Weekly Newsletter
TECHNOLOGY SURVEILLANCE

N° 16-2023   APRIL 21TH, 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   Find earlier intervention leads to greater improvements in young children on the autism spectrum

Researchers from Children's Hospital of Philadelphia (CHOP), Florida State University (FSU), and the University of California, Los Angeles (UCLA) have demonstrated that starting intervention coaching parents of autistic toddlers as early as 18 months leads to better gains in language, social communication, and daily living skills.

While prior studies provided strong evidence for the benefits of early intervention in autism, many are correlation studies rather than randomized controlled studies that can provide more conclusive results. Additionally, prior research has not demonstrated an ideal age at which to begin interventions. Whitney Guthrie, PhD, clinical psychologist with the Department of Child and Adolescent Psychiatry and Behavioral Sciences and the Division of Developmental and Behavioral Pediatrics and researcher at CHOP's Center for Autism Research, said lead, *"many of us in the autism community say earlier is better, but we actually do not have enough high-quality evidence for that, so a randomized controlled trial like this one help address that issue."* Researchers used the Early Social Interaction (ESI) model, a parent-implemented intervention for toddlers diagnosed with autism that provides a framework to support a child's development in social communication and active engagement. It also is a framework for parents as they receive both group education and individualized coaching to incorporate evidence-based strategies into everyday activities in the family's natural environments.

For more information, visit the following link:
https://www.chop.edu/news/researchers-find-earlier-intervention-leads-greater-improvements-young-children-autism-spectrum

Reference
The Children's Hospital of Philadelphia. (April 13, 2023). Researchers find earlier intervention leads to greater improvements in young children on the autism spectrum. Recovered April 14, 2023, Children's Hospital of Philadelphia: https://www.chop.edu/news/researchers-find-earlier-intervention-leads-greater-improvements-young-children-autism-spectrum

Information source: (Children's Hospital of Philadelphia, 2023)

1.2   Develop stretchable OLED display

Researchers at the Pritzker School of Molecular Engineering (PME) at the University of Chicago, led by Sihong Wang and Juan de Pablo, have designed a material which can bend in half or stretch to more than twice its original length while still emitting a fluorescent pattern. Scientists design flexible electronics with range of applications. Imagine a thin, digital display so flexible that you can wrap it around your wrist, fold it in any direction, or curve it over your car's steering wheel. Researchers have designed just such a material, which can bend in half or stretch to more than twice its original length while still emitting a fluorescent pattern.

A material developed by Asst. Prof. Sihong Wang and Prof. Juan de Pablo can stretch more than twice its original length without disrupting its ability to emit light and display a clear image. Credit: Wang Group, University of Chicago

The displays on most high-end smartphones, as well as a growing number of televisions, use OLED (organic light-emitting diode) technology, which sandwiches small organic molecules between conductors. When an electrical current is switched on, the small molecules emit a bright light. The technology is more energy-efficient than older LED and LCD displays and praised for its sharp pictures. However, the molecular building blocks of OLEDs have tight chemical bonds and stiff structures.

For more information, visit the following link:
https://news.uchicago.edu/story/uchicago-researchers-develop-stretchable-oled-display

Reference
C. P. Williams, S. (April 12, 2023). UChicago researchers develop stretchable OLED display. Recovered April 14, 2023, University of Chicago: https://news.uchicago.edu/story/uchicago-researchers-develop-stretchable-oled-displa

Information source: (University of Chicago, 2023)

1.3   Gentle method allows for environmentally friendly recycling of solar cells

Today there are two mainstream types of solar cells. The most common is silicon-based and accounts for 90% of the market. The other type is called thin-film solar cells which in turn uses three main sub-technologies, one of which is known as CIGS (Copper Indium Gallium Selenide), and consists of a layer of different metals, including indium and silver. Thin-film solar cells are by far the most effective of today's commercially available technologies. They can also be made bendable and adaptable, which means that they can be used in many different areas. The problem is that the demand for indium and silver is high, and increased production is accompanied by a growing amount of production waste, which contains a mixture of valuable metals and hazardous substances.
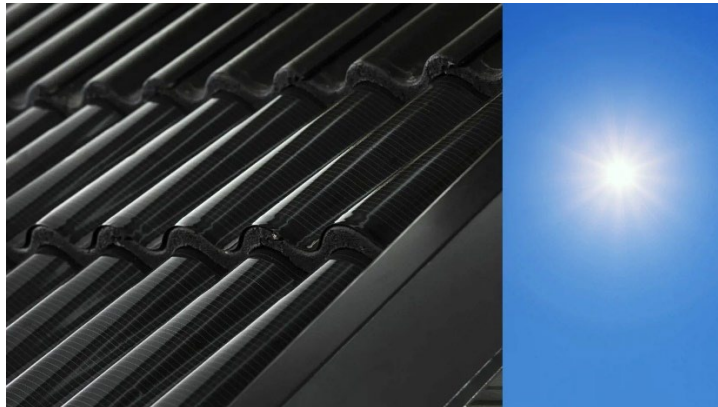
Thin-film solar cells are highly efficient and can be made bendable and adaptable, meaning they can be used in a wide range of areas, such as here on roof tiles.
Credit: Unsplash, Chamers University of Technology

By using a new method, precious metals can be efficiently recovered from thin-film solar cells. This is shown by new research from Chalmers University of Technology, Sweden. The method is also more environmentally friendly than previous methods of recycling and paves the way for more flexible and highly efficient solar cells. Now their research shows that a more environmentally friendly recycling process can have the same outcome. The researchers showed that it is possible to recover 100 percent of the silver and about 85 percent of the indium. The process takes place at room temperature without adding heat.

For more information, visit the following link:
https://www.chalmers.se/en/current/news/k-gentle-method-allows-for-environmentally-friendly-recycling-of-solar-cells/

Reference
Palm, J. (April 13, 2023). Gentle method allows for environmentally friendly recycling of solar cells. Recovered April 14, 2023, Chalmers University of Technology:

https://www.chalmers.se/en/current/news/k-gentle-method-allows-for-environmentally-friendly-recycling-of-solar-cells/

Information source: (Chalmers University of Technology, 2023)

1.4   Indoor photovoltaics spark a sustainable revolution

Newcastle University researchers have created high-efficiency, sustainable solar cells that harness ambient light to power Internet of Things (IoT) devices. The research group from the School of Natural and Environmental Sciences, led by Dr Marina Freitag, created dye-sensitized photovoltaic cells based on a copper (II/I) electrolyte, achieving an unprecedented power conversion efficiency of 38% and 1.0V open-circuit voltage at 1,000 lux (fluorescent lamp).
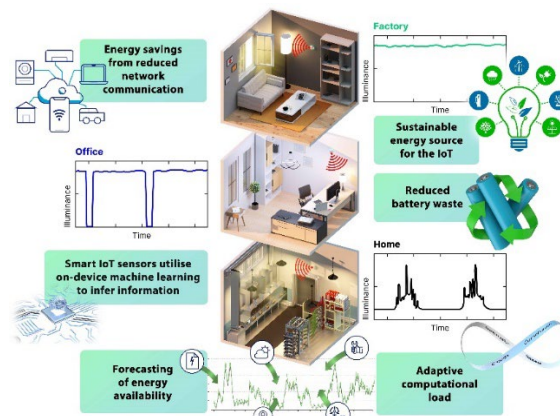
Harvesting energy from ambient light and Artificial Intelligence revolutionise the Internet of Things. Based on smart and adaptive operation, the energy consumption of sensor devices is reduced, and battery waste is avoided.
Credit: Ella Maru Studio., Newcastle University

