Weekly Discovery
We SHARE to inspire and ignite ideas!

4 Dec – 8 Dec 2023

AI
Creating Virtual Objects with The Flick of a Finger

"Imagine doing a simple hand gesture and the object in front of you is manipulated the way you desire. Now this act of creation is possible—in the world of virtual reality (VR).

Researchers in the United Kingdom have designed a new system called HotGestures, which allows users to execute quick hand gestures indicating which tool they want to use as they create objects and designs in virtual environments. In two experiments, a small handful of study participants piloted the approach, reporting that it was fast and easy to use.

Current VR systems allow users to select tools—for example, a pen—from a menu to create new objects and images in front of them. But this involves first selecting the menu, and then successfully selecting the correct tool."

Source: IEEE Spectrum (22 Nov 2023)

AI
An AI-Aided Stethoscope Can Improve Home Monitoring of Asthma in Very Young Children

"Adults and older children with asthma can take objective measures of symptoms such as peak expiratory flow (PEF), the volume of airflow in one forced exhalation, at home. This provides a more complete picture of their disease and helps them detect asthma exacerbations or negative changes to their condition at the onset. However, a 2022 report by the Global Initiative for Asthma (GINA) identifies continuous respiratory sounds such as wheezes, rhonchi, as the best indicators of asthma exacerbation, especially in children under 5 years of age. Assessment of these symptoms, still primarily done by doctors using stethoscopes in face-to-face visits, can be largely subjective, especially when judged by those who are not medical professionals. There is no objective tool currently recommended for parents to monitor their young children's symptoms at home."

Source: Eurekalert! (27 Nov 2023)

AI
Artificial Intelligence Makes Gripping More Intuitive

"Artificial hands can be operated via app or with sensors placed in the muscles of the forearm. New research shows: a better understanding of muscle activity patterns in the forearm supports a more intuitive and natural control of artificial limbs. This requires a network of 128 sensors and artificial intelligence based techniques.

There are still some challenges to address: The learning algorithm, which is based on the information from the sensors, has to be retrained every time the film slips or is removed. In addition, the sensors must be prepared with a gel to guarantee the necessary conductivity to record the signals from the muscles precisely."

Source: Technological University of Munich (4 Dec 2023)

ARCHITECTURE
Can Architecture Fight Intolerance?

"In a world where news bombards us with various forms of violence, it is always necessary to find ways to recognize the worth and dignity of each person and to respect differences.

As a constructed object and a cultural product, architecture can play a crucial role in promoting diversity and mitigating intolerance. Today, on the International Day for Tolerance—a date established by the UN in 1995 to emphasize everyone's right to freedom of thought, conscience, and religion—we showcase buildings that serve as symbols and spaces for discussions, protection, and celebration of diverse ways of existence. These structures demonstrate that by constructing inclusive spaces, we can break barriers and cross borders to connect with those different from ourselves. In doing so, we open up new perspectives for each individual through meaningful exchanges."

Source: Archdaily (20 Nov 2023)

DESIGN
Ten Design Projects by Students at Hong Kong Polytechnic University
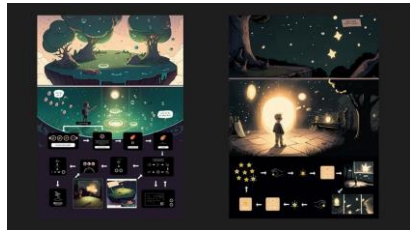

"Dezeen School Shows: a virtual reality experience that aims to help bereaved individuals meditate and heal is included in Dezeen's latest school show by students at Hong Kong Polytechnic University.

Also included is a video strategy game based on a visual novel and an educational project that engages local communities."

Source: Dezeen (27 Nov 2023)

ENGINEERING INNOVATION
## Laser Additive Manufacturing: Listening For Defects as They Happen
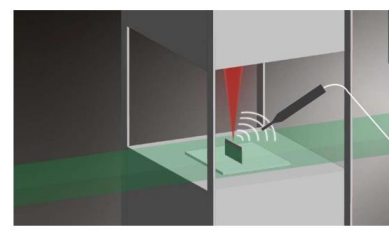
"The progression of laser additive manufacturing—which involves 3D printing of metallic objects using powders and lasers—has often been hindered by unexpected defects. Traditional monitoring methods, such as thermal imaging and machine learning methods, have shown significant limitations. They often either overlook defects or misinterpret them, making precision manufacturing elusive and barring the technique from essential industries like aeronautics and automotive manufacturing.

But what if it were possible to detect defects in real-time based on the differences in the sound the printer makes during a flawless print and one with irregularities? Up until now, the prospect of detecting these defects this way was deemed unreliable. However, researchers at the Laboratory of Thermomechanical Metallurgy (LMTM) at EPFL's School of Engineering have successfully challenged this assumption."

Source: TechXplore (5 Dec 2023)

LASER ABLATION
Gaining More Control Over the Fabrication of Surface Micro/Nano Structures Using Ultrafast Lasers
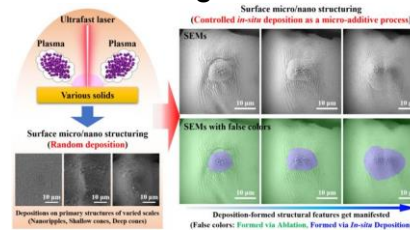
"Surface functionalization via micro/nano structuring is not only a thriving research area inspired by bionics but also of great importance for various practical applications. The key to achieving various surface functions is the fabrication of surface micro/nano structures with controlled dimensions, hierarchies, and compositions, which is driving the continuous progress of micro/nano fabrication techniques.

