Weekly Newsletter
TECHNOLOGY SURVEILLANCE

Nº 27-2023 JUL 07TH, 2023

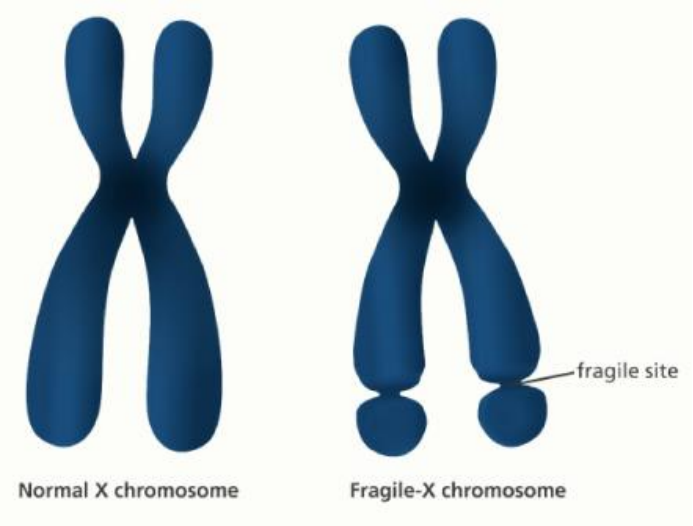
CONCYTEC

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 Antisense therapy restores fragile X protein production in human cells

An antisense therapy developed by Joel D. Richter, PhD, Sneha Shah, PhD, and Jonathan K. Watts, PhD, at UMass Chan Medical School and Elizabeth Berry-Kravis, MD, PhD, at RUSH University Medical Center, restores production of the Fragile X Mental Retardation Protein (FMRP) in cell samples taken from patients with fragile X syndrome. Published in the Proceedings of the National Academy of Sciences, this breakthrough was possible because of the novel findings, also presented in the study, that aberrant alternative splicing of messenger RNA (mRNA) plays a principal role in fragile X syndrome, the most common form of inherited intellectual disability and the most frequent single-gene cause of autism.



A rendering and image of the X chromosome with the fragile X mutation shows the pinched fragile site compared to a normal X chromosome.
Credit: UMass Chan Medical School

"This discovery offers real hope that a therapy to mitigate fragile X syndrome may be possible and could be translated to the clinic sooner than we once thought," said Dr. Richter, the Arthur F. Koskinas Chair in Neuroscience and professor of molecular medicine. *"These findings are unconventional and weren't something we were expecting. If you do good basic science, believe in your data and follow where it takes you, the results can change our fundamental understanding of biology and disease."*

For more information, visit the following link:
https://www.umassmed.edu/news/news-archives/2023/07/antisense-therapy-restores-fragile-x-protein-production-in-human-cells/

Reference
Fessenden, J. (Jul 03, 2023). Antisense therapy restores fragile X protein production in human cells. Recovered Jul 03, 2023, UMass Chan Medical School: https://www.umassmed.edu/news/news-archives/2023/07/antisense-therapy-restores-fragile-x-protein-production-in-human-cells/

Information source: (UMass Chan Medical School, 2023)

1.2 When computer vision works more like a brain, it sees more like people do

From cameras to self-driving cars, many of today's technologies depend on artificial intelligence to extract meaning from visual information. Today's AI technology has artificial neural networks at its core, and most of the time we can trust these AI computer vision systems to see things the way we do — but sometimes they falter. According to MIT and company International Business Machines (IBM) research scientists, one way to improve computer vision is to instruct the artificial neural networks that they rely on to deliberately mimic the way the brain's biological neural network processes visual images.

Credit: Massachusetts Institute of Technology

Researchers led by MIT Professor James DiCarlo, the director of MIT's Quest for Intelligence and member of the MIT-IBM Watson AI Lab, have made a computer vision model more robust by training it to work like a part of the brain that humans and other primates rely on for object recognition. This May, at the International Conference on Learning Representations, the team reported that when they trained an artificial neural network using neural activity patterns in the brain's inferior temporal (IT) cortex, the artificial neural network was more robustly able to identify objects in images than a model that lacked that neural training. And the model's interpretations of images more closely matched what humans saw, even when images included minor distortions that made the task more difficult.

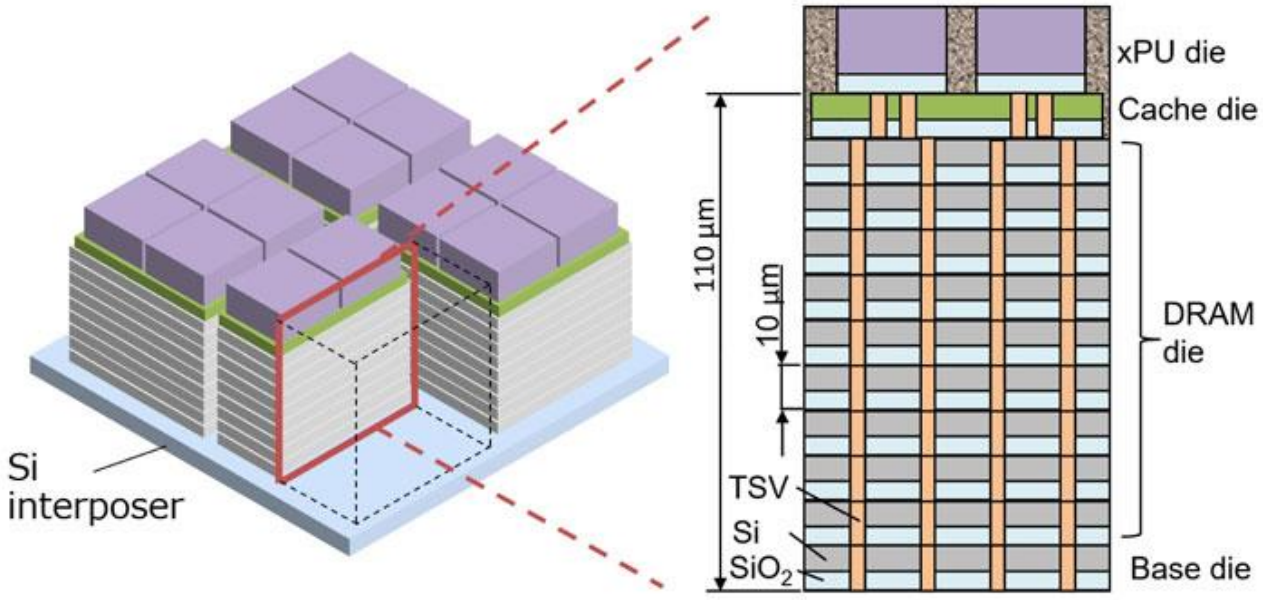
For more information, visit the following link:
https://news.mit.edu/2023/when-computer-vision-works-like-human-brain-0630

Reference
Michalowski, J. (Jun 30, 2023). When computer vision works more like a brain, it sees more like people do. Recovered Jun 30, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/when-computer-vision-works-like-human-brain-0630

Information source: (Massachusetts Institute of Technology, 2023)

1.3 A Breakthrough in Semiconductor Integration and Data Transmission

A technology for the three-dimensional integration of processing units and memory, as reported by researchers from Tokyo Tech, has achieved the highest attainable performance in the whole world, paving the way to faster and more efficient computing. Named *"BBCube 3D,"* this innovative stacked architecture achieves higher data bandwidths than state-of-the-art memory technologies, while also minimizing the energy needed for bit access.



BBCube 3D structure diagram.
Credit: Tokyo Institute of Technology

Fortunately, a team of researchers at Tokyo Institute of Technology (Tokyo Tech) in Japan may now have found a viable solution to this problem. In a recent IEEE 2023 Symposium on Very Large Scale Integration (VLSI) Technology and Circuits study, Prof. Takayuki Ohba and colleagues have proposed a technology called *"Bumpless Build Cube 3D"* or BBCube 3D. This technology holds the potential to resolve the above-mentioned issues for better integration between PUs and Dynamic Random Access Memory (DRAM).