This team also introduced a pioneering energy management technique, Employing Long Short-Term Memory (LSTM) artificial neural networks to predict changing deployment environments and adapt the computational load of IoT sensors accordingly. This breakthrough study demonstrates how the synergy of Artificial Intelligence and ambient light as a power source can enable the next generation of IoT devices. The energy-efficient IoT sensors, powered by high-efficiency ambient photovoltaic cells, can dynamically adapt their energy usage based on LSTM predictions, resulting in significant energy savings and reduced network communication requirements.

For more information, visit the following link:
https://www.ncl.ac.uk/press/articles/latest/2023/04/ai-poweredenergymanagement/

Reference
Newcastle University. (April 13, 2023). Indoor photovoltaics spark a sustainable revolution. Recovered April 14, 2023, Newcastle University: https://www.ncl.ac.uk/press/articles/latest/2023/04/ai-poweredenergymanagement/

Information source: (Newcastle University, 2023)

1.5   Technology to prevent fouling in photobioreactors for CO2 capture

Applying a small voltage to the walls of algae growing tanks can prevent cloudy buildup and allow more photosynthesis to happen. Algae grown in transparent tanks or tubes supplied with carbon dioxide can convert the greenhouse gas into other compounds, such as food supplements or fuels. But the process leads to a buildup of algae on the surfaces that clouds them and reduces efficiency, requiring laborious cleanout procedures every couple of weeks. Massachusetts Institute of Technology (MIT) researchers have come up with a simple and inexpensive technology that could substantially limit this fouling, potentially allowing for a much more efficient and economical way of converting the unwanted greenhouse gas into useful products.
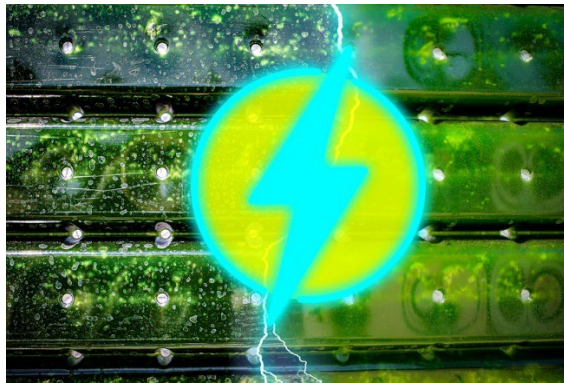
A new, inexpensive technology can limit the buildup of algae on the walls of photobioreactors that can help convert carbon dioxide into useful products.
Credit: Jose-Luis Olivares, Massachusetts Institute of Technology

The key is to coat the transparent containers with a material that can hold an electrostatic charge, and then applying a very small voltage to that layer. The system has worked well in lab-scale tests, and with further development might be applied to commercial production within a few years. The same system could be used to either repel or attract cells by just reversing the voltage, depending on the particular application. Varanasi, professor of mechanical engineering, suggests, instead of algae, a similar setup might be used with human cells to produce artificial organs by producing a scaffold that could be charged to attract the cells into the right configuration.

For more information, visit the following link:
https://news.mit.edu/2023/mit-engineers-devise-technology-prevent-fouling-photobioreactors-0413

Reference
David L. C. (April 13, 2023). MIT engineers devise technology to prevent fouling in photobioreactors for CO2 capture. Recovered April 14, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/mit-engineers-devise-technology-prevent-fouling-photobioreactors-0413

Information source: (Massachusetts Institute of Technology, 2023)

1.6   Rechargeable battery made from food

A team of researchers at the Italian Institute of Technology (IIT) has created a totally edible and rechargeable battery, starting from materials that are normally consumed as part of our daily diet. The proof-of-concept battery cell has been described in a paper, recently published in the *Advanced Materials* journal. The possible applications are in health diagnostics, food quality monitoring and edible soft robotics. The study has been realized by the group of Mario Caironi, coordinator of the Printed and Molecular Electronics laboratory of the IIT Center in Milan (Italy); Caironi has been focusing on the study of the electronical properties of food and its by-products, in order to unite them with edible materials and create new edible electronic materials.

Credit: Italian Institute of Technology

The IIT's research group took inspiration from the biochemical redox reactions that happens in all the living beings, and developed a battery that utilizes riboflavin (vitamin B2, found for example in almonds) as anode and quercetin (a food supplement and ingredient, present in capers, among others) as cathode. Activated charcoal (a widespread over-the-counter medication) was used to increase electrical conductivity, while the electrolyte was water-based. The separator, needed in every battery to avoid short circuits, was made from nori seaweed, the kind found in sushi. Then, electrodes were encapsulated in beeswax from which two food-grade gold contacts (the foil used by pastry chefs) on a cellulose derived support come out.

For more information, visit the following link:
https://opentalk.iit.it/en/a-rechargeable-battery-made-from-food/

Reference
Italian Institute of Technology. (April 13, 2023). A rechargeable battery made from food. Recovered April 14, 2023, Italian Institute of Technology: https://opentalk.iit.it/en/a-rechargeable-battery-made-from-food/

Information source: (Italian Institute of Technology, 2023)

1.7   Hitting the brakes or the accelerator on electrified semitrucks

Study looks at the environmental and economic benefits of overhead cable-line technology for nation's highways. A new study from Georgia Tech's College of Engineering looks closer at using Overhead Cable Line (OCL) technology to power trucks, evaluating if they are wise environmental and economical choices. For some countries, including the United States as a whole, Sweden and Germany, the team suggests OCL technology is ideal. It's also beneficial at the state level for New York, Washington, and Georgia. But for other areas, including India, China, West Virginia, and Kentucky, it shouldn't be implemented until the region's electric grid is cleaner. The study finds that putting electrified trucks on the roads in locations with dirtier electric grids actually would be more harmful to the environment than continuing to drive diesel tractor-trailers.

Siemens Mobility built an overhead contact line for electric trucks on a 6.2-mile stretch of Germany's autobahn.
Credit: Siemens, Georgia Institute of Technology

The study finds that diesel trucks release 2.5 times more Greenhouse Gas (GHG) emissions than overhead-line and battery-powered vehicles. It also suggests that once OCL trucks achieve a 10% adoption rate (replacing 10 percent of the current fleet on highways), the technology is environmentally and economically beneficial over the other two options, despite the high costs of installing the equipment along highways.

