

Best of Last Year: The top Tech Xplore articles of 2022

December 15 2022, by Bob Yirka



This Handout photo provided by Yuman Gao and Rui Jin on May 4, 2022 shows a new flight path planning system enables drone swarms to fly through crowded forests without collisions.

It was an interesting year for technology research, as a team at Stanford University found that the practice of [charging cars in the evenings or at night](#) will overstress the electric grid in the years to come. They suggested that policymakers institute programs to incentivize daytime

charging at work or public service stations to prevent the costs of electricity from soaring in the future.

A collaboration between Reed College, the University of Illinois and Portland State University this past spring resulted in an assessment of [the benefits of ecoroofs](#). They found that they are worth the cost for urban residents. Putting gardens on the tops of buildings or homes, they found, more than made up for installation costs in energy savings, preventing sewer overruns and providing an increase in pollinators.

And a team of engineers at the University of New South Wales designed [a new engine system based on retrofitting diesel engines](#) to run on 90% hydrogen. Led by Professor Shawn Kook, the group spent 18 months working on the design and building a working model. Testing showed that it reduced CO₂ emissions over a standard diesel engine by over 85% and that the design could be used to retrofit existing trucks.

Also, a team at Dartmouth College built [an AI application](#) that could read conversations on Reddit and report back about the mental state of the people engaging in such conversations. Testing showed the application was capable, under some scenarios, of detecting mental health disorders. The team presented their paper describing their app and their work with it at this year's International Conference on Web Intelligence and Intelligent Agent Technology.

A team of engineers at the University of Delaware announced last winter that they had designed and built [a fuel cell](#) that could remove 99% of the carbon dioxide in an ambient air sample. Describing their work as game-changing, the group suggests their milk-jug-sized device could be used to remove CO₂ from manufacturing applications and also in closed space scenarios, such as spacecraft or submarines.

A combined team of researchers from the University of Florida, the

University of Michigan and the University of Electro-Communications, in Japan, found that [directed hand-held lasers](#) could be used by criminals to attack autonomous vehicles. Such attacks, they found, could result in lidar systems becoming blind to pedestrians and confused by the movements of other vehicles around them.

A combined team from National Renewable Energy Laboratory and MIT designed and built [a new heat engine with no moving parts](#) that was as efficient as a steam turbine. The engine converted heat to electricity at approximately 40% efficiency and was created in the form of a thermophotovoltaic cell, similar to a solar panel's photovoltaic cells.

A team at Rowland Institute at Harvard University, working with a pair of colleagues from Stanford University developed [a new kind of 3D printing](#). Instead of creating objects by laying down layers from above, their new printer adds layers from all sides at the same time. It does so through the use of a [laser](#) focused through a lens onto a gelatinous resin that sets when exposed to blue light.

Last spring, a team at Aston University announced that [AI traffic light systems](#) could soon make traffic jams a distant memory. They developed a system that reads data from live traffic cameras at multiple sites, analyzes the imagery and then devises the best approach to timing traffic lights to prevent traffic from backing up. And because it is based on reinforcement learning, it improves over time.

Nissan announced last spring that it was working with NASA and the University of California, San Diego, to develop [a new type of battery for electric vehicles](#)—one that would be both lighter and safer than those currently in use. In their announcement, Nissan described such batteries as "game-changing," and would involve swapping out lithium-ion for other materials that would make them solid-state, and safe enough, they noted, for use in pacemakers.

And a team at the University of California, Irvine, discovered that [music could be used to trigger a deadly pathogen release](#) from a negative-pressure room used for biological research. They noted that someone familiar with how pressure controls are used for such rooms could embed a tone in a song playing on a smartphone that would change how the pressure-control fans operate in the room, and thus affect air flow, potentially blowing air out instead of keeping it in.

A combined team from the National Renewable Energy Laboratory and Pennsylvania State University, developed [a material](#) that could be wrapped around a hot pipe to convert its waste heat into electricity. The material exhibited a 150% higher power density than other state-of-the-art units. A larger version was able to maintain a 115% power density advantage.