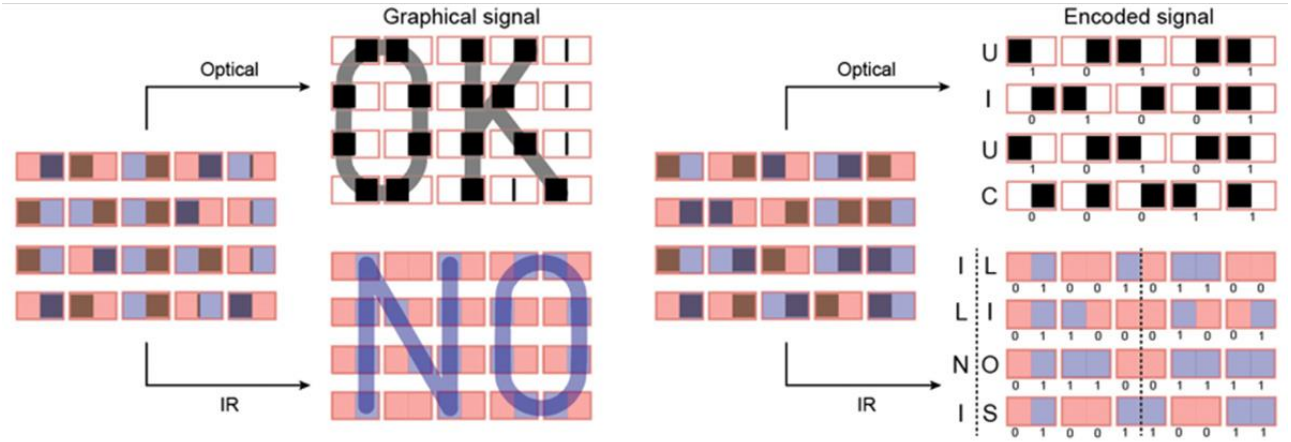
For more information, visit the following link:
https://www.titech.ac.jp/english/news/2023/067046

Reference
Kawashima, T. (Jun 29, 2023). BBCube 3D: A Breakthrough in Semiconductor Integration and Data Transmission. Recovered Jun 30, 2023, Tokyo Institute of Technology: https://www.titech.ac.jp/english/news/2023/067046

Information source: (Tokyo Institute of Technology, 2023)

1.4 Displays controlled by flexible fins and liquid droplets more versatile, efficient than LED screens

Flexible displays that can change color, convey information and even send veiled messages via infrared radiation are now possible, thanks to new research from the University of Illinois Urbana-Champaign. Engineers inspired by the morphing skins of animals like chameleons and octopuses have developed capillary-controlled robotic flapping fins to create switchable optical and infrared light multipixel displays that are 1,000 times more energy efficient than light-emitting devices.



A schematic of the mechanism displaying simultaneous optical and infrared signals of the words "OK" and "NO." In the graphic, cold pixels are indicated by a blue color and hot pixels are indicated by a pink color. Credit: University of Illinois Urbana-Champaign

The new study led by mechanical science and engineering professor Sameh Tawfick demonstrates how bendable fins and fluids can simultaneously switch between straight or bent and hot and cold by controlling the volume and temperature of tiny fluid-filled pixels. Varying the volume of fluids within the pixels can change the directions in which the flaps flip – similar to old-fashioned flip clocks – and varying the temperature allows the pixels to communicate via infrared energy.

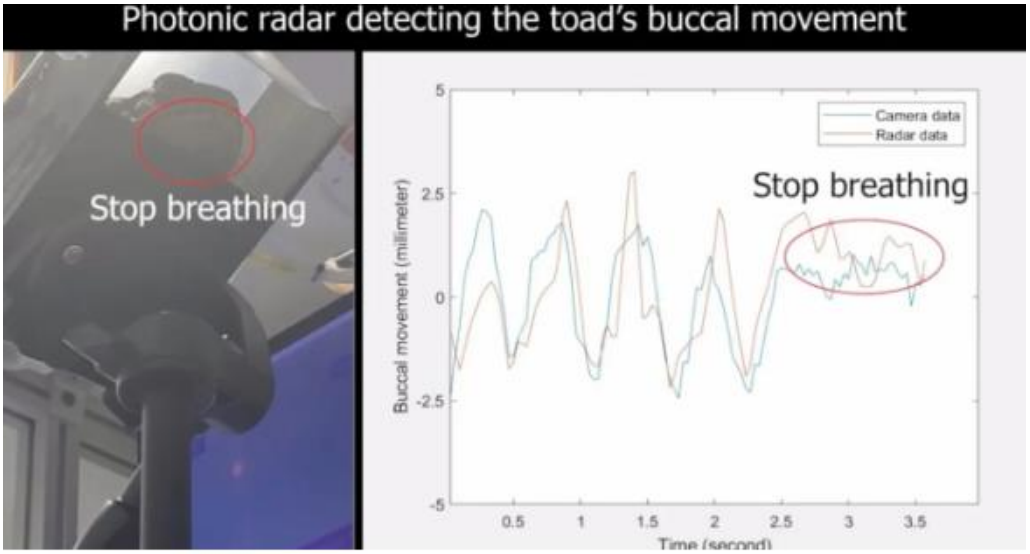
For more information, visit the following link:
https://news.illinois.edu/view/6367/1114421338

Reference
Yoksoulian, L. (Jun 30, 2023). Displays controlled by flexible fins and liquid droplets more versatile, efficient than LED screens. Recovered Jun 30, 2023, University of Illinois Urbana-Champaign: https://news.illinois.edu/view/6367/1114421338

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

1.5 Device that can remotely monitor your breathing: as tested on cane toads

A new photonic radar system has been developed by scientists at Sydney Nano and the School of Physics that delivers contactless, high-definition detection of vital signs. It could be developed for use in ICUs, aged-care facilities and for people with sleep apnoea or infants with breathing concerns.



Experimental set-up of to monitor cane toad breathing with photonic radar. Credit: The University of Sydney

Constant monitoring of vital health signs is needed in a variety of clinical environments such as intensive care units, for patients with critical health conditions, health monitoring in aged care facilities and prisons, or in safety monitoring situations where drowsiness can cause accidents. This is now mostly achieved via wired or invasive contact systems. However, these are either inconvenient or, for patients with burns or for infants with insufficient skin area, are unsuitable. Scientists at the University of Sydney Nano Institute and the New South Wales (NSW) Smart Sensing Network have now developed a photonic radar system that allows for highly precise, non-invasive monitoring.

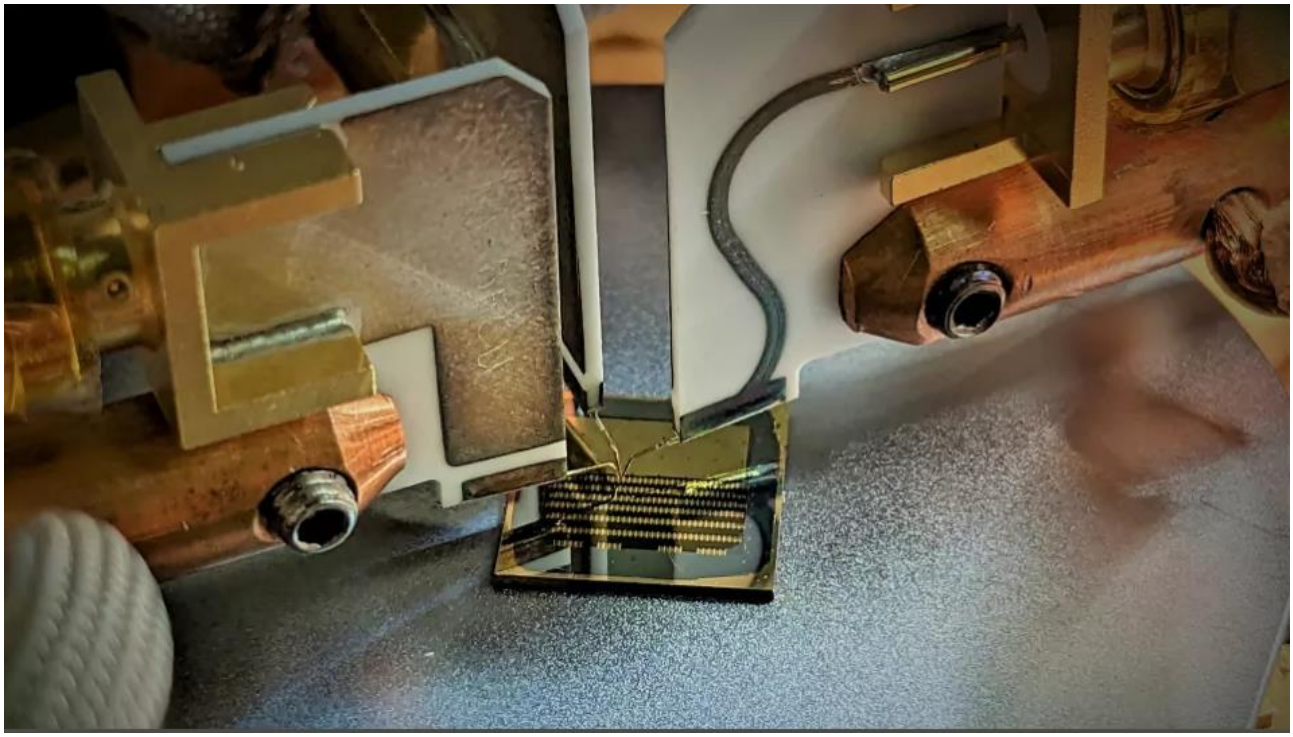
For more information, visit the following link:
https://www.sydney.edu.au/news-opinion/news/2023/06/30/device-accurately-remotely-monitor-breathing-tested-on-cane-toads-photonic-radar.html

Reference
The University of Sydney. (Jun 30, 2023). Device that can remotely monitor your breathing: as tested on cane toads. Recovered Jun 30, 2023, The University of Sydney: https://www.sydney.edu.au/news-opinion/news/2023/06/30/device-accurately-remotely-monitor-breathing-tested-on-cane-toads-photonic-radar.html

Information source: (The University of Sydney, 2023)

1.6 Cutting edge transistors for semiconductors of the future

Transistors that can change properties are important elements in the development of tomorrow's semiconductors. With standard transistors approaching the limit for how small they can be, having more functions on the same number of units becomes increasingly important in enabling the development of small, energy-efficient circuits for improved memory and more powerful computers. Researchers at Lund University in Sweden have shown how to create new configurable transistors and exert control on a new, more precise level.



