Weekly Newsletter
TECHNOLOGY SURVEILLANCE

N° 37-2023   SEP 15TH, 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   Choosen fate: one brain organoid's tale on autism

Researchers from Jürgen Knoblich's and Barbara Treutlein's research groups at IMBA and ETH Zurich developed a technique to screen a complete set of key transcriptional regulator genes linked to autism. This development is especially impactful since the genes of interest can be examined simultaneously within a single mosaic organoid, marking the beginning of an era of intricate, efficient, and expedient genetic screening in human tissue.
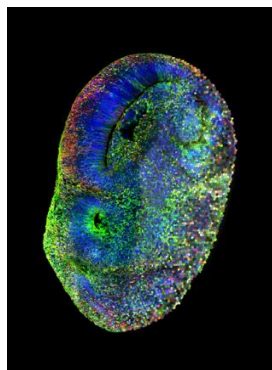
Microscopy image and artistic representation of the CHOOSE system in a human brain organoid.
Credit: Institute of Molecular Biotechnology

In the newly developed system, called *"CHOOSE"* (CRISPR-human organoids-scRNA-seq), each cell in the organoid carries at most one mutation in a specific ASD gene. The researchers could trace each mutation's effect at a single-cell level and map each cell's developmental trajectory. *"With this high-throughput methodology, we can systematically inactivate a list of disease-causing genes. As the organoids carrying these mutations grow, we analyze the effect of each mutation on the development of each cell type,"* says the study's first author Chong Li.

For more information, visit the following link:
https://www.oeaw.ac.at/imba/research-highlights/news/choosen-fate-one-brain-organoids-tale-on-autism

Reference
Institute of Molecular Biotechnology. (Sep 13, 2023). Choosen fate: one brain organoid's tale on autism. Recovered Sep 13, 2023, Institute of Molecular Biotechnology:
https://www.oeaw.ac.at/imba/research-highlights/news/choosen-fate-one-brain-organoids-tale-on-autism

Information source: (Institute of Molecular Biotechnology, 2023)

1.2   Revolutionizing lithium production on a string

Researchers at Princeton have developed an extraction technique that slashes the amount of land and time needed for lithium production. The researchers say their system can improve production at existing lithium facilities and unlock sources previously seen as too small or diluted to be worthwhile.

Salts form on the surface of the strings.
Credit: Bumper DeJesus, Princeton University

The core of the technique, is a set of porous fibers twisted into strings, which the researchers engineered to have a water-loving core and a water-repelling surface. When the ends are dipped in a salt-water solution, the water travels up the strings through capillary action — the same process trees use to draw water from roots to leaves. The water quickly evaporates from each string's surface, leaving behind salt ions such as sodium and lithium. As water continues to evaporate, the salts become increasingly concentrated and eventually form sodium chloride and lithium chloride crystals on the strings, allowing for easy harvesting.

For more information, visit the following link:
https://engineering.princeton.edu/news/2023/09/07/revolutionizing-lithium-production-string

Reference
Poore, C. (Sep 07, 2023). Revolutionizing lithium production on a string. Recovered Sep 11, 2023, Princeton University:
https://engineering.princeton.edu/news/2023/09/07/revolutionizing-lithium-production-string

Information source: (Princeton University, 2023)

1.3   Making life friendlier with personal robots

Breazeal's research explores the potential for companion robots to go far beyond assistants who obey transactional commands, like requests for the daily weather, adding items to shopping lists, or controlling lighting. At the MIT Media Lab, the PRG team designs Jibo to make him an insightful coach and companion to advance social robotics technologies and research. Visitors to the MIT Museum can experience Jibo's charming personality.

Sharifa Alghowinem, a research scientist in the Media Lab's Personal Robots Group, poses with Jibo, a friendly robot companion developed by Professor Cynthia Breazeal.
Credit: Gretchen Ertl, Massachusetts Institute of Technology

Alghowinem's research has focused on mental health care and education, often working with other graduate students and Undergraduate Research Opportunity Program students in the group. In one study, Jibo coached young and older adults via positive psychology. He adapted his interventions based on the verbal and non-verbal responses he observed in the participants. For example, Jibo takes in the verbal content of a participant's speech and combines it with non-verbal information like prolonged pauses and self-hugs. If he concludes that deep emotions have been disclosed, Jibo responds with empathy. When the participant doesn't disclose, Jibo asks a gentle follow up question like, *"Can you tell me more?"*

For more information, visit the following link:
https://news.mit.edu/2023/making-life-friendlier-personal-robots-sharifa-alghowinem-0910

Reference
Hanna, D. (Sep 10, 2023). Making life friendlier with personal robots. Recovered Sep 11, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/making-life-friendlier-personal-robots-sharifa-alghowinem-0910

Information source: (Massachusetts Institute of Technology, 2023)

1.4   *"Brainless"* robot can navigate complex obstacles

Researchers who created a soft robot that could navigate simple mazes without human or computer direction have now built on that work, creating a *"brainless"* soft robot that can navigate more complex and dynamic environments.

Credit: North Carolina State University

The new soft robots are made of ribbon-like liquid crystal elastomers. When the robots are placed on a surface that is at least 55 degrees Celsius (131 degrees Fahrenheit), which is hotter than the ambient air, the portion of the ribbon touching the surface contracts, while the portion of the ribbon exposed to the air does not. This induces a rolling motion; the warmer the surface, the faster the robot rolls.

For more information, visit the following link:
https://news.ncsu.edu/2023/09/brainless-robot

Reference
Shipman, M. (Sep 08, 2023). *"Brainless"* robot can navigate complex obstacles. Recovered Sep 11, 2023, North Carolina State University:
https://news.ncsu.edu/2023/09/brainless-robot

Information source: (North Carolina State University, 2023)

1.5   New tool skewers socially engineered attack ads

Georgia Tech researchers are countering deceptive online ads with a pioneering solution designed to challenge the rising threat of online social engineering attacks by cutting them off at the source. Trident, created by Ph.D. student Zheng Yang and his team of researchers, is an add-on compatible with Google Chrome that has proven to block these ads with nearly 100% efficiency.

"Warning! Your computer is infected with a virus. Click the button below to take immediate action!"
Credit: Georgia Institute of Technology

Advertisements are fertile ground for scams and fraudulent schemes. While such networks may offer better pay to websites than industry giants like Google and Facebook, their advertisements often employ tactics that lure unsuspecting users into compromising situations. The team compiled a vast dataset from over 100,000 websites to build Trident, including ten low-tier ad networks. This comprehensive data collection helped identify 1,479 instances of attacks encompassing a range of six common types of web-based social engineering attacks.

For more information, visit the following link:
https://research.gatech.edu/new-tool-skewers-socially-engineered-attack-ads

Reference
Popham, J. (Sep 08 2023). New tool skewers socially engineered attack ads. Recovered Sep 11, 2023, Georgia Institute of Technology:
https://research.gatech.edu/new-tool-skewers-socially-engineered-attack-ads

Information source: (Georgia Institute of Technology, 2023)

1.6   Turning used grounds into caffeinated creations

Project led by Michael Rivera, an assistant professor in the ATLAS Institute and Department of Computer Science at the University of Colorado Boulder. He and his colleagues have developed a method for 3D printing a wide range of objects using a paste made entirely out of old coffee grounds, water and a few other sustainable ingredients.

