Weekly Newsletter

TECHNOLOGY SURVEILLANCE

N° 23-2023   JUN 09TH, 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 Sensory adapted dental rooms significantly reduce autistic children's physiological and behavioral stress during teeth cleanings

New results from a study led by USC researchers at Children's Hospital Los Angeles show that a sensory adapted dental clinic environment creates less distressing oral care experiences for autistic children.

"We've shown that the combination of curated visual, auditory and tactile adaptations — all of which are easily implemented, relatively inexpensive and don't require training to safely use — led to statistically significant decreases in autistic children's behavioral and physiological distress during dental cleanings," said lead author Leah Stein Duker, assistant professor at the USC Chan Division of Occupational Science and Occupational Therapy. Autistic children experience greater oral health care challenges, which are often associated with heightened responses to sensory input. The dentist's office is filled with potentially overwhelming stimuli such as bright fluorescent lighting, whirring electric hand tools and reclining chairs.

For more information, visit the following link:
https://chan.usc.edu/news/latest/sensory-adapted-dental-rooms-significantly-reduce-autistic-childrens-physiological-and-behavioral-stress-during-teeth-cleanings

Reference
McNulty, M. (Jun 02, 2023). Sensory adapted dental rooms significantly reduce autistic children's physiological and behavioral stress during teeth cleanings. Recovered Jun 02, 2023, University of Southern California:
https://chan.usc.edu/news/latest/sensory-adapted-dental-rooms-significantly-reduce-autistic-childrens-physiological-and-behavioral-stress-during-teeth-cleanings

Information source: (University of Southern California, 2023)

1.2   Turning a circle into a square is possible with this kirigami-inspired formula

A study inspired by the Japanese paper-cutting art provides a blueprint for designing shape-shifting materials and devices. Scientists and engineers have also taken inspiration from kirigami, applying principles from paper-cutting to design robotic grippers, stretchable electronics, water-harvesting sheets, and other shape-shifting materials and devices. For the most part, such inventions are products of from-scratch design. There's been no blueprint for engineers to determine the pattern of cuts that will transform a material from one desired shape to another — that is, until now.
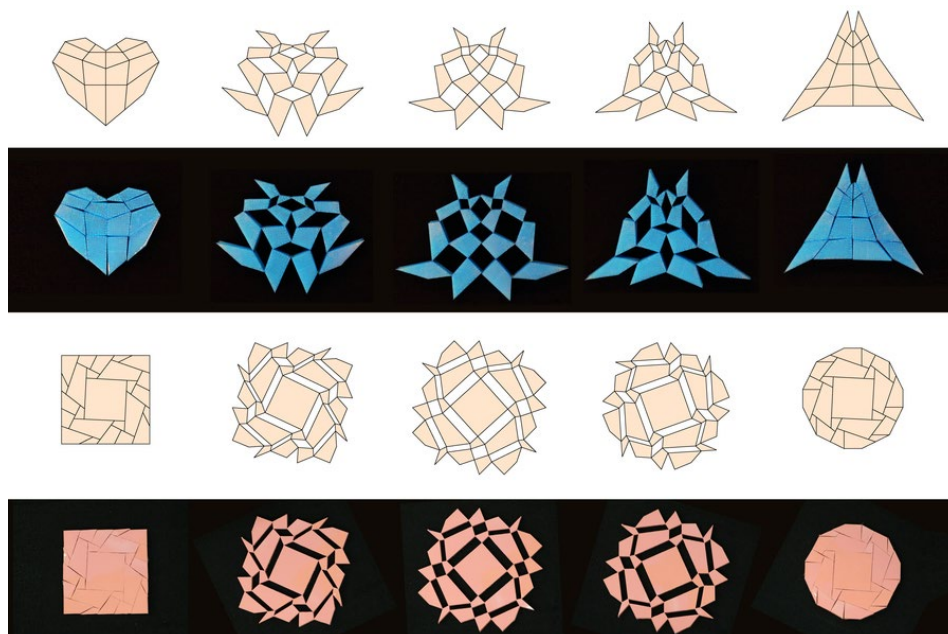
Inspired by the Japanese paper-cutting art of kirigami, MIT researchers developed a computational strategy for transforming virtually any 2D shape into any other 2D shape. The method could be used to solve various engineering challenges, such as designing a robot that can transform from one shape to another to carry out different tasks.
Credit: Massachusetts Institute of Technology

For engineers, the new method could be used to solve various design problems, such as how a robot can be engineered to transform from one shape to another to carry out a particular task or navigate certain spaces. There's also potential to design active materials, for instance as smart coverings for buildings and homes. *"One of the first applications we thought of was building façades,"* says Kaitlyn Becker, an assistant professor of mechanical engineering at MIT. *"This could help us to make large, kirigami-like façades that can transform their shape to control sunlight, ultraviolet radiation, and be adaptive to their environment."*

For more information, visit the following link:
https://news.mit.edu/2023/kirigami-inspired-formula-shape-shifting-materials-0601

Reference

Chu, J. (Jun 01, 2023). Turning a circle into a square is possible with this kirigami-inspired formula. Recovered Jun 02, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/kirigami-inspired-formula-shape-shifting-materials-0601

Information source: (Massachusetts Institute of Technology, 2023)

1.3   Artificial Intelligence can identify patterns in surface cracking to assess damage in reinforced concrete structures

The first step for Bazrafshan and Ebrahimkhanlou's group was to eliminate this uncertainty by creating a method to precisely quantify the extent of cracking. To do it, they employed a mathematical method called graph theory, which is used to measure and study networks — most recently, social networks — by pinpointing its graph features, such as the number of times cracks intersect on average.

Credit: Drexel University

Ebrahimkhanlou originally developed the process for using graph features to create a kind of *"fingerprint"* for each set of cracks in a reinforced concrete structure and — by comparing the prints of newly inspected structures to those of structures with known safety ratings — produce a quick and accurate damage assessment. The team used AI pixel-tracking algorithms to convert images of cracks to their corresponding mathematical representation: a graph.

For more information, visit the following link:
https://drexel.edu/news/archive/2023/June/AI-damage-detection-reinforced-concrete-cracking-patterns

Reference
Faulstick, B. (Jun 01, 2023). Reading between the cracks: Artificial Intelligence can identify patterns in surface cracking to assess damage in reinforced concrete structures. Recovered Jun 02, 2023, Drexel University:

https://drexel.edu/news/archive/2023/June/AI-damage-detection-reinforced-concrete-cracking-patterns

Information source: (Drexel University, 2023)

1.4   Space solar power demonstrator wirelessly transmits power in space

Wireless power transfer was demonstrated by MAPLE, one of three key technologies being tested by the Space Solar Power Demonstrator (SSPD-1), the first space-borne prototype from Caltech's Space Solar Power Project (SSPP). SSPP aims to harvest solar power in space and transmit it to the Earth's surface.
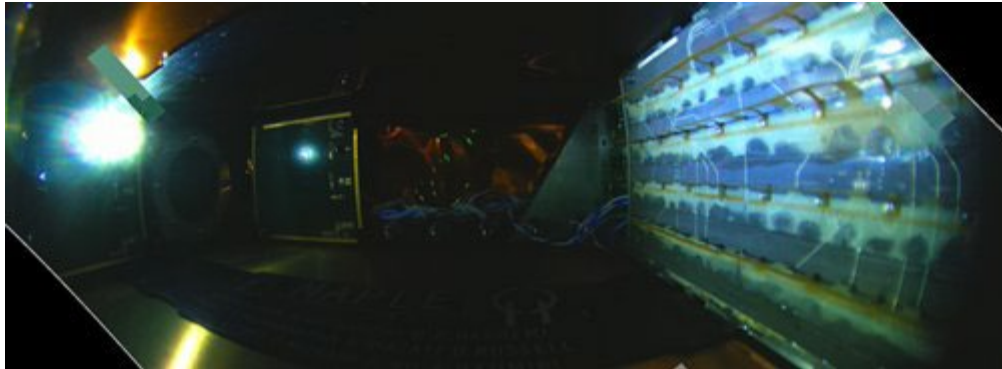

Photo from space of the interior of MAPLE, with the transmission array to the right and the receivers to the left.
Credit: SSPP, California Institute of Technology

MAPLE, short for Microwave Array for Power-transfer Low-orbit Experiment and one of the three key experiments within SSPD-1, consists of an array of flexible lightweight microwave power transmitters driven by custom electronic chips that were built using low-cost silicon technologies. It uses the array of transmitters to beam the energy to desired locations. For SSPP to be feasible, energy transmission arrays will need to be lightweight to minimize the amount of fuel needed to send them to space, flexible so they can fold up into a package that can be transported in a rocket, and a low-cost technology overall.