The millimeter-sized chip on which the transistors are located
Credit: Anton Persson, Lund University

In view of the constantly increasing need for better, more powerful and efficient circuits, there is a great interest in reconfigurable transistors. The advantage of these is that, in contrast to standard semiconductors, it is possible to change the transistor's properties after they have been manufactured.

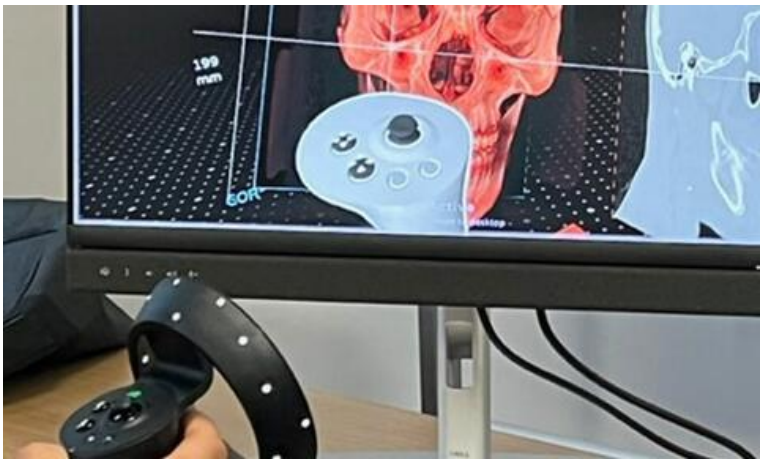
For more information, visit the following link:
https://www.lunduniversity.lu.se/article/cutting-edge-transistors-semiconductors-future

Reference
Lund University (Jul 03, 2023). Cutting edge transistors for semiconductors of the future. Recovered Jul 03, 2023, Lund University:
https://www.lunduniversity.lu.se/article/cutting-edge-transistors-semiconductors-future

Information source: (Lund University, 2023)

1.7 Learning anatomy through virtual reality

The simulation department has acquired three virtual reality workstations using AVATAR MEDICAL® technology. This technology uses medical images (CT scan, MRI, ultrasound, etc.) to produce a fluid, high-resolution 3D virtual image (also known as an Avatar) almost instantaneously. Students can thus immersively explore the structures of interest (such as bones, vessels, muscles, viscera, and skin).



Credit: Sorbonne University

Sorbonne University is the first French university to be equipped with this technology. Dr. Jebrane Bouaoud is the coordinator of virtual reality projects within Sorbonne University's simulation department, and teaches Maxillofacial Surgery at the Pitié-Salpêtrière Hospital, a public hospital in Paris. Students interviewed during a tutorial session on maxillofacial anatomy and traumatology say that *"the 3D virtual reality visualization that we can easily manipulate ourselves in space (helps them) compared to a standard 3D view that we can have on a simple computer screen. We can enter structures that are usually more difficult to visualize with a scanner. We're used to working on paper-based courses and it's much harder to understand, except when we're on a training course and it's explained to us clearly what we're seeing. We're told that there's this fracture and we're obliged to believe the teachers without even having seen the fracture being discussed, whereas here we see it ourselves, with 3D virtual reality, and it's much easier to understand."*

For more information, visit the following link:
https://www.sorbonne-universite.fr/en/actualites/learning-anatomy-through-virtual-reality

Reference
Bouaoud, J. (Jul 05, 2023). Learning anatomy through virtual reality. Recovered Jul 05, 2023, Sorbonne University:
https://www.sorbonne-universite.fr/en/actualites/learning-anatomy-through-virtual-reality

Information source: (Sorbonne University, 2023)

1.8 Artificial Intelligence tool could speed up dementia diagnosis

A new AI tool that could help doctors assess the early signs of dementia and Alzheimer's more quickly and efficiently, has been developed by researchers at the University of Sheffield. The system, known as CognoSpeak, uses a virtual agent displayed on a screen to engage a patient in a conversation.

The system it asks memory-probing questions inspired by those used in outpatient consultations and conducts cognitive tests, such as picture descriptions and verbal fluency tests. The tool then uses artificial intelligence and speech technology to analyse language and speech patterns to look for signs of dementia, Alzheimer's disease and other memory disorders. Researchers behind the technology say CognoSpeak could play a key role in reducing the burden on dementia assessment services, once further testing in GP and secondary care memory clinics across the United Kingdom is complete.

For more information, visit the following link:
https://www.sheffield.ac.uk/news/ai-tool-could-speed-dementia-diagnosis

Reference
Barton, S. (Jun 29, 2023). Artificial Intelligence tool could speed up dementia diagnosis. Recovered Jul 03, 2023, The University of Sheffield:
https://www.sheffield.ac.uk/news/ai-tool-could-speed-dementia-diagnosis

Information source: (The University of Sheffield, 2023)

1.9 New method could break down PFAS left on water treatment filters

University of Missouri researchers used thermal induction heating to break down a group of chemicals known as PFAS or *"forever chemicals"* in 20 seconds. In a recent study, Feng *"Frank"* Xiao and colleagues at the University of Missouri demonstrate an innovative method using thermal induction heating to rapidly break down PFAS left on the surface of two solid materials — granular activated carbon and anion exchange resins — after these materials have been used to filter PFAS from municipal water systems. The team's goal is to clean the materials before they are properly disposed.

PFAS is a group of synthetic chemicals commonly found in household and industrial products such as firefighting foam, food packaging and nonstick cookware. The method is based on the Joule heating effect, which uses the process of electromagnetic induction inside a metallic reactor. *"In this study, we explored the use of an engineering technique used to melt metals,"* Xiao said. *"This method produced 98% degradation of PFAS on the surface of absorbents like granular activated carbon and anion exchange resins after just 20 seconds, which makes this process highly energy efficient and much faster than conventional methods."*

For more information, visit the following link:
https://showme.missouri.edu/2023/new-method-could-break-down-pfas-left-on-water-treatment-filters/

Reference
University of Missouri. (Jun 28, 2023). New method could break down PFAS left on water treatment filters. Recovered Jul 03, 2023, University of Missouri: https://showme.missouri.edu/2023/new-method-could-break-down-pfas-left-on-water-treatment-filters/

Information source: (University of Missouri, 2023)

1.10 Inspiring the next generation of data scientists

Year-eight students from Carlton Keighley secondary school enjoyed a hands-on tour of the University's data and computing facilities, including a morning in Leeds Institute for Data Analytics (LIDA), coding and acting as data experts on real-life issues, such as sustainable transport and improved healthcare.

Credit: Mark Webster Photography, University of Leeds

They also tried brain-scanning and ventured into computer-generated environments at multi-use digital space, HELIX. The cutting-edge centre, which is not yet fully open, provides a home for all digitally-focused activity at the University. During the visit, which was one of HELIX's pre-opening events, pupils wore VR headsets while using the trailblazing equipment – enabling them to walk freely in the virtual world, unlimited by their real-life surroundings.

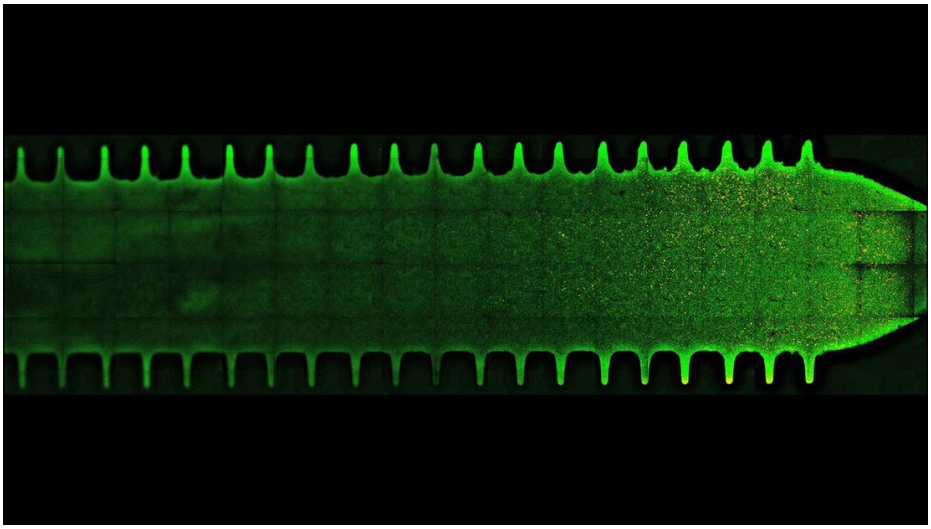
For more information, visit the following link:
https://www.leeds.ac.uk/news-science/news/article/5342/inspiring-the-next-generation-of-data-scientists

Reference
Newman, D. (Jul 05, 2023). Inspiring the next generation of data scientists. Recovered Jul 05, 2023, University of Leeds:
https://www.leeds.ac.uk/news-science/news/article/5342/inspiring-the-next-generation-of-data-scientists

Information source: (University of Leeds, 2023)

1.11 Flowing fluids shape the social life of gut microbes

Scientists led by Alex Persat at EPFL's School of Life Sciences now provides new insights into how the physical forces of flowing fluids in our gut shape bacterial communities. Working with the lab of Tom Battin at EPFL's School of Architecture, Civil and Environmental Engineering, and colleagues at Eidgenössische Technische Hochschule Zürich (ETH Zurich), the work provides insights into the intricate mechanisms by which different bacterial species of the microbiota interact with one another by sharing nutrients.



