wu, L.; Wagner, T.; Potluri, B.; Sinha, K.; Kuyuk, S.; Joglekar, A.; Plantinga, P. & Ni, K., WIPO IP Portal

A processor implements a machine learning model that includes predefined complaint data; applies the received call transcript data onto the Machine Learning model; compares, in response to applying, the call transcript data with predefined complaint data; generates a first similarity score, based on comparing, that identifies how similar the call transcript data is compared to the predefined complaint data; and automatically identifies the call transcript data as a first dissatisfaction data based on determining that the first similarity score is equal to or more than a predetermined threshold value.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US399956419&_cid=P22-LJOGDR-15211-36

Reference
Tanuku, S.; Ray, M.; Brinda, R.; Wu, L.; Wagner, T.; Potluri, B.; Sinha, K.; Kuyuk, S.; Joglekar, A.; Plantinga, P. & Ni, K. (Jun 22, 2023). System and method for real-time identification of dissatisfaction data. Recovered Jun 22, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=US399956419&_cid=P22-LJOGDR-15211-36
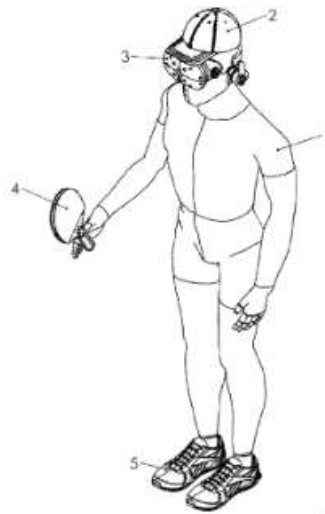
Information source: (WIPO IP Portal, 2023)

2.5.   Tennis game simulation system equipped with a smart racket

The tennis game simulation system is equipped with a smart racket in the context of the Internet of Things (IoT). using this system, real-time matches can be held virtually and location-free, and it is possible to hold matches between players from different countries without the need to travel to a single place, and when training matches with these rackets are virtual reality environmental conditions.

Overview of Tennis game simulation system equipped with a smart racket and how to use by the player.
Credit: Peyman, B. & Samin, B., WIPO IP Portal

This system uses sensors to detect the movement pattern of the human body, in such a way that by using inertia sensors, the angle of the joints (for example, the angle of the joints between the shoulder and elbow) is examined and acceleration analysis is performed and all movements, sports-related behaviors, as well as the method of gripping the racket and hitting the ball in the three main directions x, y, and z are carefully evaluated.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023111638&_cid=P22-LJOH4X-25661-5

Reference
Peyman, B. & Samin, B. (Jun 22, 2023). Tennis game simulation system equipped with a smart racket. Recovered Jun 22, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023111638&_cid=P22-LJOH4X-25661-5

Information source: (WIPO IP Portal, 2023)

2.6.   Method for operating a food processing apparatus

A method for operating a food processing apparatus comprises: collecting feedback information by means of a human-machine interface (MMI), and/or by means of at least one sensor; creating, by means of a local control unit
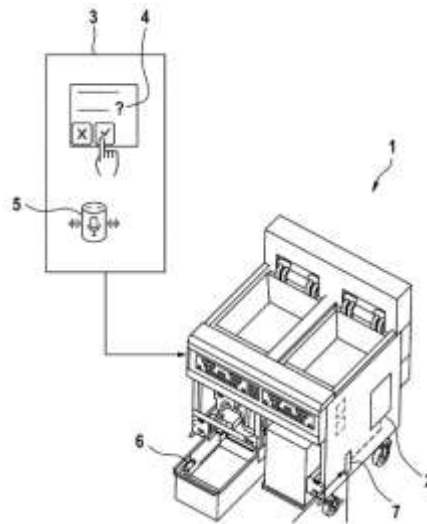
An apparatus according to the invention for use in carrying out the process, designed as a deep fryer.
Credit: Wild, H. & Manter, A., Espacenet Patent Search