For more information, visit the following link:
https://www.caltech.edu/about/news/in-a-first-caltechs-space-solar-power-demonstrator-wirelessly-transmits-power-in-space

Reference
California Institute of Technology. (Jun 01, 2023). In a first, Caltech's space solar power demonstrator wirelessly transmits power in space. Recovered Jun 02, 2023, California Institute of Technology: https://www.caltech.edu/about/news/in-a-first-caltechs-space-solar-power-demonstrator-wirelessly-transmits-power-in-space

Information source: (California Institute of Technology, 2023)

1.5   How fiber-optic sensing and new materials could reduce the cost of floating offshore wind

Scientists at the Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) are developing sensing technologies consisting of fiber-optic cables, which could be installed on Floating offshore wind (FOSW) structures that have been planned off the California coast. This would allow structures to self-monitor damaging conditions that could lead to costly repairs and would also help gauge how FOSW impacts marine mammals by detecting their activity.

Shake table tests are used to mimic ocean waves and test turbine stability. They also test the ability of fiber optic sensing to measure the response of the turbines.
Credit: Lawrence Berkeley National Laboratory

In collaboration with experts in materials science, engineering, geophysics, and FOSW developers from around the world, Berkeley Lab scientist Yuxin Wu is now working to develop solutions to reduce the cost of FOSW development and deployment, while minimizing potential environmental impacts.

For more information, visit the following link:
https://newscenter.lbl.gov/2023/06/01/reducing-the-cost-of-floating-offshore-wind/

Reference
Bobyock, J. & Procopiou, C. (Jun 01, 2023). How fiber-optic sensing and new materials could reduce the cost of floating offshore wind. Recovered Jun 05, 2023, Lawrence Berkeley National Laboratory:

https://newscenter.lbl.gov/2023/06/01/reducing-the-cost-of-floating-offshore-wind/

Information source: (Lawrence Berkeley National Laboratory, 2023)

1.6   Language models scalable self-learners

The team discovered that they could improve the model's performance even more by using a technique called *"self-training,"* where the model uses its own predictions to teach itself, effectively learning without human supervision and additional annotated training data.

Credit: Massachusetts Institute of Technology, Computer Science & Artificial Intelligence Laboratory

The self-training method significantly improved performance on a bunch of downstream tasks, including sentiment analysis, question-answering, and news classification. It outperformed both Google's LaMDA and FLAN in zero-shot capabilities, GPT models, and other supervised algorithms. However, one challenge with self-training is that the model can sometimes generate incorrect or noisy labels that harm performance. To overcome this, they developed a new algorithm called *"SimPLE"* (Simple Pseudo-Label Editing), a process to review and modify the pseudo-labels made in initial rounds of learning. By correcting any mislabeled instances, it improved the overall quality of the self-generated labels. This not only made the models more effective at understanding language, but more robust when faced with adversarial data.

For more information, visit the following link:
https://www.csail.mit.edu/news/mit-researchers-make-language-models-scalable-self-learners

Reference
Gordon, R. (Jun 02, 2023). MIT researchers make language models scalable self-learners. Recovered Jun 05, 2023, Massachusetts Institute of Technology Computer Science & Artificial Intelligence Laboratory:

https://www.csail.mit.edu/news/mit-researchers-make-language-models-scalable-self-learners

Information source: (Massachusetts Institute of Technology Computer Science & Artificial Intelligence Laboratory, 2023)

1.7   New *"designer"* titanium alloys made using 3D printing

The new materials belong to an alloy class that has long been the backbone of the titanium industry. They consist of a mixture of two forms of titanium crystals, called alpha-titanium phase and beta-titanium phase, each corresponding to a specific arrangement of atoms.
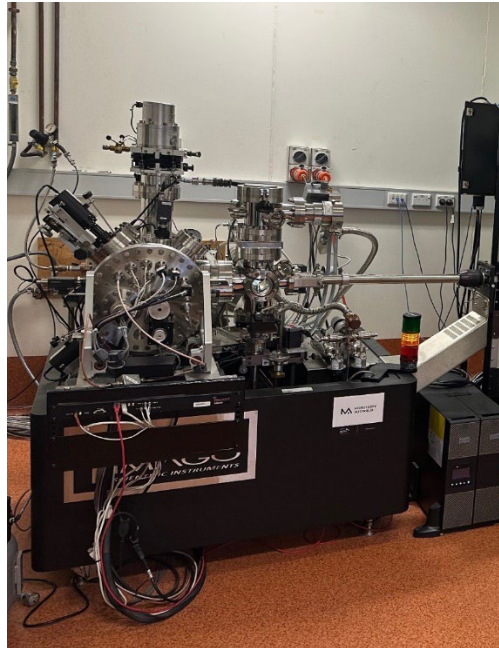
The Sydney Microscopy and Microanalysis atom probe that was used in the research. Credit: University of Sydney Pro-Vice-Chancellor (Research Infrastructure) Professor Simon Ringer. Credit: The University of Sydney

While titanium alloys have traditionally been produced by adding aluminum and titanium, the researchers investigated the use of oxygen and iron – abundant and inexpensive elements that can act as powerful stabilisers and strengtheners of alpha- and beta-titanium phases. *"We've engineered a nanoscale gradient of oxygen in the alpha-titanium phase, featuring high-oxygen segments that are strong, and low-oxygen segments that are ductile (retaining its strength after being moulded into a narrow thread) allowing us to exert control over the local atomic bonding and so mitigate the potential for embrittlement."*

For more information, visit the following link:
https://www.sydney.edu.au/news-opinion/news/2023/06/02/_new--designer--titanium-alloys-made-using-3d-printing.html

Reference
Low, L. (Jun 02, 2023). New *"designer"* titanium alloys made using 3D printing. Recovered Jun 05, 2023, The University of Sydney:
https://www.sydney.edu.au/news-opinion/news/2023/06/02/_new--designer--titanium-alloys-made-using-3d-printing.html

Information source: (The University of Sydney, 2023)

1.8   *Do Chatbot Avatars Prompt Bias in Health Care?*

Chatbots are increasingly becoming a part of health care around the world, but do they encourage bias? That's what University of Colorado School of Medicine researchers are asking as they dig into patients' experiences with the artificial intelligence (AI) programs that simulate conversation.

Credit: The Regents of the University of Colorado

"Sometimes overlooked is what a chatbot looks like – its avatar," the researchers write in a new paper published in Annals of Internal Medicine. *"Current chatbot avatars vary from faceless health system logos to cartoon characters or human-like caricatures. Chatbots could one day be digitized versions of a patient's physician, with that physician's likeness and voice. Far from an innocuous design decision, chatbot avatars raise novel ethical questions about nudging and bias."*

For more information, visit the following link:
https://news.cuanschutz.edu/medicine/do-chatbot-avatars-prompt-bias-in-health-care

Reference
University of Monash. (Jun 05, 2023). Do chatbot avatars prompt bias in health care?. Recovered Jun 05, 2023, The Regents of the University of Colorado: https://news.cuanschutz.edu/medicine/do-chatbot-avatars-prompt-bias-in-health-care

Information source: (The Regents of the University of Colorado, 2023)

1.9   Self-teaching web app improves speed, accuracy of classifying cereal DNA variations

Agricultural Research Service and Washington State University scientists have developed an innovative web app called BRIDGEcereal that can quickly and accurately analyze the vast amount of genomic data now available for cereal crops and organize the material into intuitive charts that identify patterns locating genes of interest.

With the rapid advancements in the field of genomics the past 25 years, a game-changer for crop improvement has emerged referred to as the pan-genome, defined as the assembled genome sequences from multiple varieties within a species. But understanding and enhancing crops based on the huge amount of data that have been generated also has created a challenge for researchers due to the lack of efficient and user-friendly bioinformatic tools, particularly ones designed to handle large volume DNA variations in a species.

For more information, visit the following link:
https://news.wsu.edu/news/2023/06/05/self-teaching-web-app-improves-speed-accuracy-of-classifying-cereal-variety-dna-variations/

Reference
Weybright, S. (Jun 05, 2023). Self-teaching web app improves speed, accuracy of classifying cereal DNA variations. Recovered Jun 05, 2023, Washington State University: https://news.wsu.edu/news/2023/06/05/self-teaching-web-app-improves-speed-accuracy-of-classifying-cereal-variety-dna-variations/

Information source: (Washington State University, 2023)

1.10 Separating language from thought to understand why artificial intelligence chat bots make mistakes

Using linguistic and cognitive approaches, scientists from The University of Texas at Austin, Massachusetts Institute of Technology, and University of California Los Angeles propose an explanation for why Artificial Intelligence programs like ChatGPT, which can produce fluid and coherent sentences, are sometimes prone to errors that human writers are not.