Credit: Ecole Polytechnique Fédérale de Lausanne

The team looked at how the two species share nutrients when exposed to dextran, a common food additive. They grew the bacterial communities in a microfluidic device under anaerobic conditions, which simulated the intestinal environment in the lab. Under these conditions, the bacterial communities grew in the form of multicellular communities called biofilms, where nutrient sharing impacts the position of different species relative to one another.

For more information, visit the following link:
https://news.epfl.ch/news/flowing-fluids-shape-the-social-life-of-gut-microb/

Reference
Papageorgiou, N. (Jul 04, 2023). Flowing fluids shape the social life of gut microbes. Recovered Jul 04, 2023, Ecole Polytechnique Fédérale de Lausanne:
https://news.epfl.ch/news/flowing-fluids-shape-the-social-life-of-gut-microb/

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

1.12 Planned delivery reduces risk of maternal and perinatal complications caused by pre-eclampsia

Latest findings from the CRADLE-4 study, led by academics in the Department of Women & Children's Health at King's College London, in collaboration with the University of Zambia and KLE Academy of Higher Education and Research (India), indicate that planned delivery for women with late preterm pre-eclampsia reduces risks to both mothers and babies.

Pre-eclampsia is a major cause of maternal and perinatal mortality, particularly in low and middle income countries, where few studies have been conducted on interventions that aim to reduce these adverse outcomes – despite 95% of global maternal and perinatal deaths occurring in these settings. The CRADLE-4 trial, which was carried out in nine sites across India and Zambia, compared planned delivery to expectant management in women with pre-eclampsia from 34 to 37 weeks of pregnancy. 565 pregnant women were enrolled in this randomised trial. The study confirmed that the mother is better off if delivered early, with less severe blood pressure, which is known to be dangerous. Babies of women allocated to planned early delivery had higher birthweights, on average, and no increased risk of complications compared to babies born in the expectant management (usual care) group.

For more information, visit the following link:
https://www.kcl.ac.uk/news/planned-delivery-reduces-risk-of-maternal-and-perinatal-complications-caused-by-pre-eclampsia

Reference
Shennan, A. (Jun 30, 2023). Planned delivery reduces risk of maternal and perinatal complications caused by pre-eclampsia. Recovered Jun 30, 2023, King's College London: https://www.kcl.ac.uk/news/planned-delivery-reduces-risk-of-maternal-and-perinatal-complications-caused-by-pre-eclampsia

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

1.13 Artificial Intelligence and CRISPR precisely control gene expression

The study by researchers at New York University, Columbia University, and the New York Genome Center, combines a deep learning model with CRISPR screens to control the expression of human genes in different ways—such as flicking a light switch to shut them off completely or by using a dimmer knob to partially turn down their activity. These precise gene controls could be used to develop new CRISPR-based therapies.

RNA-targeting CRISPRs can be used in a wide range of applications, including RNA editing, knocking down RNA to block expression of a particular gene, and high-throughput screening to determine promising drug candidates. Researchers at NYU and the New York Genome Center created a platform for RNA-targeting CRISPR screens using Cas13 to better understand RNA regulation and to identify the function of non-coding RNAs. Because RNA is the main genetic material in viruses including SARS-CoV-2 and flu, RNA-targeting CRISPRs also hold promise for developing new methods to prevent or treat viral infections. Also, in human cells, when a gene is expressed, one of the first steps is the creation of RNA from the DNA in the genome.

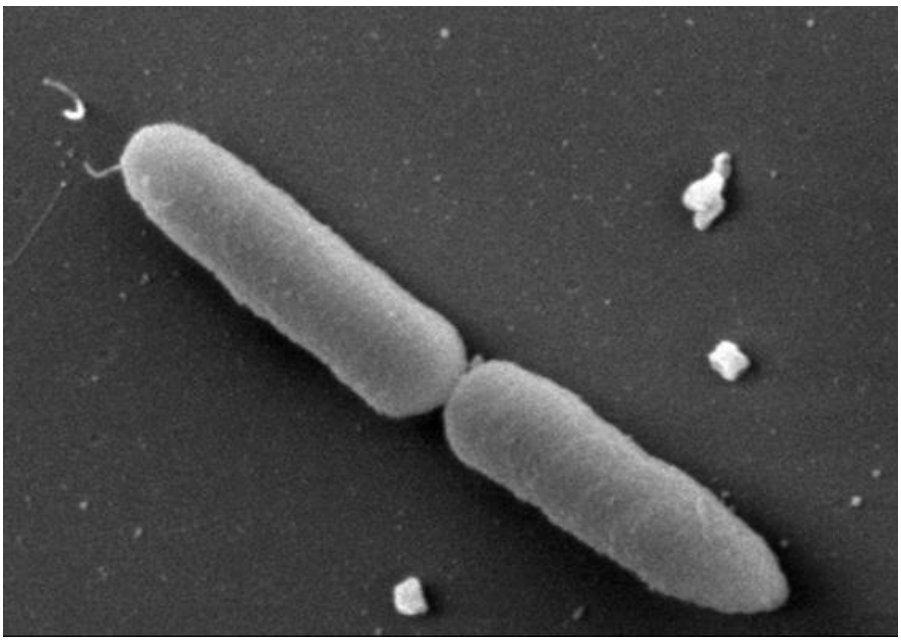
For more information, visit the following link:
https://www.nyu.edu/about/news-publications/news/2023/july/ai-crispr-gene-expression.html

Reference
Harrison, R. (Jul 03, 2023). Artificial Intelligence and CRISPR precisely control gene expression. Recovered Jul 03, 2023, New York University:
https://www.nyu.edu/about/news-publications/news/2023/july/ai-crispr-gene-expression.html

Information source: (New York University, 2023)

1.14 Common cause of gastro in young children and adults over 50 years old

In a recent study led by Associate Professor Li Zhang, from the School of Biotechnology and Biomolecular Sciences, surprising results have provided new information on the types of enteric bacteria – bacteria in the intestine – that can cause the stomach bug.



Electron microscopic image of Aeromonas veronii, a species commonly isolated from patients with gastroenteritis in Australia
Credit: Supplied, The University of New South Wales

Using a method known as quantitative real-time Polymerase Chain Reaction (PCR), fecal samples from these patients were tested to detect the presence of bacterial pathogens. To get further insights into the factors influencing gastroenteritis infection, patient samples were grouped based on age groups. On their analysis, the research team identified a unique infection pattern, characterised by three distinct infection peaks associated with patient age.

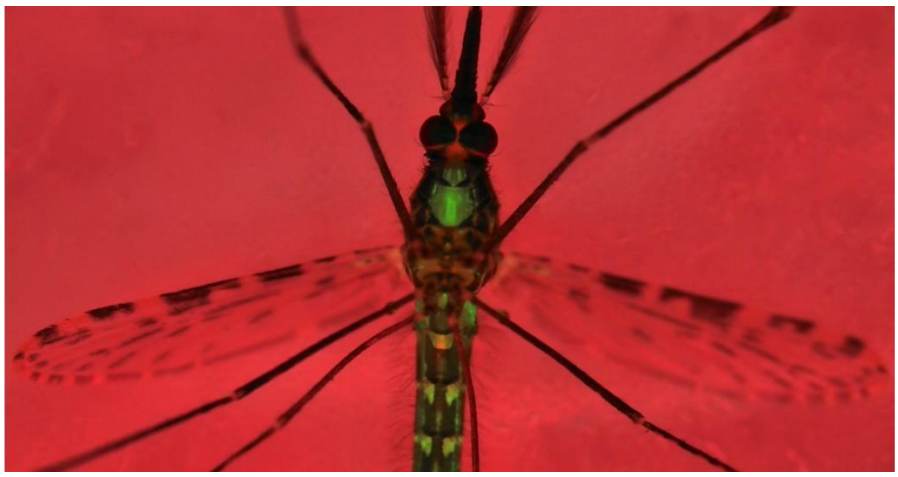
For more information, visit the following link:
https://newsroom.unsw.edu.au/news/science-tech/scientists-identify-common-cause-gastro-young-children-and-adults-over-50-years

Reference
Matson, L. (Jun 29, 2023). Scientists identify common cause of gastro in young children and adults over 50 years old. Recovered Jun 29, 2023, The University of New South Wales: https://newsroom.unsw.edu.au/news/science-tech/scientists-identify-common-cause-gastro-young-children-and-adults-over-50-years

Information source: (The University of New South Wales, 2023)

1.15 New genetic technology developed to halt malaria-spreading mosquitoes

Fortunately, scientists are developing safe technologies to stop the transmission of malaria by genetically editing mosquitoes that spread the parasite that causes the disease. Researchers at the University of California San Diego led by Professor Omar Akbari's laboratory have engineered a new way to genetically suppress populations of Anopheles gambiae, the mosquitoes that primarily spread malaria in Africa and contribute to economic poverty in affected regions. The new system targets and kills females of the A. gambiae population since they bite and spread the disease.



