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KIET School of Computer Applications (KSOCA)

TechEdge

Technical Newsletter

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In This Issue.....

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With AWS Lambda, you can run code without provisioning or managing servers. You pay only for the compute time that you consume—there's no charge when your code isn't running. You can run code for virtually any type of application or backend service—all with zero administration. Just upload your code and Lambda takes care of everything required to run and scale your code with high availability. You can set up your code to automatically trigger from other AWS services or call it directly from any web or mobile app.

Lambda is a compute service that lets you run code without provisioning or managing servers. Lambda runs your code on a high-availability compute infrastructure and performs all of the administration of the compute resources, including server and operating system maintenance, capacity provisioning and automatic scaling, and logging. With Lambda, you can run code for virtually any type of application or backend service. All you need to do is supply your code in one of the languages that Lambda supports.

You organize your code into Lambda functions. Lambda runs your function only when needed and scales automatically, from a few requests per day to thousands per second. You pay only for the compute time that you consume—there is no charge when your code is not running.

You can invoke your Lambda functions using the Lambda API, or Lambda can run your functions in response to events from other AWS services. For example, you can use Lambda to:

- Build data-processing triggers for AWS services such as Amazon Simple Storage Service (Amazon S3) and Amazon DynamoDB.
- Process streaming data stored in Amazon Kinesis.
- Create your own backend that operates at AWS scale, performance, and security.

λ When should I use Lambda?

Lambda is an ideal compute service for many application scenarios, as long as you can run your application code using the Lambda standard runtime environment and within the resources that Lambda provides.

When using Lambda, you are responsible only for your code. Lambda manages the compute fleet that offers a balance of memory, CPU, network, and other resources to run your code. Because Lambda manages these resources, you cannot log in to compute instances or customize the operating system on provided runtimes. Lambda performs operational and administrative activities on your behalf, including managing capacity, monitoring, and logging your Lambda functions.

If you need to manage your own compute resources, AWS has other compute services to meet your needs.

For example:

Amazon Elastic Compute Cloud (Amazon EC2) offers a wide range of EC2 instance types to choose from. It lets you customize operating systems, network and security settings, and the entire software stack. You are responsible for provisioning capacity, monitoring fleet health and performance, and using Availability Zones for fault tolerance.

AWS Elastic Beanstalk enables you to deploy and scale applications onto Amazon EC2. You retain ownership and full control over the underlying EC2 instances.

Lambda features:

The following key features help you develop Lambda applications that are scalable, secure, and easily extensible:

- **Concurrency and scaling controls**

Concurrency and scaling controls such as concurrency limits and provisioned concurrency give you fine-grained control over the scaling and responsiveness of your production applications.

- **Functions defined as container images**

Use your preferred container image tooling, workflows, and dependencies to build, test, and deploy your Lambda functions.

- **Code signing**

Code signing for Lambda provides trust and integrity controls that let you verify that only unaltered code that approved developers have published is deployed in your Lambda functions.

- **Lambda extensions**

You can use Lambda extensions to augment your Lambda functions. For example, use extensions to more easily integrate Lambda with your favourite tools for monitoring, observability, security, and governance.

- **Function blueprints**

A function blueprint provides sample code that shows how to use Lambda with other AWS services or third-party applications. Blueprints include sample code and function configuration presets for Node.js and Python runtimes.

- **Database access**

A database proxy manages a pool of database connections and relays queries from a function. This enables a function to reach high concurrency levels without exhausting database connections.