Large language models (LLMs), of which ChatGPT is one, are trained on enormous language datasets and generate text by predicting the word most likely to appear next in a sequence, not unlike the autocomplete function in email and text messaging. The resulting prose often sounds so convincingly human that readers wonder if something akin to human thinking lies behind it. But LLM-produced text also regularly contains bizarre mistakes and falsehoods. In a paper posted to the open-access archive arXiv, the authors argue that the strengths and weaknesses of LLMs can be understood by separating language performance into two aspects: formal and functional linguistic competence.

For more information, visit the following link:
https://liberalarts.utexas.edu/news/separating-language-from-thought-to-understand-why-ai-chat-bots-make-mistakes

Reference
Macknight, L. (Jun 05, 2023). Separating language from thought to understand why AI chat bots make mistakes. Recovered Jun 05, 2023, The University of Texas at Austin: https://liberalarts.utexas.edu/news/separating-language-from-thought-to-understand-why-ai-chat-bots-make-mistakes

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

1.11   Repair, reuse and recycle: dealing with solar panels at the end of their useful life

UNSW solar expert, Dr Richard Corkish from the Australian Centre for Advanced Photovoltaics, based at UNSW Sydney's School of Photovoltaics and Renewable Energy Engineering, says the sustainability principles of 'Reduce, Reuse and Recycle' should be applied to the end-of-life management of all PV modules.

According to a Roy Morgan report, solar energy systems on households have more than doubled since 2018 – now at nearly a third of all households
Credit: Shutterstock, University of New South Wales

For newer models of PV systems, homeowners can track and compare energy output through an online system or mobile app. However, Dr Corkish says some homes are prematurely upgrading their solar systems well before they need to. *"Whilst there's huge potential for reuse of PV modules, the lack of affordable testing to ensure the panels still meet electrical safety standards means many make their way to landfill,"* he says.

For more information, visit the following link:
https://newsroom.unsw.edu.au/news/science-tech/repair-reuse-and-recycle-dealing-solar-panels-end-their-useful-life

Reference
Duong, C. (Jun 05, 2023). Repair, reuse and recycle: dealing with solar panels at the end of their useful life. Recovered Jun 05, 2023, The University of New South Wales: https://newsroom.unsw.edu.au/news/science-tech/repair-reuse-and-recycle-dealing-solar-panels-end-their-useful-life

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

1.12   Swarming microrobots self-organize into diverse patterns

A research collaboration between Cornell and the Max Planck Institute for Intelligent Systems has found an efficient way to expand the collective behavior of swarming microrobots: Mixing different sizes of the micron-scale 'bots enables them to self-organize into diverse patterns that can be manipulated when a magnetic field is applied. The technique even allows the swarm to "cage" passive objects and then expel them.

The approach may help inform how future microrobots could perform targeted drug release in which batches of microrobots transport and release a pharmaceutical product in the human body. The microrobots in this case are 3D-printed polymer discs, each roughly the width of a human hair, that have been sputter-coated with a thin layer of a ferromagnetic material and set in a 1.5-centimeter-wide pool of water. The researchers applied two orthogonal external oscillating magnetic fields and adjusted their amplitude and frequency, causing each microrobot to spin on its center axis and generate its own flows. This movement in turn produced a series of magnetic, hydrodynamic and capillary forces.

For more information, visit the following link:
https://news.cornell.edu/stories/2023/06/swarming-microrobots-self-organize-diverse-patterns

Reference
Nutt, D. (Jun 05, 2023). Swarming microrobots self-organize into diverse patterns. Recovered Jun 06, 2023, Cornell University:
https://news.cornell.edu/stories/2023/06/swarming-microrobots-self-organize-diverse-patterns

Information source: (Cornell University, 2023)

1.13   Slow electrons for more efficient reactions

What the international team of researchers actually set out to do was to detect a mysterious chemical object: a dielectron in solution. A dielectron is made up of two electrons, but unlike an atom, it has no nucleus. Up to now, scientists have been unable to directly detect such an object. While the researchers led by ETH Zurich Professor Ruth Signorell were experimenting with dielectrons, they accidentally discovered a new process for producing slow electrons. These can be used to initiate certain chemical reactions.
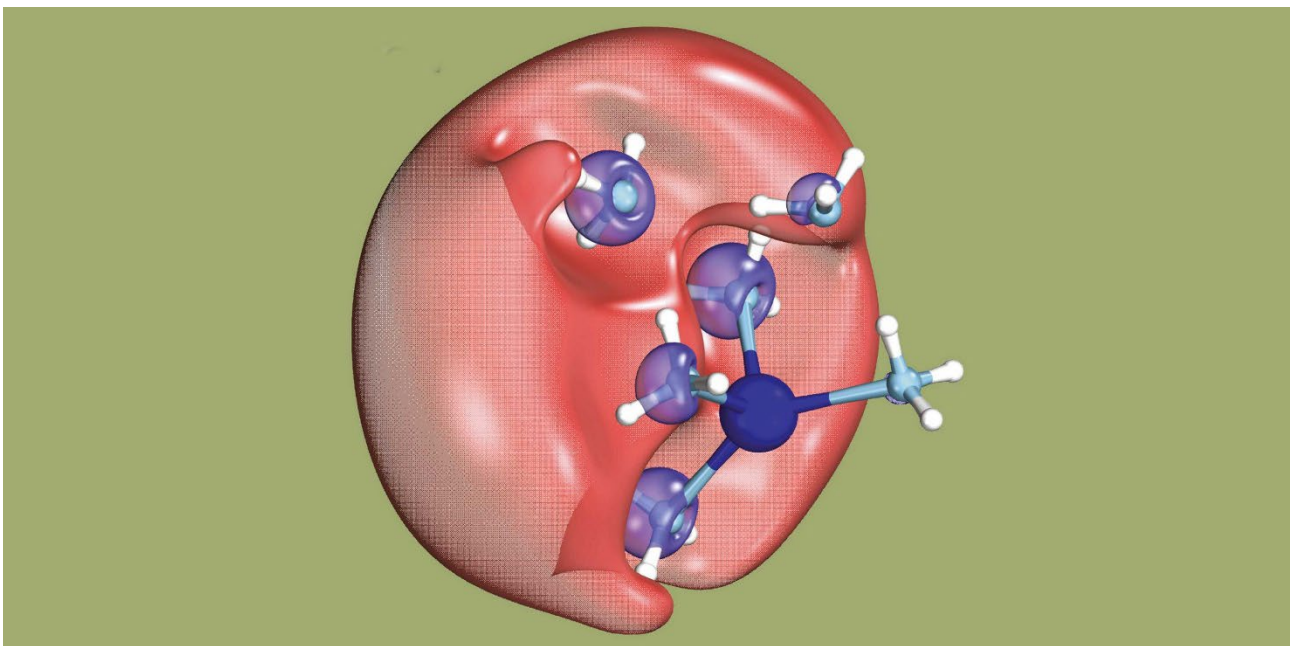
Here, two electrons are briefly united as a dielectron (red) surrounded by solvent molecules. The dielectron can't be localised more precisely. One of the electrons will subsequently leave this area
Credit: Hartweg S et al. Science, Eidgenössische Technische Hochschule Zürich

Dielectrons are unstable. They break apart again into two electrons in less than one-trillionth of a second. As the researchers were able to show, one of these electrons remains in place, while the other – which has low energy and is therefore relatively slow – moves away. What's special about the new method is that it allows the researchers to control the kinetic energy of this electron and thus its speed.

For more information, visit the following link:
https://ethz.ch/en/news-and-events/eth-news/news/2023/06/slow-electrons-for-more-efficient-reactions.html

Reference
Bergamin, F. (Jun 05, 2023). Slow electrons for more efficient reactions. Recovered Jun 06, 2023, Eidgenössische Technische Hochschule Zürich:

https://ethz.ch/en/news-and-events/eth-news/news/2023/06/slow-electrons-for-more-efficient-reactions.html

Information source: (Eidgenössische Technische Hochschule Zürich, 2023)

1.14   Robot *"chef"* learns to recreate recipes from watching food videos

The researchers, from the University of Cambridge, programmed their robotic chef with a "cookbook" of eight simple salad recipes. After watching a video of a human demonstrating one of the recipes, the robot was able to identify which recipe was being prepared and make it.

Using computer vision techniques, the robot analysed each frame of video and was able to identify the different objects and features, such as a knife and the ingredients, as well as the human demonstrator's arms, hands and face. Both the recipes and the videos were converted to vectors and the robot performed mathematical operations on the vectors to determine the similarity between a demonstration and a vector. By correctly identifying the ingredients and the actions of the human chef, the robot could determine which of the recipes was being prepared. The robot could infer that if the human demonstrator was holding a knife in one hand and a carrot in the other, the carrot would then get chopped up. Of the 16 videos it watched, the robot recognised the correct recipe 93% of the time, even though it only detected 83% of the human chef's actions. The robot was also able to detect that slight variations in a recipe, such as making a double portion or normal human error, were variations and not a new recipe. The robot also correctly recognised the demonstration of a new, ninth salad, added it to its cookbook and made it.

