Weekly Newsletter

TECHNOLOGY SURVEILLANCE

N° 22-2023   JUN 02TH, 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   Research shows that parents of children with autism and other developmental disabilities experience increased level of stress

Parenting is tough, and research shows that parents of children with autism and other developmental disabilities may experience increased levels of stress. *"Parents often have challenges related to the child's challenges with self-regulation, social and communication skills,"* explained Abirami Duraiswamy, a patient navigator at the UC Davis MIND Institute. Duraiswamy is also a co-facilitator for *"GET MINDFUL,"* a MIND Institute online self-care and support group for parents of autistic children and those with other developmental disabilities.

Credit: University of California - Davis Health

"We as parents also have the responsibility of advocacy. Navigating the service system is probably one of the most difficult things parents face in their lifetimes," Duraiswamy added. She notes that all of this makes self-care, self-compassion and support especially important for parents. A regular mindfulness practice is one way to build resilience.

For more information, visit the following link:
https://health.ucdavis.edu/news/headlines/everyday-mindfulness-for-self-care-tips-for-parents/2023/05

Reference
Russ, M. (May 25, 2023). Everyday mindfulness for self-care: Tips for parents. Recovered May 25, 2023, University of California - Davis Health:

https://health.ucdavis.edu/news/headlines/everyday-mindfulness-for-self-care-tips-for-parents/2023/05

Information source: (University of California - Davis Health, 2023)

1.2 Using an Artificial Intelligence algorithm, a new antibiotic that fights drug-resistant infections is obtained

Using an artificial intelligence algorithm, researchers at MIT and McMaster University have identified a new antibiotic that can kill a type of bacteria that is responsible for many drug-resistant infections.

Using an artificial intelligence algorithm, researchers at MIT and McMaster University have identified a new antibiotic that can kill a type of bacteria (Acinetobacter baumannii, pink) that is responsible for many drug-resistant infections.
Credit: Christine Daniloff, Massachusetts Institute of Technology

If developed for use in patients, the drug could help to combat Acinetobacter baumannii, a species of bacteria that is often found in hospitals and can lead to pneumonia, meningitis, and other serious infections. The microbe is also a leading cause of infections in wounded soldiers in Iraq and Afghanistan. *"Acinetobacter can survive on hospital doorknobs and equipment for long periods of time, and it can take up antibiotic resistance genes from its environment. It's really common now to find A. baumannii isolates that are resistant to nearly every antibiotic,"* says Jonathan Stokes, a former MIT postdoc who is now an assistant professor of biochemistry and biomedical sciences at McMaster University.

For more information, visit the following link:
https://news.mit.edu/2023/using-ai-scientists-combat-drug-resistant-infections-0525

Reference
Trafton, A. (May 25, 2023). Toward more flexible and rapid prototyping of electronic devices. Recovered May 25, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/using-ai-scientists-combat-drug-resistant-infections-0525

Information source: (Massachusetts Institute of Technology, 2023)

1.3   In a first, researchers capture fleeting *"transition state"* in ring-shaped molecules excited by light

Using a high-speed *"electron camera"* at the Department of Energy's SLAC National Accelerator Laboratory and cutting-edge quantum simulations, scientists have directly imaged a photochemical "transition state," a specific configuration of a molecule's atoms determining the chemical outcome, during a ring-opening reaction in the molecule α terpinene. This is the first time that scientists have precisely tracked molecular structure through a photochemical ring-opening reaction, triggered when light energy is absorbed by a substance's molecules.
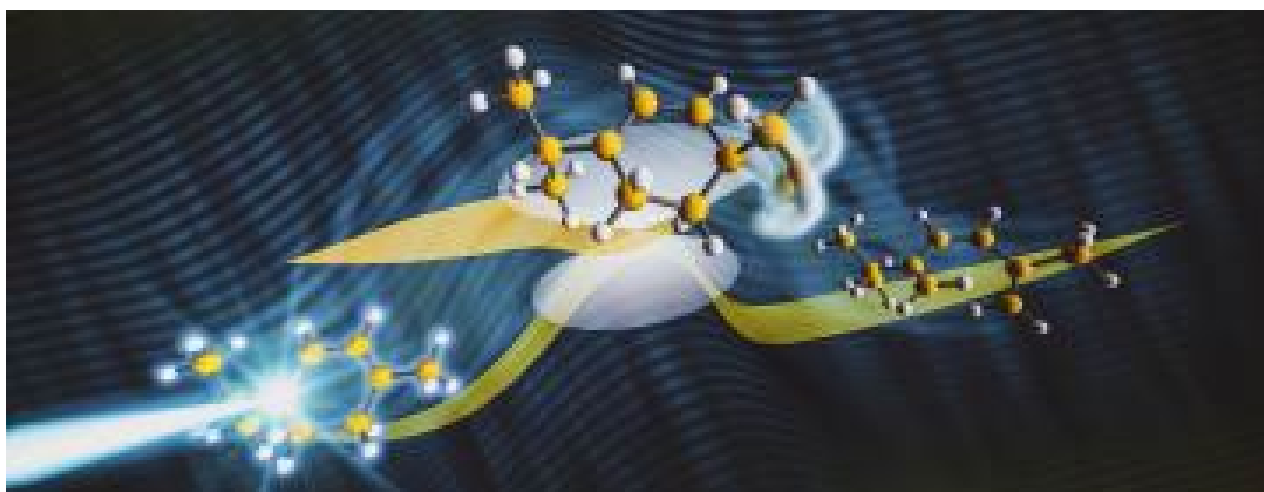
Credit: SLAC National Accelerator Laboratory

Transition states generally occur in chemical reactions which are triggered not by light but by heat. They are like a point of no return for molecules involved in a chemical reaction: As the molecules gain the energy needed to fuel the reaction, they rearrange themselves into a fleeting configuration before they complete their transformation into new molecules.

For more information, visit the following link:
https://www6.slac.stanford.edu/news/2023-05-25-first-researchers-capture-fleeting-transition-state-ring-shaped-molecules-excited

Reference
Sundermier, A. (May 25, 2023). In a first, researchers capture fleeting *"transition state"* in ring-shaped molecules excited by light. Recovered May 26, 2023, SLAC National Accelerator Laboratory:
https://www6.slac.stanford.edu/news/2023-05-25-first-researchers-capture-fleeting-transition-state-ring-shaped-molecules-excited

Information source: (SLAC National Accelerator Laboratory, 2023)

1.4   Self-supervised AI adaptation framework to enhance sensing accuracy of EMG devices

Surface electromyography (EMG) has been widely used to measure the electrical activity of muscles. However, the variability in EMG sensing signals due to biological differences of different users significantly degrades the performance and potential of EMG systems. Recently, researchers from City University of Hong Kong (CityU) developed a deep learning-based framework called EMGSense, which can achieve high sensing performance for new users using AI self-training techniques. This opens a new path for developing more advanced and accurate wearable EMG devices in areas like neurorehabilitation and virtual reality.

EMG-based sensing has created a lot of intelligent applications.
Credit: Dr. Xu Weitao, City University of Hong Kong

EMG measures the electrical activity of muscles using surface electrodes on the skin. EMG-based sensing has attracted considerable attention in recent years and has created a lot of intelligent applications, such as neurorehabilitation, activity recognition, gesture recognition and virtual reality. But a fundamental challenge in existing EMG systems is how to tackle cross-user scenarios. EMG signals can be seriously influenced by various biological factors, such as body fat, skin conditions, age and fatigue. So significant performance degradation would be caused by time-varying biological heterogeneity when the EMG system is employed by different users.

For more information, visit the following link:
https://www.cityu.edu.hk/research/stories/2023/05/25/cityu-researchers-develop-self-supervised-ai-adaptation-framework-enhance-sensing-accuracy-emg-devices

Reference
City University of Hong Kong. (May 25, 2023). CityU researchers develop a self-supervised AI adaptation framework to enhance sensing accuracy of EMG devices. Recovered May 25, 2023, City University of Hong Kong: https://www.cityu.edu.hk/research/stories/2023/05/25/cityu-researchers-develop-self-supervised-ai-adaptation-framework-enhance-sensing-accuracy-emg-devices

Information source: (City University of Hong Kong, 2023)

1.5   Energy industry apps improve efficiency

A team of University of Houston researchers has developed a series of digital applications to make energy industry processes more efficient. Three innovative online calculators, the most recent being the UH Hydrocarbon Gas Minimum Miscibility Pressure (MMP) Calculator, are available to industry professionals free of charge.

University of Houston researchers created innovative digital applications to improve energy industry processes.
Credit: University of Houston

The viscosity app calculates the thickness of crude in its natural state, also known as dead oil, needing very little information. It is a full-range method, which can measure a wide range of oil viscosity – from a fraction of centipoise (cp), a unit measurement of viscosity, to a million cp. The researchers integrated Machine Learning into their work, prompting them to gather abundant data with assistance from various contributors. The team utilized this data to create optimal versions of subsequent models.