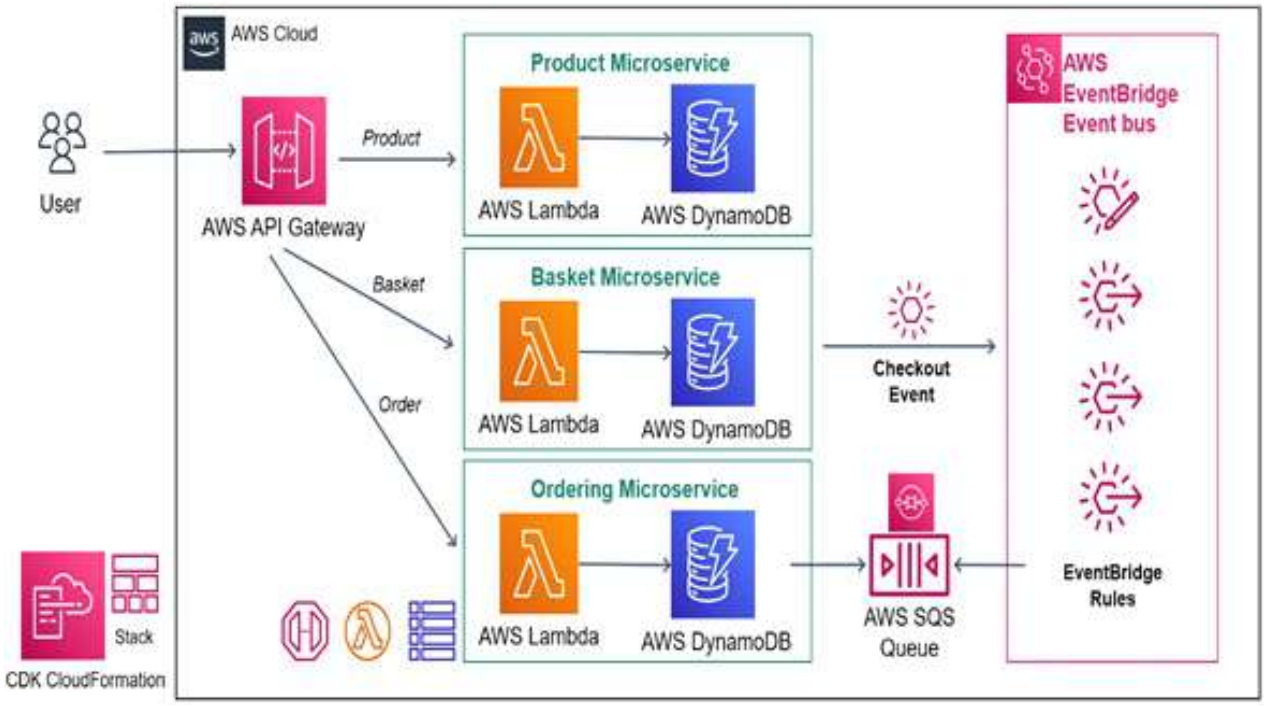
- **File systems access**

You can configure a function to mount an Amazon Elastic File System (Amazon EFS) file system to a local directory. With Amazon EFS, your function code can access and modify shared resources safely and at high concurrency.

Related services::

Lambda integrates with other AWS services to invoke functions based on events that you specify. For example:

- Use API Gateway to provide a secure and scalable gateway for web APIs that route HTTP requests to Lambda functions.



- For services that generate a queue or data stream (such as DynamoDB and Kinesis), Lambda polls the queue or data stream from the service and invokes your function to process the received data.
- Define Amazon S3 events that invoke a Lambda function to process Amazon S3 objects, for example, when an object is created or deleted.
- Use a Lambda function to process Amazon SQS messages or Amazon Simple Notification Service (Amazon SNS) notifications.
- Use AWS Step Functions to connect Lambda functions together into serverless workflows called state machines.

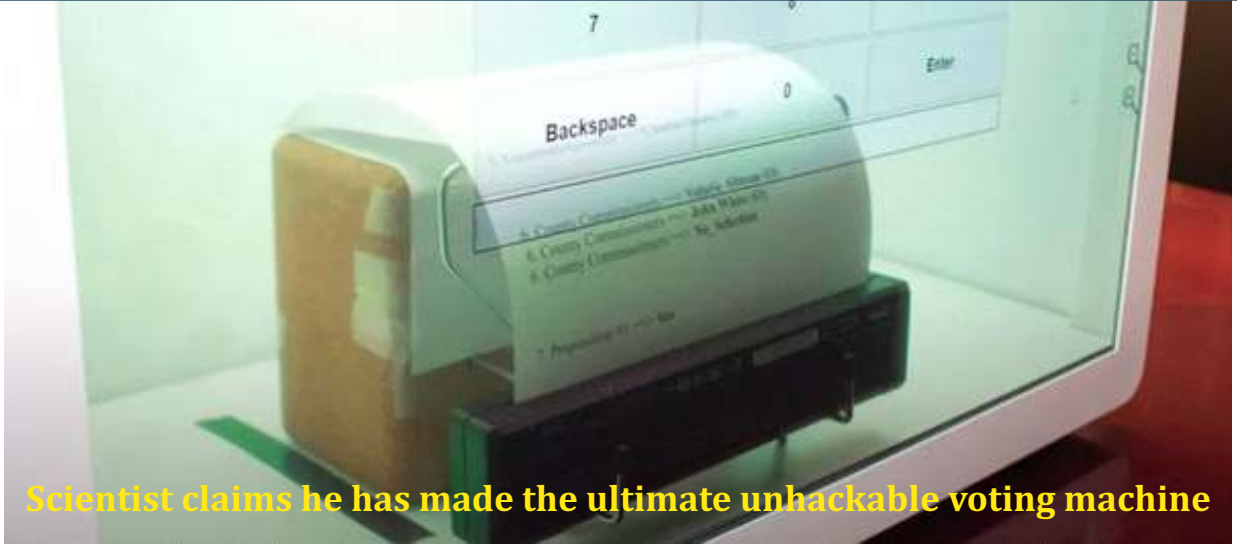
Accessing Lambda

You can create, invoke, and manage your Lambda functions using any of the following interfaces:

- AWS Management Console – Provides a web interface for you to access your functions. For more information, see Lambda console.
- AWS Command Line Interface (AWS CLI) – Provides commands for a broad set of AWS services, including Lambda, and is supported on Windows, macOS, and Linux. For more information, see Using Lambda with the AWS CLI.
- AWS SDKs – Provide language-specific APIs and manage many of the connection details, such as signature calculation, request retry handling, and error handling. For more information, see AWS SDKs.
- AWS CloudFormation – Enables you to create templates that define your Lambda applications. For more information, see AWS Lambda applications. AWS CloudFormation also supports the AWS Cloud Development Kit (AWS CDK).
- AWS Serverless Application Model (AWS SAM) – Provides templates and a CLI to configure and manage AWS serverless applications. For more information, see SAM CLI.

Pricing for Lambda

There is no additional charge for creating Lambda functions. There are charges for running a function and for data transfer between Lambda and other AWS services. Some optional Lambda features (such as provisioned concurrency) also incur charges.



Scientist claims he has made the ultimate unhackable voting machine

Juan Gilbert, a professor of computer science at the University of Florida, has claimed that he has built the ultimate unhackable voting machine that can put concerns to rest over machine-related voting.

Electronic voting systems have the U.S. divided, with advocates calling them reliable aides to the voting process, helping people with disabilities to vote, and reducing invalid ballots. On the other hand, critics have called for their boycott since they can be hacked and can tilt the vote in favour of a person or party.

Companies engaged in building voting machines, an industry with annual revenues of $300 million, do not help matters as they chose to remain secretive about how their machines work and refuse to talk to researchers or the press, the *Undark* report said. Under these circumstances, Gilbert's work is commendable since he has built a system that works using open-source software.

How does the voting system work?

Gilbert's transparent voting machine has been in the works for nearly two decades. It consists of a transparent box that also serves as a touchscreen interface for voters.

Inside the transparent box is a printer that is connected to the device's software Prime III and prints the voter's selection on a paper that is immediately fed into a scanner to be tallied. The transparent case ensures that if a USB device is connected with the intention to hack, the system will be immediately detected by voters.

To ensure that the software of any of the components is not corrupted by an unknown piece of code, it is stored on a Blu-Ray disc in a read-only format, and the voting machine reboots every single time a vote is cast.

The giant transparent touchscreen also ensures that voters are staring right at the printer immediately after their vote is cast and notice the tampering right away.

A system nobody wants to hack

Critics of ballot-marking devices (BMDs) and electronic voting systems have exposed their shortcomings publicly. One such platform has been the annual hacking event DEF Con in Las Vegas.

Earlier in the summer, Gilbert wrote to have a dozen experts give them unfettered access to his machine so that it could be tested by the best minds. Since Prime III uses open-source software, Gilbert's transparent voting machine should be easier to hack into. Manufacturers of electronic voting machines do not share their source code, citing security issues, but Gilbert has already bared it all when it comes to the code.

Yet, not one expert came forward to test the system this year, the *Undark* report said. The device is likely to feature again at next year's DEF CON event. However, Gilbert's voting machine might never see an election day.

Next up, Gilbert's system needs to be certified, for which he may have to spend hundreds of thousands of dollars. The prototype device was made using a French company, but for wide adoption, Gilbert needs to find interested buyers for the device. For jurisdictions, these are just once-a-decade events.

This genetically modified plant does the work of 30 houseplants

A Paris-based startup called Neoplants has genetically modified a plant to do the work of 30 common houseplants, according to a report by *Inverse* published on Thursday(November-10-2022).

The company genetically engineered both a pothos (Epipremnum aureum) plant and its associated root microbiome to produce Neo P1, a powerful air purifier. Now, the new super-efficient plant has hit the market, and it could very well revolutionize the air purification industry.