For more information, visit the following link:
https://www.cam.ac.uk/research/news/robot-chef-learns-to-recreate-recipes-from-watching-food-videos

Reference
Collins, S. (Jun 05, 2023). Robot *"chef"* learns to recreate recipes from watching food videos. Recovered Jun 06, 2023, University of Cambridge: https://www.cam.ac.uk/research/news/robot-chef-learns-to-recreate-recipes-from-watching-food-videos

Information source: (University of Cambridge, 2023)

1.15   Computational model mimics humans' ability to predict emotions

MIT neuroscientists have now designed a computational model that can predict other people's emotions — including joy, gratitude, confusion, regret, and embarrassment — approximating human observers' social intelligence. The model was designed to predict the emotions of people involved in a situation based on the prisoner's dilemma, a classic game theory scenario in which two people must decide whether to cooperate with their partner or betray them.
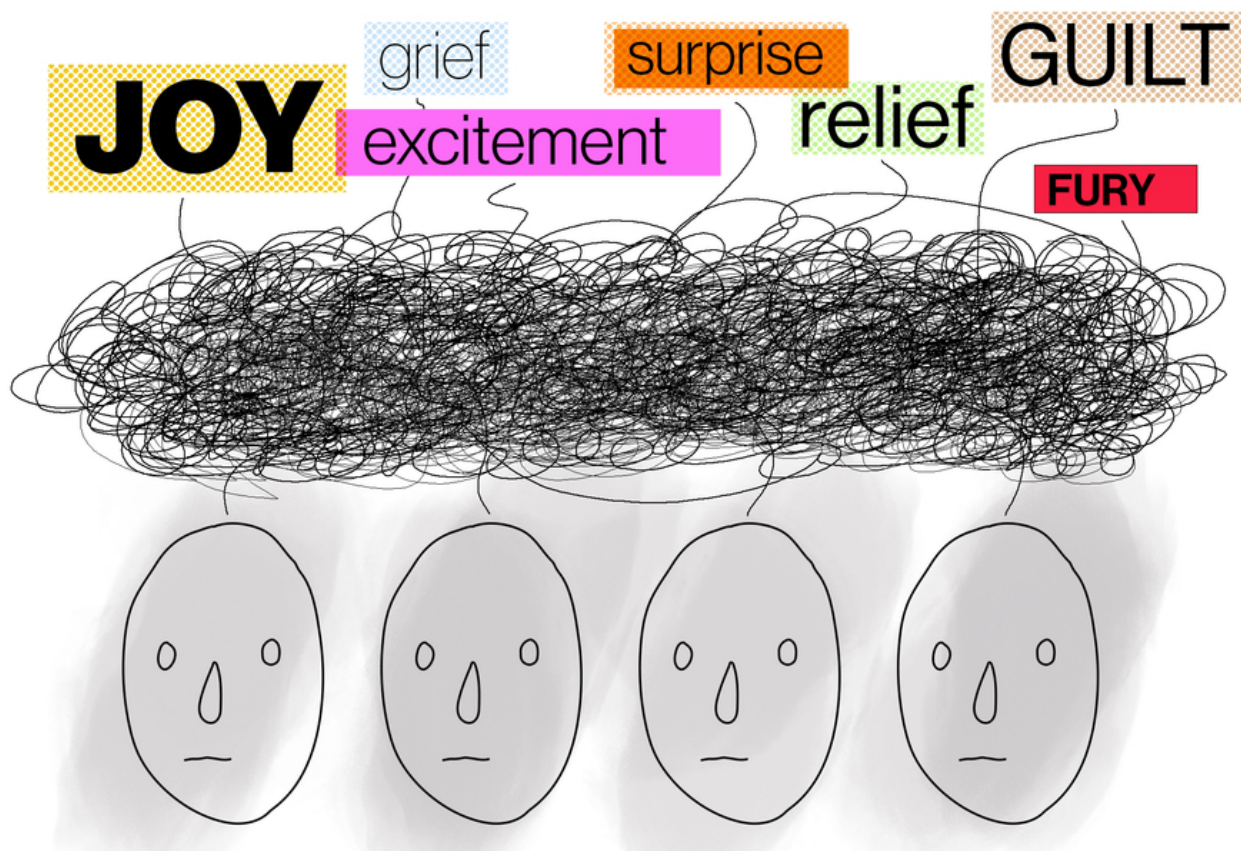
While a great deal of research has gone into training computer models to infer someone's emotional state based on their facial expression, that is not the most important aspect of human emotional intelligence, says MIT Professor Rebecca Saxe. Much more important is the ability to predict someone's emotional response to events before they occur.
Credit: Massachusetts Institute of Technology

The model's success stems from its incorporation of key factors that the human brain also uses when predicting how someone else will react to a given situation, Saxe says, a member of MIT's McGovern Institute for Brain Research. Those include computations of how a person will evaluate and emotionally react to a situation, based on their desires and expectations, which relate to not only material gain but also how they are viewed by others.

For more information, visit the following link:

https://news.mit.edu/2023/computational-model-mimics-ability-predict-emotions-0605

Reference

Trafton, A. (Jun 05, 2023). Computational model mimics humans' ability to predict emotions. Recovered Jun 06, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/computational-model-mimics-ability-predict-emotions-0605

Information source: (Massachusetts Institute of Technology, 2023)

1.16   Artificial Intelligence for discovering where and how nanoparticles bind with proteins

Identifying whether and how a nanoparticle and protein will bind with one another is an important step toward being able to design antibiotics and antivirals on demand, and a computer model developed at the University of Michigan can do it. The new tool could help find ways to stop antibiotic-resistant infections and new viruses—and aid in the design of nanoparticles for different purposes.
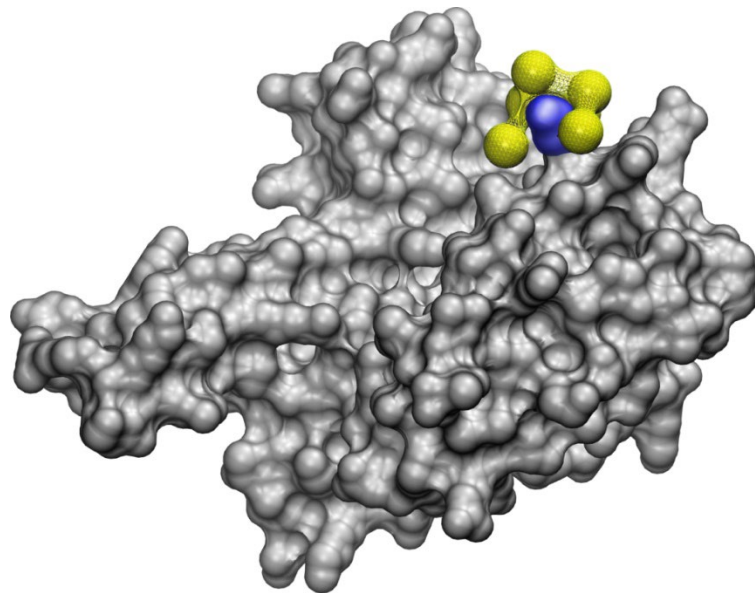
The new computer model, NeCLAS, predicts that a nanoparticle, shown as a set of yellow balls attached by netting, fits neatly around a very specific protrusion on a protein, marked in blue.
Credit: University of Michigan

The new model, named NeCLAS, uses machine learning—the AI technique that powers the virtual assistant on your smartphone and ChatGPT. But instead of learning to process language, it absorbs structural models of proteins and their known interaction sites. From this information, it learns to extrapolate how proteins and nanoparticles might interact, predict binding sites and the likelihood of binding between them—as well as predicting interactions between two proteins or two nanoparticles.

