Integrating Technology, Driving Growth

TechTalk

GALAXY Integrating Technology | Driving Growth

SPEED UP

GALAXY OFFICE AUTOMATION PVT. LTD.

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SHORESIDE SWEEP

Making Waves in Beach Cleaning Efforts

Galaxy successfully organized a beach cleanup campaign at Versova Beach, showcasing its commitment to environmental conservation. The primary focus of this initiative was to increase social awareness about the importance of maintaining clean beaches and protecting natural ecosystems for the well-being of all. The successful execution of this event highlights Galaxy's proactive approach towards environmental stewardship and giving back to society.

MD SPEAKS

Anoop Pai Dhungat
Chairman & Managing Director

Dear Readers,

Earlier, I had picked Cyber Resiliency as one of the technologies that would be widely adapted by organisations during this year. The main reason for that is that in today's connected world, where technology permeates every aspect of our lives, the threat landscape for cyberattacks has become more pervasive than ever before. From critical infrastructure to personal devices, the digital world is constantly under threat from malicious actors seeking to exploit vulnerabilities for their gain. The ability to withstand, adapt to and recover from such threats is absolutely crucial for individuals, businesses, and governments alike. This ability is call Cyber resilience.

Cyber resilience goes beyond mere cybersecurity measures, to encompass a holistic approach that includes detection, response, and restoration strategies. In essence, cyber resilience accepts that breaches are inevitable and prepares organisations to minimise the impact and recover swiftly when they occur. As the digital landscape continues to evolve, cyber resilience will remain a cornerstone of effective cybersecurity practices, enabling organizations to thrive in an increasingly interconnected world. Please reach out to our experts who will guide you towards adopting a holistic approach to cybersecurity and risk management, thereby mitigating the impact of cyber threats and safeguard your operations, reputation, and stakeholders' trust.

Happy reading.

A Heat-Resistant Drone That Can Fly Into Fires

FireDrone could be sent in ahead to find trapped people, assess layouts and unexpected hazards to allow responders to prepare accordingly and save more lives. A building is on fire, with flames billowing out of the windows. As the firefighters arrive at the scene, no one knows who is left inside, the layout of the building, and which areas are still safe. To go in blind puts firefighter lives at risk, however, no remote information-gathering robot or drone can function at the extreme temperatures inside the building.

Enter FireDrone, a new drone inspired by nature and designed to withstand extreme hot and cold temperatures, as described in a recent study published in Advanced Intelligent Systems.

"Until they enter the danger zone, firefighters can't be certain of what or who they'll find, and what challenges they'll encounter," said the study's principal investigator, Mirko Kovac, professor of aerial robotics at Imperial College London and Empa. "FireDrone could be sent in ahead to gather crucial information — noting trapped people, building layouts, unexpected hazards — so that responders can prepare accordingly to keep themselves safe and potentially save more lives."

If you've ever left your phone in the sun and got that warning "your phone needs to cool down before you can use it", you know that most electronics only function in a relatively small temperature range.

This applies to robots as well, with batteries and circuitry that warp or malfunction above and below normal temperatures, limiting where drones can be used. For flying machines, there is the additional consideration of weight — heat resistant metals, for example, might add significantly to the heft of a drone. The team looked to nature for inspiration to devise a means of maintaining a functioning internal temperature in extreme conditions. "Deploying robots in extreme environments provides great benefits to reducing risks to human lives, and who better to look to than animals that have evolved their own ways of adapting to these extremes using inspiration from how animals keep cool in heat," said Kovac.

The team combined three approaches to temperature regulation. Firstly, the drone's thin aluminium coating reflects heat - a reversal ,the paper explains, of the way penguins' dark feathers absorb heat. Secondly, canisters of liquid CO_2 convert to gas, mimicking the cooling effect of sweat evaporation on our bodies. And finally, like the spittle bug creates a foam layer to insulate itself from the elements, an innovative layer of aerogel tiles protects the flying robot's sensitive innards.

Aerogels are lightweight materials with excellent thermal insulation properties. They are formed of a low-density structure of nanofibers that creates countless pockets of air, which transmit heat poorly, protecting the delicate components from heat (or cold) outside. Reinforced with glass fibers, this creates the ideal strong, light insulation for a flying machine braving extreme conditions.

With the aluminium coating, insulating aerogel, and on-board cooling system in hand, the drone was ready for testing in some very uncomfortable conditions. They flew the drone in temperature-controlled chambers before exposing it to open flames at a firefighter training facility, showing that it could withstand temperatures of up to 200°C for ten minutes.

Cold temperatures can be just as punishing for electronics as hot, so the team took to a glacier tunnel in Switzerland to test performance in an icy environment. The insulation kept the extreme cold from penetrating to the components, while the heat generated by the whirring motors and electronics kept the batteries within their operating range. The tests confirmed FireDrone's potential for exploring and informing about dangerously hot and cold situations, but it is just a prototype so far.

Before it can zoom into burning buildings, search freezing crevasses for injured ice climbers, or sample extreme regions for scientists, the team hope to improve its versatility and equip the drone with additional sensors so it can feed more essential information back. But with drone use in wildfire, urban emergency, and arctic adventure situations currently limited by the relatively narrow window of temperatures in which they can operate, Kovac says this could be the first step in a new generation of flying machines.