The new invention is bound to be popular. "One of the side effects of the pandemic is that people are much more aware of what's in the air they breathe," Patrick Torbey, a molecular biologist and chief technical officer of Neoplants, told Inverse.

No electricity required

One of its main attributes is that it does not require electricity and therefore does not pollute. In addition, in a time when wildfires trouble many regions, air purification is in great demand.

The new invention even has the potential to remove volatile organic compounds (VOC) which conventional air purifiers can simply not process. This is because the compounds are so small that they cannot be captured by traditional methods.

However, plants are designed to be able to catch, absorb and metabolize even the smallest of particles. Neo P1 does exactly that and comes in the shape of one of the most common plants.

"We started with one of the most popular houseplants in North America," said Lionel Mora, the startup's co-founder and chief executive officer.

This was no easy task, however, as the pothos vine, which is also known as devil's ivy, had not had its genome mapped. The Neoplants team, therefore, began with this task.

"It's like trying to build a plane while flying," Torbey explained.

The whole ordeal lasted four years, but in the end, the engineers produced a plant that can metabolize four major indoor air pollutants, including formaldehyde and toluene, and that can even absorb certain VOCs.

Further experimentation led to enhanced results

The engineers did not stop there. They also experimented with the microorganisms living in the plant's roots, inserting genes from extremophile bacteria, which thrive in inhospitable environments by consuming toxic chemicals. This alteration significantly increased the resulting plant's pollutant-metabolizing capacity.

To further comply with FDA standards and avoid natural disasters, the engineers avoided experimenting on parts of the genome that could promote the plant's survival in the wild. "We don't give a selective advantage to the plant. We don't make it grow faster, we don't increase its resistance to pesticides," Torbey stated. "We're not touching any of that."

Now, the company is focused on modifying other types of plants to cater to different tastes. It's also working on reducing the plant's price which is currently set at $179.

In 2018, researchers from the University of Washington also modified the pothos plant to remove chloroform and benzene from the air around it. At the time, the technology was considered revolutionary.

MIT reveals a new type of faster AI algorithm for solving a complex equation

Artificial intelligence uses a technique called artificial neural networks (ANN) to mimic the way a human brain works. A neural network uses input from datasets to "learn" and output its prediction based on the given information.

Recently, researchers from the Massachusetts Institute of Technology Computer Science and Artificial Intelligence Lab (MIT CSAIL), have discovered a quicker way to solve an equation used in the algorithms for 'liquid' neural neurons.

Liquid neural neurons

In January 2021, MIT researchers in the U.S. built 'liquid' neural neurons, which were inspired by the brain of small species. It is considered 'liquid' because the algorithm can adjust to changes experienced by real-world systems, by changing the equations as they receive new data. In other words, the algorithms can become fluid like water, and adjust itself to change as liquid adjusts itself to the object it's in.

The flexibility of the 'liquid' neural nets created better decision-making estimates for various tasks that required sequential data. "This is a way forward for the future of robot control, natural language processing, video processing — any form of time series data processing," said Dr. Ramin Hasani, a research affiliate at CSAIL and the lead author from last year's study. "The potential is really significant."

The research team noticed that the models were costly because the number of neurons and synopses required expensive, bulky computer programs to solve the core mathematics needed for the algorithms. The math problems became increasingly more difficult to solve due to the size of the equations, often requiring many computational steps to reach a solution and get an answer.

Creating a faster AI algorithm

The researchers who first created the 'liquid neurons' a year ago have discovered a way to lessen the complexities of the bottleneck by solving the differential equations behind the interaction of two neurons through synapses. Differential equations allow for calculating the state of the world or a phenomenon within time, as it evolves step-by-step, not just from start to finish.

This allowed them to unlock a new type of faster artificial intelligence algorithm. The modes have the same characteristics as liquid neural nets, since they are flexible, fundamental, and explainable, but the innovative factor is that they are much quicker and scalable. The liquid neural net is the novel form of neural network that can adapt its behavior after it "learns" information from input data.

The novel network outperformed its counterparts

The new network has been named the "closed-form continuous-time" (CfC) neural network. It has already outperformed various other artificial neural networks in terms of predictions and completing task and has higher speed-ups and performance in recognizing human activities from motion sensors, modeling physical dynamics of a simulated walker robot, and event-based sequential image processing. As for medical predictions, the new prototypes were 220 times faster on sampling 8,000 patients, than their equivalents.

“The new machine-learning models we call 'CfC's' replace the differential equation defining the computation of the neuron with a closed form approximation, preserving the beautiful properties of liquid networks without the need for numerical integration,” said Daniela Rus, the senior author on the new study, professor at MIT and director of MIT CSAIL.