Flower planters 3D printed from used coffee grounds.
Credit: Michael Rivera, University of Colorado Boulder

The team has already experimented with using coffee grounds to craft jewelry, pots for plants and even, fittingly, espresso cups. The technique is also simple enough that it will work, with some modifications, on most low-cost, consumer-grade 3D printers. For Rivera, the project is part of his mission to make 3D printing more sustainable—allowing artists, designers, engineers and more to quickly make graspable prototypes and other household objects without adding to landfills.

For more information, visit the following link:
https://www.colorado.edu/today/2023/09/08/3d-printing-coffee-turning-used-grounds-caffeinated-creations

Reference
Strain, D. & Goda, N. (Sep 08, 2023). 3D printing with coffee: Turning used grounds into caffeinated creations. Recovered Sep 11, 2023, University of Colorado Boulder:
https://www.colorado.edu/today/2023/09/08/3d-printing-coffee-turning-used-grounds-caffeinated-creations

Information source: (University of Colorado Boulder, 2023)

1.7   Hot summer air turns into drinking water with new gel device

Researchers at The University of Texas at Austin have focused on the moisture present in the air as a potential source of drinking water for drought-stressed populations. In new research, they reached a significant breakthrough in their efforts to create drinkable water out of thin air: a molecularly engineered hydrogel that can create clean water using just the energy from sunlight.

Credit: The University of Texas at Austin

The researchers were able to pull water out of the atmosphere and make it drinkable using solar energy, in conditions as low as 104 degrees, aligning with summer weather in Texas and other parts of the world. That means people in places with excess heat and minimal access to clean water could someday simply place a device outside, and it would make water for them, with no additional effort necessary.

For more information, visit the following link:
https://news.utexas.edu/2023/09/11/hot-summer-air-turns-into-drinking-water-with-new-gel-device/

Reference
Levy, N. (Sep 11, 2023). Hot summer air turns into drinking water with new gel device. Recovered Sep 12, 2023, The University of Texas at Austin:
https://news.utexas.edu/2023/09/11/hot-summer-air-turns-into-drinking-water-with-new-gel-device/

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

1.8   Artificial Intelligence can help write a message to a friend – but don't do it

Researchers found that people in the study perceived that a fictional friend who used AI assistance to write them a message didn't put forth as much effort as a friend who wrote a message themselves. That perception may be understandable, but the effect goes beyond the message itself, said Bingjie Liu, lead author of the study and assistant professor of communication at The Ohio State University.

Sure, AI could help you write that message to a friend. But it may not be a good idea.
Credit: The Ohio State University

"After they get an AI-assisted message, people feel less satisfied with their relationship with their friend and feel more uncertain about where they stand," Liu said. But to be fair to AI, it wasn't just the use of technology that turned people off. The study also found negative effects when people learned their friend got help from another person to write a message. *"People want their partners or friends to put forth the effort to come up with their own message without help – from AI or other people,"* Liu said.

For more information, visit the following link:
https://news.osu.edu/ai-can-help-write-a-message-to-a-friend--but-dont-do-it/

Reference
Grabmeier, J. (Sep 11, 2023). AI can help write a message to a friend – but don't do it. Recovered Sep 12, 2023, The Ohio State University:
https://news.osu.edu/ai-can-help-write-a-message-to-a-friend--but-dont-do-it/

Information source: (The Ohio State University, 2023)

1.9   Bacteria generate electricity from wastewater

Boghossian's team report a groundbreaking achievement in bioelectronics, advancing the capabilities of common E. coli bacteria to generate electricity. The work outlines a novel approach that could revolutionize both waste management and energy production.

Credit: © 2023 EPFL/Jamani Caillet - CC-BY-SA 4.0, Ecole Polytechnique Fédérale de Lausanne

E. coli bacteria, a staple of biological research, have been harnessed to create electricity through a process known as extracellular electron transfer (EET). The EPFL researchers engineered E. coli bacteria to exhibit enhanced EET, making them highly efficient *"electric microbes."* Unlike previous methods that required specific chemicals for electricity generation, the bioengineered E. coli can produce electricity while metabolizing a variety of organic substrates. The implications of the study extend beyond waste treatment. Being able to generate electricity from a wide range of sources, the engineered E. coli can be utilized in microbial fuel cells, electrosynthesis, and biosensing – to name a few applications. In addition, the bacterium's genetic flexibility means that it can be tailored to adapt to specific environments and feedstocks, making it a versatile tool for sustainable technology development.

For more information, visit the following link:
https://news.epfl.ch/news/bacteria-generate-electricity-from-wastewater/

Reference
Papageorgiou, N. (Sep 11, 2023). Bacteria generate electricity from wastewater. Recovered Sep 12, 2023, Ecole Polytechnique Fédérale de Lausanne:
https://news.epfl.ch/news/bacteria-generate-electricity-from-wastewater/

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

1.10   Artificial intelligence could help build pollen jigsaw of present and ancient flora

Scientists at the University of Exeter and Swansea University are combining cutting-edge technologies including imaging flow cytometry and artificial intelligence to build a system capable of identifying and categorising pollen at much faster rates. As well as building a fuller picture of past flora, the team hope the technology could one day be applied to more accurate pollen readings in today's environment, which may help provide hayfever sufferers to mitigate symptoms.
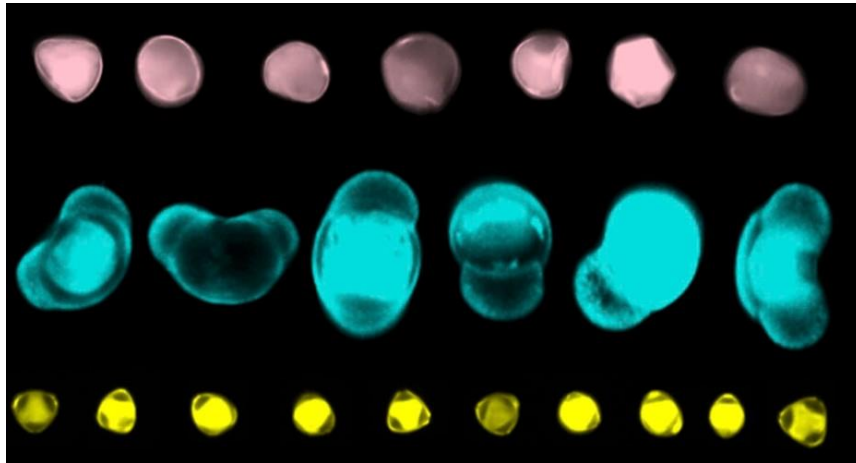
Credit: University of Exeter

Dr Ann Power, of the University of Exeter, said: *"Pollen is an important environmental indicator, and piecing together the jigsaw of different pollen types in the atmosphere, both today and in the past, can help us build up a picture of biodiversity and climate change."*

For more information, visit the following link:
https://news.exeter.ac.uk/faculty-of-health-and-life-sciences/artificial-intelligence-could-help-build-pollen-jigsaw-of-present-and-ancient-flora/

Reference
Vennells, L. (Sep 07, 2023). Artificial intelligence could help build pollen jigsaw of present and ancient flora. Recovered Sep 12, 2023, University of Exeter:

https://news.exeter.ac.uk/faculty-of-health-and-life-sciences/artificial-intelligence-could-help-build-pollen-jigsaw-of-present-and-ancient-flora/

Information source: (University of Exeter, 2023)

1.11   Cacao *"fingerprints"* for better chocolate

Food technologists use yeasts and lactic acid bacteria as fungus-inhibiting fermentation starters. However, not all cacao beans react the same way to the microorganisms, because the beans' chemical profiles and properties vary depending on the variety of cacao and where it was cultivated. That's why in her project, Lestang is developing a method to determine the chemical fingerprint of cacao beans. Her work is making clear which starters best protect a bean from fungal attack.