University of California San Diego researchers have developed a new technology to suppress Anopheles gambiae, the mosquitoes that primarily spread malaria in Africa and contribute to economic poverty in affected regions.. Credit: University of California

Ifegenia works by genetically encoding the two main elements of CRISPR within African mosquitoes. These include a Cas9 nuclease, the molecular *"scissors"* that make the cuts and a guide RNA that directs the system to the target through a technique developed in these mosquitoes in Akbari's lab. They genetically modified two mosquito families to separately express Cas9 and the fle-targeting guide RNA.

For more information, visit the following link:
https://today.ucsd.edu/story/new-genetic-technology-developed-to-halt-malaria-spreading-mosquitoes

Reference
Aguilera, M. (Jul 05, 2023). New genetic technology developed to halt malaria-spreading mosquitoes. Recovered Jul 05, 2023, University of California, San Diego: https://today.ucsd.edu/story/new-genetic-technology-developed-to-halt-malaria-spreading-mosquitoes

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

1.16 Genetics shed light on causes of intestinal disease

University of Queensland researchers have used genetics to reveal that much of the risk of developing a common and sometimes fatal intestinal disease is inherited. Dr Yeda Wu and Professor Naomi Wray from UQ's Institute for Molecular Bioscience have studied the causes of diverticular disease of intestine (DivD), an overlooked and understudied disease that is prevalent in Australia, particularly among older people.

Credit: Adobe, The University of Queensland

The team believes the models will transform scientists' knowledge around human developmental biology. In their latest publication, the team explored some of the molecular paths underlying human gastrulation onset. In future studies, they hope to A genome-wide association study of more than 700,000 people showed DivD is highly heritable with 150 genetic factors linked to the risk of getting the disease. The study also showed that people with DivD reported eating less wholemeal or wholegrain bread, had a lower intake of fruits and vegetables, and a lower water intake than people without DivD.

For more information, visit the following link:
https://www.uq.edu.au/news/article/2023/07/genetics-shed-light-causes-of-intestinal-disease

Reference
The University of Queensland. (Jul 05, 2023). Genetics shed light on causes of intestinal disease. Recovered Jul 05, 2023, The University of Queensland:
https://www.uq.edu.au/news/article/2023/07/genetics-shed-light-causes-of-intestinal-disease

Information source: (The University of Queensland, 2023)

1.17 Travel back to Ancient Greece in virtual reality

A new virtual reality (VR) app which takes users on a journey back in time to Ancient Greece where they are able to experience first-hand what it was like to consult with the Greek god Zeus at the Oracle of Dodona has been developed by a team of academics led by the University of Bristol.

Screenshot featuring a consultation at the Oracle
Credit: Virtual Reality Oracle Projectt; University of Bristol

The VR experience draws on ancient evidence to imagine a visit to the oracle of Zeus at Dodona in 465 BCE. Users can choose one of three pathways to meet other pilgrims and hear their stories, before they are able to pose their own questions to the priestesses of Zeus. Professor Kirsten Cater from Bristol's Department of Computer Science, said: *"In order to create the best VR experience we involved teachers, students, and museums in the design process through co-production, as well as supporting them as users of the final product."*

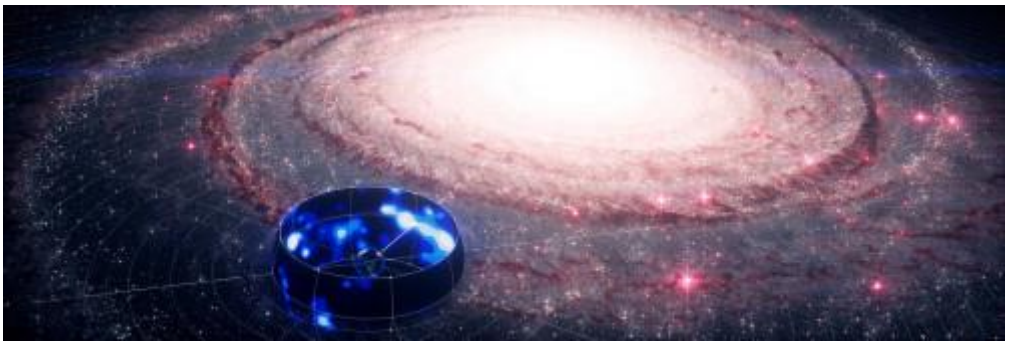
For more information, visit the following link:
https://www.bristol.ac.uk/news/2023/june/vr-oracle.html

Reference
University of Bristol. (Jun 30, 2023). Travel back to Ancient Greece in virtual reality. Recovered Jul 04, 2023, University of Bristol:
https://www.bristol.ac.uk/news/2023/june/vr-oracle.html

Information source: (University of Bristol, 2023)

1.18 IceCube shows that the Milky Way is a neutrino desert

The IceCube Collaboration — an international group of more than 350 scientists — presents this new evidence of high-energy neutrino emission from the Milky Way. The findings indicate that the Milky Way produces far fewer neutrinos than the average distant galaxies. *"What's intriguing is that, unlike the case for light of any wavelength, in neutrinos, the universe outshines the nearby sources in our own galaxy,"* says Francis Halzen, a professor of physics at the University of Wisconsin–Madison and principal investigator at IceCube.



The Galaxy in Neutrinos (blue sky map) in front of an artist's impression of the Milky Way
Credit: IceCube/Science Communication Lab for CRC 1491, University of Wisconsin

The IceCube search focused on the southern sky, where the bulk of neutrino emission from the galactic plane is expected near the center of the galaxy. However, until now, a background of neutrinos and other particles produced by cosmic-ray interactions with the Earth's atmosphere made it difficult to parse out neutrinos originating from galactic sources — a significant challenge compounded by relatively sparse neutrino production in general.

For more information, visit the following link:
https://news.wisc.edu/icecube-shows-milky-way-galaxy-is-a-neutrino-desert/

Reference
King, A. (Jun 29, 2023). IceCube shows that the Milky Way is a neutrino desert. Recovered Jul 04, 2023, University of Wisconsin: https://news.wisc.edu/icecube-shows-milky-way-galaxy-is-a-neutrino-desert/

Information source: (University of Wisconsin, 2023)

1.19 Helping plants and bacteria work together reduces fertiliser need

Researchers including those at the Universities of Warwick and Justus Liebig (Germany) have shown a new way to boost plant nutrient uptake and growth. This could reduce the need for fertilisers, an input to agriculture which can be harmful for the environment. Fertilisers can run into waterways, or get broken down by microbes in the soil, releasing the potent greenhouse gas nitrous oxide into the atmosphere. The team of researchers investigated the efficiency of plant-bacteria relationships (also known as symbiosis or nodulation) – while also shedding light on how this natural phenomenon impacts interactions with other microbes in the soil.

Credit: University of Warwick

Legumes (peas and beans) interact with symbiotic bacteria (known as rhizobia) that *"fix"* nitrogen from the air and provide it as nutrients to the plant. These microbes harness potential to help plants acquire soil nutrients to boost growth or develop stress resilience. These properties make legume crops relatively independent of the application of chemical fertilisers and offer an agriculturally sustainable approach to food production. Legumes can interact with many species of rhizobia, but the outcome of this interaction depends on the bacteria's ability to fix nitrogen and the soil type – the *"symbiotic efficiency"*.

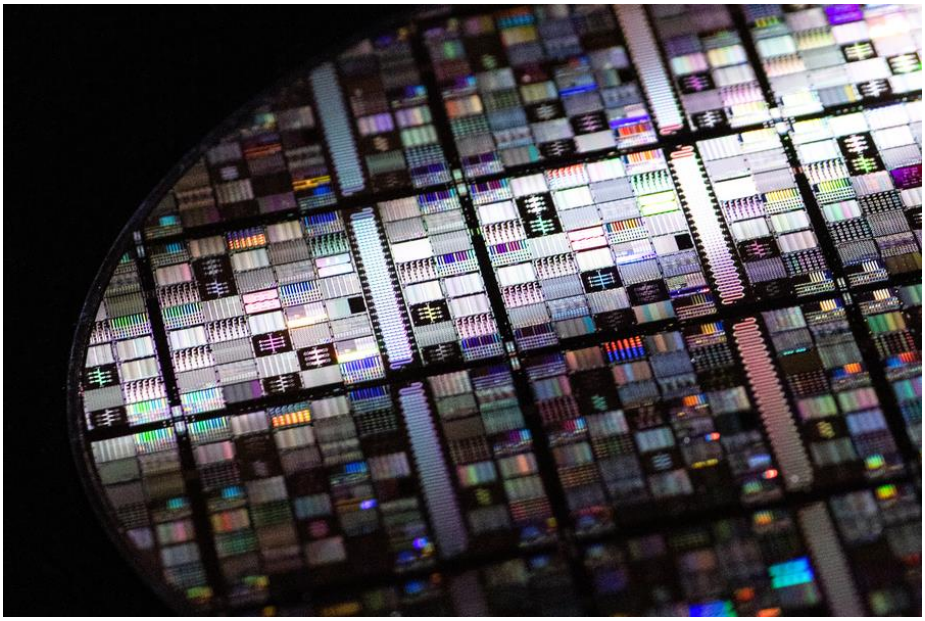
For more information, visit the following link:
https://warwick.ac.uk/newsandevents/pressreleases/?newsItem=8a1785d88906746b01891c7324e536ce

Reference
Slinn, A. (Jul 03, 2023). Helping plants and bacteria work together reduces fertiliser need. Recovered Jul 03, 2023, University of Warwick:
https://warwick.ac.uk/newsandevents/pressreleases/?newsItem=8a1785d88906746b01891c7324e536ce

Information source: (University of Warwick, 2023)

1.20 Superconducting qubit foundry accelerates progress in quantum research

Users submitted custom designs to the SQUILL Foundry and received back fabricated devices wire-bonded into cryogenic packages. Users then leveraged these devices for scientific inquiry, resulting in 13 presentations and four scientific papers in preparation or print, with more to come as research proceeds.