The equation

In order to develop the natural state of passing time within the differential equation, and to comprehend both past and future behavior, the research team used a 'closed form' solution that models the description of a whole system in its entirety.

Using this approach, the team could compute the equation at any time in the future or the past, and at a quicker rate than using other equations. With the new model, the rate is much quicker because it doesn't require step-by-step computations, as in the usual calculations of differential equations.

Example of the novel calculation

The flexibility of the 'liquid' neural nets could be used for numerous tasks including weather forecasting heart monitoring, and autonomous driving cars. The researchers used the example of an end-to-end neural network that receives driving input from a camera mounted on a car. The network is trained to create outputs, for example, the car's steering angle.

The team used liquid neural networks with 19 nodes - connection point in the artificial neurons - in addition to a small perception module to drive the car. A differential equation would describe each node of the system. When using the closed-form solution, it could give the exact behavior since it has a good estimation of the actual dynamics of the system.

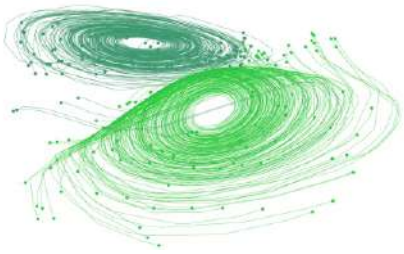
Researchers can solve the problem with a lower number of neurons, allowing for faster problem-solving and more cost-efficient outcomes. Therefore , cars can be trained to drive autonomously using input data and liquid neural net, and done so at a quicker pace. The models can also receive input as the events happen in time, which could be used for classification and controlling a car.

The new way of solving the equation can advance both natural and artificial intelligent systems. “When we have a closed-form description of neurons and synapses' communication, we can build computational models of brains with billions of cells, a capability that is not possible today due to the high computational complexity of neuroscience models,” Dr. Hasani said about the new paper. “The closed-form equation could facilitate such grand-level simulations and therefore opens new avenues of research for us to understand intelligence”

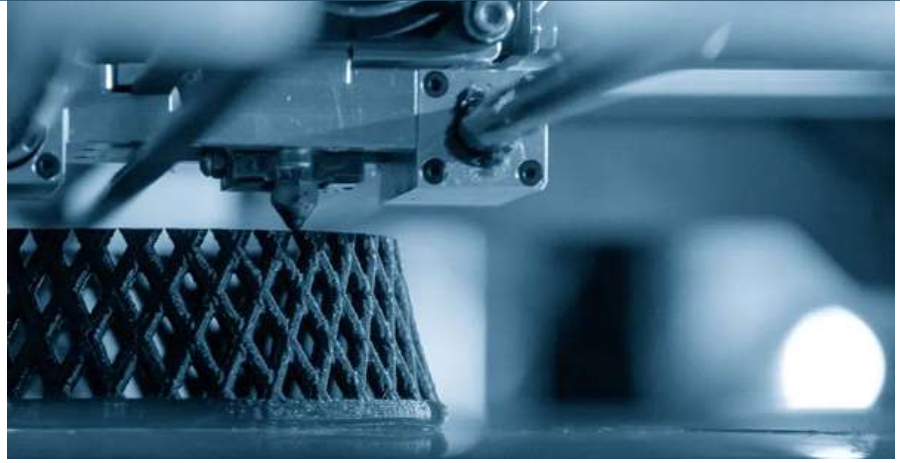
The future of 'liquid' neural networks and liquid CfC

There has been evidence of 'liquid' CfC models learning tasks in one setting, and having the capability to transfer their skills and capabilities to an entirely new environment without further training. Dr. Hasani explained how neural network systems that use differential equations can be difficult to solve and scale to millions of parameters.

This would require building larger-scale neural networks to solve larger problems. “This framework can help solve more complex machine learning tasks — enabling better representation learning — and should be the basic building blocks of any future embedded intelligence system” he stated.



The new computational method used for solving complex equations shows a significant improvement to creating a more efficient way to solve difficult calculations. Researchers hope that they can one day apply computational efficiency to safety commercial and defense systems, speeding up the output process.



Engineers designed a new nanoscale 3D printing material that can be printed at a speed of 100 mm/s

A new nanoscale 3D printing material developed by Stanford University engineers may provide superior structural protection for satellites, drones, and microelectronics

An improved lightweight, a protective lattice that can absorb twice as much energy as previous materials of a similar density has been developed by engineers for nanoscale 3D printing.

