Weekly Newsletter

TECHNOLOGY SURVEILLANCE

Nº 47-2023   NOV 24TH, 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   Researchers reveal low-quality studies of autism early interventions dominate the field

A new meta-analysis led by Micheal Sandbank, PhD, an assistant professor in the Department of Health Sciences at the UNC School of Medicine, found that the field of autism needs more high-quality randomized studies of early interventions to help clinicians understand how to better support children diagnosed with the condition. Early intensive behavioral intervention is the *"gold standard"* for early autism care in the United States. The adult-led, highly structured intervention provides young autistic children with one-on-one support for 20-40 hours per week.

Some clinicians claim it is too intense, and prefer to promote more developmentally-informed interventions, which are often provided at lower intensities and can be easily embedded in the daily family routines. However, not everyone agrees. *"There's really a lot of different interventions that are available to this population, but the researchers studying them don't agree with one another,"* said Sandbank. *"As a result, there's a fractured landscape both of what is offered and how researchers feel about what is the best support for the children and their caregivers."*

For more information, visit the following link:
https://news.unchealthcare.org/2023/11/researchers-reveal-low-quality-studies-of-autism-early-interventions-dominate-the-field/

Reference
Daniels, K. (Nov 20, 2023). Researchers reveal low-quality studies of autism early interventions dominate the field. Recovered Nov 20, 2023, University of North Carolina:
https://news.unchealthcare.org/2023/11/researchers-reveal-low-quality-studies-of-autism-early-interventions-dominate-the-field/

Information source: (University of North Carolina, 2023)

1.2   Morphing cones under compression

Cambridge engineers investigating the load-bearing capacity of conical shells, made from soft materials, have discovered performance-limiting weaknesses that could have implications for soft robotics – affecting the ability of morphing cones to perform fundamental mechanical tasks.
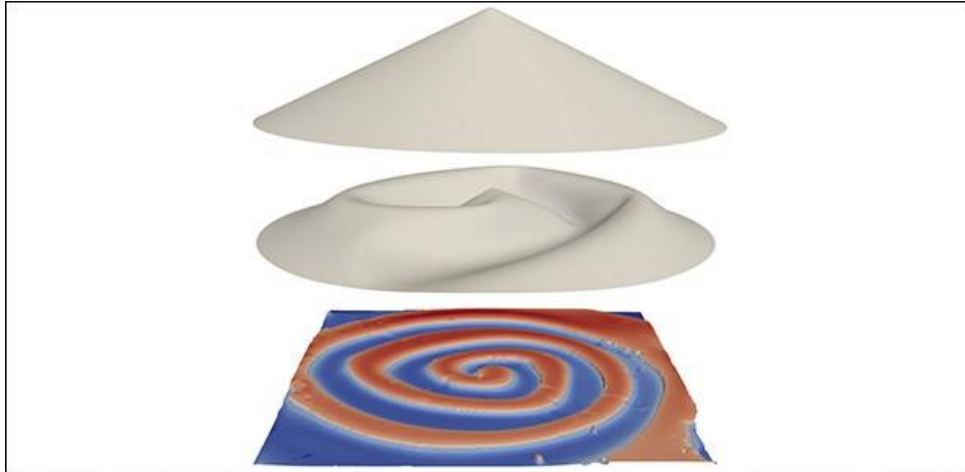
Buckling of cones can produce intricate spiral ridges, as observed in both simulations (centre) and experiments (bottom).
Credit: University of Cambridge

In soft robotics, components are designed to be deformable, squishable and flexible, and often use soft elements, mechanisms, machines and actuators – devices that convert energy into mechanical force – as building blocks to perform mechanical tasks. Examples of such building blocks include pieces of soft material that can grab, pull, push, pump, twist etc. New research, led by the University of Cambridge, has calculated, for the first time, the strength of conical liquid crystal elastomer (LCE) shells. LCE is a lightweight shape-morphing material suitable for use in soft robotics.

For more information, visit the following link:
http://www.eng.cam.ac.uk/news/morphing-cones-under-compression-new-research-uncovers-surprises-soft-robotic-actuators

Reference
Duffy, D. & Biggins, J. (Nov 16, 2023). Morphing cones under compression: new research uncovers surprises for soft robotic actuators. Recovered Nov 20, 2023, University of Cambridge:
http://www.eng.cam.ac.uk/news/morphing-cones-under-compression-new-research-uncovers-surprises-soft-robotic-actuators

Information source: (University of Cambridge, 2023)

1.3   Technique enables Artificial Intelligence on edge devices to keep learning over time

Personalized deep-learning models can enable Artificial Intelligence chatbots that adapt to understand a user's accent or smart keyboards that continuously update to better predict the next word based on someone's typing history. This customization requires constant fine-tuning of a machine-learning model with new data.

A machine-learning technique developed by researchers from MIT and elsewhere enables deep learning models, like those that underlie AI chatbots or smart keyboards, to efficiently and continuously learn from new user data directly on an edge device like a smartphone.
Credit: Massachusetts Institute of Technology

Because smartphones and other edge devices lack the memory and computational power necessary for this fine-tuning process, user data are typically uploaded to cloud servers where the model is updated. But data transmission uses a great deal of energy, and sending sensitive user data to a cloud server poses a security risk. Researchers from MIT, the MIT-IBM Watson AI Lab, and elsewhere developed a technique that enables deep-learning models to efficiently adapt to new sensor data directly on an edge device.

For more information, visit the following link:
https://news.mit.edu/2023/technique-enables-ai-edge-devices-keep-learning-over-time

Reference
Zewe, A. (Nov 16, 2023). Technique enables AI on edge devices to keep learning over time. Recovered Nov 20, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/technique-enables-ai-edge-devices-keep-learning-over-time

Information source: (Massachusetts Institute of Technology, 2023)

1.4   The mind's eye of a neural network system

In the background of image recognition software that can ID our friends on social media and wildflowers in our yard are neural networks, a type of Artificial Intelligence inspired by how own our brains process data. While neural networks sprint through data, their architecture makes it difficult to trace the origin of errors that are obvious to humans — like confusing a Converse high-top with an ankle boot — limiting their use in more vital work like health care image analysis or research. A new tool developed at Purdue University makes finding those errors as simple as spotting mountaintops from an airplane.

A tool for checking the output of neural networks makes finding errors as easy as spotting mountaintops from an airplane.
Credit: Purdue University

"In a sense, if a neural network were able to speak, we're showing you what it would be trying to say," said David Gleich, a Purdue professor of computer science in the College of Science who developed the tool, which is featured in a paper published in Nature Machine Intelligence. *"The tool we've developed helps you find places where the network is saying, 'Hey, I need more information to do what you've asked.' I would advise people to use this tool on any high-stakes neural network decision scenarios or image prediction task."*

For more information, visit the following link:
https://www.purdue.edu/newsroom/releases/2023/Q4/the-minds-eye-of-a-neural-network-system.html

Reference
Martialay, M. (Nov 16, 2023). The mind's eye of a neural network system. Recovered Nov 20, 2023, Purdue University:
https://www.purdue.edu/newsroom/releases/2023/Q4/the-minds-eye-of-a-neural-network-system.html

Information source: (Purdue University, 2023)