"The application of drones is often limited by environmental factors like temperature. We demonstrate a way to overcome this and are convinced our findings will help to unleash the future power of drones for extreme environments," he said.

https://tinyurl.com/542kuyhu

Beyond Human Imagination: Generative AI Takes Center Stage

Before the generative AI boom of the past few years, when people talked about AI, typically they were talking about machine-learning models that can learn to make a prediction based on data. For instance, such models are trained, using millions of examples, to predict whether a certain X-ray shows signs of a tumor or if a particular borrower is likely to default on a loan.

Generative AI can be thought of as a machine-learning model that is trained to create new data, rather than making a prediction about a specific dataset. A generative AI system is one that learns to generate more objects that look like the data it was trained on.

"When it comes to the actual machinery underlying generative AI and other types of AI, the distinctions can be a little bit blurry. Oftentimes, the same algorithms can be used for both," says Phillip Isola, an associate professor of electrical engineering and computer science at MIT, and a member of the Computer Science and Artificial Intelligence Laboratory (CSAIL).

And despite the hype that came with the release of ChatGPT and its counterparts, the technology itself isn't brand new. These powerful machine-learning models draw on research and computational advances that go back more than 50 years.

An increase in complexity

An early example of generative AI is a much simpler model known as a Markov chain. The technique is named for Andrey Markov, a Russian mathematician who in 1906 introduced this statistical method to model the behavior of random processes. In machine learning, Markov models have long been used for next-word prediction tasks, like the autocomplete function in an email program.

Just a few years ago, researchers tended to focus on finding a machine-learning algorithm that makes the best use of a specific dataset. But that focus has shifted a bit, and many researchers are now using larger datasets, perhaps with hundreds of millions or even billions of data points, to train models that can achieve impressive results.

The base models underlying ChatGPT and similar systems work in much the same way as a Markov model. But one big difference is that ChatGPT is far larger and more complex, with billions of parameters. And it has been trained on an enormous amount of data - in this case, much of the publicly available text on the internet.

More powerful architectures

While bigger datasets are one catalyst that led to the generative AI boom, a variety of major research advances also led to more complex deep-learning architectures.

In 2014, a machine-learning architecture known as a Generative Adversarial Network (GAN) was proposed by researchers at the University of Montreal. GANs use two models that work in tandem: One learns to generate a target output (like an image) and the other learns to discriminate true data from the generator's output. The generator tries to fool the discriminator, and in the process learns to make more realistic outputs. The image generator StyleGAN is based on these types of models.

Diffusion models were introduced a year later by researchers at Stanford University and the University of California at Berkeley. By iteratively refining their output, these models learn to generate new data samples that resemble samples in a training dataset, and have been used to create realistic-looking images. A diffusion model is at the heart of the text-to-image generation system Stable Diffusion.

In 2017, researchers at Google introduced the transformer architecture, which has been used to develop large language models, like those that power ChatGPT. In natural language processing, a transformer encodes each word in a corpus of text as a token and then generates an attention map, which captures each token's relationships with all other tokens. This attention map helps the transformer understand context when it generates new text.

These are only a few of many approaches that can be used for generative AI.

A range of applications

What all of these approaches have in common is that they convert inputs into a set of tokens, which are numerical representations of chunks of data. As long as your data can be converted into this standard, token format, then in theory, you could apply these methods to generate new data that look similar.

"Your mileage might vary, depending on how noisy your data are and how difficult the signal is to extract, but it is really getting closer to the way a general-purpose CPU can take in any kind of data and start processing it in a unified way," Isola says.