For more information, visit the following link:
https://news.umich.edu/nanobiotics-ai-for-discovering-where-and-how-nanoparticles-bind-with-proteins/

Reference
McAlpine, K. (Jun 05, 2023). Nanobiotics: AI for discovering where and how nanoparticles bind with proteins. Recovered Jun 06, 2023, University of Michigan: https://news.umich.edu/nanobiotics-ai-for-discovering-where-and-how-nanoparticles-bind-with-proteins/

Information source: (University of Michigan, 2023)

1.17   Shedding light on the complex flow dynamics within the small intestine

A novel microfluidic device revealing diverse and dynamic flows in the small intestine has now been developed by scientists from Tokyo Tech. Their innovative experimental platform uses microscopic fluorescent beads as substitutes for gut bacteria in dissected small intestine sections, allowing one to visualize and quantitatively analyze the luminal dynamic flow in the tissues deformed by a pneumatic actuator. The scientists tracked individual beads, both manually and with the help of specialized software that enabled them to conduct detailed quantitative analysis of the velocity and trajectory of the particles.
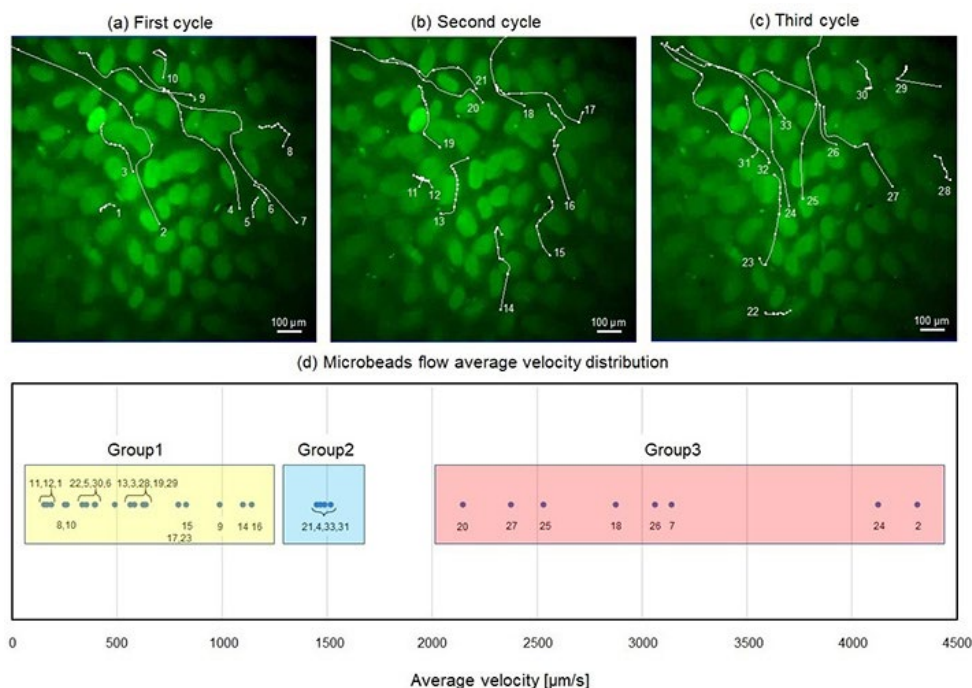
Quantitative analysis of the movement of fluorescent microbeads observed via the proposed microfluidic device
Tracking the movement of individual microbeads allows the identification of various types of unique flow around the villi.
Credit: Tokyo Institute of Technology

With this approach, the team was able to identify various types of unique flow behaviors around the villi and observe the possible underlying mechanisms that give rise to them. *"Our results suggest that the diverse flows observed in the SI for transportation, retention, and mixture are generated by its non-uniform shape and dynamic deformation,"* highlights Dr. Ishida, lead of this study. *"For future studies, our analytical demonstration could serve as a cue for investigating the relationships between some unique subsets of intestinal cells or tight junctions and gut bacteria."*

For more information, visit the following link:
https://www.titech.ac.jp/english/news/2023/066851

Reference
Tokyo Institute of Technology (Jun 05, 2023). Shedding light on the complex flow dynamics within the small intestine. Recovered Jun 06, 2023, Tokyo Institute of Technology:

https://www.titech.ac.jp/english/news/2023/066851

Information source: (Tokyo Institute of Technology, 2023)

1.18 ChatGPT candidate performs well in obstetrics and gynaecology clinical examination, compared to human candidates

In a study to determine how the Chat Generative Pre-Trained Transformer or ChatGPT would fare in medical specialist examinations compared to human candidates without additional training, the Artificial Intelligence chatbot performed better than human candidates in a mock Obstetrics and Gynaecology (O&G) specialist clinical examination, used to assess the eligibility of individuals to become O&G specialists. The results from the mock clinical examination detailed that ChatGPT also achieved high scores in empathetic communication, information-gathering and clinical reasoning.

Credit: Tapati, National University of Singapore

ChatGPT was found to outperform human candidates in several knowledge areas, including labour management, gynecologic oncology and postoperative care, topics or stations that largely focused on standard protocol-driven decision-making, but not in highly contextual situations.

For more information, visit the following link:
https://medicine.nus.edu.sg/news/chatgpt-candidate-performs-well-in-obstetrics-and-gynaecology-clinical-examination-compared-to-human-candidates/

Reference
National University of Singapore. (Jun 08, 2023). ChatGPT candidate performs well in obstetrics and gynaecology clinical examination, compared to human candidates. Recovered Jun 08, 2023, National University of Singapore:

https://medicine.nus.edu.sg/news/chatgpt-candidate-performs-well-in-obstetrics-and-gynaecology-clinical-examination-compared-to-human-candidates/

Information source: (National University of Singapore, 2023)

1.19   Turning up the heat

Oak Ridge National Laboratory scientists found that a small tweak created big performance improvements in a type of solid-state battery, a technology considered vital to broader electric vehicle adoption. These batteries use a solid electrolyte instead of a potentially flammable liquid. When the battery charges or operates, ions move between electrodes through the electrolyte between them. A new method for pressing the solid electrolyte practically eliminates tiny air pockets that block ion flow, so the battery charges twice as fast.
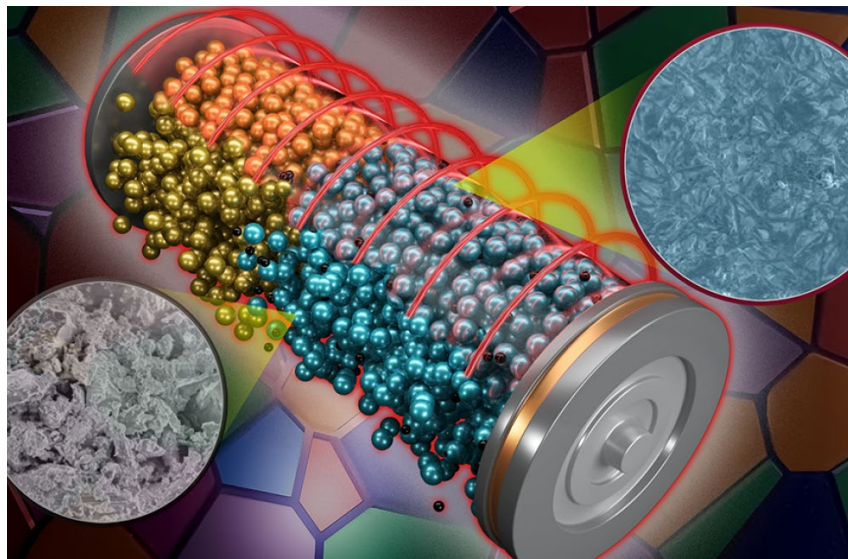
ORNL researchers developed new pressing method, shown as a blue circle on the right, that produces a more uniform solid electrolyte than traditionally processed material with more voids, shown as a gray circle on the left.
Credit: Oak Ridge National Laboratory

ORNL lead researcher Marm Dixit said the approach involved heating the press after spreading the electrolyte on it, then letting the electrolyte cool under pressure. The resulting material was almost 1,000 times more conductive. *"It's the same material — you're just changing how you make it, while improving the battery performance on a number of fronts,"* Dixit said.

For more information, visit the following link:
https://www.ornl.gov/news/turning-heat

Reference
Duncan, H. (Jun 06, 2023). Turning up the heat. Recovered Jun 06, 2023, Oak Ridge National Laboratory: https://www.ornl.gov/news/turning-heat

Information source: (Oak Ridge National Laboratory, 2023)

1.20 Great progress in the study of super-elastic molecular-based single crystal materials by BIT team

Since its first discovery in 2014, organic super elastic-ferrous deformation single crystals with martensitic-like phase transformation properties have attracted a lot of interest from researchers. Theses crystals' unique mechanical properties make them promising for use in intelligent drive, information sensing, flexible electronics and other fields.
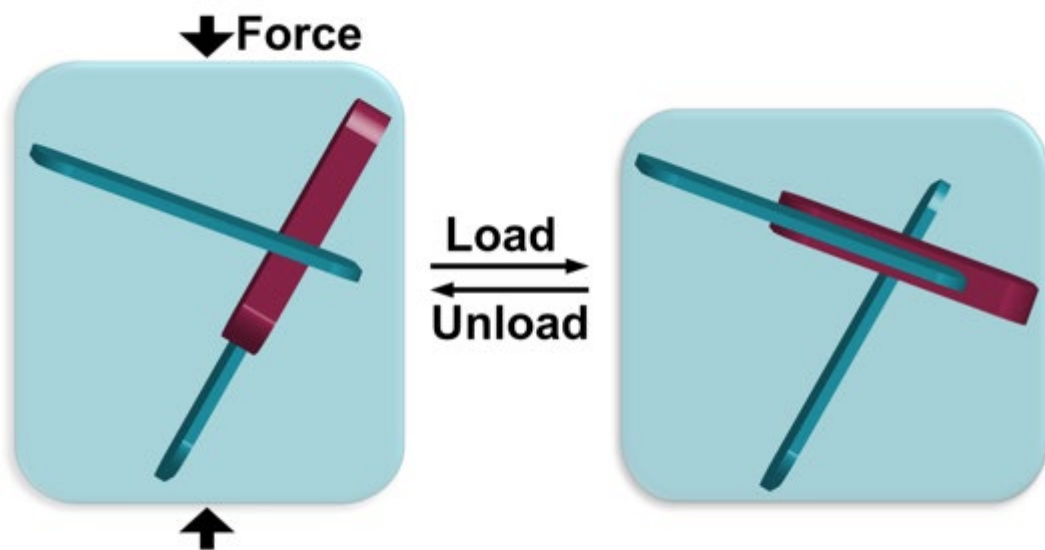
Rotation of molecular rotors in a hydrogen-bonded organic trimer due to external forces
Credit: Angew. Chem. Int. Ed., Beijing Institute of Technology

Compared to traditional martensite alloy or ceramic materials, molecular-based single crystal materials are lightweight, transparent and highly modifiable. As a result, they have innate advantages in optical regulation. How to realize the superelastic properties of single crystal materials through effective molecular design and further explore their unique technical application is the key problem to solve in further development of single crystal materials.