For more information, visit the following link:
https://uh.edu/news-events/stories/2023/may-2023/05252023-energy-industry-apps.php

Reference
Khan, R. (May 25, 2023). Energy industry apps improve efficiency. Recovered May 25, 2023, University of Houston:
https://uh.edu/news-events/stories/2023/may-2023/05252023-energy-industry-apps.php

Information source: (University of Houston, 2023)

1.6   Tiny *"robotic hand"* for minimally invasive brain surgery

A tiny robotic hand designed to enhance neurosurgery is one step closer to clinical practice. The microrobotic tool is created by a team of University of Toronto researchers led by Eric Diller, an associate professor in the department of mechanical and industrial engineering in the Faculty of Applied Science & Engineering.
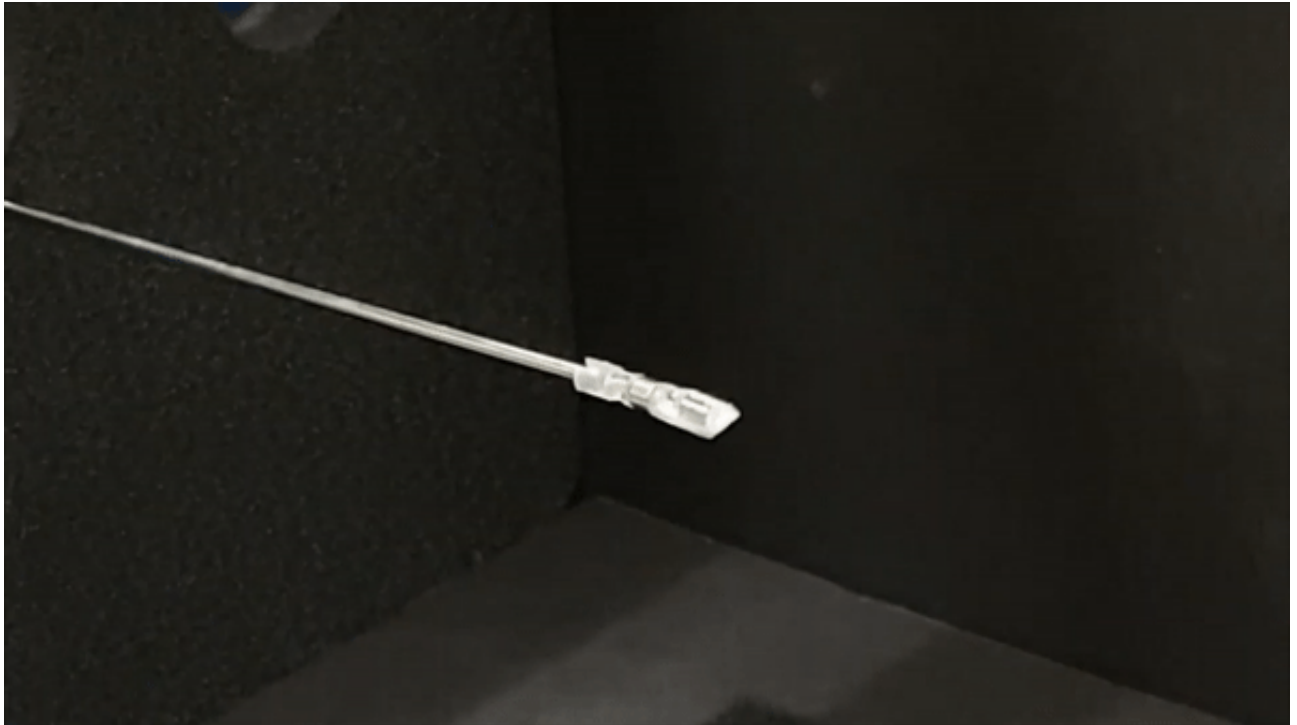
A surgical tool developed by U of T Engineering researchers uses magnetic fields to enable surgeons to access hard-to-reach areas of the brain with a minimal level of invasiveness (video via Microrobotics Lab)
Credit: Microrobotics Lab, University of Toronto

Operated by an electromagnetic system, the device enables surgeons to access hard-to-reach areas of the brain with a minimal level of invasiveness, promising faster treatment and recovery for patients. *"We are designing the mechanism that drives this robotic hand, which is basically going to act as a surgeon's hand,"* Diller says. *"We are also using magnetic fields to make this tiny hand move, which is our unique approach to doing this."*

For more information, visit the following link:
https://www.utoronto.ca/news/u-t-researchers-develop-tiny-robotic-hand-minimally-invasive-brain-surgery

Reference
Jinje, S. (May 25, 2023). U of T researchers develop tiny *"robotic hand"* for minimally invasive brain surgery. Recovered May 25, 2023, University of Toronto: https://www.utoronto.ca/news/u-t-researchers-develop-tiny-robotic-hand-minimally-invasive-brain-surgery

Information source: (University of Toronto, 2023)

Information source: (University of Toronto, 2023)

1.7   Wireless Sensors Open New Possibilities for Monitoring of Bridges

Researchers in Drexel University's College of Engineering have developed a solar-powered, wireless sensor system that can continually monitor bridge deformation and could be used to alert authorities when the bridge performance deteriorates significantly.

Close-up photo of the new piezoelectric sensor developed by University of Houston researchers.
It can potentially work in extreme environments.
Credit: Drexel University

Their wireless displacement sensor consists of a solar photovoltaic cell, a deformation measuring device — called a displacement potentiometer — and a monitoring interface transceiver. All three are mounted on the bridge to take continuous measurements of its deformation as traffic moves across it and transmit that information to a remote monitoring station. The displacement potentiometer is a small, robust, lightweight device that mounts to the girder of the bridge. It measures displacement, or movement of the girder, as the bridge temporarily deforms when vehicles pass along it. Changes in this pattern of deformation can be an early indicator of structural problems.

For more information, visit the following link:
https://drexel.edu/news/archive/2023/May/wireless-bridge-deformation-sensors

Reference
Faulstick, B. (May 25, 2023). Wireless Sensors Open New Possibilities for Monitoring of Bridges. Recovered May 26, 2023, Drexel University: https://drexel.edu/news/archive/2023/May/wireless-bridge-deformation-sensors

Information source: (Drexel University, 2023)

1.8   *"Bioprospecting"* **uncovers viruses that can kill deadly superbugs**

In a modern take on the Victorian gold rush, a Monash University-led project is successfully *"bioprospecting"* for viruses known as phages that can kill deadly superbugs. The Monash Biomedicine Discovery Institute (BDI) team, led by Dr Rhys Dunstan and Professor Trevor Lithgow of the Bacterial Cell Biology Laboratory, has had some success in tracking down the elusive killers.
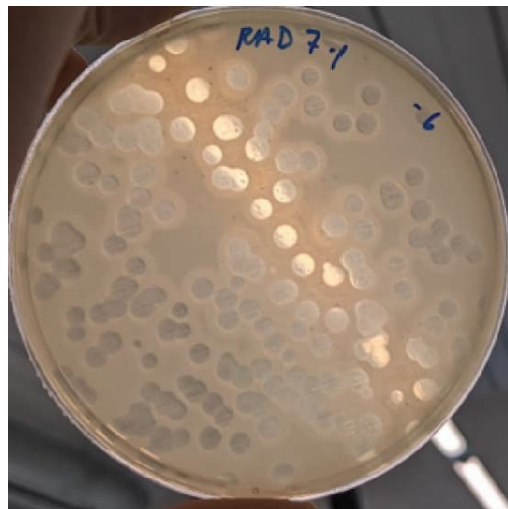
A Klebsiella phage forming plaques
Credit: Rhys Dunstan, University of Monash

In the latest study, Dr Dunstan surveyed waste-water at Addenbrooke's Hospital in Cambridge UK for phages that can kill a deadly variant of the bacterial superbug Klebsiella pneumoniae. Klebsiella pneumoniae normally lives in human intestines, where it doesn't cause disease. But if it travels to other parts of the body, it can cause pneumonia, meningitis, urinary tract infections and bloodstream infections. After analysing the bacterial features essential for the two phages to infect Klebsiella pneumoniae, Dr Dunstan's team revealed that the infection process had two essential steps involving two distinct components of the bacterial cell surface.

For more information, visit the following link:
https://www.monash.edu/news/articles/bioprospecting-uncovers-viruses-that-can-kill-deadly-superbugs

Reference
University of Monash. (May 25, 2023). *"Bioprospecting"* uncovers viruses that can kill deadly superbugs. Recovered May 26, 2023, University of Monash: https://www.monash.edu/news/articles/bioprospecting-uncovers-viruses-that-can-kill-deadly-superbugs

Information source: (University of Monash, 2023)

1.9   New method for creating 3D images

Using computational imaging tools, David Brady, a professor of optical sciences at the University of Arizona, has developed a novel technique called sparse holography that creates three-dimensional images from two-dimensional holograms. *"Normally, when you look at a hologram, you can see the object as though it was there,"* Brady said. *"But you can't really reconstruct it like it was a real three-dimensional object."*

Brady developed the set of algorithms and strategies for measuring a two-dimensional hologram and used those measurements to estimate three-dimensional objects. The resulting image is not a photograph; rather, it is a three-dimensional representation of the scene. A person can view the 3D representation using interactive software or by 3D-printing a model, Brady said. Brady's sparse holography technique can be used in situations where 3D images are needed, including instances in which there are moving objects that need to be made three-dimensional. Normally, it is not possible to create 3D images of moving objects, such as living tissue or organisms viewed through a microscope, Brady said. Sparse holography makes it a possibility. *"We can form three-dimensional images of a swimming fish or moving things,"* he said.

For more information, visit the following link:
https://news.arizona.edu/story/new-method-creating-3d-images

Reference
Rajalakshmi, N. (May 25, 2023). A new method for creating 3D images. Recovered May 26, 2023, The University of Arizona: https://news.arizona.edu/story/new-method-creating-3d-images

Information source: (The University of Arizona, 2023)

1.10 Protein-based nano-*"computer"* evolves in ability to influence cell behavior

The first protein-based nano-computing agent that functions as a circuit has been created by Penn State researchers. The milestone puts them one step closer to developing next-generation cell-based therapies to treat diseases like diabetes and cancer.