Feedback data sets representing one or more of the feedback information items; sending the feedback data sets from the apparatus to a central computing unit; classifying, by means of the central computing unit, the feedback data sets on the basis of at least one stored feedback comparison data set; generating, by means of the central computing unit, a change signal depending on the classification of at least one feedback data set; sending the change signal to the apparatus; changing a user input request directed to the user by the MMI in the apparatus based on the change signal and/or changing a function program of the apparatus based on the change signal.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/080034988/publication/US2023190035A1?q=artificial%20intelligence

Reference
Wild, H. & Manter, A. (Jun 22, 2023). Method for operating a food processing apparatus. Recovered Jun 22, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/080034988/publication/US2023190035A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.7.   Energy consumption prediction for machine

A control system for a battery electric machine (BEM) predicts the energy requirement of the BEM to complete one or more travel route segments along a path traversed by the BEM. The control system calculates the actual energy consumption of the BEM in completing the one or more travel route segments, compares the actual energy consumption with the predicted energy requirement, and updates the predicted energy requirement.

The control system also maps the updated energy requirements for BEM's to travel route segments to create a database of travel route segments mapped to energy requirements for particular BEM's traveling over those segments. The control system may change the travel route segments for the BEM, tasks to be performed by the BEM, or repair or maintenance tasks to be performed on one or more travel route segments for the BEM based on a comparison of the predicted energy requirements with the actual energy consumption for the BEM traveling over the particular travel route segment.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086767715/publication/WO2023114033A1?q=machine%20learning

Reference
Lane, C. & Braunstein, M. (Jun 22, 2023). Energy consumption prediction for machine. Recovered Jun 22, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086767715/publication/WO2023114033A1?q=machine%20learning

Information source: (Espacenet Patent Search, 2023)

2.8.   Multi-sensor device for dietary tracking

Methods, systems, and apparatuses, including computer programs encoded on computer storage media, for dietary tracking with instant dietary feedback using a portable multi-sensor device are described.

An example method may include: obtaining a first machine learning model trained based on a plurality of food images and corresponding labels; receiving a series of images from one or more cameras capturing a user taking food out of a food-serving storage; determining, using the first machine learning model based on the series of images, an identification of the food being taken by the user; determining, using a second machine learning model based on the series of images and the identification of the food, an estimated weight of the food being taken by the user; determining and displaying portion-based food information of the food being taken by the user.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086768700/publication/US2023196802A1?q=deep%20learning

Reference
Gong, F.; Zhang, W.; Fan, M. & Du, J. (Jun 22, 2023). Multi-sensor device for dietary tracking. Recovered Jun 22, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086768700/publication/US2023196802A1?q=deep%20learning

Information source: (Espacenet Patent Search, 2023)

2.9.   Selection of a wearable article for a medical device

A medical wearable matching system is provided that pre-assesses a fit of a wearable article of medical device for a patient. The matching system may facilitate fitting and selection of a class of wearable articles for a patient.
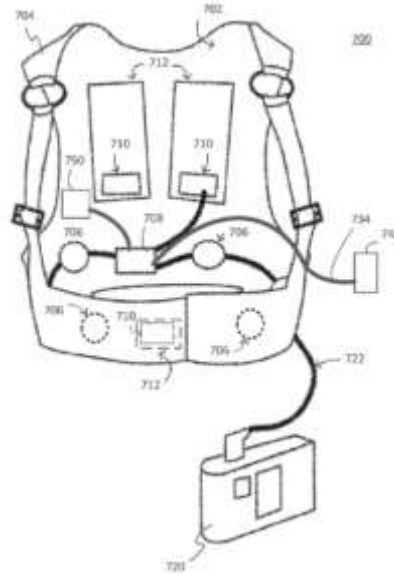
Is a schematic diagram of a medical device including a vest-type wearable article with components, in accordance with some implementations.
Credit: Sjoquist, S.; Moore, M.; Sullivan, J.; Niegowski, J.; Ingle, H.; Gilbert, L. & Brent, Z., Espacenet Patent Search