1.5   Altering our language can help us deal with the intelligence of chatbots

A new paper suggests reframing how we talk about and interact with large language models may help us adapt to their intelligence. Changing how we think and talk about large language models like ChatGPT can help us cope with the strange, new sort of intelligence they have. This is according to a new paper from an Imperial College London researcher published in Nature. Such chatbots, which are underpinned by neural network-based large language models (LLMs), can induce a compelling sense that we are speaking with fellow humans rather than Artificial Intelligence.
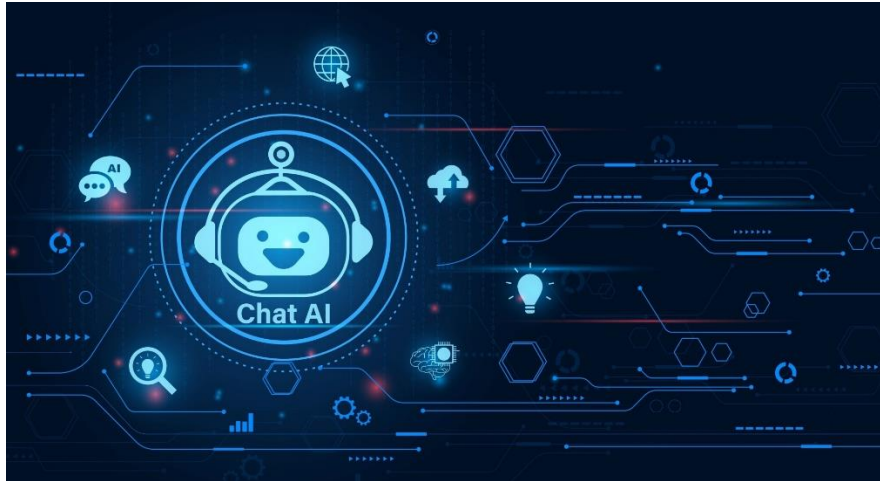
Crédito: Shutterstock, Imperial College London

Hardwired for sociability, human brains are built to connect and empathise with entities that are human-like. However, this can present problems for humans who interact with chatbots and other AI-based entities. Were these LLMs to be used by bad faith actors, for example scammers or propagandists, people could be vulnerable to handing over their bank details in pursuit of connection, or being swayed politically.

For more information, visit the following link:
https://www.imperial.ac.uk/news/249533/altering-language-help-deal-with-intelligence/

Reference
Brogan, C. (Nov 16, 2023). Altering our language can help us deal with the intelligence of chatbots. Recovered Nov 20, 2023, Imperial College London:
https://www.imperial.ac.uk/news/249533/altering-language-help-deal-with-intelligence/

Information source: (Imperial College London, 2023)

1.6   Creating realistic *"talking heads"* with an Artificial Intelligence-powered program

A team of researchers led by Assoc Prof Lu Shijian from the NTU School of Computer Science and Engineering has developed a computer program that creates realistic videos that reflect the facial expressions and head movements of the person speaking, only requiring an audio clip and a face photo.
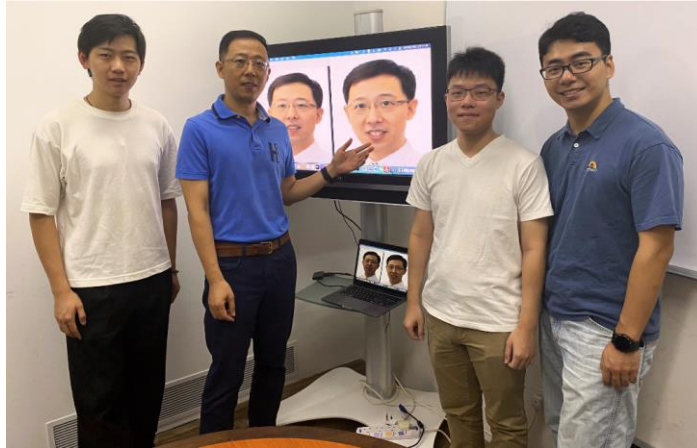
Credit: Nanyang Technological University

DIverse yet Realistic Facial Animations, or DIRFA, is an Artificial Intelligence-based program that takes audio and a photo and produces a 3D video showing the person demonstrating realistic and consistent facial animations synchronised with the spoken audio. The NTU-developed program improves on existing approaches, which struggle with pose variations and emotional control. To accomplish this, the team trained DIRFA on over one million audiovisual clips from over 6,000 people derived from an open-source database to predict cues from speech and associate them with facial expressions and head movements.

For more information, visit the following link:
https://www.ntu.edu.sg/news/detail/creating-realistic-talking-heads-with-an-ai-powered-program

Reference
Nanyang Technological University. (Nov 16, 2023). Creating realistic *"talking heads"* with an AI-powered program. Recovered Nov 21, 2023, Nanyang Technological University:
https://www.ntu.edu.sg/news/detail/creating-realistic-talking-heads-with-an-ai-powered-program

Information source: (Nanyang Technological University, 2023)

1.7   Ingestible electronic device detects breathing depression in patients

Diagnosing sleep disorders such as sleep apnea usually requires a patient to spend the night in a sleep lab, hooked up to a variety of sensors and monitors. Researchers from MIT, Celero Systems, and West Virginia University hope to make that process less intrusive, using an ingestible capsule they developed that can monitor vital signs from within the patient's GI tract.

Diagnosing disorders such as sleep apnea usually requires a night in a sleep lab, hooked up to sensors and monitors. Researchers hope to ease that process with an ingestible capsule that can monitor vital signs from within a patient's GI tract.
Credit: Massachusetts Institute of Technology

The capsule, which is about the size of a multivitamin, uses an accelerometer to measure the patient's breathing rate and heart rate. In addition to diagnosing sleep apnea, the device could also be useful for detecting opioid overdoses in people at high risk, the researchers say. *"It's an exciting intervention to help people be diagnosed and then receive the appropriate treatment if they suffer from obstructive sleep apnea,"* says Giovanni Traverso, an associate professor of mechanical engineering at MIT and a gastroenterologist at Brigham and Women's Hospital. *"The device also has the potential for early detection of changes in respiratory status, whether it's a result of opiates or other conditions that could be monitored, like asthma or chronic obstructive pulmonary disease (COPD)."*

For more information, visit the following link:
https://news.mit.edu/2023/ingestible-electronic-device-detects-breathing-depression-patients-1117.

Reference
Trafton, A. (Nov 17, 2023). Ingestible electronic device detects breathing depression in patients. Recovered Nov 21, 2023, Massachusetts Institute of Technology:
https://news.mit.edu/2023/ingestible-electronic-device-detects-breathing-depression-patients-1117

Information source: (Massachusetts Institute of Technology, 2023)

1.8   Analysis reveals inflation reduction act clean energy subsidies at work

The Princeton team, presenting their work in Environmental Science & Technology, analyzed the impacts of the landmark legislation on six different hydrogen production pathways and nine different pathways for producing synthetic liquid fuels. They identified the clean fuel pathways that benefited most from Inflation Reduction Act subsidies, those that are likely to remain uncompetitive even with subsidies, and key uncertainties in the implementation of the tax credits that could shape the law's success in promoting clean energy deployment.

The Inflation Reduction Act has boosted the cost-competitiveness of many pathways for producing clean fuels.
Credit: Stock.adobe.com, Princeton University

"The incentives in the Inflation Reduction Act completely shift the economic favorability of several low-carbon technologies," said first author Fangwei Cheng, associate research scholar at the Andlinger Center for Energy and the Environment. *"Our goal was to understand which technologies stand to benefit most from the law, and whether the law's incentives are enough to allow cleaner technologies to compete with their fossil fuel-derived equivalents."*

For more information, visit the following link:
https://engineering.princeton.edu/news/2023/11/16/analysis-reveals-inflation-reduction-act-clean-energy-subsidies-work

Reference
Poore, C. (Nov 16, 2023). Analysis reveals inflation reduction act clean energy subsidies at work. Recovered Nov 21, 2023, Princeton University:
https://engineering.princeton.edu/news/2023/11/16/analysis-reveals-inflation-reduction-act-clean-energy-subsidies-work

Information source: (Princeton University, 2023)

1.9   A peek into the future of visual data interpretation

In the last year, large language models (LLMs) have come into prominence for boasting a suite of ever-expanding capabilities including text generation, image production, and, more recently, highly descriptive image analysis. The integration of Artificial Intelligence (AI) into image analysis represents a significant shift in how people understand and interact with visual data, a task that historically has been reliant on vision to see and knowledge to contextualize.