The sample is burned, the rising smoke is absorbed and its components are determined by mass spectrometry.
Credit: Michel Büchel, Eidgenössische Technische Hochschule Zürich

For her analysis, Lestang uses rapid evaporative ionisation mass spectroscopy (REIMS), a method primarily used for microbiological tests in medicine; it is rarely used in the food sector. *"The advantage of REIMS is that both sample preparation and evaluation are much less involved and time-consuming than conventional test methods."*

For more information, visit the following link:
https://ethz.ch/en/news-and-events/eth-news/news/2023/09/cacao-fingerprints-for-better-chocolate.html

Reference
Schläfli, S. (Sep 07, 2023). Cacao *"fingerprints"* for better chocolate. Recovered Sep 12, 2023, Eidgenössische Technische Hochschule Zürich:
https://ethz.ch/en/news-and-events/eth-news/news/2023/09/cacao-fingerprints-for-better-chocolate.html

Information source: (Eidgenössische Technische Hochschule Zürich, 2023)

1.12   Using smart bioelectronic devices to capture and release tumour cells

The UPV/EHU's Microfluidics Cluster group describes the process for building a bioelectronic device consisting of gold electrodes coated with a smart polymer capable of capturing and releasing cells in a non-invasive, controllable way while monitoring the processes using conventional electrical measurements. These are the first steps towards developing universal platforms for early cancer screening.
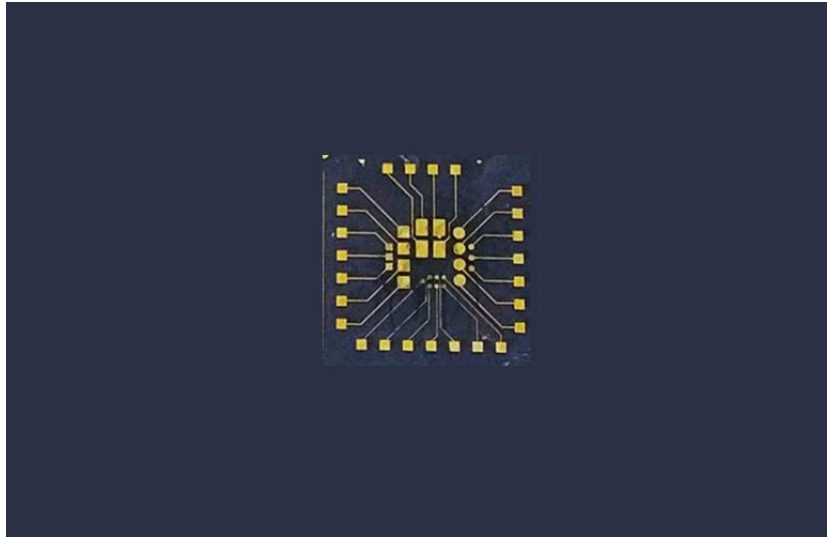
Microfabricated bioelectronic device for cell capture and release in which 24 gold microelectrodes of different sizes can be seen. Device size 20x20 mm.
Credit: Microfludics Cluster UPV/EHU, University of the Basque Country

"We wanted to come up with a device capable of concentrating cancer cells in order to detect their concentration," explained Janire Sáez, Ikerbasque research professor in the UPV/EHU's Microfluidics Cluster Group. The biosensors (devices for measuring biological or chemical parameters containing a component of a biological nature) developed so far for this purpose damage cells during the capture and release processes, and so the Microfluidics Cluster group has combined smart materials with the area of bioelectronics (which is about applying carbon-based semiconductors) so that the capture and release of cancer cells can be measured.

For more information, visit the following link:
https://www.ehu.eus/en/web/campusa-magazine/-/using-smart-bioelectronic-devices-to-capture-and-release-tumour-cells

Reference
University of the Basque Country. (Sep 08, 2023). Using smart bioelectronic devices to capture and release tumour cells. Recovered Sep 12, 2023, University of the Basque Country:
https://www.ehu.eus/en/web/campusa-magazine/-/using-smart-bioelectronic-devices-to-capture-and-release-tumour-cells

Information source: (University of the Basque Country, 2023)

1.13   First device to monitor transplanted organs detects early signs of rejection

Northwestern University researchers have developed the first electronic device for continuously monitoring the health of transplanted organs in real time. Sitting directly on a transplanted kidney, the ultrathin, soft implant can detect temperature irregularities associated with inflammation and other body responses that arise with transplant rejection. Then, it alerts the patient or physician by wirelessly streaming data to a nearby smartphone or tablet.
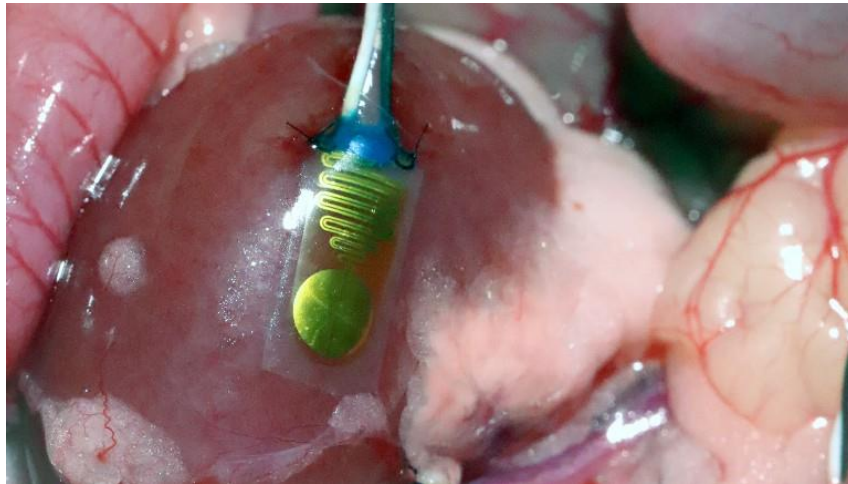
The implanted device sits in place.
Credit: Northwestern University

In a new study, the researchers tested the device on a small animal model with transplanted kidneys and found the device detected warning signs of rejection up to three weeks earlier than current monitoring methods. This extra time could enable physicians to intervene sooner, improving patient outcomes and wellbeing as well as increasing the odds of preserving donated organs, which are increasingly precious due to rising demand amid an organ-shortage crisis.

For more information, visit the following link:
https://news.northwestern.edu/stories/2023/09/first-device-to-monitor-transplanted-organs-detects-early-signs-of-rejection/

Reference
Morris, A. (Sep 07, 2023). First device to monitor transplanted organs detects early signs of rejection. Recovered Sep 13, 2023, Northwestern University:
https://news.northwestern.edu/stories/2023/09/first-device-to-monitor-transplanted-organs-detects-early-signs-of-rejection/

Information source: (Northwestern University, 2023)

1.14   Bright way to upcycle plastics into energy-storage liquids

Scientists from NTU Singapore have created a process that can upcycle most plastics into chemicals useful for energy storage, using light-emitting diodes (LEDs) and a commercially available catalyst, all at room temperature. The new process is very energy-efficient and can be easily powered by renewable energy in the future, unlike other heat-driven recycling processes like pyrolysis.