"Theoretically, the more inputs you embed into a nano-computing agent, the more potential outcomes that could result from different combinations," Chen said. *"Potential inputs could include physical or chemical stimuli and outputs could include changes in cellular behaviors, such as cell direction, migration, modifying gene expression and immune cell cytotoxicity against cancer cells."* The team plans to further develop their nano-computing agents and experiment with different applications of the technology. Dokholyan, a researcher with Penn State Cancer Institute and Penn State Neuroscience Institute, said their concept could someday form the basis of the next-generation cell-based therapies for various diseases, such as autoimmune diseases, viral infections, diabetes, nerve injury and cancer.

For more information, visit the following link:
https://www.psu.edu/news/research/story/protein-based-nano-computer-evolves-ability-influence-cell-behavior/

Reference
Sweger, Z. (May 26, 2023). Protein-based nano-*"computer"* evolves in ability to influence cell behavior. Recovered May 26, 2023, The Pennsylvania State University: https://www.psu.edu/news/research/story/protein-based-nano-computer-evolves-ability-influence-cell-behavior/

Information source: (The Pennsylvania State University, 2023)

1.11   Artificial Intelligence to uncover key driver of soil carbon storage

This interdisciplinary study incorporated a microbial computer model that describes various processes in the soil carbon cycle, the world's largest soil carbon dataset, and sophisticated techniques such as data assimilation and deep learning to better understand soil carbon dynamics. This international collaboration was coordinated by Professor Xiaomeng Huang and Ph.D. student Feng Tao from the Department of Earth System Science at Tsinghua University, as well as Professor Yiqi Luo from Cornell University.
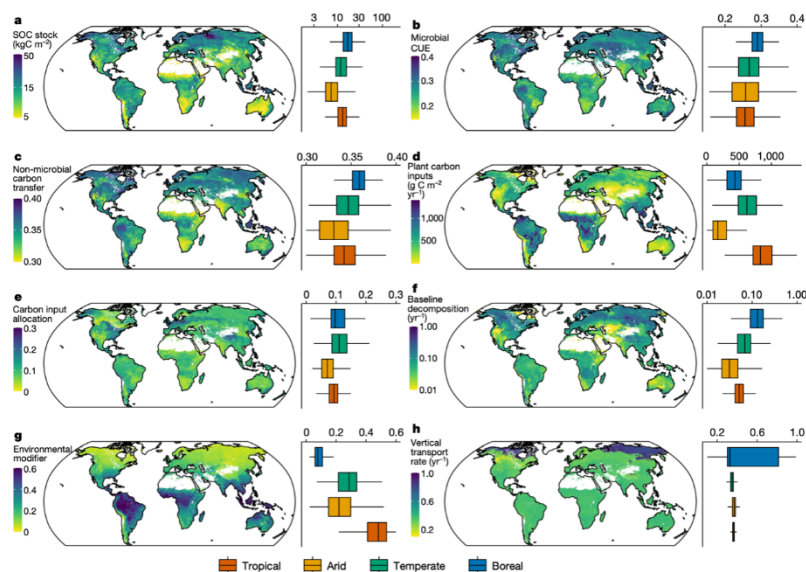
Maps of global SOC stock and related processes
Credit: Tsinghua University

This is the first study to compare the relative importance of microbial processes in the soil carbon cycle to other processes. The critical role of microbial carbon use efficiency identified in this study suggests that future research should investigate management practices that may influence microbial processes in order to increase soil carbon sequestration. The novel approach described in this study that combines process-based computer models, Big Data, and deep learning to better understand soil carbon dynamics also opens up new research avenues in related disciplines.

For more information, visit the following link:
https://www.tsinghua.edu.cn/en/info/1245/12220.htm

Reference
Han, L. (May 26, 2023). Tsinghua and Cornell scientists use AI to uncover key driver of soil carbon storage. Recovered May 29, 2023, Tsinghua University: https://www.tsinghua.edu.cn/en/info/1245/12220.htm

Information source: (Tsinghua University, 2023)

1.12 Nanorobotic system presents new options for targeting fungal infections

In a groundbreaking development with far-reaching implications for global health, a team of researchers jointly led by Hyun (Michel) Koo of the University of Pennsylvania School of Dental Medicine and Edward Steager of Penn's School of Engineering and Applied Science has created a microrobotic system capable of rapid, targeted elimination of fungal pathogens.
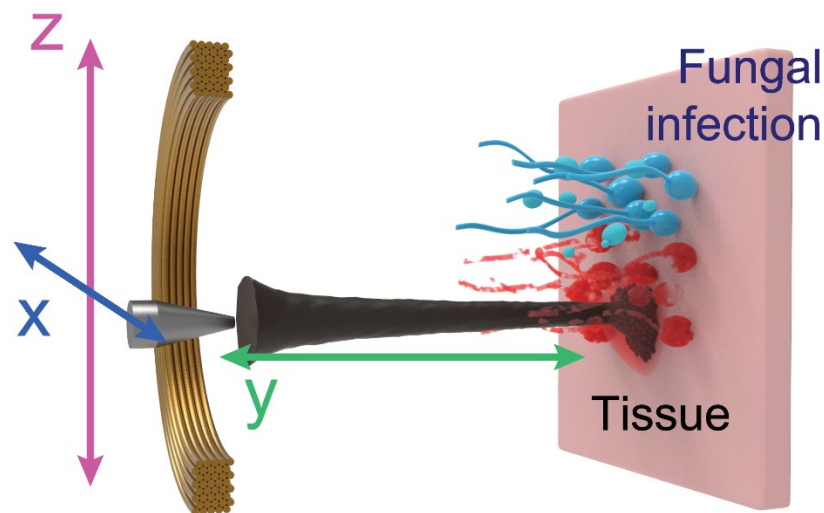
Electromagnetic cores precisely guide the array of nanozyme-bots as they target the site of fungal infection. (Image: Credit: Min Jun Oh and Seokyoung Yoon, The Pennsylvania State University

Steager's team developed the motion, velocity, and formations of nanozymes, which resulted in enhanced catalytic activity, much like the enzyme peroxidase, which helps break down hydrogen peroxide into water and oxygen. This directly allows the generation of high amounts of reactive oxygen species (ROS), compounds that have proven biofilm-destroying properties, at the site of infection.

For more information, visit the following link:
https://penntoday.upenn.edu/news/nanorobotic-system-presents-new-options-targeting-fungal-infections

Reference
Magubane, N. (May 26, 2023). Nanorobotic system presents new options for targeting fungal infections. Recovered May 29, 2023, The Pennsylvania State University: https://penntoday.upenn.edu/news/nanorobotic-system-presents-new-options-targeting-fungal-infections

Information source: (The Pennsylvania State University, 2023)

1.13   Quantum sensor built at Imperial, with potential application in GPS-free navigation

A prototype quantum sensor built at Imperial, with potential application in GPS-free navigation, has been tested in collaboration with the Royal Navy. The test marks an important step in bringing new quantum technologies out of the lab and into real-world settings.
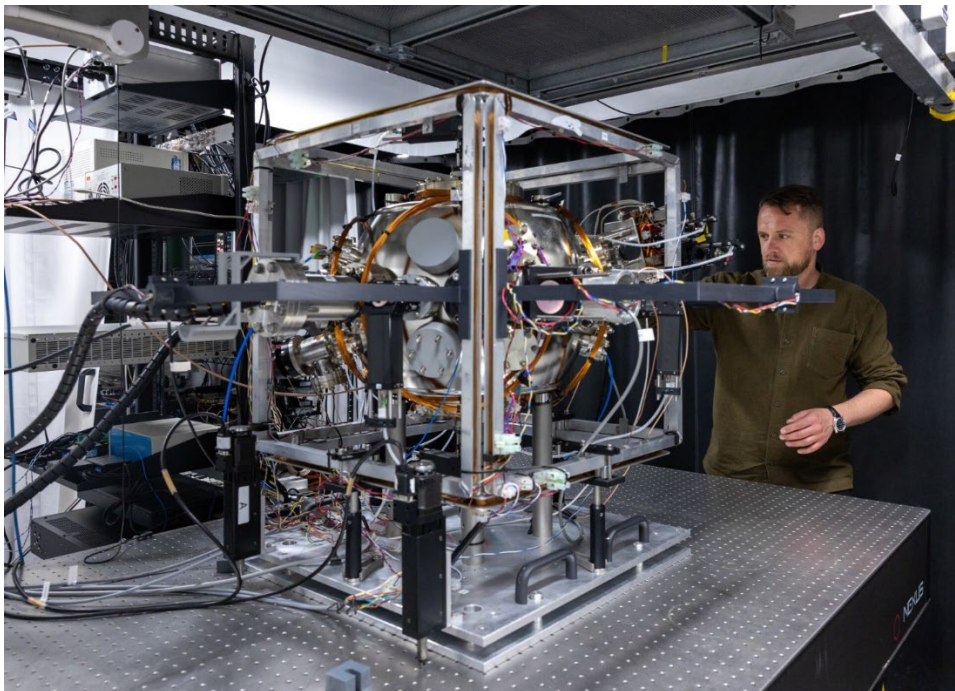
Credit: Imperial College London

Self-contained satellite-free navigation systems do exist; however, current technologies drift over time, meaning they lose accuracy unless regularly calibrated with satellites. The quantum sensor has the potential to remove this drift, significantly improving the accuracy over long timescales. The Imperial quantum sensor is a new type of accelerometer. Accelerometers measure how an object's velocity changes over time. By combining this information with rotation measurements and the initial position of the object, the current location can be calculated.