Alyssa Hwang, a Ph.D. candidate in the School of Engineering and Applied Science, developed a new framework for evaluating the performance of large language models' ability to analyze images.
Credit: iStock/Robert Way, University of Pennsylvania

Now, new AI tools present a paradigm that allows more and more people to interact with images by generating descriptions that could not only assist the visually impaired but could also inform lay audiences about the contents of a scientific figure.

For more information, visit the following link:
https://penntoday.upenn.edu/news/peek-future-visual-data-interpretation

Reference
Magubane, N. (Nov 16, 2023). A peek into the future of visual data interpretation. Recovered Nov 21, 2023, University of Pennsylvania:
https://penntoday.upenn.edu/news/peek-future-visual-data-interpretation

Information source: (University of Pennsylvania, 2023)

1.10   Inverted perovskite solar cell breaks 25% efficiency record

Northwestern University researchers have raised the standards again for perovskite solar cells with a new development that helped the emerging technology hit new records for efficiency.
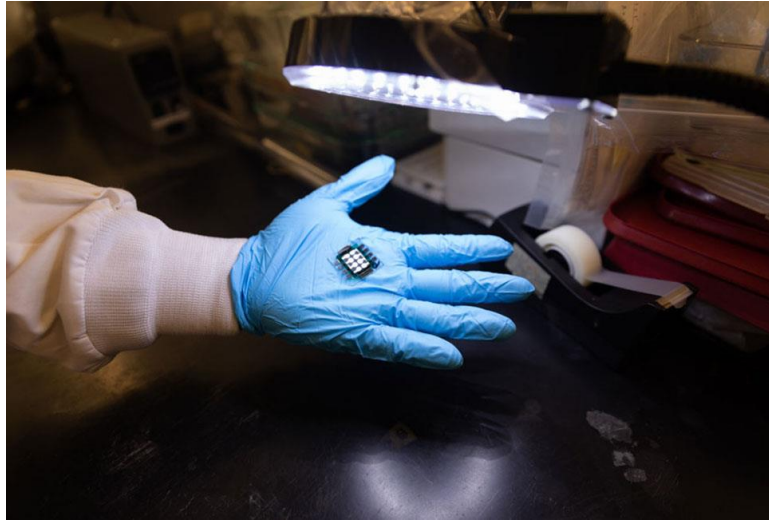
Perovskite materials whose size and composition can be adjusted to "tune" the wavelengths of light they absorb, making them a favorable and potentially lower-cost, high-efficiency emerging tandem technology
Credit: Northwestern University

The findings, describe a dual-molecule solution to overcoming losses in efficiency as sunlight is converted to energy. By incorporating first, a molecule to address something called surface recombination, in which electrons are lost when they are trapped by defects — missing atoms on the surface, and a second molecule to disrupt recombination at the interface between layers, the team achieved a National Renewable Energy Lab (NREL) certified efficiency of 25.1% where earlier approaches reached efficiencies of just 24.09%.

For more information, visit the following link:
https://news.northwestern.edu/stories/2023/11/perovskite-solar-cell-efficiency-record/

Reference
Reynolds, W. (Nov 17, 2023). Inverted perovskite solar cell breaks 25% efficiency record. Recovered Nov 21, 2023, Northwestern University:
https://news.northwestern.edu/stories/2023/11/perovskite-solar-cell-efficiency-record/

Information source: (Northwestern University, 2023)

1.11   Large Language Models pose risk to science with false answers

Large Language Models (LLMs) pose a direct threat to science, because of so-called 'hallucinations' (untruthful responses), and should be restricted to protect scientific truth, says a new paper from leading Artificial Intelligence researchers at the Oxford Internet Institute. The paper by Professors Brent Mittelstadt, Chris Russell and Sandra Wachter has been published in Nature Human Behaviour. It explains, 'LLMs are designed to produce helpful and convincing responses without any overriding guarantees regarding their accuracy or alignment with fact.'

Fertiliser for agriculture is largely dependent on ammonia which up until now has had a large carbon footprint.
Credit: Getty Images, University of Oxford

One reason for this, is the data the technology uses to answer questions does not always come from a factually correct source. LLMs are trained on large datasets of text, usually taken from online sources. These can contain false statements, opinions, and creative writing amongst other types of non-factual information.

For more information, visit the following link:
https://www.ox.ac.uk/news/2023-11-20-large-language-models-pose-risk-science-false-answers-says-oxford-study

Reference
University of Oxford. (Nov 20, 2023). Large Language Models pose risk to science with false answers, says Oxford study. Recovered Nov 21, 2023, University of Oxford:
https://www.ox.ac.uk/news/2023-11-20-large-language-models-pose-risk-science-false-answers-says-oxford-study

Information source: (University of Oxford, 2023)

1.12   Largest study of its kind shows outdated password practices are widespread

Three out of four of the world's most popular websites are failing to meet minimum requirement standards and allowing tens of millions of users to create weak passwords. The findings are part of a new Georgia Tech cybersecurity study that examines the current state of password policies across the internet.

Credit: Georgia Institute of Technology

Using a first-of-its-kind automated tool that can assess a website's password creation policies, researchers also discovered that 12% of websites completely lacked password length requirements. Assistant Professor Frank Li and Ph.D. student Suood Al Roomi in Georgia Tech's School of Cybersecurity and Privacy created the automated assessment tool to explore all sites in the Google Chrome User Experience Report (CrUX), a database of one million websites and pages.

For more information, visit the following link:
https://research.gatech.edu/largest-study-its-kind-shows-outdated-password-practices-are-widespread

Reference
Popham, J. (Nov 17, 2023). Largest study of its kind shows outdated password practices are widespread. Recovered Nov 21, 2023, Georgia Institute of Technology:
https://research.gatech.edu/largest-study-its-kind-shows-outdated-password-practices-are-widespread

Information source: (Georgia Institute of Technology, 2023)

1.13   Breakthrough in tackling increasing demand by *"internet of things"* on mobile networks

University of Maryland researchers aiming to combat rising global temperatures have developed a new *"cooling glass"* that can turn down the heat indoors without electricity by drawing on the cold depths of space.
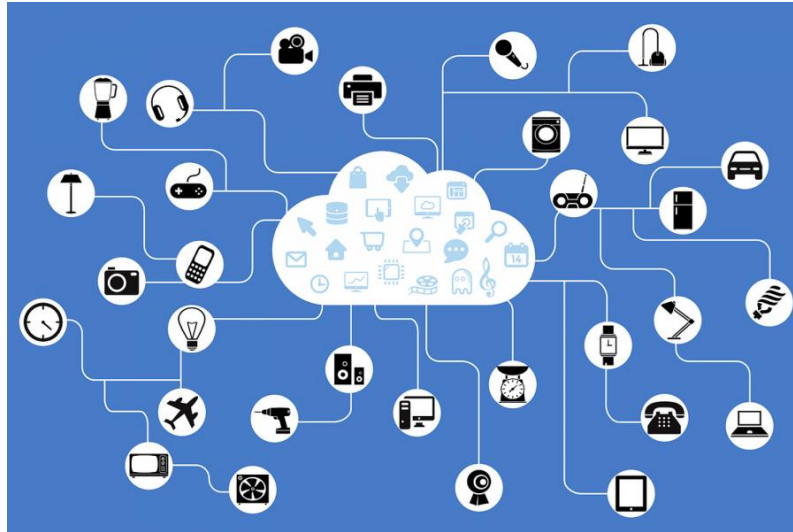
Credit: The University of Leicester

The new technology, a microporous glass coating, can lower the temperature of the material beneath it by 3.5 degrees Celsius at noon, and has the potential to reduce a mid-rise apartment building's yearly carbon emissions by 10%, according to the research team led by Distinguished University Professor Liangbing Hu in the Department of Materials Science and Engineering. The coating works in two ways: First, it reflects up to 99% of solar radiation to stop buildings from absorbing heat. More intriguingly, it emits heat in the form of longwave infrared radiation into the icy universe, where the temperature is generally around -270 degrees Celsius, or just a few degrees above absolute zero.