Currently, only nine per cent of plastics globally are recycled and the rest are typically discarded in landfills or incinerated. This is because many types of plastics have a strong carbon-carbon bond that is difficult to break, making them resistant to many chemicals and have high melting points. In comparison, NTU's new method can easily dissolve such plastics, breaking them down into chemical compounds useful for making fuel cells to generate electricity, or as liquid hydrogen carriers to support Singapore's drive towards a hydrogen economy.

For more information, visit the following link:
https://www.ntu.edu.sg/news/detail/bright-way-to-upcycle-plastics-into-energy-storage-liquids

Reference
Morris, A. (Sep 13, 2023). Bright way to upcycle plastics into energy-storage liquids. Recovered Sep 13, 2023, Nanyang Technological University:
https://www.ntu.edu.sg/news/detail/bright-way-to-upcycle-plastics-into-energy-storage-liquids

Information source: (Nanyang Technological University, 2023)

1.15   Smart pill can track key biological markers in real-time

Researchers from MIT, Boston University, and elsewhere report a smart pill the size of a blueberry that could be a game changer in the diagnosis and treatment of bowel diseases. That's because it is the first technology compatible with ingestion that can automatically detect — and report on in real time — key biological molecules that could be indicative of a problem.

The current pill is approximately one-sixth the size of the prototype reported in Science, conforming to safe, ingestible dosage forms on the market. It has also been designed to detect key biological molecules, such as nitric oxide and byproducts of hydrogen sulfide, which are important signals and mediators of the inflammation associated with bowel diseases. Current techniques for diagnosing diseases inside the gut can be invasive (think of a colonoscopy or other endoscopic procedure), and can't detect molecular biomarkers of disease in real-time. The latter is a problem because several important biomarkers are very short-lived, so they disappear before current techniques can detect them.

For more information, visit the following link:
https://news.mit.edu/2023/smart-pill-can-track-biological-markers-real-time-0908

Reference
Thomson, E. (Sep 08, 2023). Smart pill can track key biological markers in real-time. Recovered Sep 13, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/smart-pill-can-track-biological-markers-real-time-0908

Information source: (Massachusetts Institute of Technology, 2023)

1.16 Upcycling silicon from expired solar panels into lithium-ion batteries

Scientists from NTU Singapore have devised an efficient method of recovering high-purity silicon from expired solar panels to produce lithium-ion batteries that could help meet the increasing global demand to power electric vehicles. High-purity silicon makes up the majority of solar cells, yet they are typically discarded at the end of their operational lifespan after 25 to 30 years. It is challenging to separate the silicon from other solar cell components such as aluminium, copper, silver, lead, and plastic.

Moreover, recycled silicon has impurities and defects, making it unsuitable for other silicon-based technologies. Existing methods to recover high-purity silicon are energy-intensive and involve highly toxic chemicals, making them expensive and limiting their widespread adoption among recyclers. The NTU researchers overcame the challenges through a new extraction method using phosphoric acid, a substance commonly used in the food and beverage industry.

For more information, visit the following link:
https://www.ntu.edu.sg/news/detail/silicon-from-expired-solar-panels-get-upcycled-into-lithium-ion-batteries

Reference
Mitchell, M. (Sep 07, 2023). Upcycling silicon from expired solar panels into lithium-ion batteries. Recovered Sep 13, 2023, Nanyang Technological University:
https://www.ntu.edu.sg/news/detail/silicon-from-expired-solar-panels-get-upcycled-into-lithium-ion-batteries

Information source: (Nanyang Technological University, 2023)

1.17   Project explores better way to train Artificial Intelligence

One way that scientists train robots and artificial intelligence (AI) models to perform tasks – think self-driving cars – is by feeding them a perfect demonstration of what to do and asking them to copy it. This process, called imitation learning, is slow and expensive, and the resulting systems often can't handle more complex real-world scenarios.

Instead, what if researchers could provide lots of imperfect demonstrations and have the system piece together a better approach? This strategy, called superhuman imitation learning, is the focus of a new project co-led by Sanjiban Choudhury, assistant professor of computer science in the Cornell Ann S. Bowers College of Computing and Information Science, along with Brian Ziebart and Xinhua Zhang of the University of Illinois at Chicago. Choudhury, who heads the People and Robot Teaching and Learning (PoRTaL) group, will use this approach to train robots that assist people at home so robots can one day safely and efficiently perform tasks, like fetching a can of soup from the pantry and heating it up on the stove.

For more information, visit the following link:
https://news.cornell.edu/stories/2023/09/when-robots-imitate-life-project-explores-better-way-train-ai

Reference
Waldron, P. (Sep 12, 2023). When robots imitate life: Project explores better way to train AI. Recovered Sep 13, 2023, Cornell University:
https://news.cornell.edu/stories/2023/09/when-robots-imitate-life-project-explores-better-way-train-ai

Information source: (Cornell University, 2023)

1.18   Artificial Intelligence tool helps optimize antibody medicines

Antibody treatments may be able to activate the immune system to fight diseases like Parkinson's, Alzheimer's and colorectal cancer, but they are less effective when they bind with themselves and other molecules that aren't markers of disease. Now, new machine-learning algorithms developed at the University of Michigan can highlight problem areas in antibodies that make them prone to binding non-target molecules.

"We can use the models to pinpoint the positions in antibodies that are causing trouble and change those positions to correct the problem without causing new ones," said Peter Tessier, the Albert M. Mattocks Professor of Pharmaceutical Sciences at U-M and corresponding author of the study in Nature Biomedical Engineering. *"The models are useful because they can be used on existing antibodies, brand new antibodies in development, and even antibodies that haven't been made yet."* Antibodies fight disease by binding specific molecules called antigens on disease-causing agents—such as the spike protein on the virus that causes COVID-19. Once bound, the antibody either directly inactivates the harmful viruses or cells or signals the body's immune cells to do so.

For more information, visit the following link:
https://news.umich.edu/ai-tool-helps-optimize-antibody-medicines/

Reference
Smith, D. (Sep 11, 2023). AI tool helps optimize antibody medicines. Recovered Sep 13, 2023, University of Michigan:
https://news.umich.edu/ai-tool-helps-optimize-antibody-medicines/

Information source: (University of Michigan, 2023)

1.19   High water mark for innovative flood monitoring system

A tool developed by researchers at The University of Queensland that measures floodwater depth and velocity will be sold globally after it was licensed to a US-based company. Associate Professor Simon Albert and Dr Nick Hutley from UQ's School of Civil Engineering invented an automated system to provide real-time water monitoring during natural disasters, when it can be dangerous to manually measure rising water.

The UQ-developed flood tool monitoring the Gordon River, Tasmania.
Credit: University of Queensland

Dr Albert said the camera-based tool allows water resource managers to access data and make decisions remotely. *"The system uses advanced 3D stereo computer vision, machine-learning and cloud analytics to measure water height and velocity,"* he said. *"Being non-contact, it avoids risk to personnel and equipment during a disaster and the need to travel long distances."* Dr Albert said the tool had broader applications beyond flood risk and human safety, with other essential reasons to measure water.