Researchers at the University of Cambridge developed a [supercapacitor device](#) that can remove CO₂ from the air during its charge cycle and then disburse it into a container for capture during its discharge cycle. The device, envisioned and built by Trevor Binford, Grace Mapstone, Israel Temprano and Alexander Forse, resembles a rechargeable battery and is approximately the size of a coin.

During an interview with AFP, Jens Husemann, an entrepreneur running an energy conversion business, described a problem involving [solar panels being disconnected from the grid](#) during strong daylight hours, when they are producing the most power. This occurs when the grid becomes overwhelmed.

And a team with members from the University of Cambridge and the University of Oslo reported that [a mathematical paradox](#) demonstrates some of the limits of AI. They noted that most such systems, because they are built on neural networks, are not good at understanding when they arrive at a wrong answer. This is due to a paradox first described by

Alan Turing and Kurt Gödel that involved being able to prove whether a given mathematical state is true or false.

Milán Janosov, lead scientist at Datopolis with a Ph.D. in Network Science from Central European University, published what he described as [a social map of "The Witcher"](#), a graphic representation summarizing the plot and relationships between characters in the popular fantasy novel series written by Andrzej Sapkowski (and now a Netflix television series).

And a team at the University of Naples Federico II, announced that they had built [a bartending robot](#) that not only mixes drinks, but can engage in personalized interactions with human patrons. Similar in many respects to Arthur, the android bartender in the movie "Passengers," the system, called BRILLO, has been designed to engage with customers in a personalized way by listening to what they say and providing unique recommendations.

Also reminding movie fans of scenes from several sci-fi movies, a team at Zhejiang University working with a colleague from Hong Kong University of Science and another from the Technology and Huzhou Institute of Zhejiang University, created [a swarm of drones](#) capable of flying autonomously through a thick forest. Ten quadcopters were shown flying together through a bamboo forest in China without running into branches or other bushes.

A team at Stanford University conducted a study that involved [tracing the origins and diffusion of image memes online](#). They found that internet memes do not generally originate from peripheral communities—they are instead extremely centralized. They also found that most image memes are first published on a single site, Reddit, and then shared on other platforms.

A team of computer security experts at the University of Glasgow developed [a system called ThermoSecure](#) that is capable of figuring out a user's computer or smartphone password by studying traces of heat left behind by finger taps on keyboards or screens. The system requires direct, unnoticed access to the computer keyboard or smartphone, of course, but also demonstrates how far thermal imaging technology has come in the past few years.

And a team of researchers at Beihang University, working with colleagues at Imperial College London and Swiss Federal Laboratories for Materials Science and Technology, designed and built [a quadcopter](#) that works in the air and underwater and includes a suction cup for hitching a ride on a host. Hitching, the team noted, could allow for much longer deployments.

Also, a team of computer scientists at MIT's Computer Science and Artificial Intelligence Laboratory announced that they had created [a new programming language for hardware accelerators](#). If adopted by others in the community, the new language (called Exo) could make it much easier for all of the parties involved in off-loading certain parts of an application onto an accelerator, speeding things up for everyone.

Another team at MIT designed and built [a portable desalination unit](#) weighing less than 10 kilograms that can remove particles and salts to generate drinking water. The device is small enough to pack in a suitcase, making it easily portable. It can also be powered using a single solar panel, and could sell for just \$50. Real-world testing showed it capable of purifying one cup of seawater in approximately 30 minutes.

Teams from several research centers around the world participated in the Indy Autonomous Challenge at this year's Consumer Electronics Show in Las Vegas. The event pitted [life-sized autonomous race cars against one another](#). Cars in the race drove themselves over 100 miles an hour. Event

planners designated all of the cars who raced in the event as winners.

And finally, a team of engineers at Soochow University, working with two colleagues from the Max Planck Institute for Intelligent Systems and another from Harbin Institute of Technology, developed [a type of soft robot](#) that can be split into tinier components to pass through small spaces and then reassemble afterward. A video of the tiny robots in action has been named our [Top Tech Video of the Year](#).

More videos like these can be found on our new YouTube channel. [Remember to subscribe](#) as we continue to bring you the latest research news for 2023 and beyond.

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