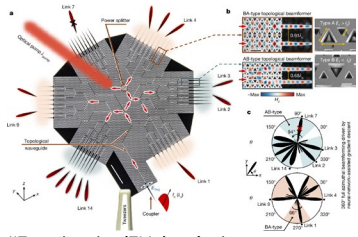


6G NETWORKS
On-Chip Topological Beamformer for Multi-Link Terahertz 6G To XG Wireless



"Terahertz (THz) wireless communication holds immense potential to revolutionize future 6G to XG networks with high capacity, low latency and extensive connectivity. Efficient THz beamformers are essential for energy-efficient connections, compensating path loss, optimizing resource usage and enhancing spectral efficiency. However, current beamformers face several challenges, including notable loss, limited bandwidth, constrained spatial coverage and poor integration with on-chip THz circuits. Here we present an on-chip broadband THz topological beamformer using valley vortices for waveguiding, splitting and perfect isolation in waveguide phased arrays, featuring 184 densely packed valley-locked waveguides, 54 power splitters and 136 sharp bends. Leveraging neural-network-assisted inverse design, the beamformer achieves complete 360° azimuthal beamforming with gains of up to 20 dBi, radiating THz signals into free space with customizable user-defined beams. Photoexciting the all-silicon beamformer enables reconfigurable control of THz beams. The low-loss and broadband beamformer enables a 72-Gbps chip-to-chip wireless link over 300 mm and eight simultaneous 40-Gbps wireless links. Using four of these links, we demonstrate point-to-4-point real-time HD video streaming. Our work provides a complementary metal-oxide-semiconductor-compatible THz topological photonic integrated circuit for efficient large-scale beamforming, enabling massive single-input multiple-output and multiple-input and multiple-output systems for terabit-per-second 6G to XG wireless communications."

Source: [Nature](#) (14 Aug 2024)

AI
Artificial Intelligence Can Not Yet Reliably Read and Extract Information from Clinical Notes in Medical Records



"It may someday be possible to use Large Language Models (LLM) to automatically read clinical notes in medical records and reliably and efficiently extract relevant information to support patient care or research. But recent research from Columbia University Mailman School of Public Health using ChatGPT-4 to read medical notes from Emergency Department admissions to determine whether injured scooter and bicycle riders were wearing a helmet finds that LLM can't yet do this reliably. The findings are published in JAMA Network Open (link is external and opens in a new window).

In a study of 54,569 emergency department visits among patients injured while riding a bicycle, scooter or other micromobility conveyance from 2019 to 2022, the AI LLM had difficulty replicating results of a text string-search based approach for extracting helmet status from clinical notes. The LLM only performed well when the prompt included all of the text used in the text string search-based approach. The LLM also had difficulty replicating its work across trials on each of five successive days, it did better replicating its hallucinations than its accurate work. It particularly struggled when phrases were negated, such as reading "w/o helmet" or "unhelmeted" and reporting that the patient wore a helmet.

Large amounts of medically relevant data are included in electronic medical records in the form of written clinical notes, a type of unstructured data. Efficient ways to read and extract information from these notes would be extremely useful for research. Currently information from these clinical notes can be extracted using simple string-matching text search approaches or through more sophisticated artificial intelligence (AI)-based approaches such as natural language processing. The hope was that new LLM, such as ChatGPT-4, could extract information faster and more reliably."

Source: [columbia](#) (19 Aug 2024)

AI
Peering Into the Mind of Artificial Intelligence to Make Better Antibiotics



"Artificial intelligence (AI) has exploded in popularity. It powers models that help us drive vehicles, proofread emails and even design new molecules for medications. But just like a human, it's hard to read AI's mind. Explainable AI (XAI), a subset of the technology, could help us do just that by justifying a model's decisions. And now, researchers are using XAI to not only scrutinize predictive AI models more closely, but also to peer deeper into the field of chemistry.

The researchers will present their results at the fall meeting of the American Chemical Society (ACS). ACS Fall 2024 is a hybrid meeting being held virtually and in person Aug. 18-22; it features about 10,000 presentations on a range of science topics."

Source: [ACS](#) (18 Aug 2024)

AI
Using AI To Find the Polymers of The Future



"Nylon, Teflon, Kevlar. These are just a few familiar polymers — large-molecule chemical compounds — that have changed the world. From Teflon-coated frying pans to 3D printing, polymers are vital to creating the systems that make the world function better.