According to the study led by Stanford University, a nanoscale 3D printing material, which creates structures that are a fraction of the width of a human hair, will enable to print of materials that are available for use, especially when printing at very small scales.

“There's a lot of interest right now in designing different types of 3D structures for mechanical performance,” says Wendy Gu, an assistant professor of mechanical engineering and a corresponding author on the paper.

“What we've done on top of that is develop a material that is really good at resisting forces, so it's not just the 3D structure, but also the material that provides very good protection.”

Printing 100 millimeters per second

Gu and her co-workers added metal nanoclusters (tiny groupings of atoms) to their printing medium to create a superior 3D printing material. Two-photon lithography, which the researchers are using to print, hardens the printing material through a chemical reaction started by laser light. They discovered that their nanoclusters were particularly effective in kicking off this reaction, which produced a substance that was a mixture of the metal and the polymer printing medium.

“The nanoclusters have very good properties for taking in the laser light and then converting that to a chemical reaction,” Gu explains.

“And they're able to do this with several classes of polymers, so they're even more versatile than I expected.”

The scientists were able to mix proteins, acrylates, and epoxies—a few popular kinds of polymers used in 3D printing—with metal nanoclusters. The printing process was accelerated by the nanoclusters as well.

For instance, Gu and her co-workers were able to print at a speed of 100 millimeters per second using the nanoclusters and proteins, which is roughly 100 times faster than what had previously been possible with nanoscale protein printing.

“The lattice structure certainly matters, but what we're showing here is that if the material it's made out of is optimized, that's more important for performance,” Gu says. “You don't have to worry about exactly what the 3D structure is if you have the right materials to print with.”

Mimicking the real world with 3D printing

Gu and her co-workers are, in some ways imitating what nature has already mastered. For instance, the mix of a hard exterior, nanoscale porosity, and trace amounts of soft substance gives bone its durability.

“Since the nanoclusters are able to polymerize these different classes of chemicals, we may be able to use them to print multiple materials in one structure,” Gu says. “That's one thing we'd like to aim for.”

A new study shows innovative brain-like computing at molecular levels

Researchers have revealed, for the first time ever, that a brain-like computing system is possible at the smallest scale of atoms.

The study was conducted at the University of Limerick's (UL) Bernal Institute in Ireland by a team of researchers from across the globe who created a new type of organic material that can learn from its prior behavior.

The researchers discovered a dynamic molecular switch that emulates synaptic behavior, or communication between neurons.

The research team was led by Damien Thompson, a professor of Molecular Modelling in UL's Department of Physics and director of SSPC, the UL-hosted Science Foundation Ireland Research Centre for Pharmaceuticals, along with Christian Nijhuis at the Centre for Molecules and Brain-Inspired Nano Systems in the University of Twente and Enrique del Barco from the University of Central Florida.

Development

The team created a two-nanometer-thick layer of molecules. The size, in comparison, is 50,000 times thinner than a strand of hair, and it has the ability to remember its history as electrons pass through. “Switching probability and the values of the on/off states continually change in the molecular material, which provides a disruptive new alternative to conventional silicon-based digital switches that can only ever be either on or off,” said Thompson.

The research team demonstrated the new materials and properties of them by using experimental characterizations and electrical measurements. These dimensions were supported by multi-scale model systems spanning from predictability of the molecular structures to analytical mathematical modeling of the electrical information.

Creating the novel material through imitating biological properties

The novel dynamic behavior of the synapses at the molecular level was imitated by combining fast electron transfer with slower proton coupling limited by diffusion, similar to the role of biological calcium ions or neurotransmitters, the study stated.

The behavior also displays all the mathematical logic functions needed in deep learning, a subset of machine learning within artificial intelligence. In doing so, it successfully emulated Pavlovian 'call and response' synaptic brain-like behavior. In Pavlovian response, Nobel Prize-winning physiologist Ivan Pavlov found that dogs, and other animals, could be conditioned to respond involuntarily to rewards, which became the ideology of classical conditioning.

The transformation can emulate the plasticity of synapse neuronal junctions, which are the sites where the transmission of electric nerve impulses occur between two neurons. “The community has long known that silicon technology works completely differently from how our brains work and so we used new types of electronic materials based on soft molecules to emulate brain-like computing networks,” said Thompson.