For more information, visit the following link:
https://le.ac.uk/news/2023/november/mobile-networks-demand

Reference
University of Maryland. (Nov 20, 2023). Breakthrough in tackling increasing demand by *"internet of things"* on mobile networks. Recovered Nov 22, 2023, The University of Leicester: https://le.ac.uk/news/2023/november/mobile-networks-demand

Information source: (The University of Leicester, 2023)

1.14   Artificial Intelligence system self-organises to develop features of brains of complex organisms

Cambridge scientists have shown that placing physical constraints on an artificially-intelligent system – in much the same way that the human brain has to develop and operate within physical and biological constraints – allows it to develop features of the brains of complex organisms in order to solve tasks.

Graphic representing an artificially intelligent brain
Credit: DeltaWorks, University of Cambridge

As neural systems such as the brain organise themselves and make connections, they have to balance competing demands. For example, energy and resources are needed to grow and sustain the network in physical space, while at the same time optimising the network for information processing. This trade-off shapes all brains within and across species, which may help explain why many brains converge on similar organisational solutions. Jascha Achterberg, a Gates Scholar from the Medical Research Council Cognition and Brain Sciences Unit (MRC CBU) at the University of Cambridge said*: "Not only is the brain great at solving complex problems, it does so while using very little energy. In our new work we show that considering the brain's problem solving abilities alongside its goal of spending as few resources as possible can help us understand why brains look like they do."*

For more information, visit the following link:
https://www.cam.ac.uk/research/news/ai-system-self-organises-to-develop-features-of-brains-of-complex-organisms

Reference
Brierley, C. (Nov 20, 2023). AI system self-organises to develop features of brains of complex organisms. Recovered Nov 22, 2023, University of Cambridge:
https://www.cam.ac.uk/research/news/ai-system-self-organises-to-develop-features-of-brains-of-complex-organisms

Information source: (University of Cambridge, 2023)

1.15   Residential solar power saves less energy than expected

Imagine a household that consumes 1,000 kilowatt hours of energy per month. Then they install solar panels on their roof that generate 500 kilowatt hours of electricity per month on average. How much should their consumption of electricity drawn from the power grid decline after they install solar? Five hundred kilowatt hours is the expectation, but in reality, it's less than that for most people. Now, they're consuming more than 1,000 kilowatt hours per month.

Credit: Georgia Institute of Technology

This paradox is called the solar rebound effect: the ratio of the increase in energy consumption to the amount that is generated by the solar panels. In new research out of the Georgia Institute of Technology, Matthew Oliver, an associate professor in the School of Economics, presented this argument for how the economics of solar power really work, in *"Tipping the Scale: Why Utility-Scale Solar Avoids a Solar Rebound and What It Means for U.S. Solar Policy,"*

For more information, visit the following link:
https://research.gatech.edu/residential-solar-power-saves-less-energy-expected

Reference
Malone, T. (Nov 20, 2023). Residential solar power saves less energy than expected. Recovered Nov 22, 2023, Georgia Institute of Technology:
https://research.gatech.edu/residential-solar-power-saves-less-energy-expected

Information source: (Georgia Institute of Technology, 2023)

1.16   More efficient way to transmit data between our devices

University of Sussex researchers have developed a more energy-efficient alternative to transmit data that could potentially replace Bluetooth in mobile phones and other tech devices. With more and more of us owning smart phones and wearable tech, researchers at the University of Sussex have found a more efficient way of connecting our devices and improving battery life. Applied to wearable devices, it could even see us unlocking doors by touch or exchanging phone numbers by shaking hands.

Credit: University of Sussex

Professor Robert Prance and Professor Daniel Roggen, of the University of Sussex, have developed the use of electric waves, rather than electromagnetic waves, for a low-power way to transmit data at close range, while maintaining the high throughput needed for multimedia applications. Bluetooth, Wifi, and 5G currently rely on electromagnetic modulation, a form of wireless technology which was developed over 125 years ago. In the late 19th Century, the focus was to transmit data over long distances using electromagnetic waves. By contrast, electric field modulation uses short-range electric waves, which consumes much less power than Bluetooth.

For more information, visit the following link:
https://www.sussex.ac.uk/research/full-news-list?id=62668

Reference
Ellis, L. (Nov 20, 2023). Long in the Bluetooth: Sussex scientists develop a more efficient way to transmit data between our devices. Recovered Nov 22, 2023, University of Sussex:
https://www.sussex.ac.uk/research/full-news-list?id=62668

Information source: (University of Sussex, 2023)

1.17   What if Alexa or Siri sounded more like you? Study says you'll like it better

One voice does not fit all when it comes to virtual assistants like Siri and Alexa, according to a team led by Penn State researchers that examined how customization and perceived similarity between user and voice assistant (VA) personalities affect user experience. They found a strong preference for extroverted VAs — those that speak louder, faster and in a lower pitch. They also found that increasing personality similarity by automatically matching user and VA voice profiles encouraged users to resist persuasive information, such as misinformation about COVID-19 vaccines. In the study, 38% of unvaccinated individuals changed their minds about vaccination after listening to vaccine misinformation shared by a virtual assistant.

Credit: blackCAT/Getty Images. All Rights Reserved, The Pennsylvania State University

The findings may have implications for ways to increase user resistance to misinformation, according to the researchers. *"Our study shows that when users interact with a voice assistant that is similar to their personality, they think more highly of the service provided by it,"* said S. Shyam Sundar, study co-author and the James P. Jimirro Professor of Media Effects at Penn State.

For more information, visit the following link:
https://www.psu.edu/news/research/story/what-if-alexa-or-siri-sounded-more-you-study-says-youll-it-better

Reference
Tutella, F. (Nov 21, 2023). What if Alexa or Siri sounded more like you? Study says you'll like it better. Recovered Nov 22, 2023, The Pennsylvania State University:
https://www.psu.edu/news/research/story/what-if-alexa-or-siri-sounded-more-you-study-says-youll-it-better

Information source: (The Pennsylvania State University, 2023)

1.18   Mapping soundscapes everywhere

Nathan Jacobs, a professor of computer science and engineering, along with graduate students Subash Khanal, Srikumar Sastry and Aayush Dhakal, all studying computer science and engineering, at the McKelvey School of Engineering at Washington University in St. Louis, developed Geography-Aware Contrastive Language Audio Pre-training (GeoCLAP), a novel framework for soundscape mapping that can be applied anywhere in the world.

Credit: Washington University in St. Louis

The team's key innovation comes from their use of three different modalities, or types of data, in their framework, which incorporates geotagged audio, textual description and overhead images. Unlike previous methods for soundscape mapping that focused on only two modalities, GeoCLAP's richer understanding allows users to create probable soundscapes from either textual or audio queries for any geographic location.