Researchers from the Laser Materials Processing Research Center at the School of Materials Science and Engineering of Tsinghua University, China, have spent years in developing laser-enabled fabrication techniques for preparing surface micro/nano structures and exploring their functional applications. The functions and applications we have studied include extreme wettability, anti-icing, broadband light absorption, structural colors, solar water evaporation, thermal interface management, tribological properties, surface-enhanced Raman spectroscopy, and photo electrocatalysis for energy applications, etc."

Source: Eurekalert! (27 Nov 2023)

MACHINE LEARNING
Chatgpt Generates Fake Data Set to Support Scientific Hypothesis

"Researchers have used the technology behind the artificial intelligence (AI) chatbot ChatGPT to create a fake clinical-trial data set to support an unverified scientific claim.

In a paper published in JAMA Ophthalmology on 9 November1, the authors used GPT-4 — the latest version of the large language model on which ChatGPT runs — paired with Advanced Data Analysis (ADA), a model that incorporates the programming language Python and can perform statistical analysis and create data visualizations. The AI-generated data compared the outcomes of two surgical procedures and indicated — wrongly — that one treatment is better than the other.

"Our aim was to highlight that, in a few minutes, you can create a data set that is not supported by real original data, and it is also opposite or in the other direction compared to the evidence that are available," says study co-author Giuseppe Giannaccare, an eye surgeon at the University of Cagliari in Italy."

Source: Nature (22 Nov 2023)

MACHINE LEARNING
## AI Accelerates Problem-Solving in Complex Scenarios

"A mixed-integer linear programming (MILP) solver splits a massive optimization problem into smaller pieces and uses generic algorithms to try and find the best solution. However, the solver could take hours — or even days — to arrive at a solution. The process is so onerous that a company often must stop the software partway through, accepting a solution that is not ideal but the best that could be generated in a set amount of time.

Researchers from MIT and ETH Zurich used machine learning to speed things up. They identified a key intermediate step in MILP solvers that has so many potential solutions it takes an enormous amount of time to unravel, which slows the entire process. The researchers employed a filtering technique to simplify this step, then used machine learning to find the optimal solution for a specific type of problem. Their data-driven approach enables a company to use its own data to tailor a general-purpose MILP solver to the problem at hand. This new technique sped up MILP solvers between 30 and 70 percent, without any drop in accuracy. One could use this method to obtain an optimal solution more quickly or, for especially complex problems, a better solution in a tractable amount of time."

Source: MIT News (5 Dec 2023)

ROBOTICS
Exposure To Soft Robots Decreases Human Fears About Working with Them
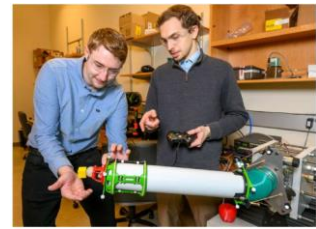

"A Washington State University study found that watching videos of a soft robot working with a person at picking and placing tasks lowered the viewers' safety concerns and feelings of job insecurity. This was true even when the soft robot was shown working in close proximity to the person. This finding shows soft robots hold a potential psychological advantage over rigid robots made of metal or other hard materials.

The study, published in the journal IISE Transactions on Occupational Ergonomics and Human Factors, did find that faster interactions with a soft robot tended to cause more negative responses, but when the study participants had previous experience with robots, faster speed did not bother them. In fact, they preferred the faster interactions. This reinforces the finding that greater familiarity increased overall comfort with soft robots."

Source: TechXplore (5 Dec 2023)

ROBOTICS
## A New Optimization Framework for Robot Motion Planning
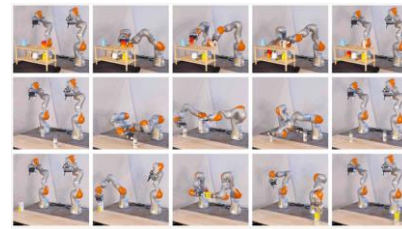
"MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) researchers' "Graphs of Convex Sets (GCS) Trajectory Optimization" algorithm presents a scalable, collision-free motion planning system for these robotic navigational needs. The approach marries graph search (a method for finding discrete paths in a network) and convex optimization (an efficient method for optimizing continuous variables so that a given cost is minimized) and can quickly find paths through maze-like environments while simultaneously optimizing the trajectory of the robot. GCS can map out collision-free trajectories in as many as 14 dimensions (and potentially more), with the aim of improving how machines work in tandem in warehouses, libraries, and households.

The CSAIL-led project consistently finds shorter paths in less time than comparable planners, showing GCS' capability to efficiently plan in complex environments. In demos, the system skillfully guided two robotic arms holding a mug around a shelf while optimizing for the shortest time and path."

Source: MIT News (30 Nov 2023)

QUANTUM PHYSICS
Diamonds And Rust Help Unveil 'Impossible' Quasi-Particles
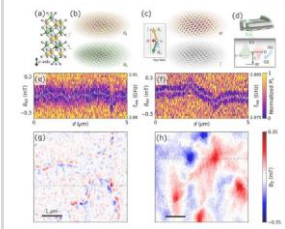
"Researchers led by the University of Cambridge used a technique known as diamond quantum sensing to observe swirling textures and faint magnetic signals on the surface of hematite, a type of iron oxide.

The research has also shown the direct connection between the previously hidden swirling textures and the magnetic charges of materials like hematite as if there is a secret code linking them together. The results, which could be useful in enabling next-generation logic and memory applications, are reported in the journal Nature Materials."

Source: Phys Org (5 Dec 2023)