For more information, visit the following link:
https://coe.gatech.edu/news/2023/04/hitting-brakes-or-accelerator-electrified-semitrucks

Reference
Maderer, J. (April 13, 2023). Hitting the brakes or the accelerator on electrified semitrucks. Recovered April 14, 2023, Georgia Tech: https://coe.gatech.edu/news/2023/04/hitting-brakes-or-accelerator-electrified-semitrucks

Information source: (Georgia Institute of Technology, 2023)

1.8   Progress in search for alopecia areata treatment for adolescents

A Yale-led clinical trial found that the medicine ritlecitinib appears safe and promising for treating adolescents with a form of often-disfiguring hair loss. A medication that has been found to effectively treat the skin disease alopecia areata in adults is also successful in treating adolescent patients, according to a Yale-led clinical trial.

The first image shows a patient prior to treatment with ritlecitinib. The second image shows complete hair regrowth while taking ritlecitinib.
Credit: Jim Shelton, Yale University

The new oral medication studied in the clinical trial, a Janus kinase (JAK) inhibitor known as ritlecitinib, was developed by Pfizer. Other JAK inhibitors, a class of drugs originally used to treat rheumatoid arthritis and certain blood disorders, have been approved for the treatment of a host of intractable skin diseases, including alopecia areata, following more than a decade of research led by Yale dermatologist Dr. Brett King. *"This new work is a huge advancement for treating alopecia areata because the clinical trial involved adolescents in addition to adults,"* said King, an associate professor of dermatology at Yale School of Medicine and first author of the new study, which was published in The Lancet. *"Because alopecia areata frequently affects children and adolescents, it is groundbreaking to advance a medicine that shows safety and effectiveness in the treatment of younger patients."*

For more information, visit the following link:
https://news.yale.edu/2023/04/13/progress-search-alopecia-areata-treatment-adolescents

Reference
Shelton, J. (April 13, 2023). Progress in search for alopecia areata treatment for adolescents. Recovered April 17, 2023, Yale University: https://news.yale.edu/2023/04/13/progress-search-alopecia-areata-treatment-adolescents

Information source: (Yale University, 2023)

1.9 Develop capsule x-ray dosimeter for real-time radiotherapy monitoring

In radiotherapy, precision in targeting tumor tissue while minimizing damage to healthy tissue is crucial. Monitoring the dose of radiation delivered and absorbed in real-time, particularly in the gastrointestinal tract, poses significant difficulty. Additionally, existing methods used for monitoring biochemical indicators such as pH and temperature are inadequate for comprehensive evaluation of radiotherapy.
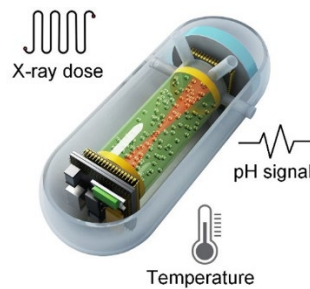
Functional model of capsule.
Credit: SIAT, Chinese Academy of Sciences

To address this challenge, a joint research team from the Shenzhen Institute of Advanced Technology (SIAT) of the Chinese Academy of Sciences, the National University of Singapore (NUS), and Tsinghua University has developed a capsule-shaped swallowable X-ray dosimeter (with a diameter of 5 mm and thickness of 0.2 mm), which can estimate radiation dose based on radioluminescence and temperature using a neural network-based regression model. The researchers found that the dosimeter was approximately five times more accurate than standard methods for dose determination. In vivo clinical dosimeters such as metal-oxide-semiconductor field-effect transistors, thermoluminescence sensors, and optically excited films are commonly placed directly on or near the patient's skin to estimate the dose absorbed in the target area.

For more information, visit the following link:
https://english.cas.cn/newsroom/research_news/life/202304/t20230413_329307.shtml

Reference
Yuan, L. (April 14, 2023). Researchers develop capsule X-Ray dosimeter for real-time radiotherapy monitoring. Recovered April 17, 2023, Chinese Academy of Sciences: https://english.cas.cn/newsroom/research_news/life/202304/t20230413_329307.shtml

Information source: (Chinese Academy of Sciences, 2023)

1.10   Drones and lasers pinpoint greenhouse gas leaks

As evidence mounts that gas drilling and sewer systems leak far more greenhouse gases than previously believed, a team of Princeton researchers has developed a method to pinpoint leaks both big and small for speedy repair. Because it takes advantage of the remote-sensing capabilities of lasers combined with the agility of drones, the new technology can also be used to quickly spot otherwise unseen leaks in hard-to-access areas, an innovation the researchers said unlocks game-changing potential for atmospheric sensing.

The retroflector mounted onto the drone.
Credit: Bumper DeJesus, Princeton University

"Current approaches for detecting leaks often rely on handheld infrared cameras that are labor-intensive to operate and insensitive to small leaks, or they use methods that require setting up extensive measurement infrastructure ahead of time," said Gerard Wysocki, associate professor of electrical and computer engineering and associated faculty at the and linger Center for Energy and the Environment. *"But with a drone, you are completely free in how you are able to set up your sensing area."* The researchers' approach consists of a small drone outfitted with only a retroreflector, a type of mirror that reflects incoming light directly back to the source, and a base station of gas sensing equipment with the capability to track the drone's movement during flight. Bouncing a laser beam off the drone as it flies to set points around a suspected leak allows an operator to pinpoint the source of the leak and measure its intensity.

For more information, visit the following link:
https://engineering.princeton.edu/news/2023/04/14/using-drones-and-lasers-researchers-pinpoint-greenhouse-gas-leaks

Reference
Poore, C. (April 14, 2023). Using drones and lasers, researchers pinpoint greenhouse gas leaks. Recovered April 17, 2023, Princeton University: https://engineering.princeton.edu/news/2023/04/14/using-drones-and-lasers-researchers-pinpoint-greenhouse-gas-leaks

Information source: (Princeton University, 2023)

1.11   Microfluidic device for collecting microplastics via acoustic focusing

Microplastics (MPs), plastic debris smaller than 5 mm, indirectly harm the environment. They are traditionally collected and removed from water by filtering through meshes, which is inefficient. In this light, researchers from Japan have developed a high-enrichment microfluidic device that utilizes acoustic focusing to collect and remove 10–200 µm MPs from wastewater without recirculation. Its collection rates and enrichment ratios ranged approximately from 70–90% and 50–100, respectively on test samples.
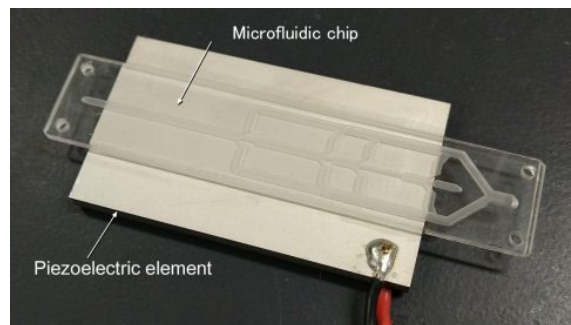
The device developed by researchers from Japan has four serial trifurcated junctions where a 500 kHz acoustic wave is applied for a 105-fold enrichment of various-sized microplastics in water.
Credit: Yoshitake Akiyama, Shinshu University

The acoustic technology generates ultrasonic waves that transport MPs to the center of the fluid stream and thereby enrich, i.e., increase the collected amount, of MPs. However, high enrichment of MPs using current microfluidic devices requires repeated recirculation of fluids through them. In this light, a group of researchers, led by Professor Yoshitake Akiyama of the Department of Mechanical Engineering and Robotics at the Faculty of Textile Science and Technology at Shinshu University, has developed a high enrichment device for 10–200 µm MPs.