For more information, visit the following link:
https://source.wustl.edu/2023/11/mapping-soundscapes-everywhere/

Reference
Ballard, S. (Nov 21, 2023). Mapping soundscapes everywhere. Recovered Nov 22, 2023, Washington University in St. Louis:
https://source.wustl.edu/2023/11/mapping-soundscapes-everywhere/

Information source: (Washington University in St. Louis, 2023)

1.19   Artificial Intelligence for perovskite solar cells

Perovskite tandem solar cells combine a perovskite solar cell with a conventional solar cell, for example based on silicon. These cells are considered a next-generation technology: They boast an efficiency of currently more than 33 percent, which is much higher than that of conventional silicon solar cells. Moreover, they use inexpensive raw materials and are easily manufactured. To achieve this level of efficiency, an extremely thin high-grade perovskite layer, whose thickness is only a fraction of that of human hair, has to be produced.
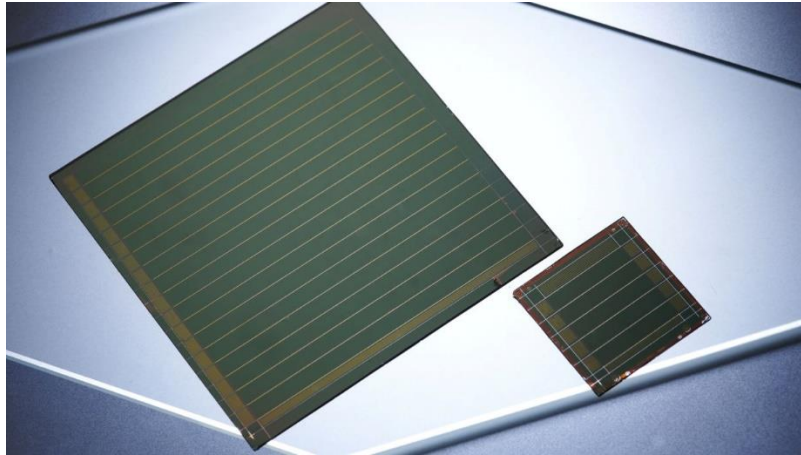
Credit: Madeus Bramsiepe, Karlsruhe Institute of Technology

"Manufacturing these high-grade, multi-crystalline thin layers without any deficiencies or holes using low-cost and scalable methods is one of the biggest challenges," says tenure-track professor Ulrich W. Paetzold who conducts research at the Institute of Microstructure Technology and the Light Technology Institute of KIT. Even under apparently perfect lab conditions, there may be unknown factors that cause variations in semiconductor layer quality: *"This drawback eventually prevents a quick start of industrial-scale production of these highly efficient solar cells, which are needed so badly for the energy turnaround,"* explains Paetzold.

For more information, visit the following link:
https://www.kit.edu/kit/english/pi_2023_94_ai-for-perovskite-solar-cells-key-to-better-manufacturing.php

Reference
Landgraf, M. (Nov 16, 2023). AI for perovskite solar cells: key to better manufacturing. Recovered Nov 22, 2023, Karlsruhe Institute of Technology:
https://www.kit.edu/kit/english/pi_2023_94_ai-for-perovskite-solar-cells-key-to-better-manufacturing.php

Information source: (Karlsruhe Institute of Technology, 2023)

1.20   Autonomous excavator constructs a six-metre-high dry-stone wall

The team of researchers included: Gramazio Kohler Research, the Robotics Systems Lab, Vision for Robotics Lab, and the Chair of Landscape Architecture. They developed this innovative design application as part of the National Centre of Competence in Research for Digital Fabrication (NCCR dfab).

The Excavator picks and scans each boulder to be placed in the correct position. Circularity Park in Oberglatt, Eberhard AG.
Credit: Marc Schneider, ETH Zurich

Using sensors, the excavator can autonomously draw a 3D map of the construction site and localise existing building blocks and stones for the wall's construction. Specifically designed tools and machine vision approaches enable the excavator to scan and grab large stones in its immediate environment. It can also register their approximate weight as well as their centre of gravity. An algorithm determines the best position for each stone, and the excavator then conducts the task itself by placing the stones in the desired location. The autonomous machine can place 20 to 30 stones in a single consignment – about as many as one delivery could supply.

For more information, visit the following link:
https://english.cas.cn/newsroom/research_news/chem/202311/t20231121_644775.shtml

Reference
Walther, M. (Nov 22, 2023). Autonomous excavator constructs a six-metre-high dry-stone wall. Recovered Nov 22, 2023, Eidgenössische Technische Hochschule Zürich:
https://english.cas.cn/newsroom/research_news/chem/202311/t20231121_644775.shtml

Information source: (Eidgenössische Technische Hochschule Zürich, 2023)

II.   PATENTS

2.1.   Method and system for implementing ai-powered augmented reality learning devices

Novel tools and techniques are provided for implementing learning technologies, and, more particularly, to methods, systems, and apparatuses for implementing Artificial Intelligence (*"AI"*) -powered augmented reality learning devices. In various embodiments, a computing system might receive captured images of positions of a user's eyes correlated with particular portions of first content being displayed on a display device.
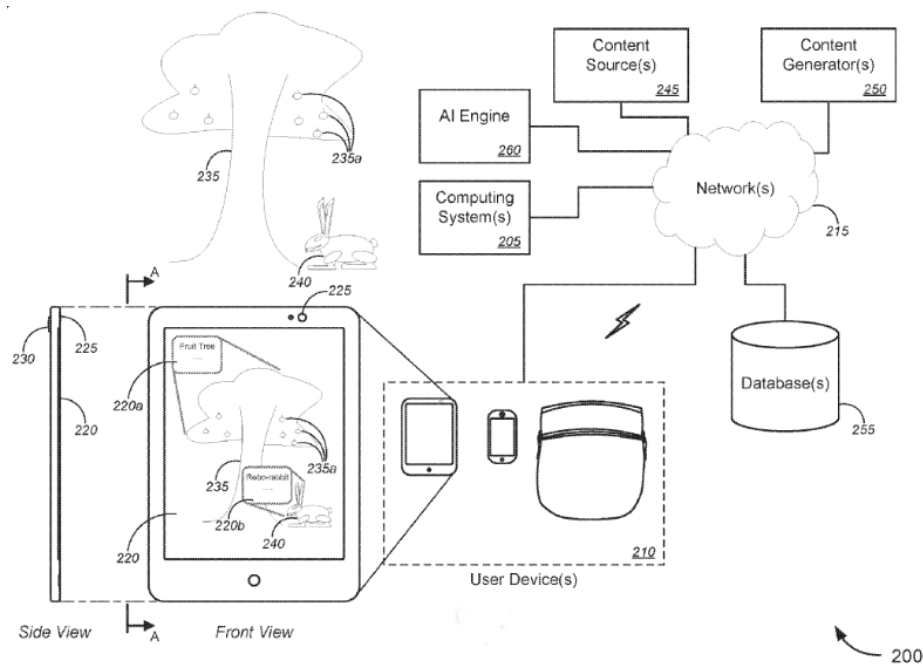
Schematic diagram illustrating another system for implementing AI-powered augmented reality learning devices, in accordance with various embodiments.
Credit: Lewis, R., WIPO IP Portal

Might identify a first object(s) of a plurality of objects being displayed on the display device that correspond to the positions of the user's eyes as the first content is being displayed, based on analysis of the received captured images of the positions of the user's eyes; might send, to a content source, a request for additional content containing the identified first object(s); and based on a determination that second content containing the identified first object(s) is available, might retrieve and display the second content on the display surface of the display device.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414439090&_cid=P21-LPBFYG-65396-1

