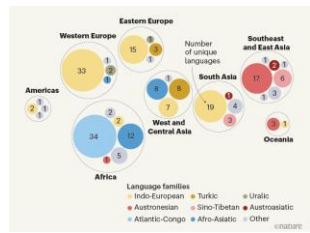


AI
Meta's AI Translation Model Embraces Overlooked Languages



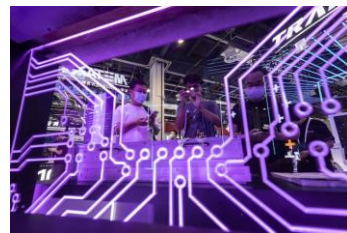
"Machine-translation models use artificial intelligence (AI) to translate one human language into another — a worthy feat, given the potential for enhanced communication to break down the barriers posed by differences in language and culture. Yet most of these models can interpret only a small fraction of the world's languages, in part because training them requires online data that don't exist for many languages. The US technology company Meta has designed a project called No Language Left Behind (NLLB) to change that. Writing in *Nature*, the NLLB team¹ presents a publicly available model that can translate between 204 languages, many of which are used in low- and middle-income countries.

Research into machine translation was instrumental in enabling some of the advances that led to the development of large language models (LLMs), such as the one that underlies ChatGPT. This technology is now an integral part of daily life in multilingual regions such as Europe, but the translation capabilities of LLMs are mostly limited to 'high-resource' languages that can offer large amounts of online data with which to train the models. It's no surprise, then, that English, French and Japanese, for example, feature in this group. Languages that are used in economically rich countries are generally well represented online — for example, on Wikipedia, in mainstream news media and on social-media sites.

By contrast, low-resource languages are those for which the data needed to train a successful machine-translation system are lacking. In most cases, the low-resource languages are used in resource-poor regions or in low- and middle-income countries in the global south, making it difficult for the communities that use these languages to fund the creation of the data sets required."

Source: [Nature](#) (5 Jun 2024)

AI
How To Track the Economic Impact of Public Investments In AI



"Government spending on artificial intelligence (AI) is surging worldwide. In the United States, for example, the federal government invested more than US\$3 billion in the 2023 fiscal year and an influential US taskforce — the National Artificial Intelligence Research Resource (NAIRR) — recommended channelling at least \$2.6 billion more to public-funded research over an initial six-year period¹. The private sector is pumping even more into AI research, spending hundreds of billions of dollars each year. The stakes are high.

Why is AI research a priority for public funding? Governments are betting on investments in innovative emerging industries such as AI as a means to transform their economies and generate sustained job growth. But with limited public resources, it's crucial that these bets are well placed — and informed by data and evidence. That is the only way to maximize the return on public AI investments and steer the trajectory of AI towards serving the public.

However, quantifying spending in frontier areas of research and innovation — let alone the return on such spending — is notoriously difficult. Most national and state statistics systems are ill-equipped to track how investments in AI work their way through the economy because the companies and individuals who are driving the deployment of emerging AI tools are dispersed across a variety of conventional industrial sectors."

Source: [Nature](#) (10 Jun 2024)

AI
New Technique Improves AI Ability to Map 3D Space With 2D Cameras



"Researchers have developed a technique that allows artificial intelligence (AI) programs to better map three-dimensional spaces using two-dimensional images captured by multiple cameras. Because the technique works effectively with limited computational resources, it holds promise for improving the navigation of autonomous vehicles.

"Most autonomous vehicles use powerful AI programs called vision transformers to take 2D images from multiple cameras and create a representation of the 3D space around the vehicle," says Tianfu Wu, corresponding author of a paper on the work and an associate professor of electrical and computer engineering at North Carolina State University. "However, while each of these AI programs takes a different approach, there is still substantial room for improvement.

"Our technique, called Multi-View Attentive Contextualization (MvACon), is a plug-and-play supplement that can be used in conjunction with these existing vision transformer AIs to improve their ability to map 3D spaces," Wu says. "The vision transformers aren't getting any additional data from their cameras, they're just able to make better use of the data."

MvACon effectively works by modifying an approach called Patch-to-Cluster attention (PaCa), which Wu and his collaborators released last year. PaCa allows transformer AIs to more efficiently and effectively identify objects in an image.

"The key advance here is applying what we demonstrated with PaCa to the challenge of mapping 3D space using multiple cameras," Wu says."

Source: [NCSU](#) (13 Jun 2024)

ARCHITECTURE
Designing Spaces for Impactful Musical Experiences



"Music consumption has historically been closely connected to the environments in which it is enjoyed. Before the advent of music recordings, listening to music was a social activity tied to collective rituals in physical spaces, such as concerts or smaller communal gatherings. With the development of music records and now with the current availability of virtually any kind of music at our fingertips, experiencing music has become a more solitary and routine endeavor. However, returning to the roots of communal musical experiences may unlock numerous benefits much needed in our isolating digital age. These collective musical events have the potential to significantly enhance a community's social cohesion and improve their mental health through memorable shared experiences.