The matching system may also evaluate potential effects of the fit on operations of the medical device. Patient specific data, such as measurements, are fed into a fit prediction artificial intelligence ("AI") model. The fitting AI model is trained with fitting data of previous patients to predict a class of wearable medical article that is likely, above a threshold amount, to provide a target fit for the patient. The patient specific information may also be fed into an adverse potential AI model. The adverse potential AI model is trained with patient experience data describing adverse operations of a wearable article worn by prior patients.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086768830/publication/US2023197273A1?q=artificial%20intelligence

Reference
Sjoquist, S.; Moore, M.; Sullivan, J.; Niegowski, J.; Ingle, H.; Gilbert, L. & Brent, Z. (Jun 22, 2023). Selection of a wearable article for a medical device. Recovered Jun 23, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086768830/publication/US2023197273A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.10. Driving using virtual reality emulating real driving of a route

Some aspects of this disclosure include apparatuses and methods for detecting objects along a driving route, storing information associated with the detected objects, and using the stored objects and information to assist the driver of a motor vehicle (and/or for automated driving of the motor vehicle) when the motor vehicle is driven along the same driving area.
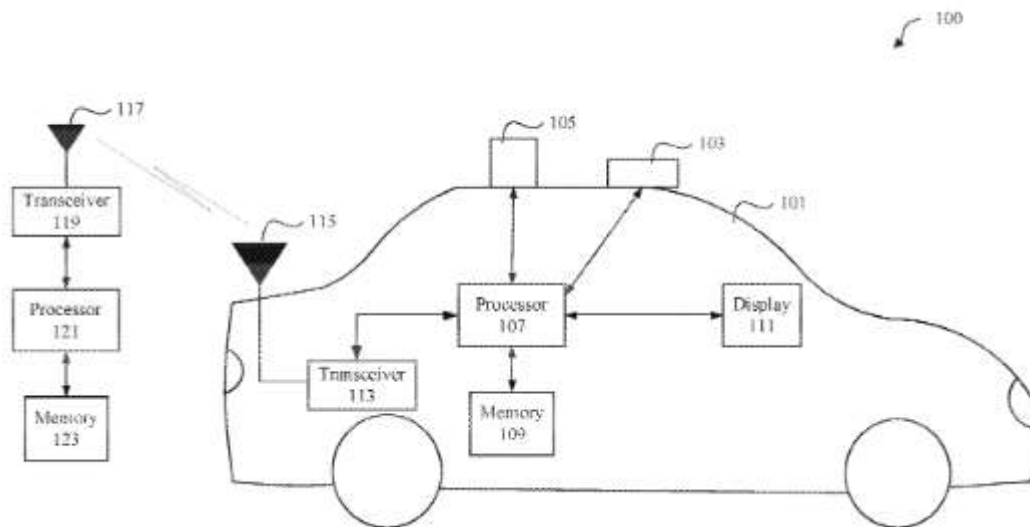
Illustrates an example system implementing driving assistance mechanisms, according to some aspects of the disclosure.
Credit: Grosshauser, F., Espacenet Patent Search

For example, some aspects of this disclosure relate to a method including capturing, using a first sensor, information associated with a route driven by a motor vehicle. The method can further include determining, using a processor and the captured information, whether an object associated with the route and data associated with the object are stored in a memory. In response to determining that the object is stored in the memory, the method can further include displaying the object in a virtual reality (VR) mode using the stored data associated with the object.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086767730/publication/US2023194293A1?q=virtual%20reality

Reference
Grosshauser, F. (Jun 22, 2023). Driving using virtual reality (VR) emulating real driving of a route. Recovered Jun 23, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086767730/publication/US2023194293A1?q=virtual%20reality

Information source: (Espacenet Patent Search, 2023)

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Information source: (Espacenet Patent Search, 2023)