Reference
Lewis, R. (Nov 16, 2023). Method and system for implementing ai-powered augmented reality learning devices. Recovered Nov 17, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414439090&_cid=P21-LPBFYG-65396-1

Information source: (WIPO IP Portal, 2023)

2.2.   System and method for augmented and virtual reality

One embodiment is directed to a system for enabling two or more users to interact within a virtual world comprising virtual world data, comprising a computer network comprising one or more computing devices, the one or more computing devices comprising memory, processing circuitry.
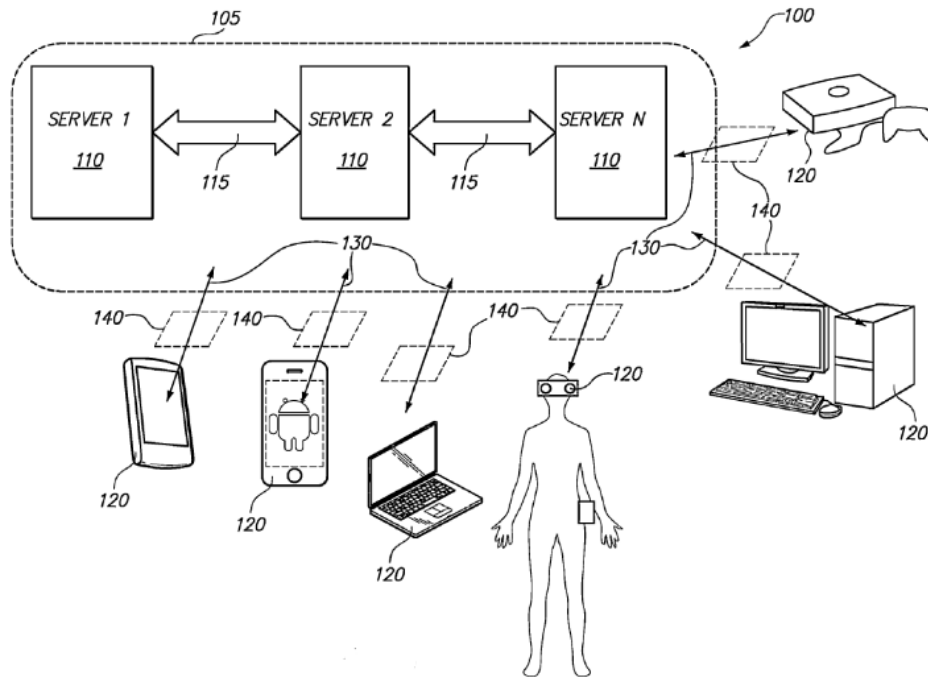
Illustrates a representative embodiment of the disclosed system for facilitating interactive virtual or augmented reality environments for multiple users.
Credit: Miller, S., WIPO IP Portal

And software stored at least in part in the memory and executable by the processing circuitry to process at least a portion of the virtual world data; wherein at least a first portion of the virtual world data originates from a first user virtual world local to a first user, and wherein the computer network is operable to transmit the first portion to a user device for presentation to a second user, such that the second user may experience the first portion from the location of the second user, such that aspects of the first user virtual world are effectively passed to the second user.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414441105&_cid=P21-LPBU3K-40965-1

Reference
Miller, S. (Nov 16, 2023). System and method for augmented and virtual reality. Recovered Nov 17, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414441105&_cid=P21-LPBU3K-40965-1

Information source: (WIPO IP Portal, 2023)

2.3. Systems and methods for utilizing a living entity as a marker for augmented reality content

Systems and methods for utilizing living entities as markers for virtual content in an augmented reality environment are discussed herein. The virtual content may comprise objects, surfaces, textures, effects, and/or other content visibly manifested in views of the augmented reality environment. In some implementations, the virtual content may comprise an avatar and/or other full- or partial-body virtual content object depicted based on the living entity.
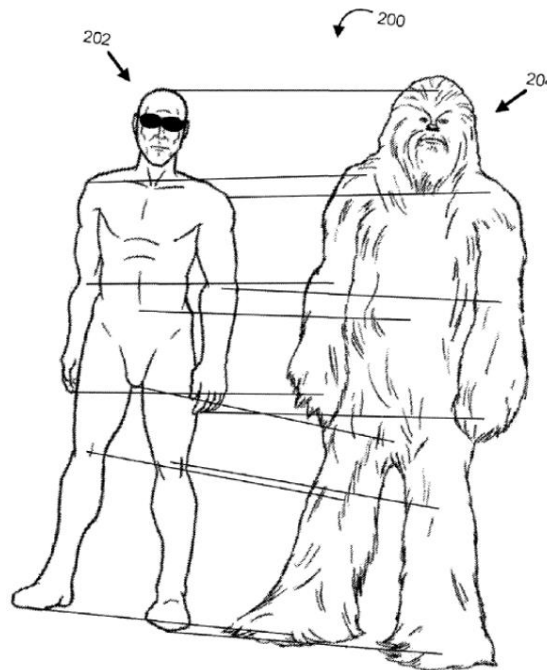
Illustrates an exemplary correlation between an arrangement of linkage points defined with respect to a living entity and a reference frame of a virtual content item, in accordance with one or more implementations.
Credit: Hariton, N., WIPO IP Portal

A living entity and multiple linkage points for the living entity may be detected within the field of view of a user. Based on the arrangement of the linkage points, virtual content may be rendered and appear superimposed over or in conjunction with a view of the living entity in the augmented reality environment. In some implementations, the rendering of virtual content in the augmented reality environment may be triggered by the arrangement of the multiple linkage points for a given living entity.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414438807&_cid=P21-LPBU3K-40965-1

Reference
Hariton, N. (Nov 16, 2023). Systems and methods for utilizing a living entity as a marker for augmented reality content. Recovered Nov 17, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414438807&_cid=P21-LPBU3K-40965-1

Information source: (WIPO IP Portal, 2023)

2.4.   Auctions in extended reality environments

Extended reality auction techniques are described that support conducting live auctions in an extended reality environment, such as augmented or virtual reality environments. Image data, for instance, is received by a computing device from a first computing device depicting an item for auction.
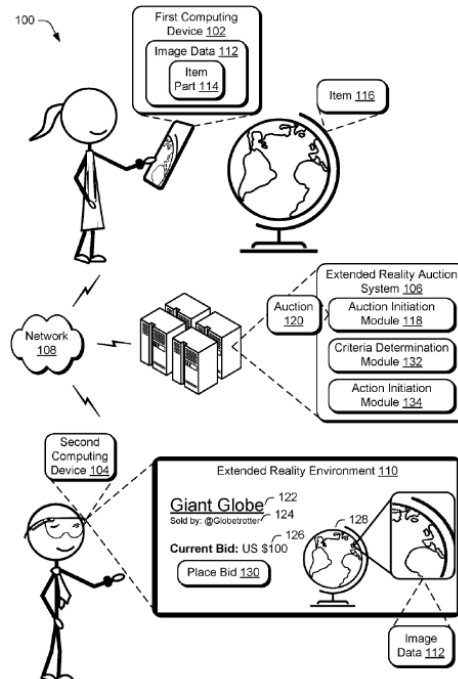
Is an illustration of an environment in an example implementation that is operable to employ digital systems and techniques for initiating and maintaining auctions for display in an extended reality environment as described herein. Credit: Francis, S.; Haro, A.; Chalkley, A. & Rangaswami, D., WIPO IP Portal

An extended reality auction system initiates an auction for the item based on identifying that at least part of the item is in the image data. The image data is provided to a second computing device for display in the extended reality environment during the auction. Responsive to determining that a criterion of the auction is not satisfied by the image data, remedial action is initiated by the extended reality auction system.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414438639&_cid=P21-LPBU3K-40965-1