For more information, visit the following link:
https://www.imperial.ac.uk/news/245114/quantum-sensor-future-navigation-system-tested/

Reference
Dunning, H. & Angus, T. (May 26, 2023). Quantum sensor for a future navigation system tested aboard Royal Navy ship. Recovered May 29, 2023, Imperial College London: https://www.imperial.ac.uk/news/245114/quantum-sensor-future-navigation-system-tested/

Information source: (Imperial College London, 2023)

1.14   Revolutionary sunlight-powered catalyst transforms methane into valuable chemicals

In a concerted effort with collaborators from the University College London, Professor Zhengxiao GUO from the Department of Chemistry, The University of Hong Kong (HKU), and Professor Junwang TANG, now at the Department of Chemical Engineering, Tsinghua University, have jointly developed a highly active and selective catalytic material that can efficiently convert methane, a potent greenhouse gas, into formaldehyde, an essential chemical in a waste-free manner.
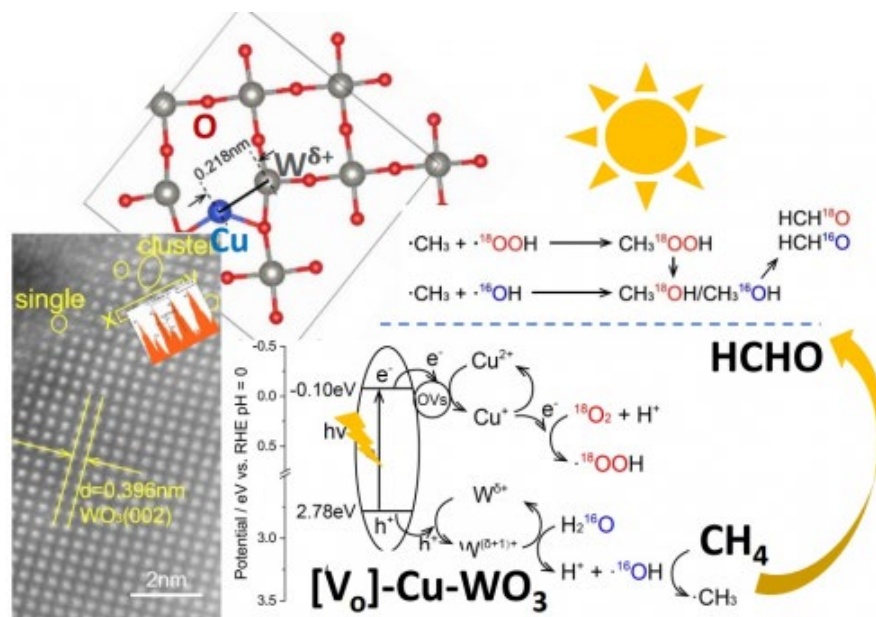
Credit: The University of Hong Kong

This innovative material, derived from tungsten trioxide (WO3 catalyst), features a dual active site comprising copper and tungsten atomic species that work in tandem to ensure an effective and selective conversion process. The conversion process can achieve nearly 100% selectivity under visible light, which avoids unwanted byproducts and increase efficiency, making it an eco-friendly alternative to current production methods. The findings have just been published in the prestigious journal Nature Communications.

For more information, visit the following link:
https://hku.hk/press/news_detail_26140.html

Reference
To, C. (May 28, 2023). Let the sun work its magic: revolutionary sunlight-powered catalyst transforms methane into valuable chemicals. Recovered May 29, 2023, The University of Hong Kong: https://hku.hk/press/news_detail_26140.html

Information source: (The University of Hong Kong, 2023)

1.15   New kind of walking robot that takes advantage of dynamic instability to navigate

Investigators from Osaka University have developed a biomimetic *"myriapod"* robot that takes advantage of a natural instability that can convert straight walking into curved motion. In a study published recently in Soft Robotics, researchers from Osaka University describe their robot, which consists of six segments (with two legs connected to each segment) and flexible joints. Using an adjustable screw, the flexibility of the couplings can be modified with motors during the walking motion.
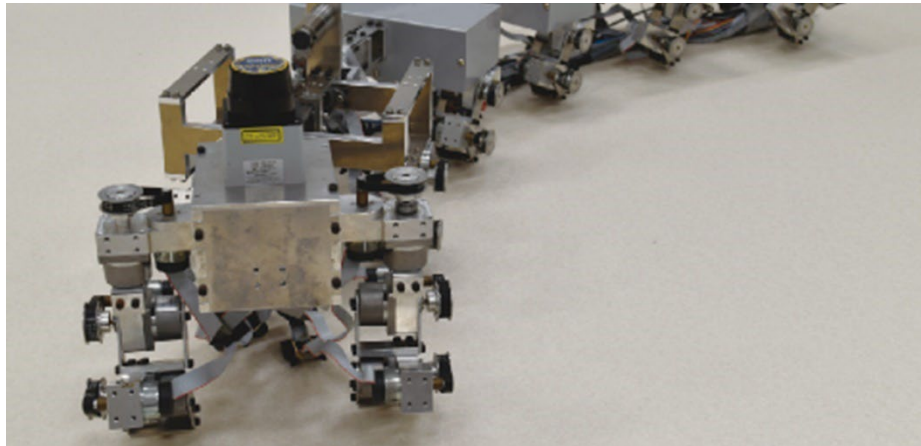
Credit: Osaka University

The researchers showed that increasing the flexibility of the joints led to a situation called a *"pitchfork bifurcation,"* in which straight walking becomes unstable. Instead, the robot transitions to walking in a curved pattern, either to the right or to the left. Normally, engineers would try to avoid creating instabilities. However, making controlled use of them can enable efficient maneuverability. *"We were inspired by the ability of certain extremely agile insects that allows them to control the dynamic instability in their own motion to induce quick movement changes,"* says Shinya Aoi, an author of the study. Because this approach does not directly steer the movement of the body axis, but rather controls the flexibility, it can greatly reduce both the computational complexity as well as the energy requirements.

For more information, visit the following link:
https://resou.osaka-u.ac.jp/en/research/2023/20230529_1

Reference
Shinya, A. (May 28, 2023). Robot centipedes go for a walk. Recovered May 29, 2023, University of Osaka University: https://resou.osaka-u.ac.jp/en/research/2023/20230529_1

Information source: (Osaka University, 2023)

1.16   Achieving power conversion efficiency (PCE) with organic solar cells (OSC)

Researchers from The Hong Kong Polytechnic University (PolyU) have achieved a breakthrough power-conversion efficiency (PCE) of 19.31% with organic solar cells (OSCs), also known as polymer solar cells. This remarkable binary OSC efficiency will help enhance applications of these advanced solar energy devices.

The PCE, a measure of the power generated from a given solar irradiation, is considered a significant benchmark for the performance of photovoltaics (PVs), or solar panels, in power generation. The improved efficiency of over 19% that was achieved by the PolyU researchers constitutes a record for binary OSCs, which have one donor and one acceptor in the photo-active layer.

The team developed a non-monotonic intermediated state manipulation (ISM) strategy to manipulate the bulk-heterojunction (BHJ) OSC morphology and simultaneously optimise the crystallisation dynamics and energy loss of non-fullerene OSCs. Unlike the strategy of using traditional solvent additives, which is based on excessive molecular aggregation in films, the ISM strategy promotes the formation of more ordered molecular stacking and favourable molecular aggregation. As a result, the PCE was considerably increased and the undesirable non-radiative recombination loss was reduced. Notably, non-radiative recombination lowers the light generation efficiency and increases the heat loss.

For more information, visit the following link:
https://www.polyu.edu.hk/media/media-releases/2023/0529_polyu-researchers-achieve-record-efficiency/

Reference
Lai, I. & Wong, A. (May 29, 2023). PolyU researchers achieve record 19.31% efficiency with organic solar cells. Recovered May 29, 2023, The Hong Kong Polytechnic University: https://www.polyu.edu.hk/media/media-releases/2023/0529_polyu-researchers-achieve-record-efficiency/

Information source: (The Hong Kong Polytechnic University, 2023)

1.17   New transparent Augmented Reality display to see digital content in real-time

The world's first flexible, transparent Augmented Reality (AR) display screen using 3D printing and low-cost materials has been created by researchers at the University of Melbourne, KDH Design Corporation and the Melbourne Centre for Nanofabrication (MCN). The development of the new display screen is set to advance how AR is used across a wide range of industries and applications.

The flexible, transparent polymer-based material will advance how AR is used across a range of industries.
Credit: Cesar Nicolas, The University of Melbourne

AR technology overlays digital content onto the real world, enhancing the user's real-time perception and interaction with their environment. Until now, creating flexible AR technology that can adjust to different angles of light sources has been a challenge, as current mainstream AR manufacturing uses glass substrates, which must undergo photomasking, lamination, cutting, or etching microstructure patterns. These time-consuming processes are expensive, have a poor yield rate and are difficult to seamlessly integrate with product appearance designs.