The physical aspect of these is not to be underestimated. It's where innovative design and architecture step in, transforming mere spaces into catalysts for curiosity, transcendence, and collective joy. By harnessing emerging technology and fostering interdisciplinary collaboration, designers and architects can create environments that elevate concerts and music rituals into transformative and grounding moments."

Source: [Archdaily](#) (10 Jun 2024)

AVIATION
Airbus Partners with Avincis on Advanced Air Mobility



"Airbus and Avincis, a well-established European helicopter operator, have signed a Memorandum of Understanding (MoU) to partner on the development of Advanced Air Mobility (AAM). The companies will collaborate to explore opportunities for operating electric vertical take-off and landing (eVTOL) aircraft throughout Europe.

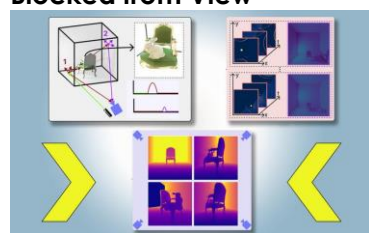
Through the agreement, Airbus and Avincis will focus on defining the concept of operations for eVTOLs in Europe and beyond. Both parties will jointly work to define mission profiles for eVTOL operations in Europe and other target regions. This agreement is another step towards the creation of an AAM ecosystem and is an expansion of Airbus' long standing relationship with Avincis.

John Boag, CEO, Avincis, said: "Our partnership with Airbus is an important milestone for Avincis, as we look to the future of emergency air services and the platforms that will support our missions for generations to come. eVTOLs will play an important role in our long-term fleet strategy as these technologies continue to evolve to give us further reach and capability in the field.

"Airbus is at the cutting-edge of this evolution, and we are excited to be working with their team in understanding how we can harness the latest technology to bring more sustainable solutions to emergency services globally."

Source: [Airbus](#) (5 Jun 2024)

COMPUTER VISION
Researchers Leverage Shadows to Model 3D Scenes, Including Objects Blocked from View



"Imagine driving through a tunnel in an autonomous vehicle, but unbeknownst to you, a crash has stopped traffic up ahead. Normally, you'd need to rely on the car in front of you to know you should start braking. But what if your vehicle could see around the car ahead and apply the brakes even sooner?

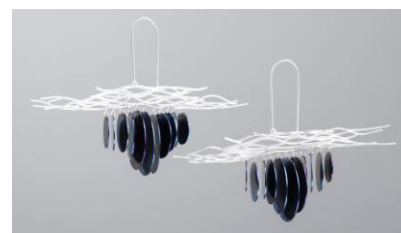
Researchers from MIT and Meta have developed a computer vision technique that could someday enable an autonomous vehicle to do just that.

They have introduced a method that creates physically accurate, 3D models of an entire scene, including areas blocked from view, using images from a single camera position. Their technique uses shadows to determine what lies in obstructed portions of the scene.

They call their approach PlatoNeRF, based on Plato's allegory of the cave, a passage from the Greek philosopher's "Republic" in which prisoners chained in a cave discern the reality of the outside world based on shadows cast on the cave wall."

Source: [EurekAlert!](#) (18 Jun 2024)

DESIGN
New Designers Presents Nine Student Design Projects



"New Designers is an annual London showcase of the UK's most innovative emerging design talent.

"Since its inception 39 years ago, New Designers has provided a platform for over 3,000 graduates every year to present their visionary ideas to industry professionals and the public.

"The event takes place over two weeks, with different disciplines highlighted in Week 1 and Week 2, spanning fashion, textiles, furniture, product design, illustration and more."

Source: [Dezeen](#) (18 Jun 2024)

LLM
Researchers Use Large Language Models to Help Robots Navigate



"Someday, you may want your home robot to carry a load of dirty clothes downstairs and deposit them in the washing machine in the far-left corner of the basement. The robot will need to combine your instructions with its visual observations to determine the steps it should take to complete this task.

For an AI agent, this is easier said than done. Current approaches often utilize multiple hand-crafted machine-learning models to tackle different parts of the task, which require a great deal of human effort and expertise to build. These methods, which use visual representations to directly make navigation decisions, demand massive amounts of visual data for training, which are often hard to come by.

To overcome these challenges, researchers from MIT and the MIT-IBM Watson AI Lab devised a navigation method that converts visual representations into pieces of language, which are then fed into one large language model that achieves all parts of the multistep navigation task.

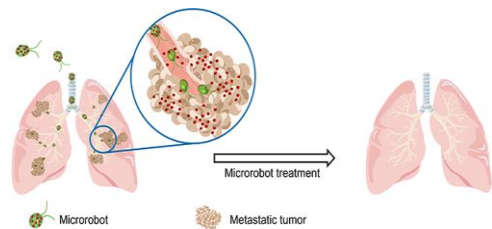
Rather than encoding visual features from images of a robot's surroundings as visual representations, which is computationally intensive, their method creates text captions that describe the robot's point-of-view. A large language model uses the captions to predict the actions a robot should take to fulfill a user's language-based instructions.