Reference
Francis, S.; Haro, A.; Chalkley, A. & Rangaswami, D. (Nov 16, 2023). Auctions in extended reality environments. Recovered Nov 17, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414438639&_cid=P21-LPBU3K-40965-1

Information source: (WIPO IP Portal, 2023)

2.5.   Augmented reality unboxing experience

Methods and systems are disclosed for performing operations for providing an augmented reality unboxing experience. The operations include retrieving an augmented reality element comprising a virtual box that is in a closed state.
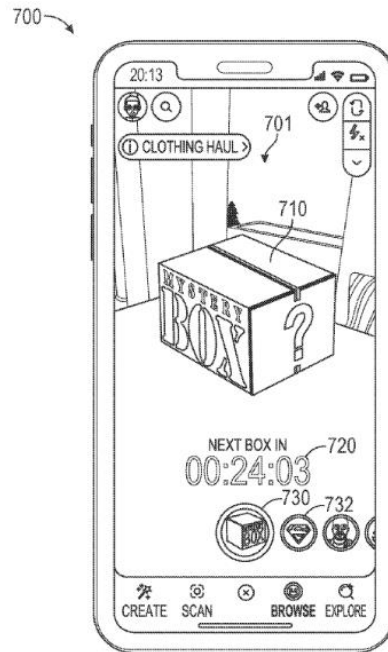
General view of the physical and technological components associated with the system or device of the present invention, where the mobile device, the sensors and the communication between several of these are evidenced.
Credit: Dudovitch, G.; Engle, S.; Heikkinen, C. & Mishin, M., WIPO IP Portal

The operations include obtaining triggers associated with the virtual box, the triggers configured to change the virtual box from the closed state to an open state. The operations include displaying the virtual box. The operations include receiving input associated with the virtual box. The operations include determining that the received input corresponds to the one or more triggers associated with the virtual box. The operations include modifying the virtual box from being displayed in the closed state to being displayed in the open state.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414441159&_cid=P21-LPBU3K-40965-1

Reference
Dudovitch, G.; Engle, S.; Heikkinen, C. & Mishin, M. (Nov 16, 2023). Augmented reality unboxing experience. Recovered Nov 17, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US414441159&_cid=P21-LPBU3K-40965-1

Information source: (WIPO IP Portal, 2023)

2.6.   Ride vehicle Artificial Intelligence entity systems and methods

Systems and methods presented herein include one or more guest activity recognition devices configured to recognize activity of one or more guests within a physical environment of an amusement park.
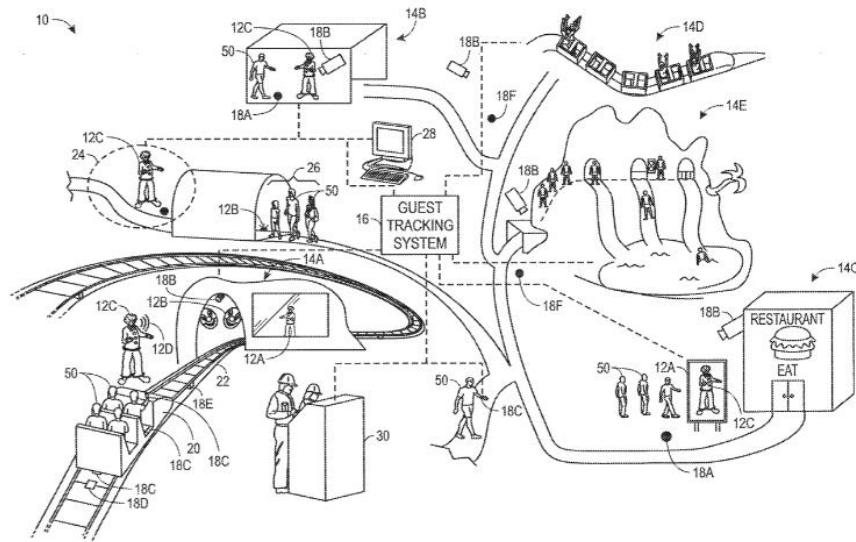
Schematic representation of an amusement park with ride vehicle Artificial Intelligence (AI) entities, in accordance with an embodiment of the present disclosure.
Credit: Jordan, R. & Traynor, M., WIPO IP Portal

The system also includes one or more ride vehicles of a ride of the amusement park, each ride vehicle including an Artificial Intelligence entity management system configured to maintain one or more ride vehicle Artificial Intelligence entities of the ride vehicle based at least in part on the recognized activity of the one or more guests; and one or more features disposed on the ride vehicle and configured to be activated by the Artificial Intelligence entity management system to simulate the existence of the one or more ride vehicle Artificial Intelligence entities in accordance with one or more properties of the one or more ride vehicle Artificial Intelligence entities.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086862120/publication/WO2023220305A1?q=artificial%20intelligence

Reference
Jordan, R. & Traynor, M. (Nov 16, 2023). Ride vehicle Artificial Intelligence entity systems and methods. Recovered Nov 17, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086862120/publication/WO2023220305A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.7.   System and method for generating personalized and community-based recommendations

The present disclosure provides a system and a method for providing personalized and community-based recommendations. The system is configured with one or more primary sensors and a wearable device to monitor multiple health parameters from a user.
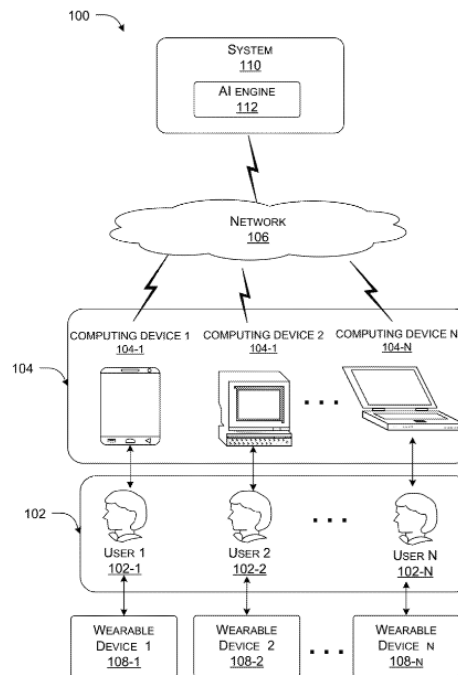
Illustrates an exemplary network architecture (100) of a proposed system, (110), in accordance with an embodiment of the present disclosure.
Credit: Krishnaswamy, D.; Bhatnagar, A. & Bhardwaj, N., Espacenet Patent Search

The wearable device is configured with one or more secondary sensors to monitor additional health parameters from the user. Further, the system uses Artificial Intelligence (AI) to generate a personalized model or a digital twin based on the inputs from the one or more primary sensors and the wearable device. The generated personalized model continuously monitors the inputs and triggers an emergency service upon a significant variation in the inputs. Further, the system provides various micro services to facilitate personalized and community based recommendations. The system utilizes a Blockchain network to generate smart contracts and reward the user based on the inputs from the digital twin model.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/088699399/publication/US2023368882A1?q=Blockchain

Reference
Krishnaswamy, D.; Bhatnagar, A. & Bhardwaj, N. (Nov 16, 2023). System and method for generating personalized and community-based recommendations. Recovered Nov 17 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/088699399/publication/US2023368882A1?q=Blockchain

Information source: (Espacenet Patent Search, 2023)