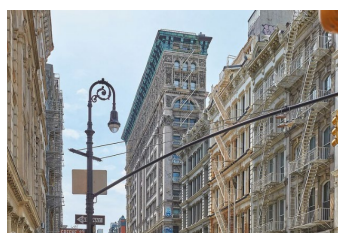
Finding the next groundbreaking polymer is always a challenge, but now Georgia Tech researchers are using artificial intelligence (AI) to shape and transform the future of the field. Rampi Ramprasad's group develops and adapts AI algorithms to accelerate materials discovery.

This summer, two papers published in the Nature family of journals highlight the significant advancements and success stories emerging from years of AI-driven polymer informatics research. The first, featured in Nature Reviews Materials, showcases recent breakthroughs in polymer design across critical and contemporary application domains: energy storage, filtration technologies, and recyclable plastics. The second, published in Nature Communications, focuses on the use of AI algorithms to discover a subclass of polymers for electrostatic energy storage, with the designed materials undergoing successful laboratory synthesis and testing.

"In the early days of AI in materials science, propelled by the White House's Materials Genome Initiative over a decade ago, research in this field was largely curiosity-driven," said Ramprasad, a professor in the School of Materials Science and Engineering. "Only in recent years have we begun to see tangible, real-world success stories in AI-driven accelerated polymer discovery. These successes are now inspiring significant transformations in the industrial materials R&D landscape. That's what makes this review so significant and timely."

Source: [EurekAlert!](#) (19 Aug 2024)

ARCHITECTURE
Lessons From SoHo and Wong Chuk Hang: Adapting Static Structures for New Demands



"How have architecture and building design adapted to unforeseen future uses? As cities evolve, their needs for buildings inevitably change. Buildings may transition between cultural, commercial, industrial, and office functions depending on a city's identity and economic activity. In a world that is becoming increasingly dynamic and fast-paced, it's essential to consider the challenges static structures face when required to meet new demands. Cities have repurposed these static structures in ways not anticipated during their original design, with many successes in repurposing industrial buildings. Unlike structures designed with flexibility in mind, most manufacturing facilities were not initially intended for multiple uses. Yet, how have cities, communities, and occupants used these spaces, and what are the challenges of transforming a building's existing uses?"

Source: [Archdaily](#) (19 Aug 2024)

ARCHITECTURE
Transforming Office Spaces: Repurposing Underutilized Structures in The United States



"The continuation of remote work practices has altered cities' bustling downtown areas along with the traditional office landscape, leaving behind many vacant spaces whose future purpose is a matter of speculation. Four years after the onset of hybrid working policies, office occupancy rates in urban centers remain lower than pre-pandemic levels, signaling a long-term shift in the work environment. Some developers have aimed to reposition these buildings while other are seeking alternative uses of vacant buildings in central location. While both approaches prove beneficial in their own ways, the potential for repurposing office buildings is vast and exciting. From residential living to cutting-edge research facilities, architects and developers explore diverse possibilities and challenges of transforming these underutilized structures into thriving new spaces."

Source: [Archdaily](#) (19 Aug 2024)

DESIGN
Seven Portable AI Devices That Attempt to Give Shape to A New Technology



"Following the recent launch of a necklace wearable that provides AI friendship, here are seven products that are trying to imagine the future of hardware for artificial intelligence.

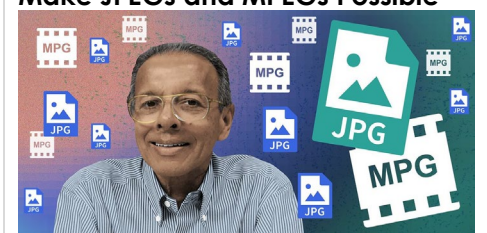
If 2023 was the year that familiarised consumers with AI through ChatGPT, Midjourney and other apps, 2024 has been the year of the AI device, with several companies attempting to build on the technology to create the next smartphone, smartwatch or other indispensable personal gadget.

These are not just devices that incorporate AI into their software but that put the technology at the core of the user's experience and attempt to devise new ways of interaction.

Is AI the beginning of the end of the smartphone? Will we live with more technology but fewer screens? These seven devices provide a glimpse into possible futures."

Source: [Dezeen](#) (14 Aug 2024)

DIGITAL IMAGES
Nasir Ahmed: An Unsung Hero of Digital Media: His Digital-Compression Breakthrough Helped Make JPEGs and MPEGs Possible



"Stop for a second and think about the Internet without digital images or video. There would be no faces on Facebook, Instagram and TikTok probably wouldn't exist. Those Zoom meetings that took the place of in-person gatherings for school or work during the height of the COVID-19 pandemic? Not an option.

Digital audio's place in our Internet-connected world is just as important as still images and video. It has changed the music business—from production to distribution to the way fans buy, collect, and store their favorite songs.