Because their method utilizes purely language-based representations, they can use a large language model to efficiently generate a huge amount of synthetic training data.

While this approach does not outperform techniques that use visual features, it performs well in situations that lack enough visual data for training. The researchers found that combining their language-based inputs with visual signals leads to better navigation performance."

Source: [MIT News](#) (12 Jun 2024)

Swimming Microrobots Deliver Cancer-Fighting Drugs to Metastatic Lung Tumors in Mice



“Engineers at the University of California San Diego have developed microscopic robots, known as microrobots, capable of swimming through the lungs to deliver cancer-fighting medication directly to metastatic tumors. This approach has shown promise in mice, where it inhibited the growth and spread of tumors that had metastasized to the lungs, thereby boosting survival rates compared to control treatments.

The findings are detailed in a paper published on June 12 in *Science Advances*.

To create the microrobots, researchers chemically attached drug-filled nanoparticles to the surface of green algae cells. The algae, which provide the microrobots with their movement, enable the nanoparticles to efficiently swim around in the lungs and deliver their therapeutic payload to tumors.

The nanoparticles are made of tiny biodegradable polymer spheres, which are loaded with the chemotherapeutic drug doxorubicin and coated with red blood cell membranes. This coating serves a critical function: it protects the nanoparticles from the immune system, allowing them to stay in the lungs long enough to exert their anti-tumor effects. “It acts as a camouflage,” said study co-first author Zhengxing Li, who is a nanoengineering Ph.D. student in both Wang and Zhang’s research groups. “This coating makes the nanoparticle look like a red blood cell from the body, so it will not trigger an immune response.”

Source: [UCSD](#) (12 Jun 2024)

Quantum Data Assimilation: A Quantum Leap in Weather Prediction



“Researchers developed a novel algorithm to solve data assimilation problems using quantum computers, significantly reducing computational cost.

Data assimilation is an important mathematical discipline in earth sciences, particularly in numerical weather prediction (NWP). However, conventional data assimilation methods require significant computational resources. To address this, researchers developed a novel method to solve data assimilation on quantum computers, significantly reducing the computation time. The findings of the study have the potential to advance NWP systems and will inspire practical applications of quantum computers for advancing data assimilation.

In the study, the researchers focused on the four-dimensional variational data assimilation (4DVAR) method, one of the most widely used data assimilation methods in NWP systems. However, since 4DVAR is designed for classical computers, it cannot be directly used on quantum hardware. Prof. Kotsuki clarifies, “Unlike the conventional 4DVAR, which requires a cost function and its gradient, quantum annealers require only the cost function. However, the cost function must be represented by binary variables (0 or 1). Therefore, we reformulated the 4DVAR cost function, a quadratic unconstrained optimization (QUO) problem, into a quadratic unconstrained binary optimization (QUBO) problem, which quantum annealers can solve.”

Source: [Chiba](#) (13 Jun 2024)

A Strikingly Natural Coincidence: Heating Gallium Nitride and Magnesium Forms a Superlattice with Implications for Semiconductor Doping and Electronic Devices

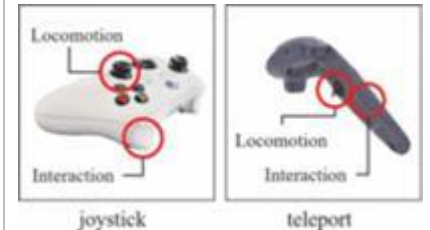


“A study led by Nagoya University in Japan revealed that a simple thermal reaction of gallium nitride (GaN) with metallic magnesium (Mg) results in the formation of a distinctive superlattice structure. This represents the first time researchers have identified the insertion of 2D metal layers into a bulk semiconductor. By carefully observing the materials through various cutting-edge characterization techniques, the researchers uncovered new insights into the process of semiconductor doping and elastic strain engineering. They published their findings in the journal *Nature*.

GaN is an important wide bandgap semiconductor material that is poised to replace traditional silicon semiconductors in applications demanding higher power density and faster operating frequencies. These distinctive characteristics of GaN make it valuable in devices such as LEDs, laser diodes, and power electronics—including critical components in electric vehicles and fast chargers. The improved performance of GaN-based devices contributes to the realization of an energy-saving society and a carbon-neutral future.”

Source: [NU](#) (12 Jun 2024)

Navigation Techniques for Virtual Reality



“Navigation is a fundamental element in virtual reality (VR) applications, as it is essential for exploring space and finding one’s way. Different locomotion techniques can lead to variations in how users control their movements in response to dynamic obstacles, potentially affecting users’ task performance and experience.

In an article published in *IEEE Transactions on Visualization and Computer Graphics*, researchers conduct a comparative study of the effects of environmental dynamics (static and dynamic) and the three locomotion techniques on spatial knowledge, task performances, and user experiences. The authors propose guidelines for VR application developers to apply different locomotion techniques in various environments to enhance users’ spatial knowledge and improve task performances and user experiences.”

Source: [IEEE Xplore](#) (21 May 2024)

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