For more information, visit the following link:
https://www.shinshu-u.ac.jp/english/topics/2023/04/filtering-pollution-.html

Reference
Shinshu University (April 14, 2023). Filtering pollution: a microfluidic device for collecting microplastics via acoustic focusing. Recovered April 17, 2023, Shinshu University: https://www.shinshu-u.ac.jp/english/topics/2023/04/filtering-pollution-.html

Information source: (Shinshu University, 2023)

1.12   ¿Can you use natural materials for building construction?

Lola Ben-Alon is a professor at Columbia Graduate School of Architecture Planning and Preservation (GSAPP), where she directs the Natural Materials Lab and the Building Tech curriculum. She specializes in socially and environmentally sustainable building materials, construction practices, and engineering-architecture collaborations.

Her work strives to catalyze the use of these materials in upscaled as well as community-engaged applications by developing novel production modes—digital fabrication, mechanical compression, and manual craft. Her work also engages in the performance characterization of these materials to enhance mix designs, durability, and to advance building policy. We are currently developing a line of research that involves 3D-printed earth and fibers, and converges material science, architectural design, and installation. We use 3D printing and digital fabrication to allow new aesthetics and geometrical configurations for traditional materials and weaving patterns. By increasing the natural fiber content in 3D-printed earth, we also increase thermal performance and carbon storage. We use wheat straw, hemp, kenaf, sisal, banana leaves, and flax fibers, mostly bi-products or agro wastes of the food and fashion industry. We also experiment with our mixtures to create wearable substances that use soils and fibers interweaved into flexible, bio-based, and fully biodegradable textiles. We are also assessing the social life cycle of natural wall assemblies versus conventional wall systems, and modeling their thermal and hygroscopic performance.

For more information, visit the following link:
https://news.columbia.edu/news/can-you-use-natural-materials-building-construction

Reference
Glasberg, E. (April 14, 2023). Can you use natural materials for building construction? Recovered April 17, 2023, Columbia University: https://news.columbia.edu/news/can-you-use-natural-materials-building-construction

Information source: (Columbia University in the City of New York, 2023)

1.13   Robotic nano-surgery shown to be effective at treating brain cancer in pre-clinical models

Researchers at The Hospital for Sick Children (SickKids) and the University of Toronto Robotics Institute – an institutional strategic initiative – have teamed up to develop a new treatment option for patients diagnosed with Glioblastoma (GBM). Glioblastoma is the most common and aggressive form of brain cancer – the average life expectancy after a diagnosis is around 15 months.
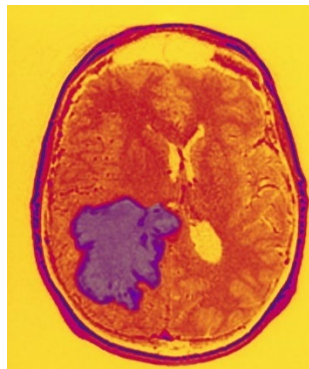
Credit: BSIP, University of Toronto

Yu Sun, a professor in U of T's department of mechanical and industrial engineering in the Faculty of Applied Science and Engineering, and Xi Huang, a senior scientist at SickKids and an associate professor in the department of molecular genetics at the Temerty Faculty of Medicine, together, they designed a precision control system that applies a rotating magnetic field to mobilize magnetic carbon nanotubes (mCNTs) filled with iron oxide particles and demonstrated that mCNT swarms could be activated inside a single cell to function as nano-scalpels. They showed that mechanical stimulations provided by mobilized mCNTs inside GBM cells disrupt cancer cells' internal structures leading to cell death. Importantly, the team demonstrated that the nano-surgical treatment reduced tumour size and extended the survival of mice bearing chemotherapy-resistant GBM.

For more information, visit the following link:
https://www.utoronto.ca/news/robotic-nano-surgery-shown-be-effective-treating-brain-cancer-pre-clinical-models

Reference
Siegel, H. (April 14, 2023). Robotic nano-surgery shown to be effective at treating brain cancer in pre-clinical models. Recovered April 17, 2023, University of Toronto: https://www.utoronto.ca/news/robotic-nano-surgery-shown-be-effective-treating-brain-cancer-pre-clinical-models

Information source: (University of Toronto, 2023)

1.14 Low temperature antifreeze hydrogel material

The development of high-strength hydrogels has greatly broadened the application field of gel materials. However, most hydrogels have a limited temperature range for their application due to the large amount of water they contain. At low temperatures, the physicochemical properties of hydrogels change drastically, and the formation of ice crystals leads to toughness-brittleness transition, reduced transparency, and functional deterioration. The development of hydrogels with frost resistance and excellent low-temperature mechanical properties is of great scientific value. Professor He Zhiyuan's research group from the School of Materials Science and Engineering of BIT and the research group of Wu Ziliang, a researcher at Zhejiang University, found that glassy hydrogels containing dense hydrogen bond association structure have excellent intrinsic antifreeze properties and low temperature mechanical properties.
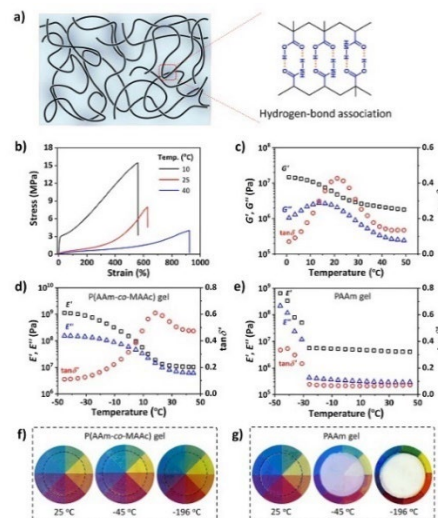
Credit: Zhao Lin, Beijing Institute of Technology

The gel has a water content of about 50wt%, and has excellent mechanical properties at room temperature. Due to the dynamic characteristics of hydrogen bonds, the mechanical and viscoelastic behavior show significant temperature dependence. The variable temperature stretching results showed that the gel still showed yield phenomenon at minus 45 °C and had good toughness.