Credit: Massachusetts Institute of Technology

"There is certainly a learning curve when you are used to fabricating devices in-house, but the support and information provided by the foundry to aid users in the process has been phenomenal," says Professor Machiel Blok, who runs a research group at the University of Rochester. The foundry helped his group overcome a years-long delay, caused by the pandemic, in fabricating quantum processors at their facility.

For more information, visit the following link:
https://news.mit.edu/2023/superconducting-qubit-foundry-accelerates-progress-quantum-research-0705

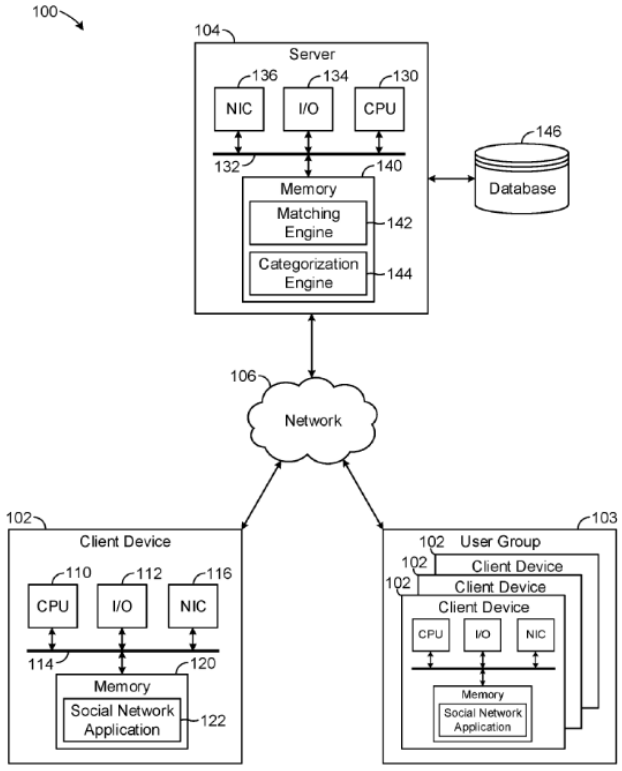
Reference
Foy, K. (Jul 05, 2023). Superconducting qubit foundry accelerates progress in quantum research. Recovered Jul 05, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/superconducting-qubit-foundry-accelerates-progress-quantum-research-0705

Information source: (Massachusetts Institute of Technology, 2023)

II. PATENTS

2.1. Automated categorization of groups in a social network

A method for automatically categorizing groups of users in a social network, and using the categories to propose matches between groups or users and groups includes accessing content shared within a group in a social network application, processing the shared content with at least one machine learning model to determine labels for the content.



Illustrates an example social network system.
Credit: Benchetrit, R., WIPO IP Portal

Determining categories for the group based on the labels for the content, accessing matching criteria for a user of the social network application, generating a match between the user and the group based on the matching criteria for the user and the categories for the group, supplying data indicative of the match to a client device of the user, receiving a match acceptance from the client device, and in response to receiving the match acceptance, providing the user access to the group in the social network application.

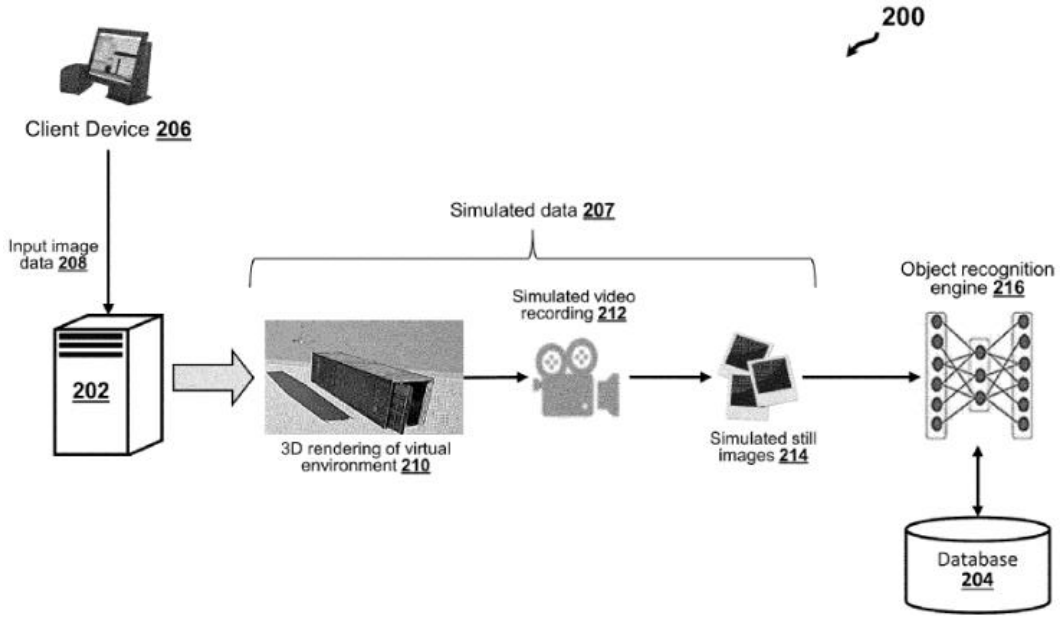
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US400263783&_cid=P22-LJPUNL-38479-1

Reference
Benchetrit, R. (Jun 29, 2023). Automated categorization of groups in a social network. Recovered Jun 29, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US400263783&_cid=P22-LJPUNL-38479-1

Information source: (WIPO IP Portal, 2023)

2.2. Systems and methods for training artificial intelligence models using 3D renderings

The embodiments execute machine-learning architectures for training and managing machine-learning architectures for object recognition and other image processing operations. A computer receives image data (e.g., still images, videos) with imagery of a target object.



Show dataflow between components of a system performing image-processing operations, according to an embodiment. Credit: Dopp, L.; Vattay, A. & Kelly, M., WIPO IP Portal

The computer generates a rendering of a virtual environment containing a simulated object representing the target object. The computer generates a simulated video recording containing a *"fly around"* of the simulated object. Using the simulated video recording, the computer generates simulated still images as snapshots of the simulated object at various angles. The computer trains the machine-learning architecture to recognize the target object by applying the machine-learning architecture on the simulated still images containing the simulated object.

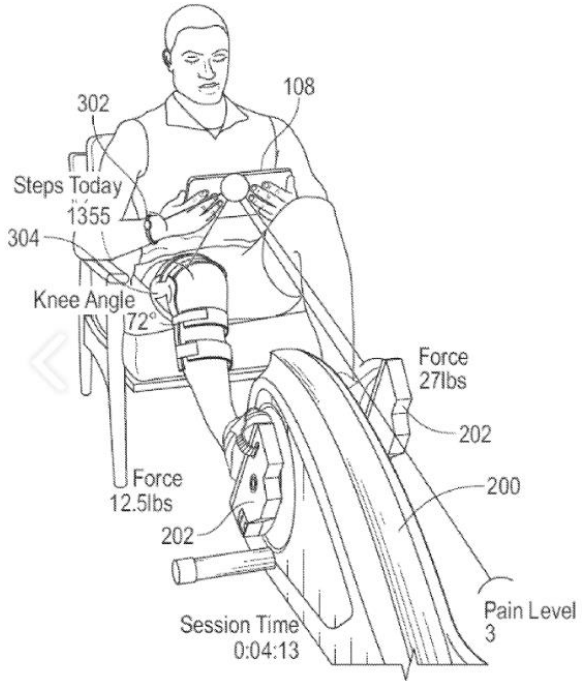
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US400264558&_cid=P22-LJPX6R-79744-1

Reference
Dopp, L.; Vattay, A. & Kelly, M. (Jun 29, 2023). Systems and methods for training artificial intelligence models using 3D renderings. Recovered Jun 29, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US400264558&_cid=P22-LJPX6R-79744-1

Information source: (WIPO IP Portal, 2023)

2.3. Systems and methods of using artificial intelligence and machine learning in a telemedical environment to predict user disease states

Methods, systems, and computer-readable mediums for generating, by an artificial intelligence engine, treatment plans for optimizing a user outcome. The method comprises receiving attribute data associated with a user. The attribute data comprises one or more symptoms associated with the user. The method also comprises, while the user uses a treatment apparatus to perform a first treatment plan for the user, receiving measurement data associated with the user.



Is a perspective view of an example of a user using the treatment apparatus. Credit: Mason, S., WIPO IP Portal

The method further comprises generating, by the artificial intelligence engine configured to use one or more machine learning models, a second treatment plan for the user. The generating is based on at least the attribute data associated with the user and the measurement data associated with the user. The second treatment plan comprises a description of one or more predicted disease states of the user. The method also comprises transmitting, to a computing device, the second treatment plan for the user.