For more information, visit the following link:
https://www.unimelb.edu.au/newsroom/news/2023/may/world-first-transparent-augmented-reality-display-opens-possibilities-to-see-digital-content-in-real-time

Reference
The University of Melbourne (May 29, 2023). New transparent Augmented Reality display opens possibilities to see digital content in real-time. Recovered May 29, 2023, The University of Melbourne:
https://www.unimelb.edu.au/newsroom/news/2023/may/world-first-transparent-augmented-reality-display-opens-possibilities-to-see-digital-content-in-real-time

Information source: (The University of Melbourne, 2023)

1.18   Assessing Political Bias in Language Models

The language models behind ChatGPT and other generative Artificial Intelligence are trained on written words that have been culled from libraries, scraped from websites and social media, and pulled from news reports and speech transcripts from across the world. There are 250 billion such words behind GPT-3.5, the model fueling ChatGPT, for instance, and GPT-4 is now here.
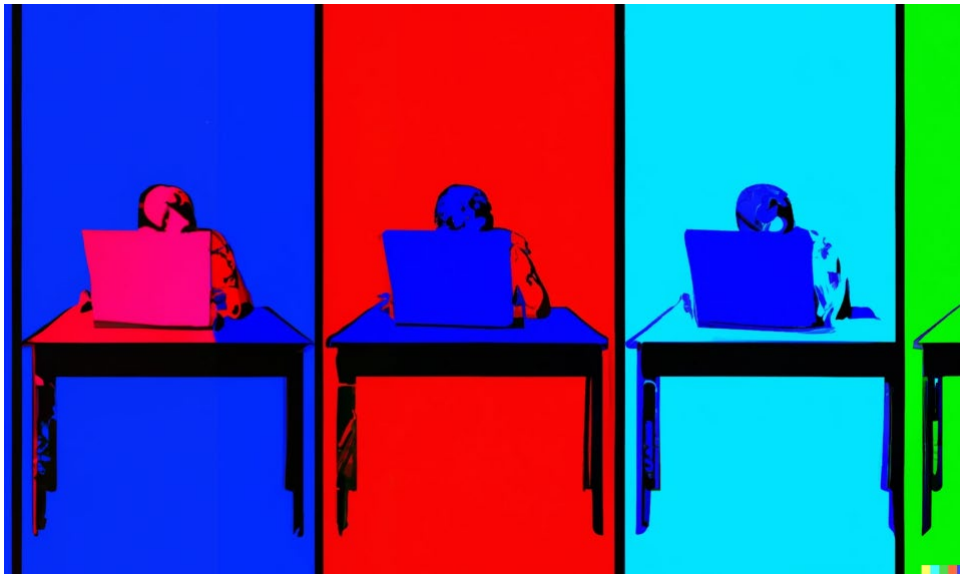
DALL-E
Credit: Stanford University

In the paper, a research team including Stanford postdoctoral student Esin Durmus, Columbia PhD student Faisal Ladhak, Stanford PhD student Cinoo Lee, and Stanford computer science professors Percy Liang and Tatsunori Hashimoto introduces OpinionQA, a tool for evaluating bias in language models. OpinionQA compares the leanings of language models against public opinion polling.

For more information, visit the following link:
https://hai.stanford.edu/news/assessing-political-bias-language-models

Reference
Myers, A. (May 22, 2023). Assessing Political Bias in Language Models. Recovered May 29, 2023, Stanford University: https://hai.stanford.edu/news/assessing-political-bias-language-models

Information source: (Stanford University, 2023)

1.19   Integrating digital technology with the human voice

In the decades since, Z has sought possibility in the objects of everyday life — Slinkies, plastic water jugs, hair clippers, and power tools — working these found materials into densely layered compositions, woven through with her classically trained soprano. The sound of the freight elevator in her loft, a glass falling on the floor, or a fragment of conversation can all become defamiliarized and creatively repurposed in the work. What begins as a simple act of noticing, then, in the process of composition, evolves into much larger meditations on the human condition.

Z's expressive form of electronic music, Ziporyn says, reflects how we live today. It reflects the condition of living in a world mediated by technology, a world of bits and atoms, where the digital and analog are continually overlapping zones of experience. Her work, he says, defies any artificial separation between the so-called natural and the synthetic. And, as Z reminds us, we ourselves are electric: Everything we do, think, and feel is powered by the electrical currents coursing throughout the body. Her performances, says Ziporyn, are arguments for accepting that both the material and digital are part of what it means to think, feel, sense, and express — part of what it means to be human.

For more information, visit the following link:
https://news.mit.edu/2023/pamela-z-singing-body-electric-0530

Reference
Ventura, A. (May 30, 2023). Pamela Z: Singing the body electric. Recovered May 30, 2023, Massachusetts Institute of Technology: https://news.mit.edu/2023/pamela-z-singing-body-electric-0530

Information source: (Massachusetts Institute of Technology, 2023)

1.20   A novel high-throughput method for screening protein-secreting microbial strains

A unique method to screen large-scale libraries for industrially useful bacterial strains was recently developed by Tokyo Tech researchers. The simple approach combines biosensors and microfluidics to quickly identify mutant strains that secrete large amounts of industrially useful proteins, opening the doors to more applications, like reasonably priced biopharmaceuticals.
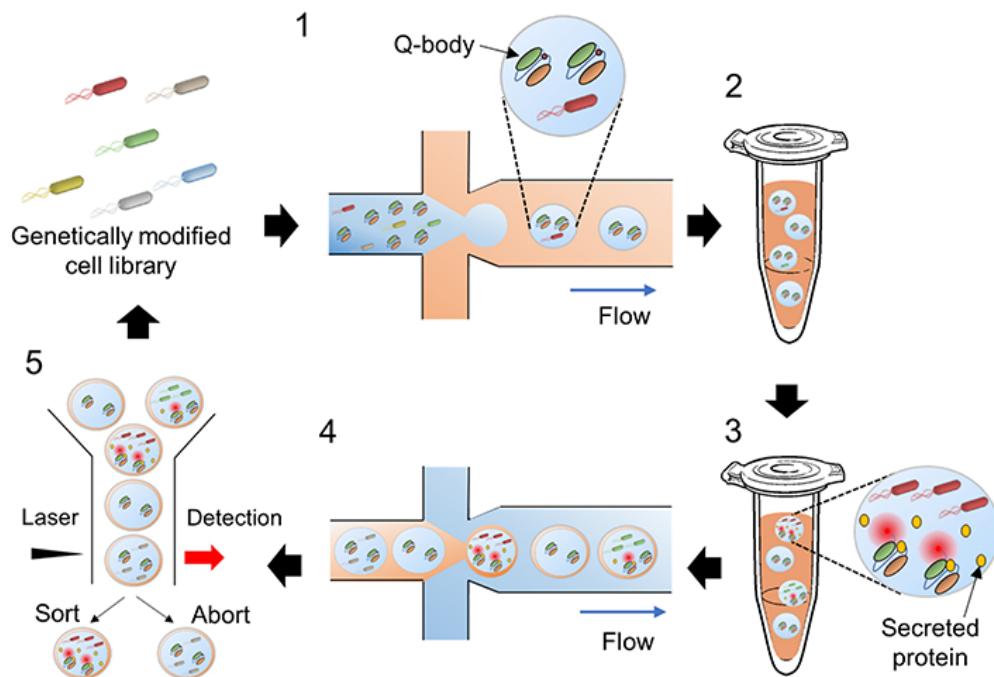
Overview of the screening approach
Credit: Tokyo Institute of Technology

With modern genetic engineering tools, it is now possible to modify microorganisms so that their production of industrially useful proteins—such as those used in biopharmaceuticals—is enhanced. By introducing genetic modifications into these organisms, we can use them as biological factories to produce large quantities of the desired protein. Bacteria with this enhanced ability can produce insulin, growth hormones, and enzymes. This approach of increasing microbial secretory protein expression has led to breakthroughs in medicine, industry, and agriculture.

For more information, visit the following link:
https://www.titech.ac.jp/english/news/2023/066811

Reference
Tokyo Institute of Technology (May 30, 2023). A novel high-throughput method for screening protein-secreting microbial strains. Recovered May 30, 2023, Tokyo Institute of Technology: https://www.titech.ac.jp/english/news/2023/066811

Information source: (Tokyo Institute of Technology, 2023)

2   PATENTS

2.1   Assigning transportation on demand vehicles

Embodiments are provided for managing transportation-on-demand vehicles, including a non-transitory computer-readable medium including instructions that when executed by at least one processor, cause it to perform operations, which may include:
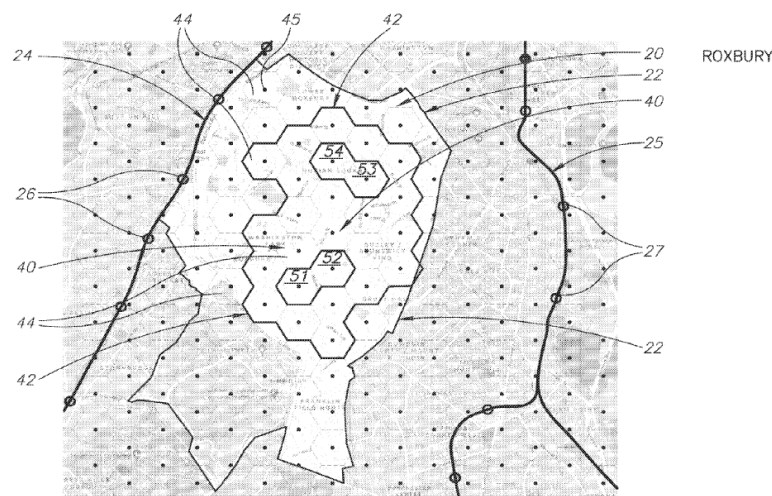
Schematically shows a map of a neighborhood of Boston Massachusetts as an example GROI that is tiled with geotiles and exhibits a ZOI having a first-mile/last-mile transportation need. Credit: Galon, B.; Sorani, M.; Bezalel, N-; Bick, R.; Vaksin, V; Tvizer, D.; Barak, N. & Fuchs, G., WIPO IP Portal