For more information, visit the following link:
https://english.bit.edu.cn/news2020/focus/d74e3480100c4270980e15fd04a76aa4.htm

Reference
Lin, Z. (April 14, 2023). BIT 's progress in low temperature antifreeze hydrogel material. Recovered April 17, 2023, Beijing Institute of Technology: https://english.bit.edu.cn/news2020/focus/d74e3480100c4270980e15fd04a76aa4.htm

Information source: (Beijing Institute of Technology, 2023)

1.15   Medical 3D printing

Prof Kawal Rhode, School of Biomedical Engineering & Imaging Sciences, and Royal Veterinary College Student, Asma Bint-Zubair, have restored a 100 year old chimpanzee skeleton using CT scans and novel 3D printing techniques. A similar level of skill has been used in this project in the scanning process to get the appropriate data for manipulation, in the printing process and especially in the final treatment of the printed parts to remove surplus material while preserving essential features.

Credit: King's College London

Future collaborative plans include looking at the Museum collection to identify other skeletons that could benefit from the techniques utilised in this restoration. 3D printing techniques can also be used to create replicas that visitors and students can handle without fear of damage.

For more information, visit the following link:
https://www.kcl.ac.uk/news/medical-3d-printing-preserves-100-year-old-life-sciences-museum-specimen

Reference
Rhode, K. (April 14, 2023). Medical 3D printing restores 100 year old Museum of Life Sciences specimen. Recovered April 17, 2023, King's College London: https://www.kcl.ac.uk/news/medical-3d-printing-preserves-100-year-old-life-sciences-museum-specimen

Information source: (King's College London, 2023)

1.16 Creation of Artificial Intelligence to better communicate their stellar research

An international team of scientists, led by a researcher at The University of Manchester, have developed a novel Artificial Intelligence (AI) approach to distil technical astronomy terminology into simple understandable. In astronomy, technical terminology is used to describe specific ideas in efficient ways that are easily understandable amongst professional astronomers. However, this same terminology can also become a barrier to including non-experts in the conversation. The Radio Galaxy Zoo EMU (RGZ EMU) collaboration is building a project on the Zooniverse citizen science platform, which asks the public for help in describing and categorising galaxies imaged through a radio telescope.

Credit: The University of Manchester

The RGZ EMU team first asked experts to describe a selection of radio galaxies with their technical terms, and then asked non-experts to describe them in plain English. Using a first of its kind AI based approach developed by the team, they then identified the plain English descriptions which carried the most scientific information.

For more information, visit the following link:
https://www.manchester.ac.uk/discover/news/astronomers-create-ai-to-better-communicate-their-stellar-research/

Reference
The University of Manchester. (April 17, 2023). Astronomers create AI to better communicate their stellar research. Recovered April 17, 2023, The University of Manchester: https://www.manchester.ac.uk/discover/news/astronomers-create-ai-to-better-communicate-their-stellar-research/

Information source: (The University of Manchester, 2023)

1.17 Optimization could cut the carbon footprint of Artificial Intelligence training

A new way to optimize the training of deep learning models, a rapidly evolving tool for powering Artificial Intelligence (AI), could slash AI energy demands. Developed at the University of Michigan, the open-source optimization framework studies deep learning models during training, pinpointing the best tradeoff between energy consumption and the speed of the training.
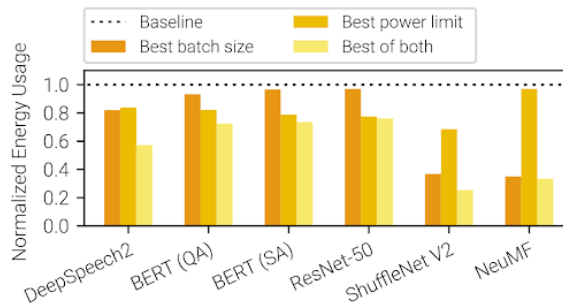
A variety of common deep learning models benefit from Zeus' ability to tune GPU power limits and the training batch size. When both parameters were tuned, the software achieved up to 75% energy reduction.
Credit: SymbioticLab, University of Michigan

"At extreme scales, training the GPT-3 model just once consumes 1,287 MWh, which is enough to supply an average U.S. household for 120 years," said Mosharaf Chowdhury, an associate professor of electrical engineering and computer science. With Zeus, the new energy optimization framework developed by Chowdhury and his team, figures like this could be reduced by up to 75% without any new hardware—and with only minor impacts on the time it takes to train a model. Zeus uses two software knobs to reduce energy consumption. One is the graphics processing unit (GPU) power limit, which lowers a GPU's power use while slowing down the model's training until the setting is adjusted again. The other is the deep learning model's batch size parameter, which controls how many samples from the training data the model works through before updating the way the model represents the relationships it finds in the data.

For more information, visit the following link:
https://news.umich.edu/optimization-could-cut-the-carbon-footprint-of-ai-training-by-up-to-75/

Reference
Champion, Z. (April 17, 2023). Optimization could cut the carbon footprint of AI training by up to 75%. Recovered April 17, 2023, University of Michigan: https://news.umich.edu/optimization-could-cut-the-carbon-footprint-of-ai-training-by-up-to-75/

Information source: (University of Michigan, 2023)

1.18   Solar hydrogen system that co-generates heat and oxygen

École Polytechnique Fédérale de Lausanne (EPFL) researchers have built a pilot-scale solar reactor that produces usable heat and oxygen, in addition to generating hydrogen with unprecedented efficiency for its size.

Credit: Celia Luterbacher, École Polytechnique Fédérale de Lausanne

A parabolic dish on the EPFL campus is easily overlooked, resembling a satellite dish or other telecommunications infrastructure. But this dish is special, because it works like an artificial tree. After concentrating solar radiation nearly 1,000 times, a reactor above the dish uses that sunlight to convert water into valuable and renewable hydrogen, oxygen, and heat. *"This is the first system-level demonstration of solar hydrogen generation. Unlike typical lab-scale demonstrations, it includes all auxiliary devices and components, so it gives us a better idea of the energy efficiency you can expect once you consider the complete system, and not just the device itself,"* says Sophia Haussener, head of the Laboratory of Renewable Energy Science and Engineering (LRESE) in the School of Engineering. The work builds on preliminary research demonstrating the concept on the laboratory scale, using LRESE's high-flux solar simulator.