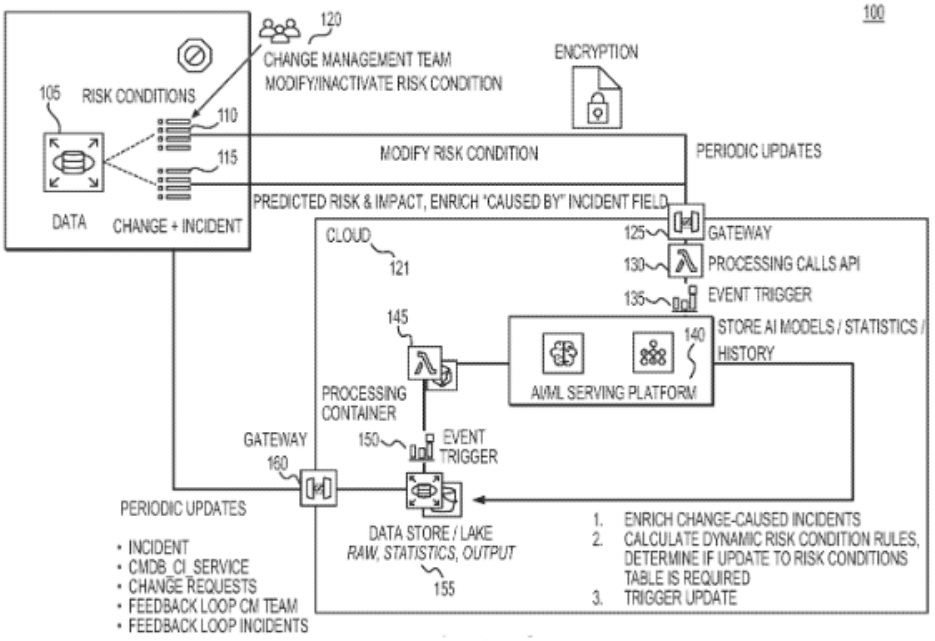
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US400265047&_cid=P22-LJPX6R-79744-1

Reference
Mason, S. (Jun 29, 2023). Systems and methods of using artificial intelligence and machine learning in a telemedical environment to predict user disease states. Recovered Jun 29, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=US400265047&_cid=P22-LJPX6R-79744-1

Information source: (WIPO IP Portal, 2023)

2.4. Systems and methods for improving quality of artificial intelligence model

A method for improving the quality of a machine-learning based model includes generating a first query requesting a description of a change proposed to a system and an intended outcome of the change proposed; receiving a first response; generating a second query providing a risk of an incident associated with the change proposed and requesting justification of the change proposed in view of the risk.



Depicts an exemplary system overview for using artificial intelligence to predict and troubleshoot incidents in a system, according to one or more embodiments.
Credit: Wellmann, B.; Duma, G.; Sparke, G. & Castro, B., WIPO IP Portal

Receiving a second response; generating a third query requesting an implementation plan for the change proposed; receiving a third response; generating an alert to an incident owner providing the description, intended outcome, risk, justification, and implementation plan of the change proposed; receiving a risk confirmation or rejection from the incident owner confirming or rejecting a relationship between the change proposed and the risk; and updating the machine-learning based model to learn an association between extracted features of the change and extracted features of the incident.

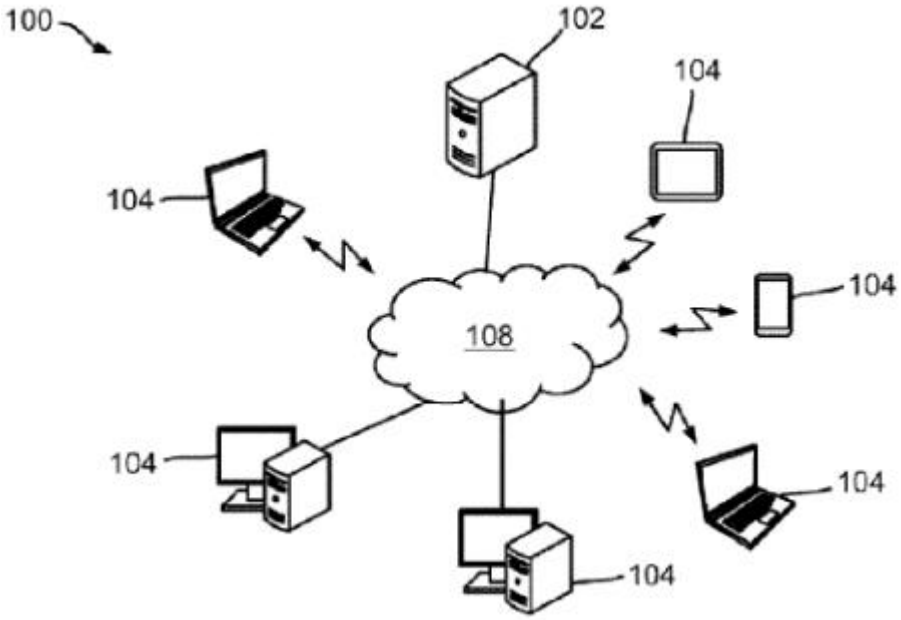
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023122646&_cid=P22-LJPX6R-79744-1

Reference
Wellmann, B.; Duma, G.; Sparke, G. & Castro, B. (Jun 29, 2023). Systems and methods for improving quality of artificial intelligence model. Recovered Jun 29, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023122646&_cid=P22-LJPX6R-79744-1

Information source: (WIPO IP Portal, 2023)

2.5. Artificial-intelligence-based e-commerce system and method for manufacturers, suppliers, and purchasers

A computerized network system for facilitating e-commerce for multiple users. The system has at least one sewer computer; a plurality of client-computing devices used by the users; and a network coupling the server computer with the client-computing devices.



Is a schematic diagram of an e-commerce system, according to some embodiments of the present disclosure.
Credit: Scherwitz, S., WIPO IP Portal

The server computer has a database and an artificial intelligence (AI) module coupled to each other and both coupled to a data input/output interface in communication with the client-computing devices for repeatedly collecting e-commerce related data from a plurality of data sources, weighting the collected data from each data source based on the frequency of the data collection from the data source, repeatedly training the AI module using the collected data for optimizing one or more data-analysis models, analyzing the collected data using the one or more data-analysis models, generating predictions and identifying pre-verified users, and outputting the generated predictions and/or the pre-verified users to a graphic user interface (GUI).

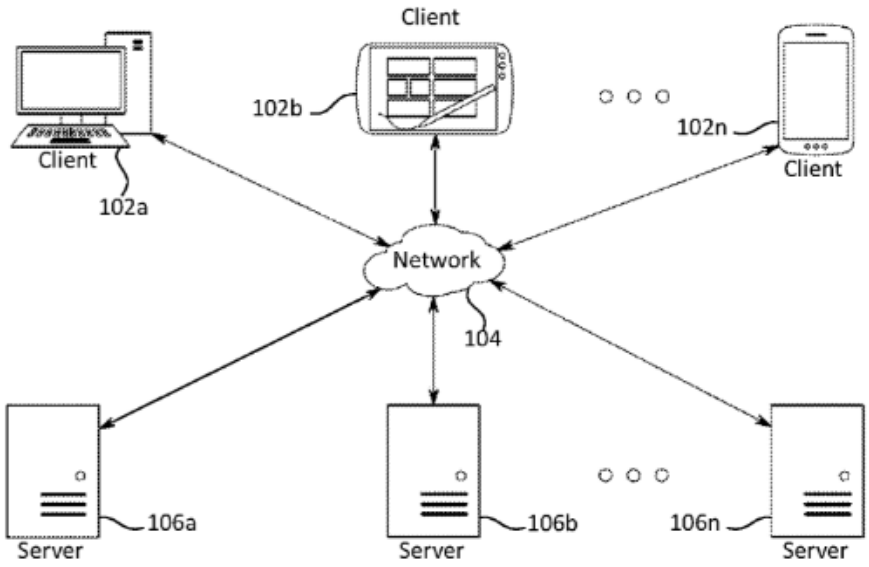
For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US400264014&_cid=P22-LJPX6R-79744-1

Reference
Scherwitz, S. (Jun 29, 2023). Artificial-intelligence-based e-commerce system and method for manufacturers, suppliers, and purchasers. Recovered Jun 29, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US400264014&_cid=P22-LJPX6R-79744-1

Information source: (WIPO IP Portal, 2023)

2.6. System and methods for determination of effective nutritional supplements to improve performance and well-being

A method for operating a food processing apparatus comprises: collecting feedback information by means of a human-machine interface (MMI), and/or by means of at least one sensor; creating, by means of a local control unit



Is a block diagram depicting an embodiment of a network environment comprising client device in communication with server device.
Credit: Wiley, T. & Wiley, N., Espacenet Patent Search

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

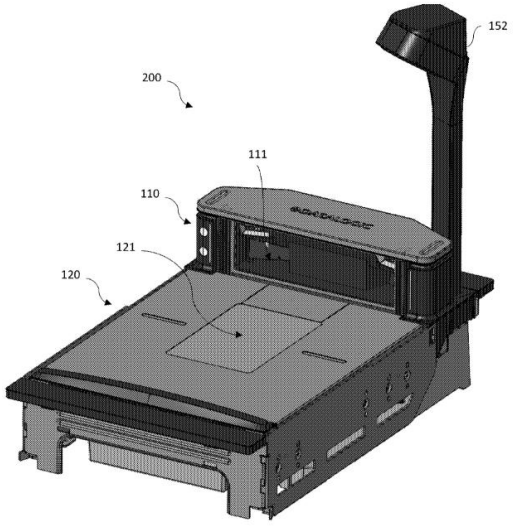
For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/084887710/publication/WO2023119203A1?q=artificial%20intelligence

Reference
Wiley, T. & Wiley, N. (Jun 29, 2023). System and methods for determination of effective nutritional supplements to improve performance and well-being. Recovered Jun 29, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/084887710/publication/WO2023119203A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.7. Fixed retail scanner with distributed on-board Artificial Intelligence (AI) accelerator modules and related methods

The disclosure includes a fixed retail scanner includes a data reader. The data reader includes a main board including a system processor disposed within the data reader, and one or more camera modules disposed within the data reader and operably coupled with the system processor.