For more information, visit the following link:
https://english.bit.edu.cn/news2020/focus/c5602a40e92044b4b80a8d7dcad7c16d.htm

Reference
Lin, Z. (Jun 06, 2023). Great progress in the study of super-elastic molecular-based single crystal materials by BIT team. Recovered Jun 06, 2023, Beijing Institute of Technology: https://english.bit.edu.cn/news2020/focus/c5602a40e92044b4b80a8d7dcad7c16d.htm

Information source: (Beijing Institute of Technology, 2023)

2   PATENTS

2.1   Skin-like stretchable neuromorphic devices for artificial intelligence applications

This disclosure generally relates to neuromorphic computing devices, systems, and platforms for artificial intelligence applications. Specifically, the disclosed platform is stretchable, and devices fabricated based on such a platform can thus be configured to adhere to human skin conformably even in areas of the skin that frequently stretch, bend, or otherwise deform.
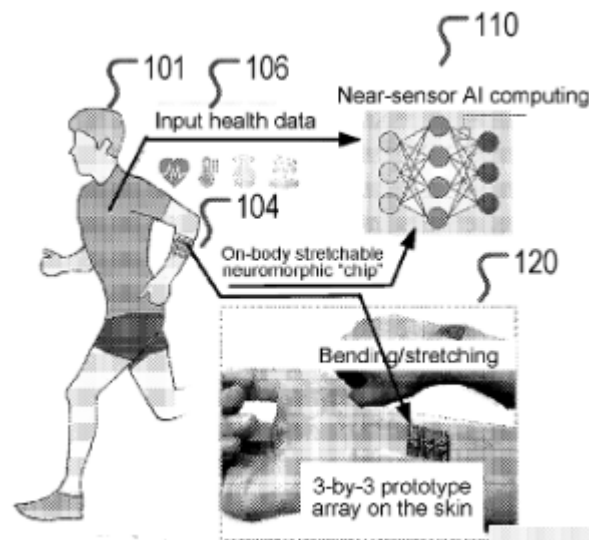
Illustrates an example skin-like wearable device containing an artificial neural network (ANN) implemented using neuromorphic computation principles and trained for on-skin health monitoring.
Credit: Wang, S.; Dai, Y. & Dai, S., WIPO IP Portal

The devices may be integrated to form a wearable and stretchable artificial neural network (ANN) circuit for performing predictive health monitoring and other functions. For example, each neuron of the ANN may be based on a neuromorphic organic-electrochemical-transistor (OECT) structure and each OECT structure may be based on a redox-active electrochemical cell. The ANN can be trained and updated as the device is being worn on human body. The electronic characteristics relevant the neuromorphic computation of the ANN may be minimally impacted by repeated stretching of the device.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023096837&_cid=P10-LIKTSE-29596-1

Reference

Wang, S.; Dai, Y. & Dai, S. (Jun 01, 2023). Skin-like stretchable neuromorphic devices for artificial intelligence applications. Recovered Jun 01, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023096837&_cid=P10-LIKTSE-29596-1

Information source: (WIPO IP Portal, 2023)

2.2   Artificial Intelligence-based shopping mall purchase prediction device

An artificial intelligence-based shopping mall purchase prediction device includes a memory and a processor electrically coupled to the memory.
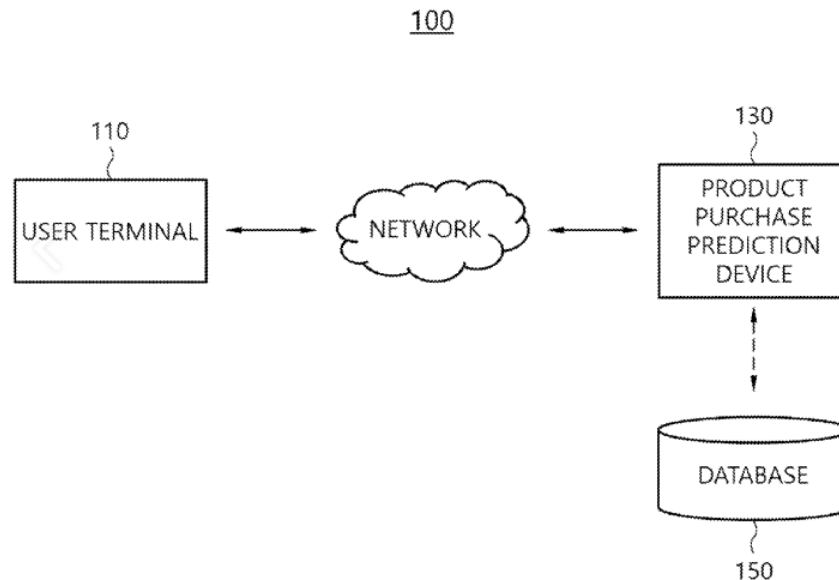
Is a diagram for describing a configuration of a product purchase prediction system according to the present disclosure.
Credit: Jeong, H., WIPO IP Portal

The processor collects product purchase data of a user object to build a data warehouse, adds a lifestyle characteristic to the data warehouse, builds a first characteristic data population, applies a statistical criterion to the first characteristic data population to determine at least one predictive independent variable among the characteristics of the product purchase data, builds a second characteristic data population, calculates a product purchase prediction degree by independently applying a plurality of artificial intelligence algorithms that apply a relatively high weight to the at least one predictive independent variable based on the second characteristic data population, and determines a product purchase prediction model associated with a highest product purchase prediction degree as an optimization model for the at least one predictive independent variable.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398808549&_cid=P10-LIKTSE-29596-2

Reference
Jeong, H. (Jun 01, 2023). Artificial Intelligence-based shopping mall purchase prediction device. Recovered Jun 01, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398808549&_cid=P10-LIKTSE-29596-2

Information source: (WIPO IP Portal, 2023)

2.3   Creating and managing private electronic currency

Methods and systems are disclosed for transactions with a private digital currency. The private e-currency may be backed by a financial institution, managed using a blockchain, and only available for transactions with members of a network associated with the financial institution.
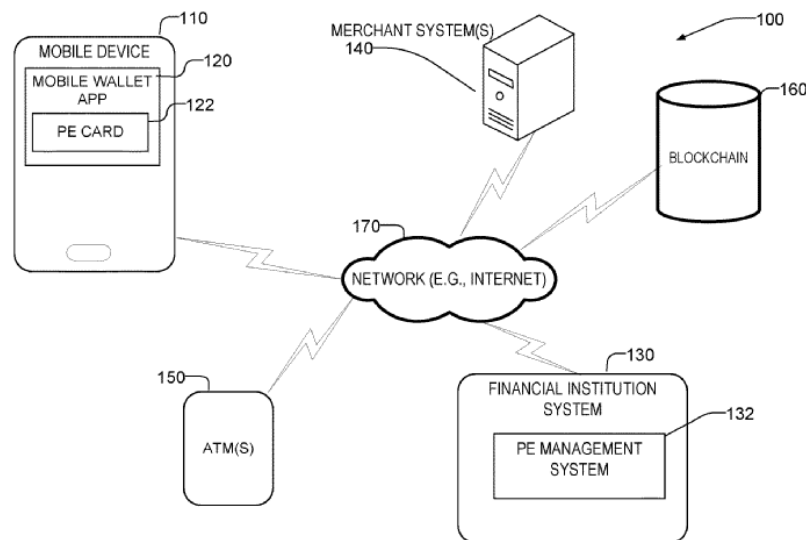
Is a diagram showing one example of an environment for a mobile wallet application.
Credit: Maeng, J., WIPO IP Portal