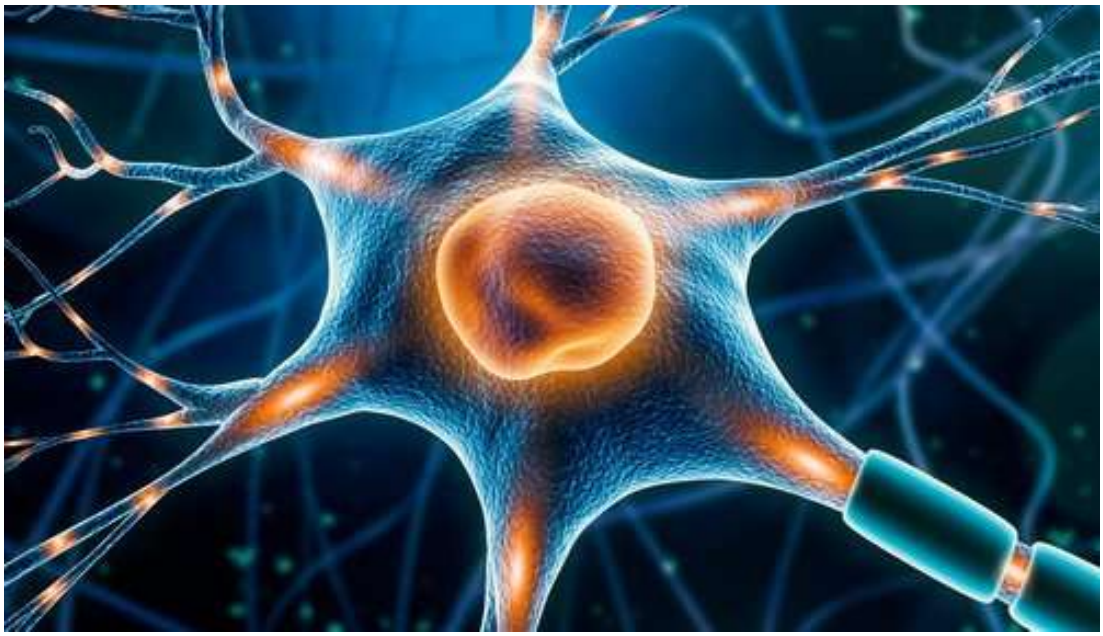
Future applications

The team was able to combine their knowledge and skills in "materials modeling, synthesis, and characterization to the point where we could demonstrate these new brain-like computing properties," Thompson stated.

The researchers mentioned that the method and new material can be applied to dynamic molecular systems driven by other stimuli in the future, such as light, and added to different kinds of dynamic covalent bond formation, in which the material would use its plasticity to remember and take the shape of various other materials.

"This is just the start. We are already busy expanding this next generation of intelligent molecular materials, which is enabling development of sustainable alternative technologies to tackle grand challenges in energy, environment, and health," said Thompson.

Norelee Kennedy, professor and vice president of research at UL, agrees. "Our researchers are continuously finding new ways of making more effective, more sustainable materials," Kennedy stated. "This latest finding is very exciting, demonstrating the reach and ambition of our international collaborations and showcasing our world-leading ability at UL to encode useful properties into organic materials," she continued.



Tea and wine may slow down memory decline, study reveals

According to a new study conducted by researchers from Rush University Medical Center in Chicago, people who consume more foods with antioxidant flavonols may have a slower rate of memory decline.

Flavonols are a type of flavonoid, a group of natural substances found in fruits, vegetables, grains, tea, and wine. Known for their benefits on health, these natural compounds are regarded as an essential component in a wide range of nutraceutical, pharmacological, therapeutic, and cosmetic applications.

961 people with an age average of 81

The study employed 961 people, according to a press release. At an age average of 81 without dementia, the subjects were asked to fill out a questionnaire about how often they consume certain foods. Additionally, they underwent yearly cognitive and memory tests that involved recalling lists of words, remembering numbers, and putting them in the correct order.

In addition, questions regarding their level of education, how much time they spent exercising, and how much time they spent doing mentally stimulating activities like reading and playing games were asked. They were followed for an average of seven years.

And then, the subjects were split into five equal groups based on how many flavonols they had in their diets.

The study population had an average dietary intake of total flavonols of about 10 mg per day, compared to the average amount of flavonols consumed by US adults, which ranges from 16 to 20 milligrams (mg) per day. The highest group ingested an average of 15 mg per day, which is about equivalent to one cup of dark leafy greens, whereas the lowest group consumed only approximately 5 mg daily.

The research team utilized an overall global cognition score that represented the results of 19 cognitive tests to determine rates of cognitive decline. For those with no cognitive issues, the average score was 0.5; for those with mild cognitive impairment, it was 0.2; and for those with Alzheimer's disease, it was -0.5.