For more information, visit the following link:
https://www.uq.edu.au/news/article/2023/09/high-water-mark-innovative-uq-flood-monitoring-system

Reference
Baskin, B. (Sep 13, 2023). High water mark for innovative UQ flood monitoring system. Recovered Sep 14, 2023, The University of Queensland:
https://www.uq.edu.au/news/article/2023/09/high-water-mark-innovative-uq-flood-monitoring-system

Information source: (The University of Queensland, 2023)

1.20   New flood prediction model has potentially life-saving benefits

A new simulation model that can predict flooding during an ongoing disaster more quickly and accurately than currently possible has been developed by University of Melbourne researchers. Researchers say the new model has major potential benefits for emergency responses, reducing flood forecasting time from hours and days to just seconds, and enabling flood behaviour to be accurately predicted quickly as an emergency unfolds.
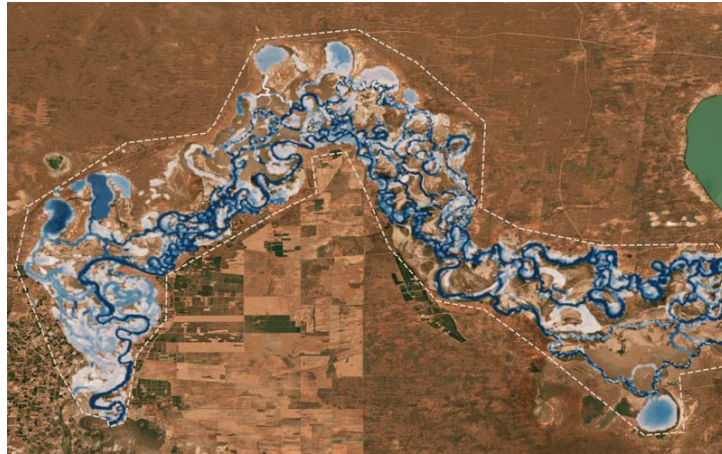
A new simplified hydrodynamic model provides a practical and effective solution to predict flooding quickly.
Credit: The University of Melbourne

University of Melbourne PHD student Niels Fraehr, alongside Professor Q. J. Wang, Dr Wenyan Wu and Professor Rory Nathan, from the Faculty of Engineering and Information Technology, developed the Low-Fidelity, Spatial Analysis and Gaussian Process Learning (LSG) model to predict the impacts of flooding. The LSG model can produce predictions that are as accurate as our most advanced simulation models, but at speeds which are 1000 times faster. Professor Nathan said the development had enormous potential as an emergency response tool.

For more information, visit the following link:
https://www.unimelb.edu.au/newsroom/news/2023/september/new-flood-model-has-potentially-life-saving-benefits

Reference
The University of Melbourne (Sep 12, 2023). New flood prediction model has potentially life-saving benefits. Recovered Sep 14, 2023, The University of Melbourne:
https://www.unimelb.edu.au/newsroom/news/2023/september/new-flood-model-has-potentially-life-saving-benefits

**Information source:** (The University of Melbourne, 2023)

II. PATENTS

2.1.   System and method to emulate human cognition in artificial intelligence using bio-inspired physiology simulation

An AI enabled human emulation system, a method, and a computer program product may be provided for embodied cognition with humanoid robot hardware (robot) to emulate human behavior. The system may include a memory configured to store computer program code and a processor configured to execute the computer program code to employ common sense reasoning, in much the same holistic way that humans do.
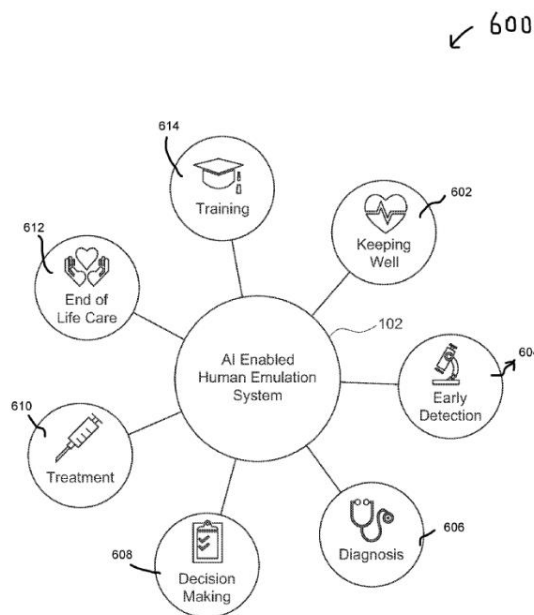
Illustrates an exemplar scenario for implementation of an AI enabled human emulation system deployed in a healthcare ecosystem to control a robot in a more humanlike way, in accordance with an example embodiment.
Credit: Hanson, D., WIPO IP Portal

The processor may be configured to obtain a trained AI model and sensor data from a surrounding environment of the robot. The AI model is trained using a brain emulation system and a human body physiology simulation system. The processor may be further configured to generate novel emergent pattern data to self-regulate the robot. The processor may also be configured to control the robot that interacts with a user by expressing a behavior to the user.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US406480223&_cid=P11-LMB362-42554-5

Reference
Hanson, D. (Sep 07, 2023). System and method to emulate human cognition in artificial intelligence using bio-inspired physiology simulation. Recovered Sep 08, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US406480223&_cid=P11-LMB362-42554-5

Information source: (WIPO IP Portal, 2023)

2.2.   Neural network for model-blended time series forecast

A computer system is provided, including a processor and associated memory storing instructions that when executed cause the processor to implement a plurality of artificial intelligence (AI) models. Each AI model is configured to receive, as input, time series data and to output a model-specific time series forecast including a respective predicted value for each of a plurality of future time steps.
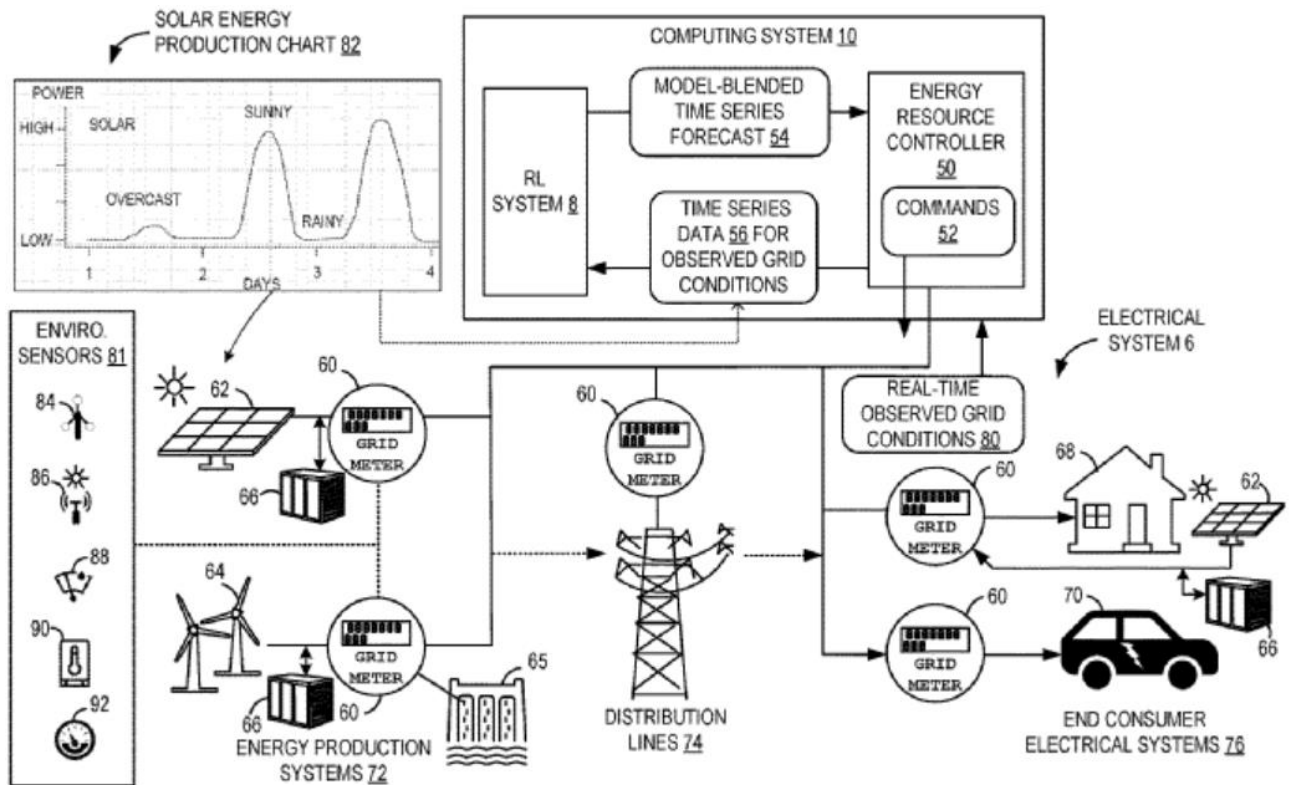
Shows a schematic view of an example computing system including an energy resource controller configured to output a command to an electrical system based on predicted values computed by a reinforcement learning (RL) system, according to one example configuration of the present disclosure.
Credit: Chakraborty, A. & Kalyanaraman, S., WIPO IP Portal