Determining service need feature vectors for a geographical region of interest, each service need feature vector including components associated with: at least one of a plurality of transportation needs, a transportation time, and a location within the geographical region of interest; identifying at least one cluster including a portion of the service need feature vectors; identifying an associated spatiotemporal zone of interest in the geographical region of interest; deploying at least a portion of the fleet of transportation-on-demand vehicles; tracking locations of the deployed transportation-on-demand vehicles for the identified zones of interest; receiving a request associated with a user location in the zone of interest for a transportation-on-demand vehicle; and selecting one of the deployed transportation-on-demand vehicles.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398482431&_cid=P12-LIAGPB-59526-1

Reference

Galon, B.; Sorani, M.; Bezalel, N-; Bick, R.; Vaksin, V; Tvizer, D.; Barak, N. & Fuchs, G. (May 25, 2023). Assigning transportation on demand vehicles. Recovered May 25, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398482431&_cid=P12-LIAGPB-59526-1

Information source: (WIPO IP Portal, 2023)

2.2 System and method for assessing pixels of satellite images of agriculture land parcel using Artificial Intelligence.

A system and method for assessing categorized pixels of satellite images associated with agriculture land parcel using an artificial intelligence (AI) model are provided.
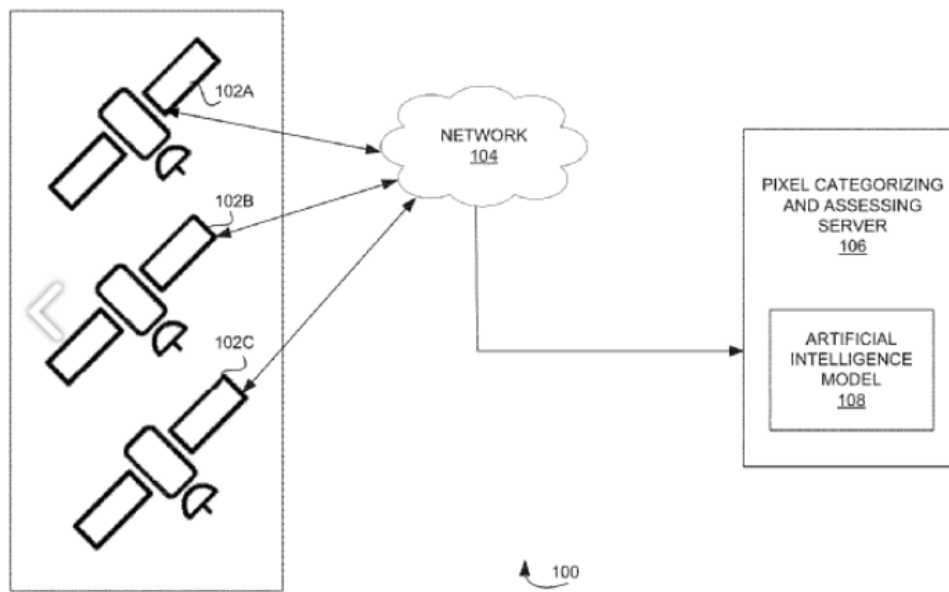
Illustrates a system for assessing categorized pixels of satellite images associated with an agriculture land parcel using an artificial intelligence (AI) model according to some embodiments herein;
Credit: Basu, P.; Singh, R.; Nambhothiri, K. & Aggarwal, B., WIPO IP Portal

The method includes, (i) obtaining satellite images associated with agriculture land parcel; (ii) pre-processing the satellite images to generate pre-processed satellite images, (iii) training the AI model by categorizing historical plurality of pixels from historical plurality of satellite images based on historical satellite data and correlating historical scores to historical categorized pixels to obtain trained AI model, (iv) classifying pixels of pre-processed satellite images into crop area-pixels and non-crop area pixels by determining a profile of time series data that corresponds to at least one of normalized difference vegetation index, normalized difference water index, land surface temperature, modified normalized difference water index, or land surface water index, (v) determining, using trained AI model, categorized pixels based on classification, (vi) assessing categorized pixels with a score.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398482867&_cid=P12-LIAGRD-60560-1

Reference

Basu, P.; Singh, R.; Nambhothiri, K. & Aggarwal, B. (May 25, 2023). System and method for assessing pixels of satellite images of agriculture land parcel using AI. Recovered May 25, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398482867&_cid=P12-LIAGRD-60560-1

Information source: (WIPO IP Portal, 2023)

2.3   Systems/methods for identifying products for purchase within audio-visual content utilizing QR or other machine-readable visual codes

An automated system/method for identifying and enabling viewer selection/purchase of products or services associated with digital content presented on a display device. Products within the digital content are identified and existing product placement data is ascertained. For products that do not include such data, other methodologies, with the assistance of third-party servers, are employed to assess identity and purchase availability. Viewer input designate products to assess or products can be automatically assessed.
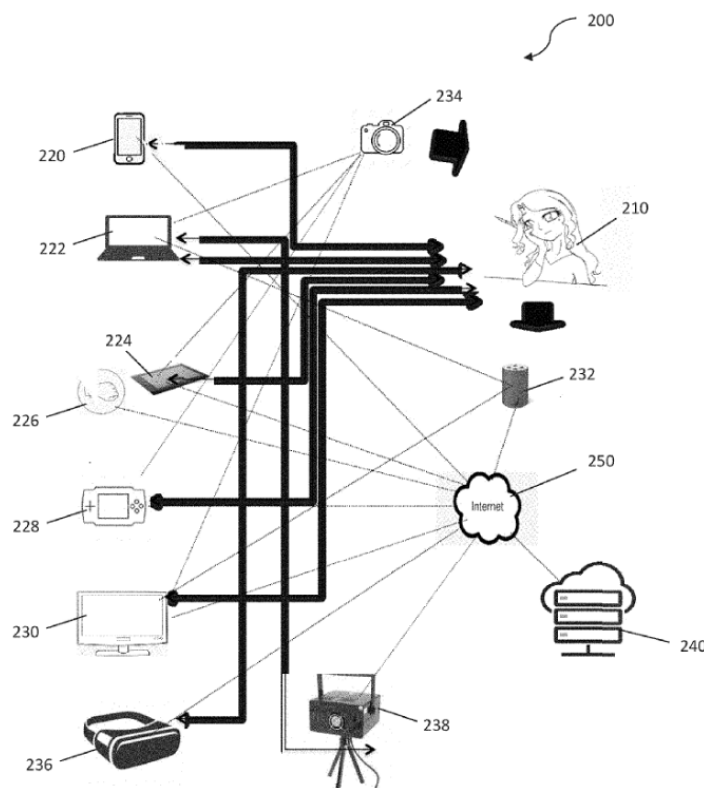
Schematically illustrates exemplary types of devices that may be employed by or within the present invention.
Credit: Drynan, S., WIPO IP Portal

Viewers initiate purchase of identified products via the display device or other electronic devices controlled by viewers, such as via viewers' smart phones. Various processes for identifying products include use of AI processing, access to data on third-party servers, crowd sourcing and other methodologies. Various techniques for selecting products for purchases are employed including employing 3D codes (e.g., QR codes) alongside presented products to enable other portable electronic devices to facilitate purchase. Other features are described.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398482640&_cid=P12-LIAGWP-63490-1

Reference

Drynan, S. (May 25, 2023). Systems/methods for identifying products for purchase within audio-visual content utilizing QR or other machine-readable visual codes. Recovered May 25, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=US398482640&_cid=P12-LIAGWP-63490-1

Information source: (WIPO IP Portal, 2023)

2.4 Devices and methods for obtaining dimensions and features of an object

Measuring devices, processing devices, systems and methods for determining a position and/or orientation of one or more walls of a room and/or identifying a feature or opening in a wall of a room.
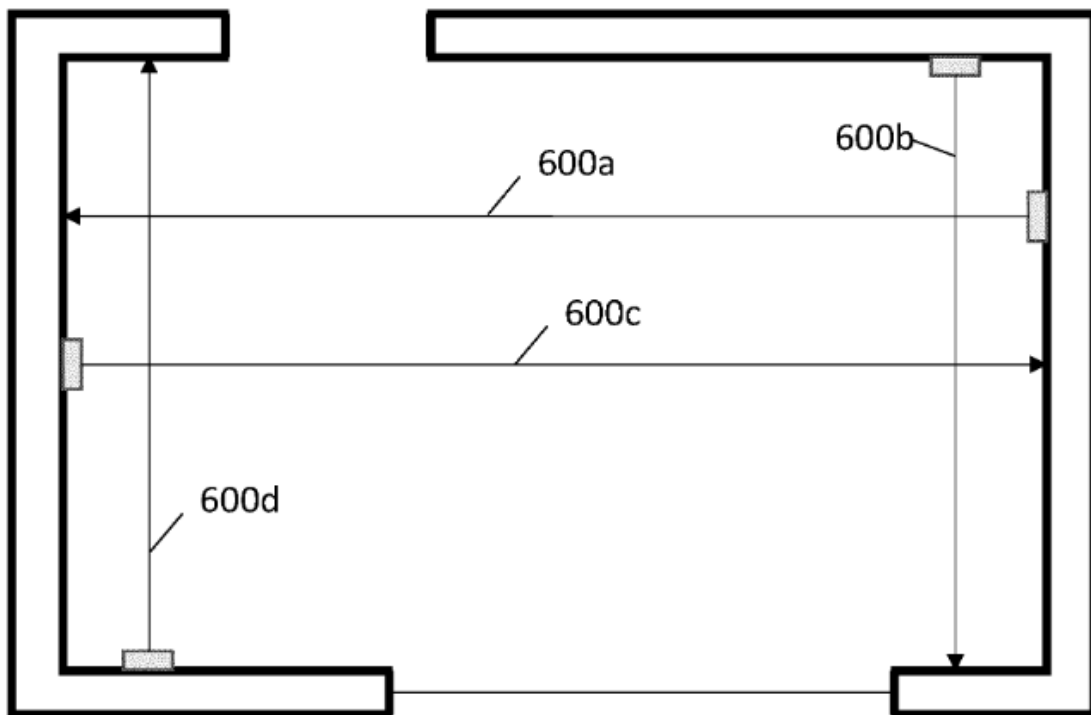
Is a plan view of a room.
Credit: Rock, A. & Kriegler, E., WIPO IP Portal