For more information, visit the following link:
https://actu.epfl.ch/news/a-solar-hydrogen-system-that-co-generates-heat-and/

Reference
Luterbacher, C. (April 17, 2023). A solar hydrogen system that co-generates heat and oxygen. Recovered April 17, 2023, Ecole Polytechnique Fédérale de Lausanne: https://actu.epfl.ch/news/a-solar-hydrogen-system-that-co-generates-heat-and/

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

1.19   Neuromorphic visual sensor can recognise moving objects and predict their path

The new smart sensor uses embedded information to detect motion in a single video frame. A new bio-inspired sensor can recognise moving objects in a single frame from a video and successfully predict where they will move to. This smart sensor, described in a *Nature Communications* paper, will be a valuable tool in a range of fields, including dynamic vision sensing, automatic inspection, industrial process control, robotic guidance, and autonomous driving technology. Inspired by the human visual system, researchers at Aalto University have developed a new neuromorphic vision technology that integrates sensing, memory, and processing in a single device that can detect motion and predict trajectories.
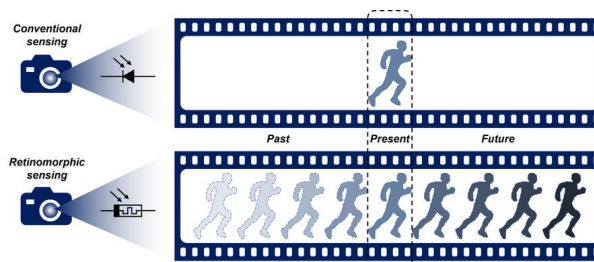
Conventional sensors only capture a single moment in a frame, but the new sensor can read information about the past and use that to predict the future.
Credit: Hongwei Tan, Aalto University

To demonstrate the technology, the researchers used videos showing the letters of a word one at a time. Because all the words ended with the letter *"E,"* the final frame of all the videos looked similar. Conventional vision sensors couldn't tell whether the *"E"* on the screen had appeared after the other letters in *"APPLE"* or *"GRAPE."* But the photomemristor array could use hidden information in the final frame to infer which letters had preceded it and predict what the word was with nearly 100% accuracy. In another test, this team showed the sensor videos of a simulated person moving at three different speeds. Not only was the system able to recognize motion by analysing a single frame, but it also correctly predicted the next frames.

For more information, visit the following link:
https://www.aalto.fi/en/news/a-neuromorphic-visual-sensor-can-recognise-moving-objects-and-predict-their-path

Reference
Hongwei, T. & Van Dijken, S. (April 17, 2023). A neuromorphic visual sensor can recognise moving objects and predict their path. Recovered April 17, 2023, Aalto University: https://www.aalto.fi/en/news/a-neuromorphic-visual-sensor-can-recognise-moving-objects-and-predict-their-path

Information source: (Aalto University, 2023)

1.20 Develops highly-sensitive wearable *"piezoelectric"* blood pressure sensor for continuous health monitoring

A collaborative research team led by Korea Advanced Institute of Science and Technology (KAIST) Professor Keon Jae Lee verifies the accuracy of the highly-sensitive sensor through clinical trials, has developed a highly sensitive, wearable piezoelectric blood pressure sensor.
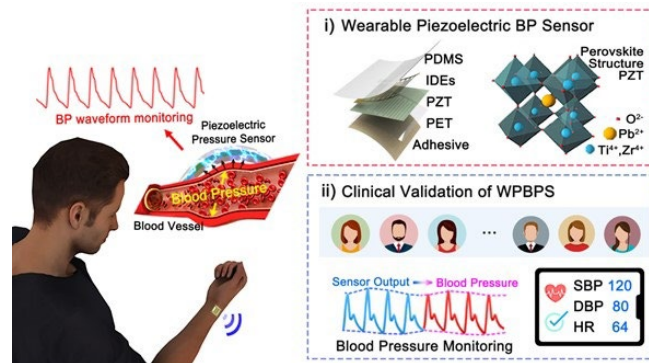
Schematic illustration of the overall concept for a wearable piezoelectric blood pressure sensor (WPBPS).
Credit: Korea Advanced Institute of Science and Technology

Recently, there has been a growing interest in healthcare devices for continuous blood pressure monitoring. Although smart watches using LED-based photoplethysmography (PPG) technology have been on market, these devices have been limited by the accuracy constraints of optical sensors, making it hard to meet the international standards of automatic sphygmomanometers. Professor Lee's team has developed the wearable piezoelectric blood pressure sensor by transferring a highly sensitive, inorganic piezoelectric membrane from bulk sapphire substrates to flexible substrates. Ultrathin piezoelectric sensors with a thickness of several micrometers (one hundredth of the human hair) exhibit conformal contact with the skin to successfully collect accurate blood pressure from the subtle pulsation of the blood vessels.

For more information, visit the following link:
https://news.kaist.ac.kr/newsen/html/news/?mode=V&mng_no=28290

Reference
Korea Advanced Institute of Science and Technology (April 17, 2023). KAIST team develops highly-sensitive wearable piezoelectric blood pressure sensor for continuous health monitoring. Recovered April 17, 2023, Korea Advanced Institute of Science and Technology: https://news.kaist.ac.kr/newsen/html/news/?mode=V&mng_no=28290

Information source: (Korea Advanced Institute of Science and Technology, 2023)

2   PATENTS

2.1   Creating multiple prioritized clinical summaries using Artificial Intelligence

A system, method, and a computer program product for generating a clinical summary of a patient using Artificial Intelligence is provided. A patient data that includes unstructured data and structured data is collected from multiple computing devices.
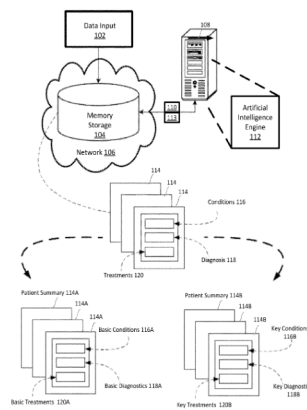
Are block diagrams illustrating an example patient profile management system for generating patient data and patient summaries according to some embodiments. Credit: Amarasingham, R., Chen, Y., Atsina, K., Philip, S., and Kang, H., WIPO IP Portal

Natural language processing models determine clinical issues from the unstructured data. A knowledge graph generated using a relational language model determines treatments associated with the active clinical issues. Active diagnostic and treatment orders are determined from the structured data. Multiple summaries summarizing the active clinical issues, treatments, active diagnostic orders, and active treatment orders are determined using natural language generation models trained to summarize multiple tasks. The multiple summaries are aggregated into a single summary.

For more information, visit the following link:
https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023060087&_cid=P20-LGL99Q-03873-1

Reference
Amarasingham, R.; Chen, Y.; Atsina, K.; Philip, S. & Kang, H. (April 13, 2023). Creating multiple prioritized clinical summaries using Artificial Intelligence. Recovered April 13, 2023,   WIPO   IP   Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023060087&_cid=P20-LGL99Q-03873-1

Information source: (WIPO IP Portal, 2023)

2.2   A method and a validation device for executing Blockchain transactions

The present technology relates to a method and a system for conducting transactions based on distributed ledger. This shortcoming is addressed by securely storing all the necessary blockchain data in a validation device.