The processor is further configured to implement a model selection neural network configured to select a predicted most accurate AI model from among the plurality of AI models for each of the plurality of future time steps. The processor is further configured to implement a blended output generator configured to output a model-blended time series forecast including the respective predicted value computed by the predicted most accurate AI model selected for each of the plurality of future time steps.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US406484137&_cid=P11-LMB362-42554-3

Reference
Chakraborty, A. & Kalyanaraman, S. (Sep 07, 2023). Neural network for model-blended time series forecast. Recovered Sep 08, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US406484137&_cid=P11-LMB362-42554-3

Information source: (WIPO IP Portal, 2023)

2.3.   A system for visual data analysis of ultrasound examinations with and without a contrast medium, for early automated diagnostics of pancreatic pathologies

We present a system and method for analysis of image and data of ultrasound and ultrasound with contrast medium of human pancreatic tissues to automatically diagnose acute pancreatitis of the pancreas and identify pancreatic non-viable tissues at an early stage.
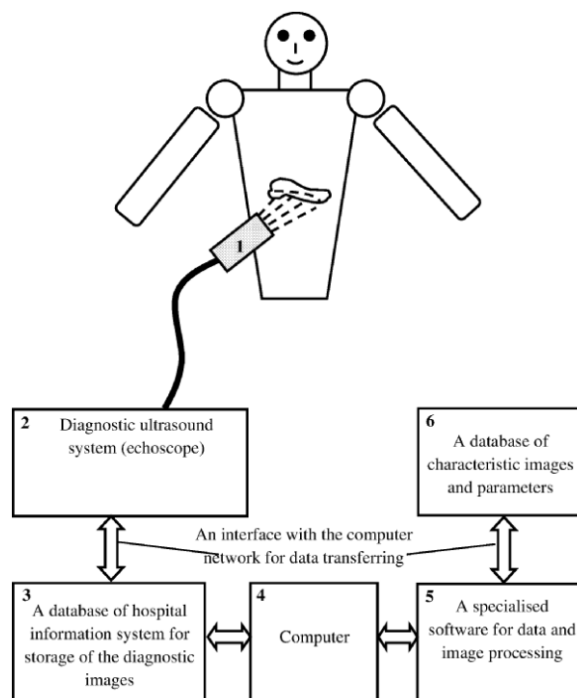
A scheme of the system for analysis of images and data of ultrasound examination and contrast ultrasound examination for automated early diagnosis of acute pancreatitis and pancreatic necrosis applying an artificial intelligence (different neural networks) and the classifier algorithms, with its components.
Credit: Kielaite, A.; Raisutis, R.; Strupas, K. & Samuilis, A., WIPO IP Portal

The system consists of a diagnostic ultrasound system with specialized software for contrast studies (ultrasound) for in vivo ultrasound examinations of human internal organs, recording reflected ultrasound signals from pancreatic tissues (without contrast material and when contrast material is injected) and an image and data processing algorithm with artificial intelligence (neural network) elements providing a diagnostic estimate of a recommendatory nature.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US406484220&_cid=P11-LMB362-42554-3

Reference
Kielaite, A.; Raisutis, R.; Strupas, K. & Samuilis, A. (07 de setiembre de 2023). A system for visual data analysis of ultrasound examinations with and without a contrast medium, for early automated diagnostics of pancreatic pathologies. Recovered Sep 08, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=US406484220&_cid=P11-LMB362-42554-3

Information source: (WIPO IP Portal, 2023)

2.4.   Autonomous video conferencing system with virtual director assistance

Systems and methods are provided to power video conferencing and remote collaboration with subsymbolic and symbolic artificial intelligence. The autonomous video conferencing systems of this disclosure include one main smart camera and multiple peripheral smart cameras, optionally coupled with one or more smart sensors.
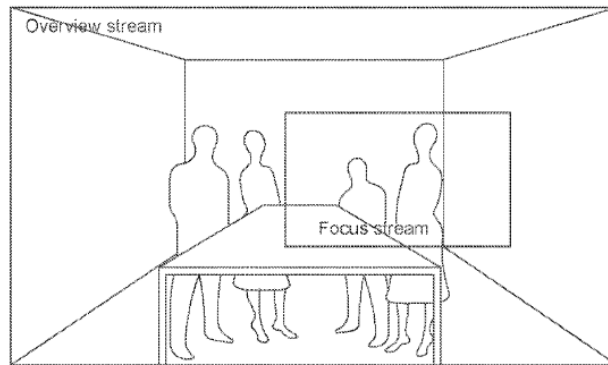
Depicts an overview video stream and a focus video stream according to one embodiment.
Credit: Hafstad, J.; Lopez, A. & et. al., WIPO IP Portal

Each smart camera is equipped with a vision pipeline supported by machine learning to detect objects and their interactions as well as related changes in gesture and posture, and a virtual director adapted to apply a. predetermined rule set consistent with television studio production principles. The main camera is adapted to select and update a focus video stream in real time under the direction of its virtual director and stream the updated focus stream to a user computer. Methods for creating an automated television studio production for a. variety of conferencing spaces and special-purpose scenarios with virtual director assistance are provided.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023167693

Reference
Hafstad, J.; Lopez, A. & et. al. (Sep 07, 2023). Autonomous video conferencing system with virtual director assistance. Recovered Sep 08, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023167693

Information source: (WIPO IP Portal, 2023)