A measuring device comprises a datum for positioning against a first wall of the room such that the measuring device has a known alignment and offset relative to the first wall; a plurality of motion sensors configured to measure rotational and linear movement of the measuring device in a body frame comprising orthogonal x, y and z axes, wherein the body frame x-axis and body frame y-axis are parallel to a datum plane defined by the datum and the body frame z-axis is perpendicular to the datum plane; and optionally a ranging module configured to measure a distance to a second wall in a ranging direction parallel to or transverse to the datum plane. A data processor is configured to process motion sensor and/or ranging data to determine position and/or orientation of one or more walls, and/or to identify a feature or opening in a wall of a room.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023089055&_cid=P12-LIAH4K-68262-1

Reference

Rock, A. & Kriegler, E. (May 25, 2023). Devices and methods for obtaining dimensions and features of an object. Recovered May 25, 2023, WIPO IP Portal: https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2023089055&_cid=P12-LIAH4K-68262-1

Information source: (WIPO IP Portal, 2023)

2.5 Enhancing videos of people interacting with virtual objects in an extended reality environment

A system and method for generating videos of individuals interacting with virtual objects. A wearable extended reality appliance generates an extended reality environment including at least one virtual object.
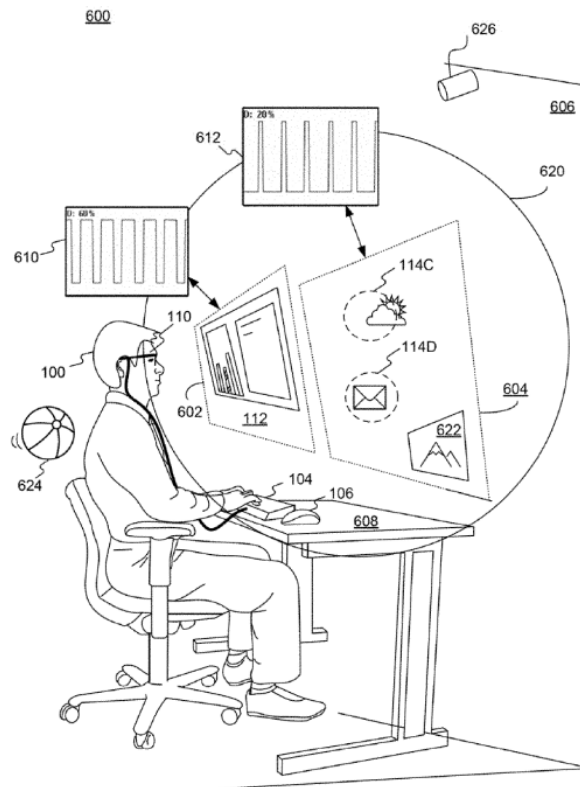
Illustrates an exemplary extended reality environment for displaying virtual content, consistent with some embodiments of the present disclosure.
Credit: Knaani, A.; Baron, A.; Elhadad, E. Dolev, O.; Berliner, T.; Peleg, D. & Kahan, T., WIPO IP Portal

First image data reflects a first perspective of an individual wearing the wearable extended reality appliance, including physical hand movements interacting with the at least one virtual object from the first perspective. Second image data reflects a second perspective facing the individual, including second physical hand movements interacting with a virtual object from the second perspective. The first image data and the second image data are analyzed to determine an interaction with the virtual object. The rendered representation of the virtual object from the second perspective is melded with the second image data to generate a video of the individual interacting with the virtual object from the second perspective.

For more information, visit the following link:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398482827&_cid=P12-LIAH7F-69933-1

Reference

Knaani, A.; Baron, A.; Elhadad, E. Dolev, O.; Berliner, T.; Peleg, D. & Kahan, T. (May 25, 2023). Enhancing videos of people interacting with virtual objects in an extended reality environment. Recovered May 25, 2023, WIPO IP Portal:
https://patentscope.wipo.int/search/es/detail.jsf?docId=US398482827&_cid=P12-LIAH7F-69933-1

Information source: (WIPO IP Portal, 2023)

2.6 Artificial Intelligence for travel partner and destination recommendations

A method, computer system, and a computer program product for travel recommendation enhancement are provided. A first travel profile that includes travel preferences is input into a first Machine Learning model.
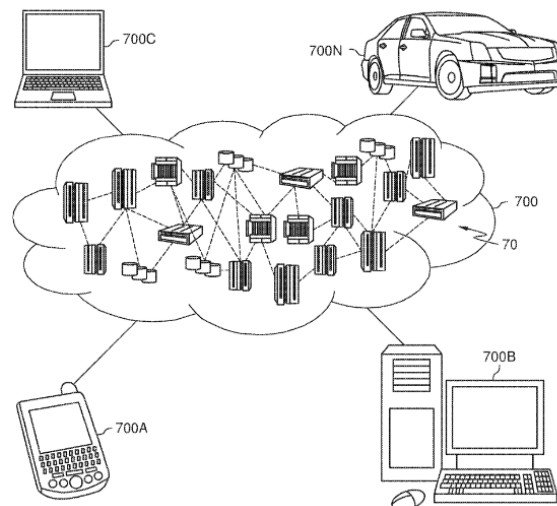
Block diagram of an illustrative cloud computing environment including the computer system. Credit: Bharti, H.; Bhattacharya, P.; Dutta, B.; Wadekar, D. & Mittal, R., Espacenet Patent Search

In response to the inputting, a second travel profile is received from the first Machine Learning model as a match for the first travel profile. The first Machine Learning model searches a database of travel profiles and generates at least one weighted directed acyclic graph based on properties of the travel profiles to determine the match. First and second nodes of the at least one weighted directed acyclic graph correspond to the first travel profile and to the second travel profile, respectively. One or more messages presenting the match are generated and transmitted.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086383997/publication/US202316
2300A1?q=machine%20learning

Reference
Bharti, H.; Bhattacharya, P.; Dutta, B.; Wadekar, D. & Mittal, R. (May 25, 2023). Artificial Intelligence for travel partner and destination recommendations. Recovered May 18, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086383997/publication/US202316
2300A1?q=machine%20learning

Information source: (Espacenet Patent Search, 2023)

2.7   Generation and delivery of text-based content using artificial intelligence (AI) based techniques

According to examples, a system for using artificial intelligence (AI) techniques to generate audio and video content based on text content is described. The system may include a processor and a memory storing instructions. The processor, when executing the instructions, may cause the system to analyze a plurality of text segments associated with a text content item having text content, determine an association between the plurality of text segments and arrange the plurality of text segments based on the determined association, wherein the arranging includes generating one or more text segment clusters.
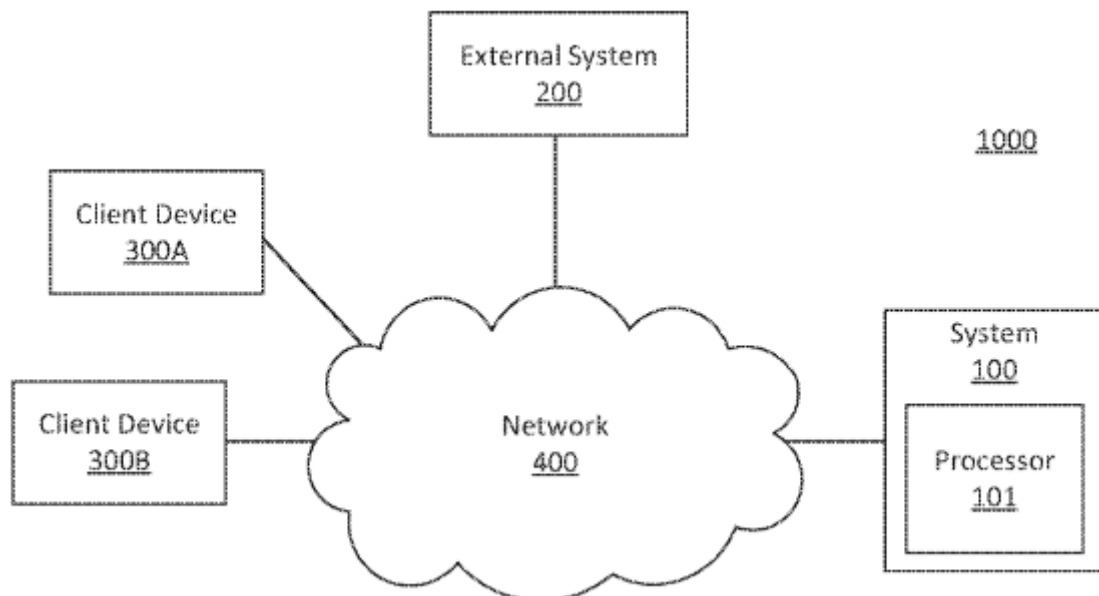
Illustrates a block diagram of a system environment, including a system, that may be implemented to use artificial intelligence (AI) techniques to generate audio and video content based on text content, according to an example.
Credit: El Ghazzal, S., Espacenet Patent Search