Illustrates a system for executing distributed ledger transactions according to a non-limiting embodiment.
Credit: Ammer, V., WIPO IP Portal

According to a first broad aspect of the present technology, there is provided a validation device for validation, authentication and/or authorization of blockchain transactions. The validation device comprising the following modules: non-volatile memory to store data; at least one physical communication interface; an Integrated Circuit (IC) capable of executing program instructions. According to a second broad aspect of the present technology, there is provided a method of executing blockchain transactions in a system, comprising a validation device and a computing device connected to at least one communication network in order to access a blockchain.

For more information, visit the following link:
https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023056569&_cid=P20-LGL9SZ-10240-3

Reference
Ammer, V. (April 13, 2023). A method and a validation device for executing blockchain transactions. Recovered April 13, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023056569&_cid=P20-LGL9SZ-10240-3

Information source: (WIPO IP Portal, 2023)

2.3   Determining impact of content on an audience

The present teachings include content processing techniques (e.g., via a content processing platform hosted by a remote computing resource) to analyze source content for determining an impact of the content on an audience. Specifically, a content processing platform may use a weighted Pattern Matching Machine Learning Classification Algorithm (WPMMLCA) to identify and measure the impact of patterns uncovered within the source content.
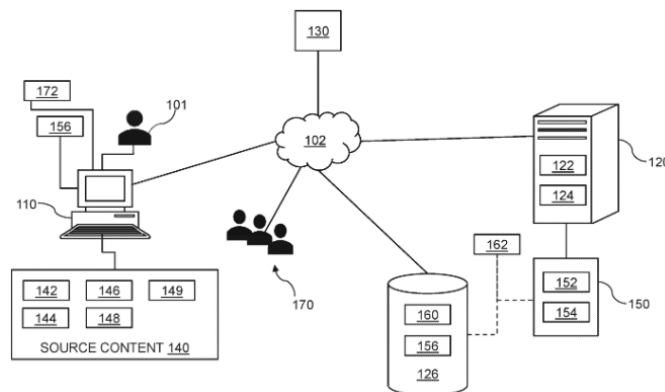
Shows a system for determining impact of source content on an audience, in accordance with a representative embodiment.
Credit: Thomas, D., Walker, D., Amin, P., Edley, C., Borge, F., Goldstein, B., Amin, A., and Seck, A., WIPO IP Portal

The patterns may be deliberately constructed to achieve a goal, e.g., to motivate an audience. The WPMMLCA may also or instead identify habitual/unintentional content patterns that can impact the audience. Identified patterns may relate to, for example, narrative frame (a cognitive shortcut that cues often implicit associations), context, lexicon, concept, language, structure, sequence, sentiment, and/or intended audience. The content processing platform may further provide recommendations and suggestions to alter/remediate source content based upon likely cognitive, motivational and other impact(s) of the subject content and characteristics of an audience.

For more information, visit the following link:
https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023059651&_cid=P20-LGLBB0-28702-5

Reference
Thomas, D.; Walker, D.; Amin, P.; Edley, C.: Borge, F.; Goldstein, B.; Amin, A. & Seck, A. (April 13, 2023). Determining impact of content on an audience. Recovered April 13, 2023, WIPO IP   Portal:
https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023059651&_cid=P20-LGLBB0-28702-5

Information source: (WIPO IP Portal, 2023)

2.4 Time-space movement track acquisition and generation method and apparatus, device, system, and storage medium

The present invention relates to a time-space movement track acquisition and generation method and apparatus, a device, a system, and a storage medium.

The method comprises: obtaining a first time series containing multiple sampling points, where the sampling points are projection points of a reality display device; for any sampling point, setting window time on the basis of the sampling moment of a current sampling point, searching for the first sampling point and the last sampling point in the window time, taking a first position which is a center point of the reality display device corresponding to the current sampling point as a circle center, calculating the angular rate between the first and the last sampling point, and using the current sampling point as a displacement point if the angular rate is greater than a preset angular rate threshold; executing the above-mentioned process with respect to the multiple sampling points to obtain a second time series containing multiple displacement points; and drawing a movement track plot on the basis of the second time series. The present application can comprehensively, fully and systematically record time and space information of human body movement in a virtual reality or a hybrid reality setting.

For more information, visit the following link:
https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023056753&_cid=P11-LGMEMS-02718-1

Reference
Zhao, Q. & Yang, R. (April 13, 2023). Time-space movement track acquisition and generation method and apparatus, device, system, and storage medium. Recovered April 18, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023056753&_cid=P11-LGMEMS-02718-1

Information source: (WIPO IP Portal, 2023)

2.5   System and method for facilitating a transporting process

A system and method for facilitating a transporting process is disclosed. The method includes receiving a request from a customer for shipping one or more products and determining a demand forecast corresponding to the one or more products based on the received request.

The method includes determining number of one or more desired trailers and number of products based one or more cost factors, the received request and the determined demand forecast. The method includes determining number of one or more vehicles and number of round trips and generating a source sorting plan. The method also includes determining number of sorting slots required for sorting the one or more products and generate a transportation sorting plan. Further, the method includes outputting the determined number of sorting slots and the generated transportation sorting plan on a graphical user interface of one or more electronic devices.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/085797709/publication/US2023112290A1?q=artificial%20intelligence

Reference
Ye, S.; Li, S. & Dong, W. (April 13, 2023). System and method for facilitating a transporting process. Recovered April 13, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/085797709/publication/US2023112290A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.6   Data compression techniques for Machine Learning models

In some aspects, techniques for creating representative and informative training datasets for the training of Machine-Learning models are provided.

For example, a risk assessment system can receive a risk assessment query for a target entity. The risk assessment system can compute an output risk indicator for the target entity by applying a Machine Learning model to values of informative attributes associated with the target entity. The Machine Learning model may be trained using training samples selected from a representative and informative (RAI) dataset. The RAI dataset can be created by determining the informative attributes based on attributes used by a set of models and further extracting representative data records from an initial training dataset based on the determined informative attributes. The risk assessment system can transmit a responsive message including the output risk indicator for use in controlling access of the target entity to an interactive computing environment.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/083995679/publication/WO2023060150A1?q=machine%20learning

Reference
Guo, B. & Bondugula, R. (April 13, 2023). Data compression techniques for Machine Learning models. Recovered April 14, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/083995679/publication/WO2023060150A1?q=machine%20learning

Information source: (Espacenet Patent Search, 2023)

2.7   Methods and systems for providing an enhanced response to a query in an Internet of Things environment

Methods and systems for providing an enhanced response to a query in an internet of things (IoT) environment are provided.
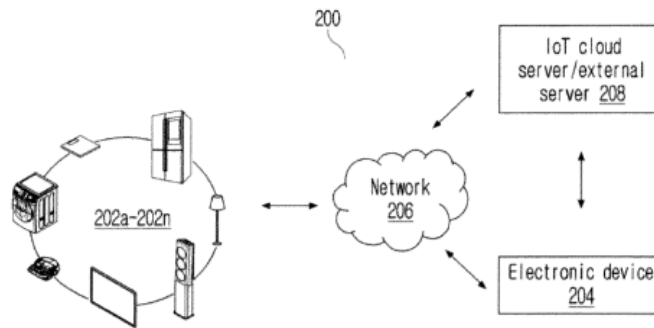
Credit: Krishnamurthy, V., Agarwal, S., Maligireddy, P., and Hariharan, S., Espacenet Patent Search