2.8.   Systems and methods for generating a zero-waste design pattern and reduction in material waste

The present invention discloses systems and methods for generating a zero-waste design pattern and reduction in fabric/material waste including but not limited to garment(s), furniture, shoes and other accessories.
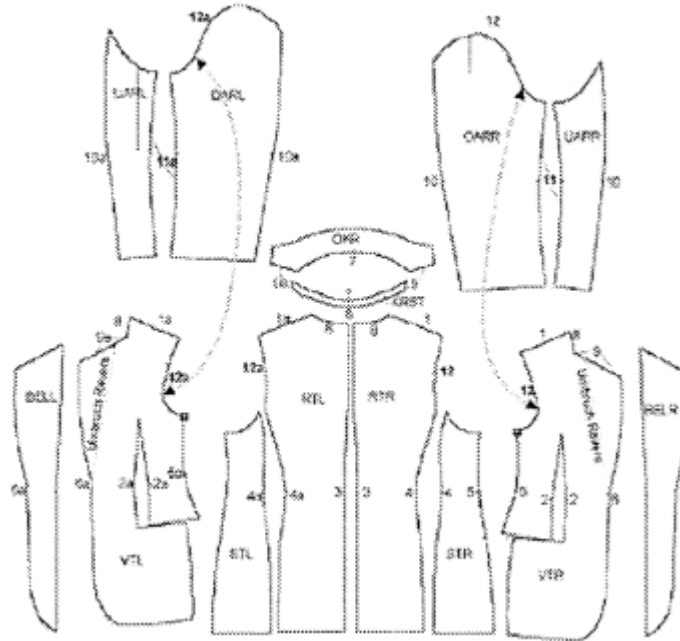
Illustrates exemplary jacket fabric cuts from a traditional jacket design.
Credit: Xu, S. & Wang, T., Espacenet Patent Search

Wherein the method comprises the steps of: (i) accepting a target design input comprising a first plurality of cut pieces; (ii) rendering a first 3D clothing surface from the first plurality of cut pieces from the target design input; (iii) merging/splitting, optimizing and packing the first plurality of cut pieces iteratively to yield a second plurality of cut pieces; (iv) rendering a second 3D clothing surface from the second plurality of cut pieces; and (v) comparing the first 3D clothing surface and second 3D clothing surface and performing the tasks of merging/splitting, optimizing and packing iteratively when a distortion between the first 3D clothing surface and second 3D clothing surface exceeds a pre-defined threshold value.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/088699914/publication/WO2023220011A1?q=3d

Reference
Xu, S. & Wang, T. (Nov 16, 2023). Systems and methods for generating a zero-waste design pattern and reduction in material waste. Recovered Nov 20, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/088699914/publication/WO2023220011A1?q=3d

Information source: (Espacenet Patent Search, 2023)

2.9.   Tracking of multiple extended reality devices

This application is directed to device synchronization and alignment in extended reality. Two electronic devices create two maps of a scene according to two distinct coordinate systems. A first electronic device determines a device pose of a second electronic device in a first coordinate system of the first electronic device. The device pose is used to determine a transformation relationship between the two coordinate systems.
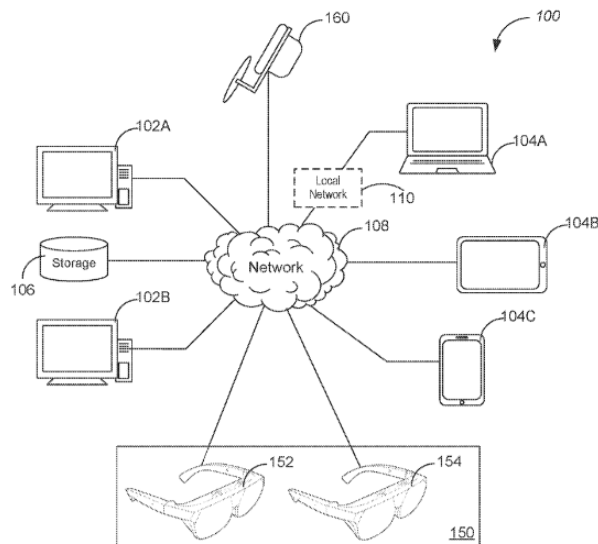
Example data processing environment having one or more servers communicatively coupled to one or more client devices, in accordance with some embodiments.
Credit: Xu, Y., Espacenet Patent Search

The first electronic device obtains a second object pose that is measured in a second coordinate system of the second electronic device and used to render an object in a second map of the second electronic device. The second object pose is converted to a first object pose in the first coordinate system based on the transformation relationship. The object is rendered concurrently in the first and second maps of the first and second electronic devices based on the first and second object poses, respectively.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/088730753/publication/WO2023219615A1?q=virtual%20reality

Reference
Xu, Y. (Nov 16, 2023). Tracking of multiple extended reality devices. Recovered Nov 20, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/088730753/publication/WO2023219615A1?q=virtual%20reality

Information source: (Espacenet Patent Search, 2023)

2.10.   Techniques for machine learning model selection for domain generalization

A computing device may perform training of a set of machine learning models on a first data set associated with a first domain. In some examples, the training may include, for each machine learning model of the set of machine learning models, inputting, as values for a set of parameters of the respective sets of parameters and for an iteration of a set of iterations, a moving average of the set of parameters calculated over a threshold number of previous iterations.
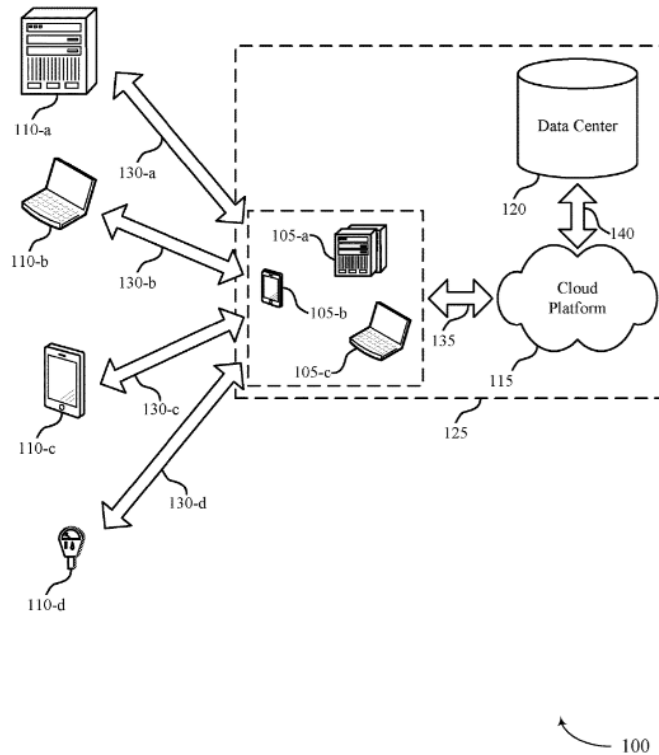
Illustrative diagram of a setup for generating waveform data from a patient, according to some non-limiting embodiments or aspects of the present disclosure..
Credit: Arpit, D.; Wang, H.; Zhou, Y. & Xiong, C., Espacenet Patent Search

The computing device may select a set of model states that are generated during the training of the plurality of machine learning models based on a validation performance of the set of model states performed during the training. The computing device may then generate an ensembled machine learning model by aggregating the set of machine learning models corresponding to the set of selected model states.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/088699136/publication/US2023368078A1?q=machine%20learning

Reference
Arpit, D.; Wang, H.; Zhou, Y. & Xiong, C. (Nov 16, 2023). Techniques for machine learning model selection for domain generalization. Recovered Nov 20, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/088699136/publication/US2023368078A1?q=machine%20learning

Information source: (Espacenet Patent Search, 2023)