Researchers discovered that the cognitive score of those with the highest intake of flavonols fell at a pace of 0.4 units per decade less slowly than those with the lowest intake after adjusting for other variables that may affect the rate of memory decline, such as age, sex, and smoking.

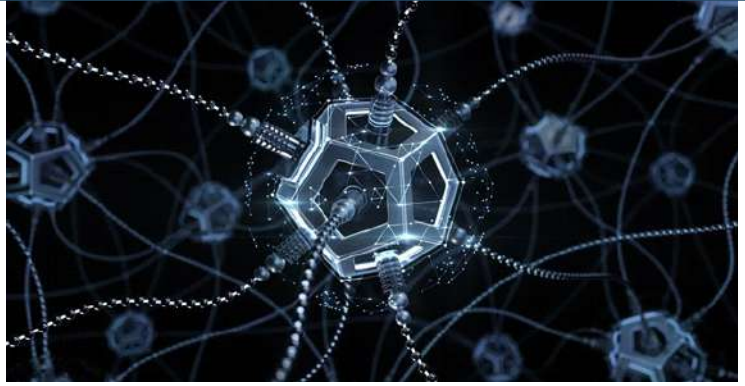
Thomas M. Holland, MD, MS of Rush University Medical Center in Chicago, remarked that this is likely caused by flavonols' innate anti-inflammatory and antioxidant capabilities.

A link between higher amounts of flavonols and slower cognitive decline

Breaking the flavonol into its four constituents - kaempferol, quercetin, myricetin, and isorhamnetin - the research team also found the top food contributors for each category. As per the study paper, they were kale, beans, tea, spinach, and broccoli for kaempferol; tomatoes, kale, apples, and tea for quercetin; tea, wine, kale, oranges, and tomatoes for myricetin; and pears, olive oil, wine, and tomato sauce for isorhamnetin.

"It's exciting that our study shows making specific diet choices may lead to a slower rate of cognitive decline," said study author Holland. "Something as simple as eating more fruits and vegetables and drinking more tea is an easy way for people to take an active role in maintaining their brain health."

Even though the study points out a link between higher amounts of flavonols and slower cognitive decline, Holland noted this does not prove that flavonols have a direct role in causing a slower rate of cognitive decline.



Like a human? Artificial neural networks need to sleep to learn better

According to a recent study by the University of California, San Diego, neural networks can imitate the sleep patterns of the human brain in order to tackle catastrophic forgetting.

"The brain is very busy when we sleep, repeating what we have learned during the day," said Maxim Bazhenov, Ph.D., professor of medicine and a sleep researcher at the University of California San Diego School of Medicine in the press release. "Sleep helps reorganize memories and presents them in the most efficient way."

Sleep strengthens rational memory, the capacity to recall arbitrary or illogical associations between objects, people, or events, and guards against forgetting previous memories, according to research by Bazhenov and colleagues.

They fail from time to time

Although artificial neurons work faster than the human brain, sometimes even like a computer, it is obvious that it needs rest.

"In contrast, the human brain learns continuously and incorporates new data into existing knowledge," said Bazhenov, "and it typically learns best when new training is interleaved with periods of sleep for memory consolidation."

Bazhenov, a senior author, and colleagues talk about how biological models might lessen the danger of catastrophic forgetting in artificial neural networks, increasing their usefulness across a range of research areas.

Get some sleep not to forget

The researchers employed spiking neural networks, which artificially imitate natural neural systems by transmitting information as discrete events (spikes) at specific times rather than continuously.

They discovered that catastrophic forgetting was reduced when the spiking networks were trained on a new task but with sporadic off-line intervals that mirrored sleep. According to the study's authors, the networks may replay previous memories while sleeping, just like the human brain, without explicitly requiring prior training data.

"It meant that these networks could learn continuously, like humans or animals. Understanding how the human brain processes information during sleep can help to augment memory in human subjects. Augmenting sleep rhythms can lead to better memory.

Artificial neurons and the human brain

The human brain consists of approximately 85 billion cells called neurons, weighing an average of 1250-1500 grams. The brain is an organ that has two hemispheres (cortex), and the two cortices of the brain are separate from each other. As these cortices are physically different, their functions are also different. Compared to a computer, the right cortex of the brain works like a parallel processor. The left cortex, on the other hand, works like a serial processor.

Artificial neuron studies generally aim to develop artificial instructions similar to these by analyzing human thinking methods.