What do those millions of profiles on LinkedIn, dating apps, and social media platforms (and the inexhaustible selection of music available for download online) have in common? They rely on a compression algorithm called the discrete cosine transform, or DCT, which played a major role in allowing digital files to be transmitted across computer networks.

"DCT has been one of the key components of many past image- and video-coding algorithms for more than three decades," says Touradj Ebrahimi, a professor at Ecole Polytechnique Fédérale de Lausanne, in Switzerland, who currently serves as chairman of the JPEG standardization committee. "Only a few image-compression standards not using DCT exist today," he adds.

The Internet applications people use every day but largely take for granted were made possible by scientists and engineers who, for the most part, toiled in anonymity. One such "hidden figure" is Nasir Ahmed, the Indian-American engineer who figured out an elegant way to cut down the size of digital image files without sacrificing their most critical visual details."

Source: [IEEE Spectrum](#) (19 Aug 2024)

DIGITAL IMAGES
Waste Textiles Turned into Sweets in

LITHIUM-ION BATTERIES
Development Of a Model Capable of

ROBOTS
Robot Planning Tool Accounts for

SUSTAINABILITY
New Twist on Synthesis Technique

FabriCandy Project



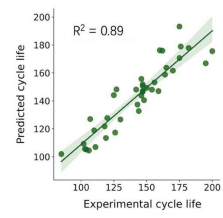
"Scraps of fabric have been recycled into edible treats by designer Jinghan Li, who wants people to consider waste as a resource for food.

Li undertook the FabriCandy project as part of her masters in biodesign at London's Central Saint Martins (CSM) college, producing an array of colourful confections.

She made the candies by applying the enzyme cellulase to natural fabrics, which breaks down their cellulose content into glucose."

Source: [Dezeen](#) (20 Aug 2024)

Predicting the Cycle Lives of High-Energy-Density Lithium-Metal Batteries



"NIMS and SoftBank Corp. have jointly developed a model capable of predicting the cycle lives of high-energy-density lithium-metal batteries by applying machine learning methods to battery performance data. The model proved able to accurately estimate batteries' longevity by analyzing their charge, discharge and voltage relaxation process data without relying on any assumption about specific battery degradation mechanisms. The technique is expected to be useful in improving the safety and reliability of devices powered by lithium-metal batteries.

This research team fabricated a large number of high-energy-density lithium-metal battery cells—each composed of a lithium-metal anode and a nickel-rich cathode—using advanced battery fabrication techniques the team had previously developed. The team then evaluated the charge/discharge performance of these cells. Finally, the team constructed a model able to predict the cycle lives of lithium-metal batteries by applying machine learning methods to the charge/discharge data. The model proved able to make accurate predictions by analyzing charge, discharge and voltage relaxation process data without relying on any assumption about specific battery degradation mechanisms."

Source: [EurekAlert!](#) (19 Aug 2024)

Human Carelessness



"A new algorithm may make robots safer by making them more aware of human inattentiveness.

In computerized simulations of packaging and assembly lines where humans and robots work together, the algorithm developed to account for human carelessness improved safety by about a maximum of 80% and efficiency by about a maximum of 38% compared to existing methods.

The work is reported in IEEE Transactions on Systems, Man, and Cybernetics: Systems.

"There are a large number of accidents that are happening every day due to carelessness – most of them, unfortunately, from human errors," said lead author Mehdi Hosseinzadeh, assistant professor in Washington State University's School of Mechanical and Materials Engineering. "Robots act as planned and follow the rules, but the humans often don't follow the rules. That's the most difficult and challenging problem."

Source: [WSU](#) (15 Aug 2024)

Developed at Rice Promises Sustainable Manufacturing



"James Tour's lab at Rice University has developed a new method known as flash-within-flash Joule heating (FWF) that could transform the synthesis of high-quality solid-state materials, offering a cleaner, faster and more sustainable manufacturing process. The findings were published in Nature Chemistry on Aug. 8.

Traditionally, synthesizing solid-state materials has been a time-consuming and energy-intensive process, often accompanied by the production of harmful byproducts. But FWF enables gram-scale production of diverse compounds in seconds while reducing energy, water consumption and greenhouse gas emissions by more than 50%, setting a new standard for sustainable manufacturing.

The innovative research builds on Tour's 2020 development of waste disposal and upcycling applications using flash Joule heating, a technique that passes a current through a moderately resistive material to quickly heat it to over 3,000 degrees Celsius (over 5,000 degrees Fahrenheit) and transform it into other substances."

Source: [RICE](#) (16 Aug 2024)

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