The method includes receiving a query and generating a response for the query. The method further includes determining at least one intent in relation to at least one portion of the generated response and ranking the at least one intent based on user preferences and a usage history associated with at least one user device present in an IoT environment. The method further includes distinguishing the at least one portion of the generated response with the determined at least one intent based on the ranking of the at least one intent.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/085803594/publication/WO2023059041A1?q=INTERNET%20OF%20THINGS

Reference
Krishnamurthy, V.; Agarwal, S.; Maligireddy, P. & Hariharan, S. (April 13, 2023). Methods and systems for providing an enhanced response to a query in an IoT environment. Recovered April 13, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/085803594/publication/WO2023059041A1?q=INTERNET%20OF%20THINGS

Information source: (Espacenet Patent Search, 2023)

2.8   Electronic deposit box for data protection and storage

An Information Handling System (IHS), method and computer program product secure data such as Personally Identifiable Information (PII) with separated dual encryption of each data payload and obscured labeling, providing an electronic deposit box (EpositBox) to thwart a data breach, which are then stored in a blockchain with retrieval facilitated by a sidecar indexing database.
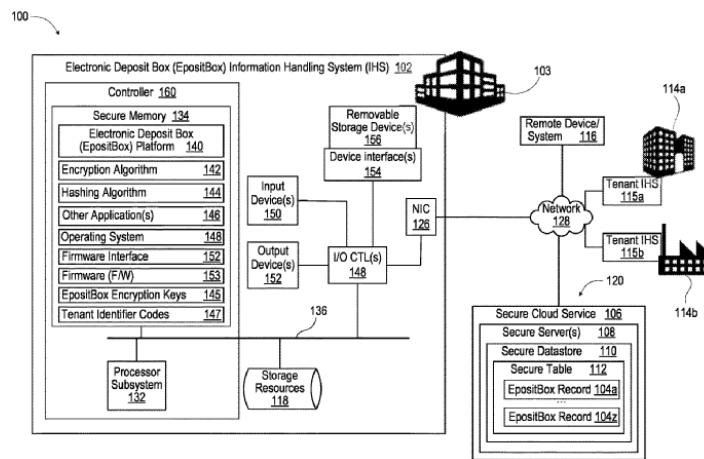
With tenant IHSes generating respective data structures that are secured by EpositBox IHS.
Credit: Carson, J., Espacenet Patent Search

The IHS receives a tenant data structure tenant record's having tabular label's associated with a data payload. The IHS assigns a block ID, appends a signature, and a tenant identifier to the tenant record. The IHS stores the tenant record in the blockchain, and the block ID and signature are stored in the sidecar.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/085796900/publication/US2023114566A1?q=BLOCKCHAIN

Reference
Carson, J. (April 13, 2023). Electronic deposit box for data protection and storage. Recovered April 18, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/085796900/publication/US2023114566A1?q=BLOCKCHAIN

Information source: (Espacenet Patent Search, 2023)

2.9   Machine for 3D printing and simultaneous cooking of foods

The invention relates to a 3D printing machine for printing cooked foods, which contains at least one printing module comprising at least three main movable bodies: a printing block that includes heating elements able to cook the food simultaneously to the printing thereof; a printing base; and an oven, where in the main movable bodies being able to slide vertically, independently of one another, along a vertical displacement device.
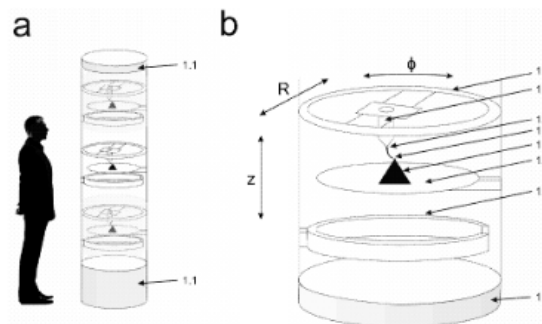
General outline of the modular machine (a) and one of the printing sets (b).
Credit: Gómez, L., Espacenet Patent Search

The machine is specially designed for the 3D printing and simultaneous cooking of food products by means of complex elaborations including several ingredients. The invention also relates to a method for obtaining cooked foods using the machine.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/069177222/publication/US2021137152A1?q=IMPRESION%203D

Reference
Gómez, L. (April 13, 2023). Machine for 3D printing and simultaneous cooking of foods. Recovered   April   13,   2023,   Espacenet   Patent   Search: https://worldwide.espacenet.com/patent/search/family/069177222/publication/US2021137152A1?q=IMPRESION%203D

Information source: (Espacenet Patent Search, 2023)

2.10   Wayfinding and guidance to assets, devices, and sensors in buildings

A Method and an arrangement for navigating a user to a device located in a building, comprising:
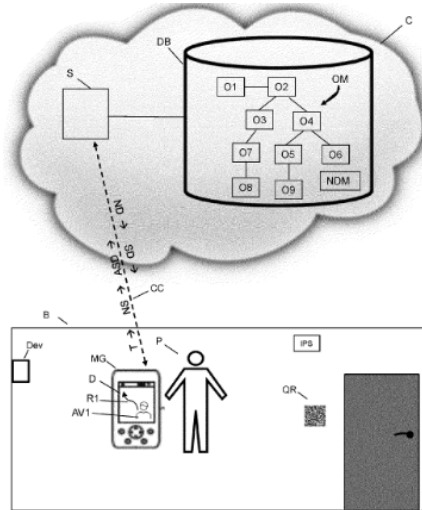
Illustrates an exemplary arrangement for navigating a user to a device located in a building.
Credit: Blatter S., and Zechlin, O.., Espacenet Patent Search

A mobile communication device (smartphone, tablet computer) configured to select the device to navigate to by user input, wherein the mobile communication device is connected to an Object Model (OM) representing the devices located in the building; a server comprising access to a memory where the OM is stored, wherein the server is configured to determine a route from the position of the user to the device to navigate to based on information provided by the object model; where in the route to the device to navigate to is displayed and synchronized on the display of the mobile communication device.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/078087168/publication/EP416359 4A1?q=INTERNET%20OF%20THINGS

Reference
Ammer, V. (April 13, 2023). Wayfinding and guidance to assets, devices and sensors in buildings. Recovered April 13, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/078087168/publication/EP416359 4A1?q=INTERNET%20OF%20THINGS

Information source: (Espacenet Patent Search, 2023)