Is a perspective view of a data reader according to an embodiment of the disclosure. Credit: Santi, S.; Zandhuisen, A.; Howard, B. & Gutke, S., Espacenet Patent Search

Each camera module may include a local on-board imager AI engine configured to perform AI tasks according to a loaded trained AI model. A system artificial intelligence (AI) engine may be disposed within the data reader and configured to perform AI tasks according to a loaded trained AI model. The system processor is operably coupled to each of the imager AI engines and the system AI engine for scheduling and dispatching AI tasks across a distributed network of AI resources including the imager AI engines and the system AI engine.

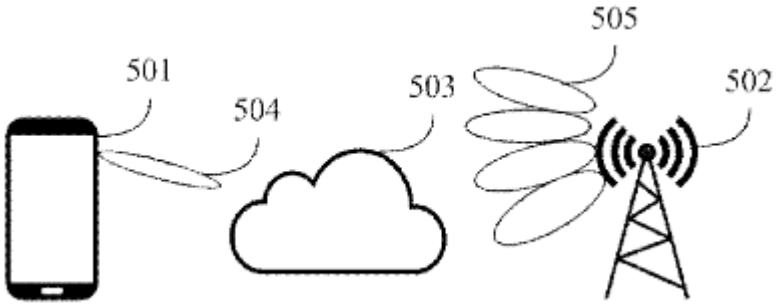
For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086896716/publication/US2023206206A1?q=artificial%20intelligence

Reference
Santi, S.; Zandhuisen, A.; Howard, B. & Gutke, S. (Jun 29, 2023). Fixed retail scanner with distributed on-board Artificial Intelligence (AI) accelerator modules and related methods. Recovered Jun 29, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086896716/publication/US2023206206A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.8. Methods and devices for beam management operation

Devices and methods for performing a beam management operation are provided in this disclosure. A radio communication device may include a transceiver that is configured to transmit a plurality of reference signals, each reference signal being beamformed based on a set of beamforming weights that is different from a set of beamforming weights of at least one other reference signal, and receive a plurality of measurement results representing measurements for at least some of the plurality of reference signals.



Exemplarily shows an illustration with respect to radio communication.
Credit: Schreck, J.; Choi, Y.; Himayat, N.; Liu, D. & Talwar, S., Espacenet Patent Search

The radio communication device may further include a processor that is configured to provide the plurality of measurement results to a machine learning model configured to determine a parameter for a beam management operation using a predefined codebook and perform the beam management operation according to the predefined codebook based on the determined parameter.

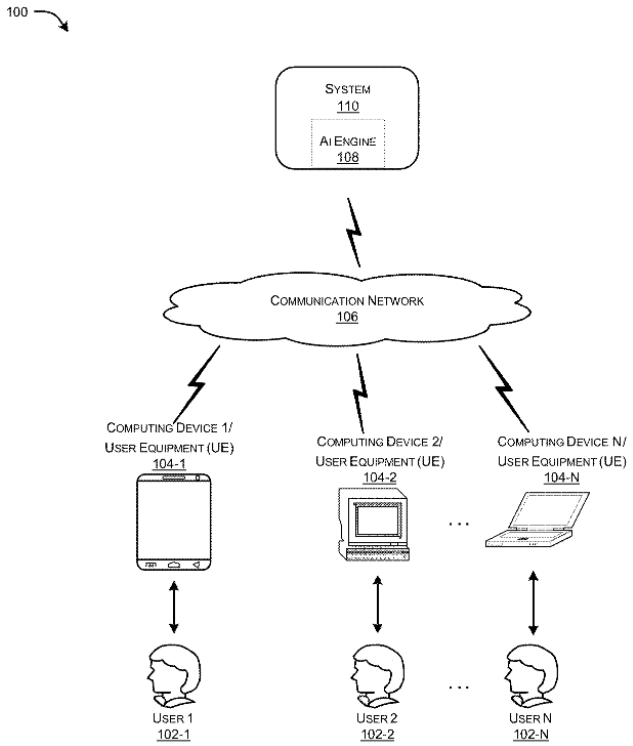
For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086900986/publication/WO2023115437A1?q=machine%20learning

Reference
Schreck, J.; Choi, Y.; Himayat, N.; Liu, D. & Talwar, S. (Jun 29, 2023). Methods and devices for beam management operation. Recovered Jun 29, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/086900986/publication/WO2023115437A1?q=machine%20learning

Information source: (Espacenet Patent Search, 2023)

2.9. System and method for object detection in discontinuous space

The present disclosure provides system and method for object detection in a discontinuous space. The system receives at least one captured image from one or more computing devices associated with one or more users. The at least one captured image comprises one or more objects in the discontinuous space, and the one or more objects are associated with at least one attribute. The system computes a score corresponding to each of at least one attribute of the one or more objects.



Illustrates exemplary network architecture in which or with which embodiments of the present disclosure may be implemented.
Credit: Gaikwad, T.; Sinha, B.; Duggal, G. & Garg, M., Espacenet Patent Search

The system detects the one or more objects in the discontinuous space based on the computed score. Further, the system determines a similarity grade for the one or more detected objects, where the similarity grade corresponds to an accuracy of inference for the one or more detected objects. Finally, the system updates a database based on the accuracy of inference to facilitate object detection in the discontinuous space.

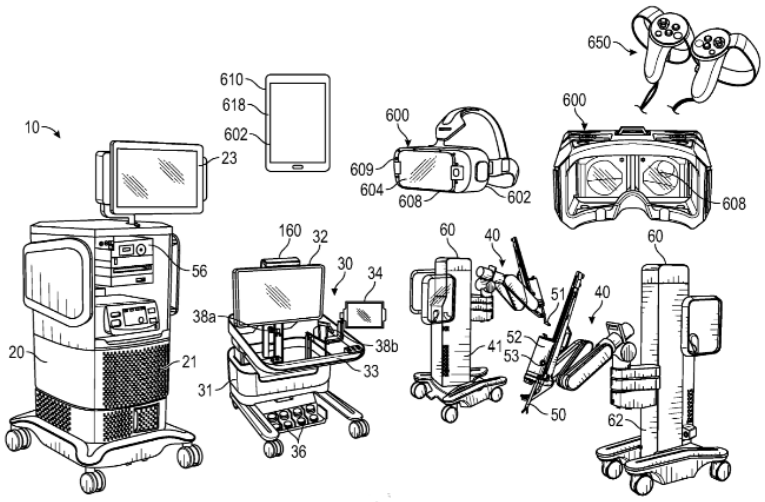
For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086896912/publication/US2023206484A1?q=deep%20learning

Reference
Gaikwad, T.; Sinha, B.; Duggal, G. & Garg, M. (Jun 29, 2023). System and method for object detection in discontinuous space. Recovered Jun 30, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/086896912/publication/US2023206484A1?q=deep%20learning

Information source: (Espacenet Patent Search, 2023)

2.10. Systems and methods for clinical workspace simulation

A robotic surgical simulation system for clinical workplace simulation includes a virtual reality headset configured to display the clinical workplace simulation, a processor, and a memory. The memory includes instructions stored thereon, which, when executed by the processor, cause the robotic surgical simulation system to: generate a virtual operating room within a three-dimensional coordinate space.



Is a schematic illustration of a surgical robotic system including a control tower, a console, and one or more surgical robotic arms according to an aspect of the disclosure.
Credit: Rosson, P.; Inwood, A.; Greenlee, L. & Muscroft, S., Espacenet Patent Search

The virtual operating room includes a virtual surgical console. The instructions when executed by the processor further cause the system to compute, based on the captured image, a position of the user within the three-dimensional coordinate space relative to the virtual surgical console; and determine whether a user is engaged with or disengaged from the virtual surgical console based on the computed position.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/082020856/publication/WO2023117155A1?q=virtual%20reality

Reference
Rosson, P.; Inwood, A.; Greenlee, L. & Muscroft, S. (Jun 29, 2023). Systems and methods for clinical workspace simulation. Recovered Jun 30, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/082020856/publication/WO2023117155A1?q=virtual%20reality

Information source: (Espacenet Patent Search, 2023)