The processor, when executing the instructions, may then order the one or more text segment clusters according to one or more ordering criteria, implement a wording algorithm to generate text for a content item to be generated based on the text content and generate an audio association for the text for the content item to be generated.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/084767091/publication/US202316 2720A1?q=artificial%20intelligence

Reference
El Ghazzal, S. (May 25, 2023). Generation and delivery of text-based content using artificial intelligence (AI) based techniques. Recovered May 26, 2023, Espacenet Patent Search:
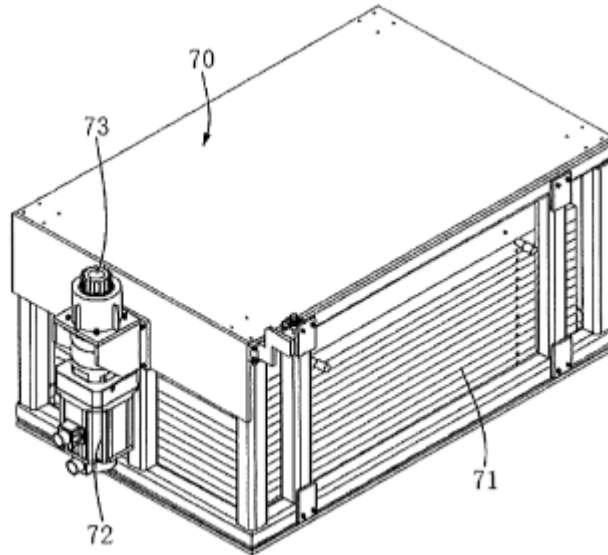
https://worldwide.espacenet.com/patent/search/family/084767091/publication/US2023162720A1?q=artificial%20intelligence

Information source: (Espacenet Patent Search, 2023)

2.8   Rotary moving 3D printer

A rotary mobile 3D printer, with a printer; an upright post; and a cross arm.

Schematic diagram of the counterweight component in the printing device provided by an embodiment of the present invention.
Credit: Ma, Y., Espacenet Patent Search

The printer is connected to the cross arm; the cross arm is rotatably connected to the upright post so that the cross arm is rotatable around the connection point where the cross arm is rotatably connected to the upright post; the printer is rotatable together with the cross arm; the printer is movable back and forth in a first direction and back and forth in a second direction relative to the cross arm; the first direction is the lengthwise direction of the cross arm; and the second direction extends at an angle with respect to the first direction.

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

Reference
Ma, Y. (May 25, 2023). Rotary moving 3D printer. Recovered May 26, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/086384466/publication/US2023160222A1?q=3d

Information source: (Espacenet Patent Search, 2023)

2.9   Systems and methods for monitoring food temperatures

A system includes one or more memory units and a processor. The processor is configured to receive, from a food temperature probe, a first temperature associated with a first food item. The processor is further configured to receive, from the food temperature probe, a second temperature associated with a second food item.
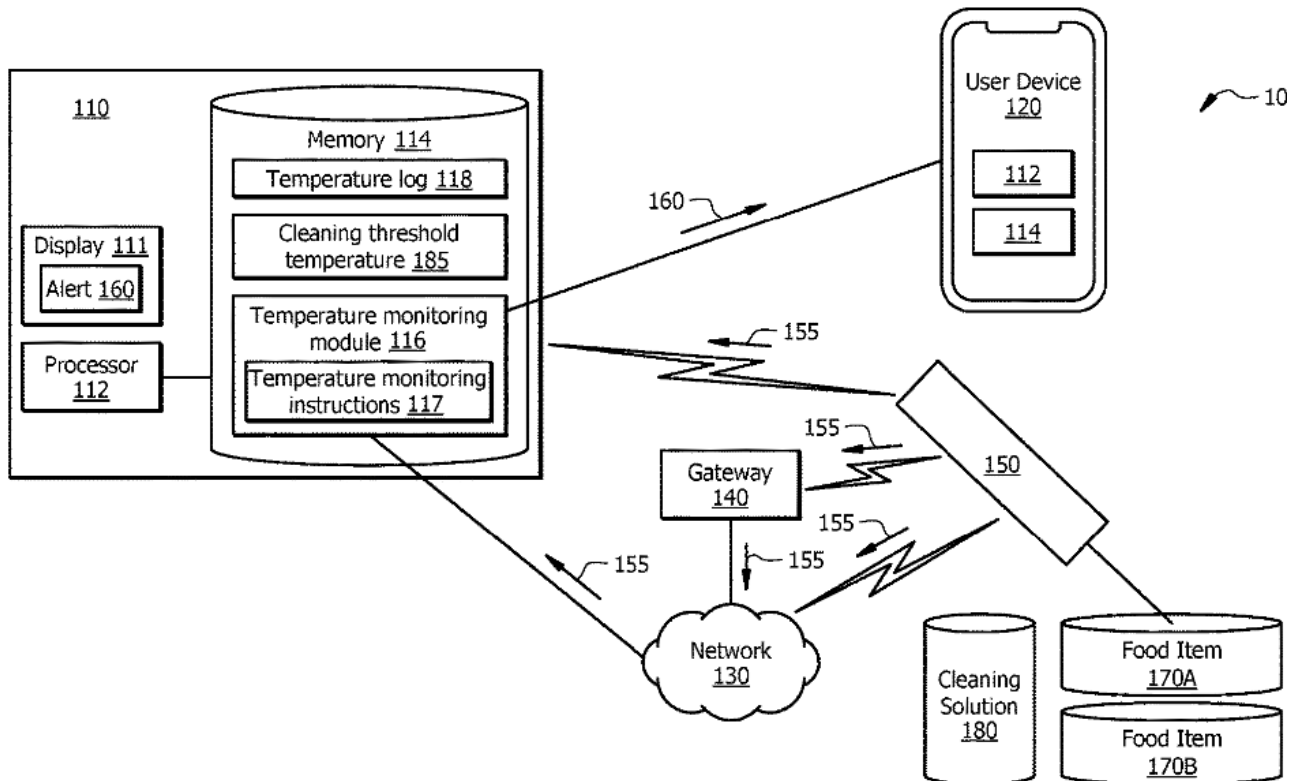
Block diagram of an example neural network, suitable for generating language embeddings for natural languages.
Credit: Mirza, S.; Redmond, M. & Keller, J., Espacenet Patent Search

The processor is further configured to receive, from the food temperature probe, a third temperature that was measured by the food temperature probe after measuring the first temperature but before measuring the second temperature, the third temperature associated with a cleaning of the food temperature probe. The processor is further configured to send an alert for display on a user device when the third temperature is greater than the cleaning threshold temperature.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/086384560/publication/US2023160753A1?q=internet%20of%20things

Reference
Mirza, S.; Redmond, M. & Keller, J. (May 25, 2023). Systems and methods for monitoring food temperatures. Recovered May 26, 2023, Espacenet Patent Search:

https://worldwide.espacenet.com/patent/search/family/086384560/publication/US2023160753A1?q=internet%20of%20things

Information source: (Espacenet Patent Search, 2023)

2.10 Multi-task adapters and task similarity for efficient extraction of pathologies from medical reports

Described are techniques for processing text data. A process can include obtaining an input text data indicative of pathologies associated with a corresponding radiological image.
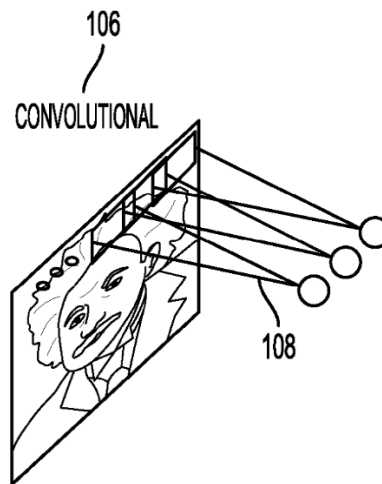
Illustrates an example of a fully connected neural network, in accordance with some examples;
Credit: Sehanobish, A.; Das, A. & Odry, B., Espacenet Patent Search

A BERT-based Machine Learning network can be used to generate a plurality of location tags, each location tag associated with a sentence of input text data and indicative of an anatomical location in the corresponding radiological image. A plurality of sentence groups can be generated using the input text data and the plurality of location tags, each sentence group including sentences of input text data that are associated with a location tag indicative of the same anatomical location. A multi-task learning (MTL)-based Machine Learning network can be used to generate a plurality of sets of features, each set of features generated based on a particular sentence group and indicative of pathology severity predictions determined for the anatomical location associated with the particular sentence group.

For more information, visit the following link:
https://worldwide.espacenet.com/patent/search/family/084547342/publication/US2023161978A1?q=techniques%20for%20processing%20text%20data

Reference
Sehanobish, A.; Das, A. & Odry, B. (May 25, 2023). Multi-task adapters and task similarity for efficient extraction of pathologies from medical reports. Recovered May 26, 2023, Espacenet Patent Search:
https://worldwide.espacenet.com/patent/search/family/084547342/publication/US2023161978A1?q=techniques%20for%20processing%20text%20data

Information source: (Espacenet Patent Search, 2023)