2.5.   Optimal materials and devices design using artificial intelligence

A system and method for optimizing materials and devices design. The method includes building machine learning models to predict a quality of target measurements based on an experimental design input by formulating a regularized multi-objective optimization to recommend the final experimental design using a logistic curve for the loss function and a model uncertainty quantification term for the final solution.
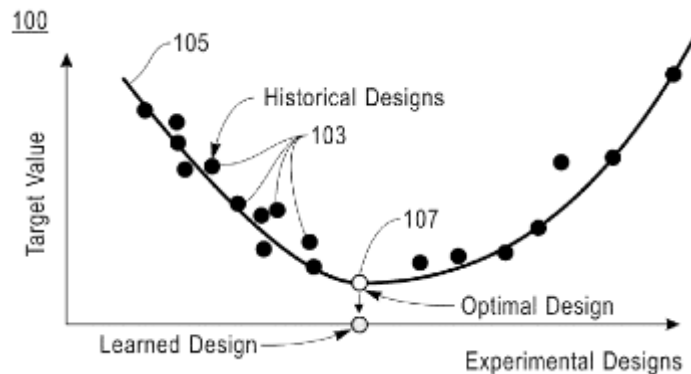
Conceptually depicts a first embodiment of a "smart" experimental design system and method for developing a prediction model with a multi-objective optimization given enough historical data input.
Credit: Tien, O. & Jeffrey, R., WIPO IP Portal

Alternately, the system and method uses a black-box optimization for optimal process design that includes iteratively building a sequence of surrogate functions, where intermediate designs are generated to improve the quality of the surrogate function. Further a derivative-free optimization is performed that utilizes global optimization techniques (global search) with Gaussian process (local method) with a Bayesian optimization to produce a sequence of designs that leads to an optimal design. The system and method is used in machine learning/deep learning for tuning hyperparameters and an architecture search of prediction models.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US406483731

Reference
Tien, O. & Jeffrey, R. (Sep 07, 2023). Optimal materials and devices design using artificial intelligence. Recovered Sep 08, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US406483731

Information source: (WIPO IP Portal, 2023)

2.6.   Method of camera capturing signal controlled by security gateway

Techniques for improving alarm event detection for security systems are described herein. For example, a security system can receive a first set of data associated with an event in an environment from a first detection device.
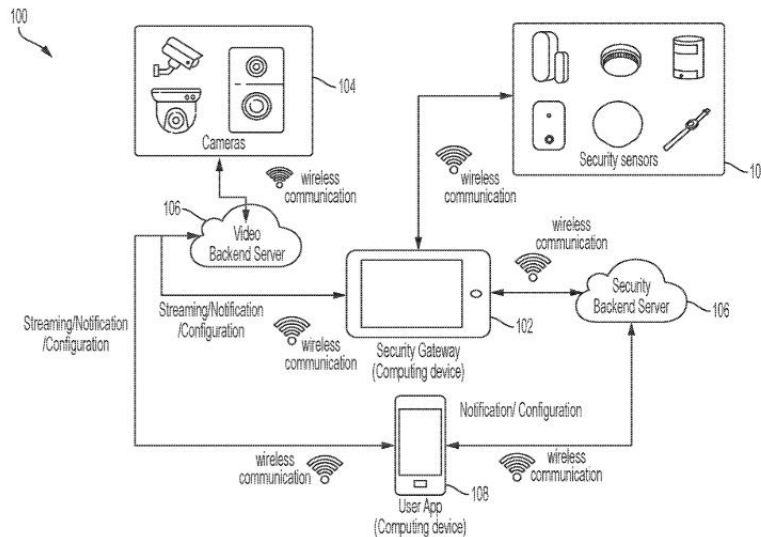
Illustrates an example home security system, according to embodiments of the present disclosure.
Credit: Tang, L; Morgan, B., Espacenet Patent Search

The security system can instruct a second detection device to detect a second set of data for the environment based on the first set of data. The security system can determine an alarm status for the event based at least in part on a condition of the event output by an artificial intelligence model. The artificial intelligence model can output the condition responsive to receiving an input including the first set of data and the second set of data. The alarm status can include a false alarm event or an alarm event. The security system can output an alarm indicating the event based on determining that the alarm status is an alarm event.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/087850216/publication/US2023284022A1?q=artificial%20intelligence

Reference
Tang, L; Morgan, B. (Sep 07, 2023). Method of camera capturing signal controlled by security gateway. Recovered Sep 08 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/087850216/publication/US2023284022A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.7.   Methods and apparatus for automatic sale forecasts using machine learning processes

This application relates to employing trained machine learning processes to predict sales across various sale channels. For example, a computing device may generate features based on historical sales information, and trains the machine learning processes based on the generated features.
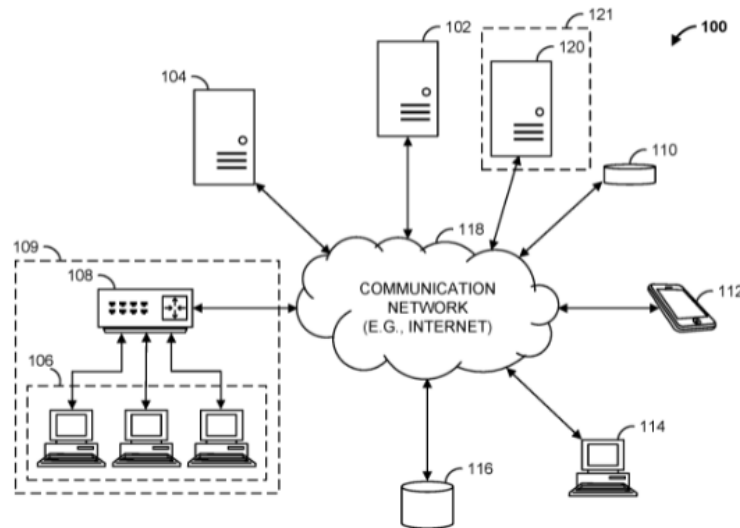
Is a block diagram of a forecasting system in accordance with some embodiments.
Credit: Dutta, T.; Meduri, S. & Wankhede, I., Espacenet Patent Search

In some examples, the computing device determines fixed cost effects from selling items across various sales channels, and adjusts the sales information based on the fixed cost effects. The computing device also generates features based on the adjusted sales. The computing device may apply the trained machine learning processes to sales information for one or more items to predict the sales of one or more items across one or more sales channels during a future temporal period. In some examples, the trained machine learning processes generate a ranking of items for a sales channel based on the output generated from the trained machine learning processes.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/087850723/publication/US2023281531A1?q=machine%20learning

Reference
Dutta, T.; Meduri, S. & Wankhede, I. (Sep 07, 2023). Methods and apparatus for automatic sale forecasts using machine learning processes. Recovered Sep 08, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/087850723/publication/US2023281531A1?q=machine%20learning

Information source: (Espacenet Patent Search, 2023)

2.8.   System and method for real-time visualization of defects in a material

The present disclosure provides a system and method for real-time visualization of a material during ultrasonic non-destructive testing. The system includes a graphical user interface (GUI) capable of showing a three-dimensional (3-D) image of a composite laminate constructed of a series of two-dimensional (2-D) cross sections.
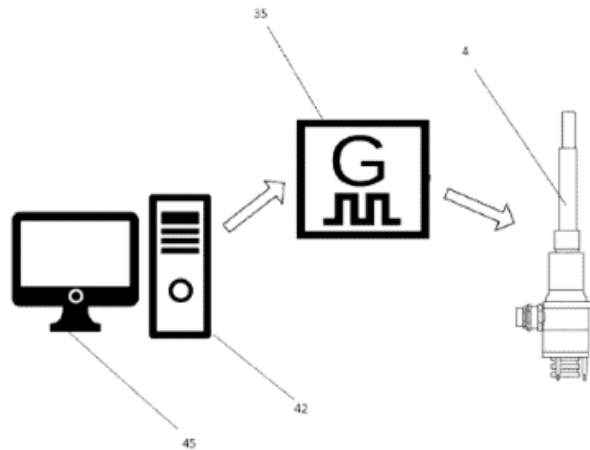
Schematic diagram of a transducer housing assembly in communication with a processor and a display means according to one embodiment of the present invention.
Credit: Jack, D.; Minnie, W. & Blandford, B., Espacenet Patent Search