The members may include mobile wallets, merchants and ATM's. A mobile wallet may register with the network and receive an amount of the private e-currency from the financial institution. The mobile wallet may establish a connection with a payment recipient such as another wallet, an ATM or a merchant, and receive a payee address. The mobile wallet may send a transaction request to the blockchain for payment to the payee address of a payment amount of the private e-currency, so that the payment recipient can, using a blockchain, confirm or deny the transaction request.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398551025&_cid=P22-LITCF7-56415-6

Reference
Maeng, J. (Jun 01, 2023). Creating and managing private electronic currency. Recovered Jun 01, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398551025&_cid=P22-LITCF7-56415-6

Information source: (WIPO IP Portal, 2023)

2.4   Autonomous robotic system for collecting products

The present invention relates to a method of operation and autonomous robotic system for remotely collecting products in stores. The system includes a mobile robot (1), and navigation, product recognition and multi-objective planning systems. The mobile robot (1) comprises vision sensors to obtain image and distance information, a mobile base (2), and an actuator (3) or robotic arm arranged on the mobile base and which can perform movements in height, depth and rotation to handle and move products from store shelves to a temporary storage area (4).
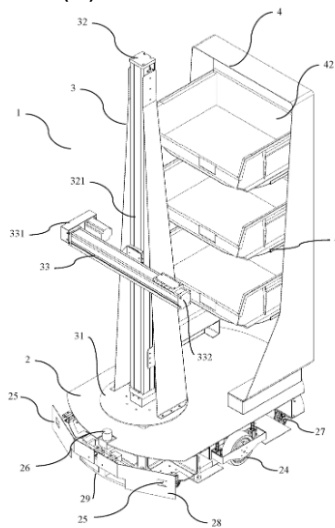
Shows a perspective view of a mobile robot according to a first embodiment of the invention.
Credit: Soto, A.; Eyzaguirre, J.; De Vicente, J. & Calabi, D., WIPO IP Portal

Said actuator (3) comprises an end effector (34) with at least two suction cups of different sizes and having rotational and tilting movements about a vertical axis. The product recognition system comprises identification algorithms configured to recognise, based on the vision information, object shapes corresponding to an external shape, and to read logos or texts on the products to identify the products, obtaining location and distance information about the identified products. The main objective of the invention is to provide a mobile robot capable of collecting and handling items or products of different shapes and sizes, without requiring operator intervention or replacement of the tools used.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023092244&_cid=P10-LIKVNM-47964-1

Reference
Soto, A.; Eyzaguirre, J.; De Vicente, J. & Calabi, D. (Jun 01, 2023). Devices and methods for obtaining dimensions and features of an object. Recovered Jun 01, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023092244&_cid=P10-LIKVNM-47964-1

Information source: (WIPO IP Portal, 2023)

2.5   Orthodontic aligner manufacturing and quality assessment system

Implementations describe systems and methods for manufacturing and performing quality assessment of dental appliances. In one embodiment, a method of manufacturing a dental appliance comprises receiving, at a holder, a feature of the dental appliance, the feature comprising a first surface having a first shape, wherein the holder holds the feature of the dental appliance at a reference position.
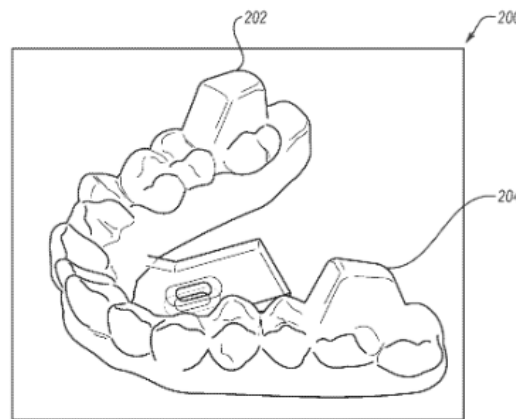
Illustrates a perspective view of a mold for a dental appliance.
Credit: Nishimuta, J.; Soltero, E.; Guzman, E.; Sato, J.; Rodriguez, K.; Blanco, J.; Enriquez, E.; Pickens, L.; Wong, W; Perez, G.; Garcia, C.; Barraza, O.; Hurtado, M. & Turner, D., WIPO IP Portal

The method further includes automatically placing an object against the feature at the reference position using a robot arm, wherein the object comprises a second surface having a second shape that mates with the first shape. The method further includes applying pressure to press the object against the feature of the dental appliance and bonding the object to the feature of the dental appliance while applying the pressure.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023096876&_cid=P10-LILQH3-34704-9

Reference
Nishimuta, J.; Soltero, E.; Guzman, E.; Sato, J.; Rodriguez, K.; Blanco, J.; Enriquez, E.; Pickens, L.; Wong, W; Perez, G.; Garcia, C.; Barraza, O.; Hurtado, M. & Turner, D. (Jun 01, 2023). Orthodontic aligner manufacturing and quality assessment system. Recovered Jun 01, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023096876&_cid=P10-LILQH3-34704-9

Information source: (WIPO IP Portal, 2023)

2.6   An adaptive disease prediction system in an Artificial Intelligence symptom-checker

The present invention provides solution to the above-mentioned problem in the art by providing a system and a method for an efficient and adaptive disease prediction system as a part of an expert-based online AI symptom-checker. The system may diagnose a wide variety of diseases accurately in an under 3-minute chatbot based conversation.
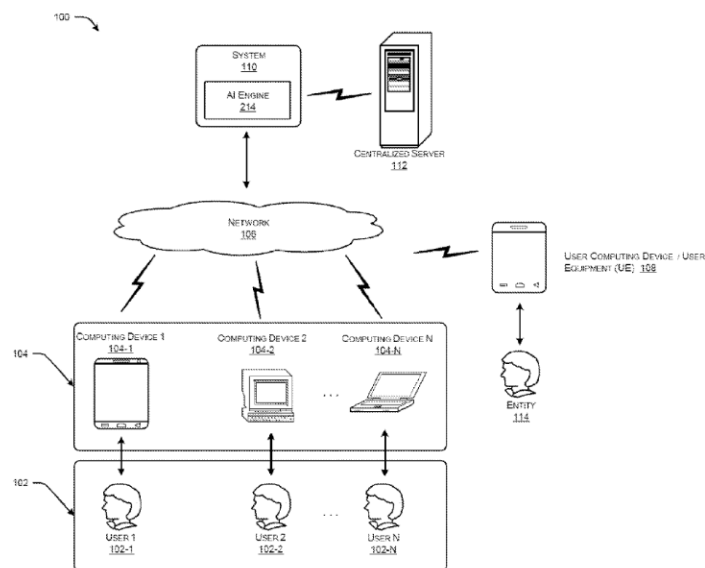
Illustrates an exemplary network architecture in which or with which the system of the present disclosure can be implemented, in accordance with an embodiment of the present disclosure. Credit: Bhatt, C.; Kumar, S.; Verma, A.; Tadepalli, K.; Shah, R.; Chittala, V.; Kumar, H. & Yogendra, N., Espacenet Patent Search

The system architecture comprises of state-based components namely dialogue, patient, utterance, disease and symptom state. The disease prediction module may use a complex knowledge graph coupled with the state information to predict disease scores, predict disease scores based on various factors such as symptom coverage, relative disease importance, diseases priors, risk factors, lab tests, body organs and body systems and further provide mechanisms to arrive at a convergence based on factors such as confidence scores, questions asked and the like.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086538942/publication/WO2023095069A1?q=artificial%20intelligence

Reference
Bhatt, C.; Kumar, S.; Verma, A.; Tadepalli, K.; Shah, R.; Chittala, V.; Kumar, H. & Yogendra, N. (Jun 01, 2023). An adaptive disease prediction system in an AI symptom-checker. Recovered Jun 01, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086538942/publication/WO2023095069A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.7   Method of robotic hub communication, detection, and control