The GUI is capable of displaying the 3-D image as each additional 2-D cross section is scanned by an ultrasonic testing apparatus in real time or near real time, including probable defect regions that contain a flaw such as a hole, crack, wrinkle, or foreign object within the composite. Furthermore, in one embodiment, the system includes an artificial intelligence capable of highlighting defect areas within the 3-D image in real time or near real time and providing data regarding each defect area, such as the depth, size, and/or type of each defect.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/087851384/publication/US2023280310A1?q=artificial%20intelligence

Reference
Jack, D.; Minnie, W. & Blandford, B. (Sep 07, 2023). System and method for real-time visualization of defects in a material. Recovered Sep 08, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/087851384/publication/US2023280310A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.9. Multi-stage wash system for vat polymerization-based 3D printed parts

The invention is generally a system for drying, recycling, and washing off residual resin from three-dimensionally (3D) printed objects. Exemplary systems may include a wash reservoir, a fan module, and one or more air exchange vents.
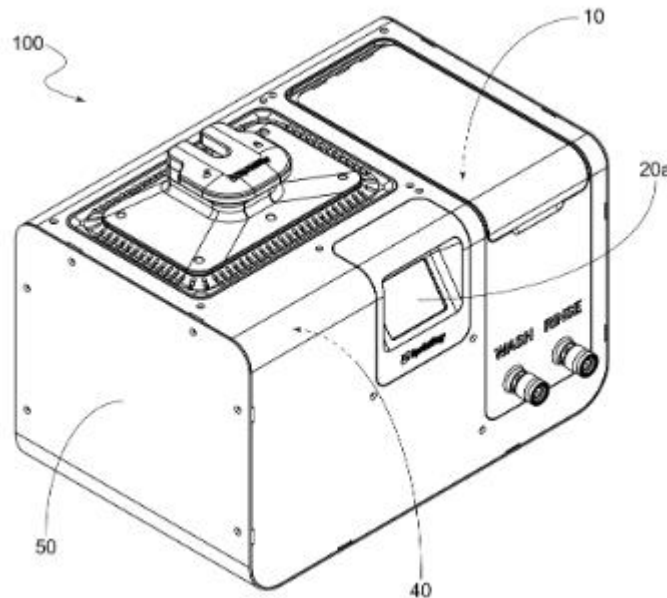
Perspective view of a multi-stage wash system for VP-based 3D printed parts according to an embodiment of the present invention.
Credit: Mansouri, A.; Bassir, H.; Tian, H.; Ye, S.; Patel, A. & Ye, H., Espacenet Patent Search

The wash reservoir contains a wash solvent and a propeller fully or partially submerged into the wash solvent. The propeller splashes the wash solvent upwards to disperse on the 3D printed object, thereby largely washing away the resin residue present in the 3D printer object. The fan module is connected to the wash reservoir to create a positive or negative air pressure inside the wash reservoir, thereby redirecting the airflow to the wash reservoir. The air exchange vents are provided between a splash guard and a platform/lid of the wash reservoir to act as an air intake when the fan module blows air out of the wash reservoir and as an exhaust vice versa.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/087851861/publication/US2023278288A1?q=3d

Reference
Mansouri, A.; Bassir, H.; Tian, H.; Ye, S.; Patel, A. & Ye, H. (Sep 07, 2023). Multi-stage wash system for vat polymerization-based 3D printed parts. Recovered Sep 11, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/087851861/publication/US2023278288A1?q=3d

Information source: (Espacenet Patent Search, 2023)

2.10.   Systems and methods for the facilitation of blockchains

Systems and techniques for enabling the automation of blockchain processes within a non-fungible token (NFT) platform, through structures and techniques for generating and maintaining descriptors of content and users, are illustrated. One embodiment includes a method for selecting personalized token-directed actions.
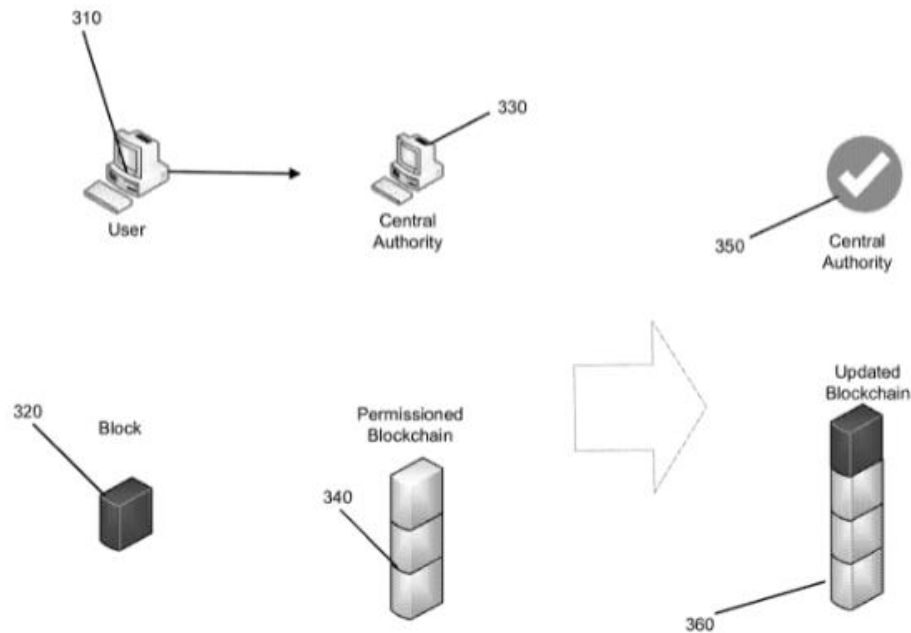
Conceptual diagram of a permissioned blockchain in accordance with an embodiment of the invention.
Credit: Jakobsson, B.; Finlow-Bates, K.; Gerber, S.; Stewart, G. & Rosen, K., Espacenet Patent Search

The method determines a tag including metadata associated with a token. The method determines a profile associated with a user, wherein the user is at least one of an owner of the token and a content creator associated with the token. The method performs a clustering based at least one of the tag and the profile, wherein the clustering includes a collection of tokens sorted according to at least one of shared categories of tokens and shared categories of token users. The method identifies an action corresponding to the token, based on the clustering, wherein the action governs future token access by the user. The method initiates the action.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/087850697/publication/US2023281583A1?q=blockchain

Reference
Jakobsson, B.; Finlow-Bates, K.; Gerber, S.; Stewart, G. & Rosen, K. (Sep 07, 2023). Systems and methods for the facilitation of blockchains. Recovered Sep 11, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/087850697/publication/US2023281583A1?q=blockchain

Information source: (Espacenet Patent Search, 2023)