Various surgical systems are disclosed. A surgical system can include a surgical robot and a surgical hub. The surgical robot can include a control unit in signal communication with a control console and a robotic tool.
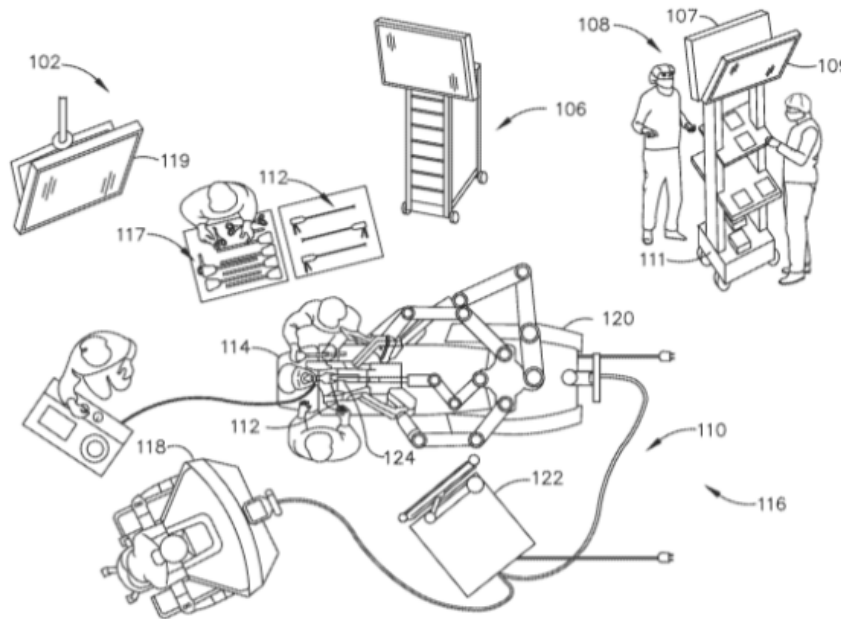
Is a surgical system being used to perform a surgical procedure in an operating room, in accordance with at least one aspect of the present disclosure.
Credit: Shelton IV, F.; Morgan, J.; Harris, J.; Yates, D., Espacenet Patent Search

The surgical hub can include a display. The surgical hub can be in signal communication with the control unit. A facility can include a plurality of surgical hubs that communicate data from the surgical robots to a primary server. To alleviate bandwidth competition among the surgical hubs, the surgical hubs can include prioritization protocols for collecting, storing, and/or communicating data to the primary server.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086499641/publication/US202317 1304A1?q=robot

Reference
Shelton IV, F.; Morgan, J.; Harris, J.; Yates, D. (Jun 01, 2023). Method of robotic hub communication, detection, and control. Recovered Jun 01, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086499641/publication/US20231 71304A1?q=robot

Information source: (Espacenet Patent Search, 2023)

2.8 Device, system, and method for electronic access control to reunify persons

A device, system, and method for electronic access control to reunify persons is provided. A device determines, using electronic data, a modality of an incident associated with a premises.
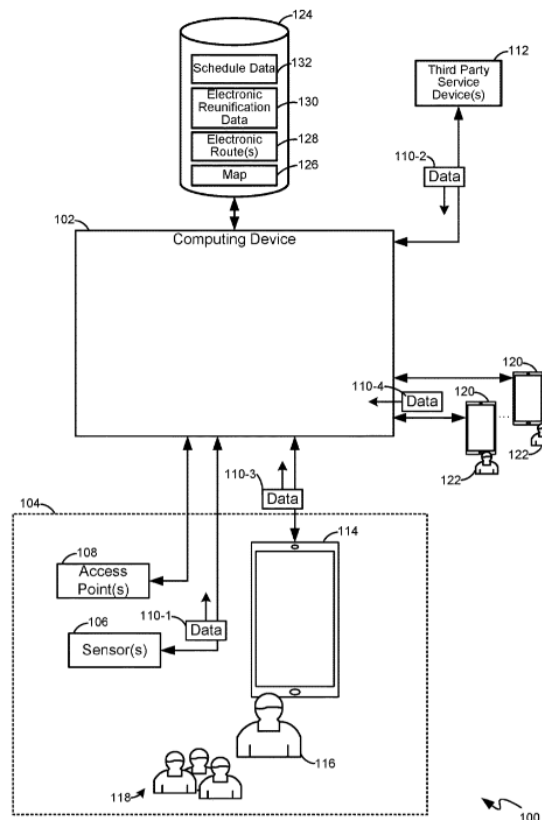
Is a system for electronic access control to reunify persons, in accordance with some examples.
Credit: Schuler, F.; Stowell, J. & Grant, K., Espacenet Patent Search

The device determines: one or more routes associated with the premises and the modality; and electronic reunification data associated with the modality, the electronic reunification data defining one or more first persons and one or more second persons that are to meet in association with the incident and in accordance with the one or more routes. The device controls access points at the premises, along the one or more routes, to one or more of unlock, lock, open, or close. The device transmits one or more notifications to one or more communication devices, indicative of the electronic reunification data.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086384466/publication/US2023160222A1?q=3d

Reference

Schuler, F.; Stowell, J. & Grant, K. (Jun 01, 2023). Device, system, and method for electronic access control to reunify persons. Recovered Jun 02, 2023, Espacenet Patent Search: https://worldwide.espacenet.com/patent/search/family/086384466/publication/US2023160222A1?q=3d

Information source: (Espacenet Patent Search, 2023)

2.9   Face mask and method of producing a face mask

A face mask for filtering airborne particles having a cover portion configured to be positioned in use over the nose, the mouth and a chin area of the face of a wearer. At least one aperture extends through the cover portion such that air can flow through the cover portion via the aperture.
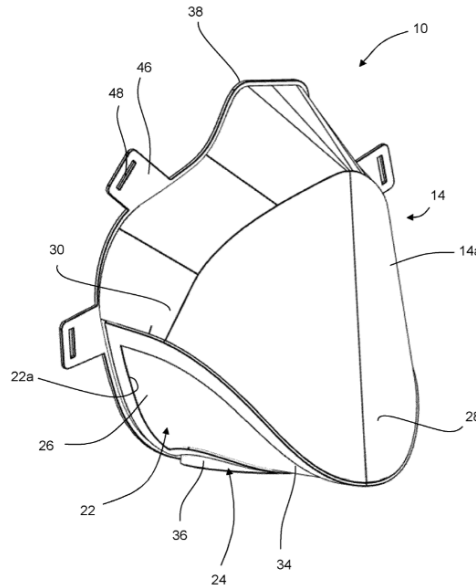
Is an isometric view of a face mask according to an embodiment of the present teachings.
Credit: Cowey, B., Espacenet Patent Search

The face mask includes a seal for sealing around the nose, mouth and chin area. The face mask also includes a filter or filters arranged over the or each aperture, the or each filter configured to filter air. The cover portion is of a substantially transparent material, such that the face of the wearer is substantially visible through the cover portion. The or each filter is arranged on the cover portion such that the mouth of the wearer is substantially visible through the cover portion from an anterior view and from a lateral view of the face.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/078822004/publication/EP4190406A1?q=3d

Reference
Cowey, B. (Jun 01, 2023). Face mask and method of producing a face mask. Recovered Jun 02, 2023, Espacenet Patent Search:
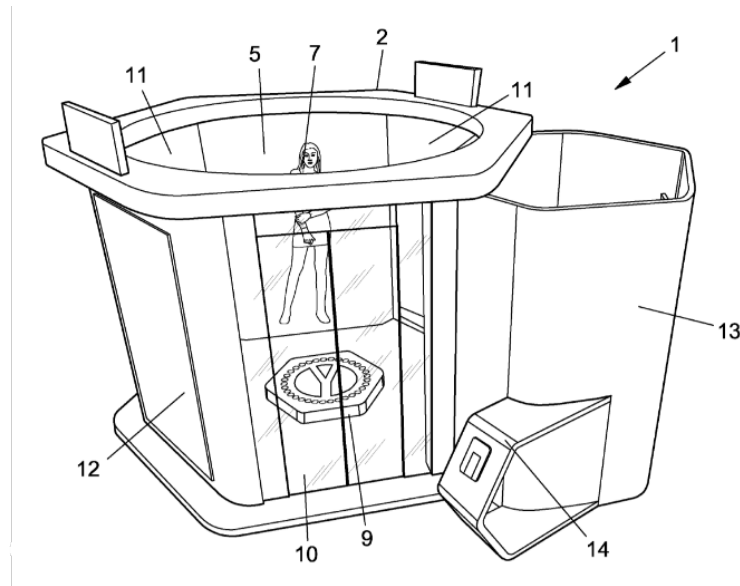https://worldwide.espacenet.com/patent/search/family/078822004/publication/EP4190406A1?q=3d

Information source: (Espacenet Patent Search, 2023)

2.10   System for selling goods through e-commerce in a mobile physical environment

A system for selling goods through e-commerce in a mobile physical environment.

Shows the system for selling goods through e-commerce in a mobile physical environment as a whole according to a first embodiment of the invention.
Credit: Maiello, M, Espacenet Patent Search

Comprising a transportable module including a changing booth delimiting an entertainment area of a user, a platform indicating a correct position of the user inside the booth, a television camera configured to film said user on said platform, a digital mirror, augmented reality software configured to create a three-dimensional virtual representation of the user filmed on said platform by said television camera, hang at least one virtual element onto him/her and project in real time onto said digital mirror said virtual representation with said at least one virtual element hung onto it.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/080225563/publication/WO2023094578A1?q=virtual%20reality

Reference
Maiello, M. (Jun 01, 2023). System for selling goods through e-commerce in a mobile physical environment. Recovered Jun 02, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/080225563/publication/WO2023094578A1?q=virtual%20reality

Information source: (Espacenet Patent Search, 2023)