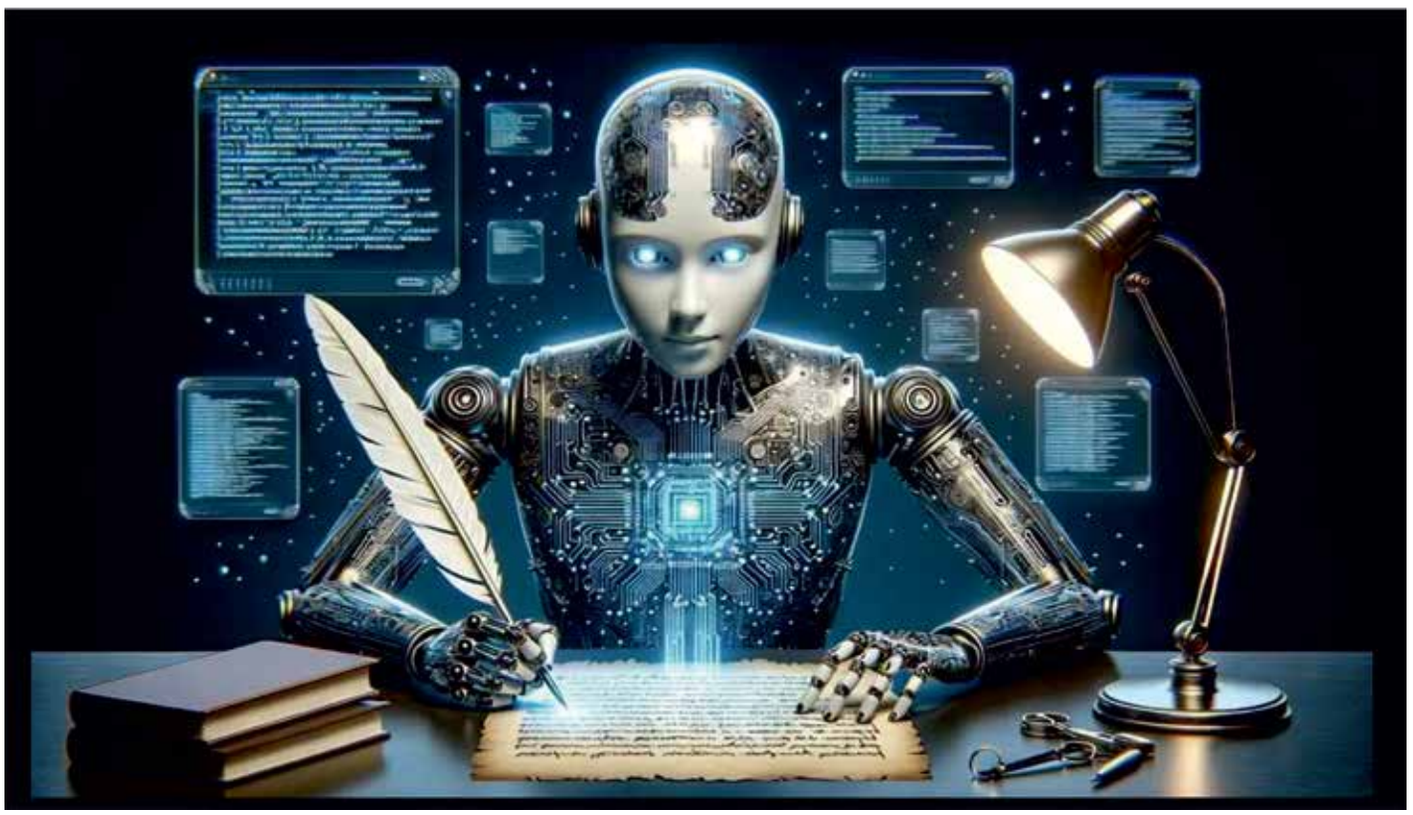
This opens up a huge array of applications for generative AI.

For instance, Isola's group is using generative AI to create synthetic image data that could be used to train another intelligent system, such as by teaching a computer vision model how to recognize objects.

Jaakkola's group is using generative AI to design novel protein structures or valid crystal structures that specify new materials. The same way a generative model learns the dependencies of language, if it's shown crystal structures instead, it can learn the relationships that make structures stable and realizable, he explains.

But while generative models can achieve incredible results, they aren't the best choice for all types of data. For tasks that involve making predictions on structured data, like the tabular data in a spreadsheet, generative AI models tend to be outperformed by traditional machine-learning methods, says Devavrat Shah, the Andrew and Erna Viterbi Professor in Electrical Engineering and Computer Science at MIT and a member of IDSS and of the Laboratory for Information and Decision Systems.

"The highest value they have, is to become this terrific interface to machines that are human friendly. Previously, humans had to talk to machines in the language of machines to make things happen. Now, this interface has figured out how to talk to both humans and machines," says Shah.



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Containerization, a technology with benefits!

Applications are getting more complex, and the demand to develop faster is ever-increasing. This puts stress on your infrastructure, IT teams, and processes. Containers help you alleviate issues and iterate faster—across multiple environments.

Containers are technologies that allow the packaging and isolation of applications with their entire runtime environment—all of the files necessary to run. This makes it easy to move the contained application between environments (dev, test, production, etc.) while retaining full functionality. By building security into the container pipeline and defending infrastructure, containers stay reliable, scalable, and trusted. You can also easily move the containerized application between public, private and hybrid cloud environments and on-prem data centers with consistent behavior and functionality.

What are the benefits of containers?
Containers help reduce conflicts between your development and operations teams by separating areas of responsibility. Developers can focus on their apps and operations teams can focus on the infrastructure. And, because containers are based on open-source technology, you get the latest and greatest advancements as soon as they're available. Containers help your team simplify, speed up, and orchestrate application development and deployment.

Containers share the same operating system kernel and isolate the application processes from the rest of the system so the whole thing can be moved, opened, and used across development, testing, and production configurations. Because they are lightweight and portable, containers provide the opportunity for faster development and meeting business needs as they arise.

What is container orchestration?
Kubernetes is an open source platform that automates Linux container operations. It eliminates many of the manual processes involved in deploying and scaling containerized applications. Kubernetes gives you the platform to schedule and run containers on clusters of physical or virtual machines. Kubernetes architecture divides a cluster into components that work together to maintain the cluster's defined state. As a part of our Application Modernisation portfolio Galaxy helps customers by using Red Hat Openshift platform to provide a container orchestration engine that extends Kubernetes with additional capabilities.

What can you do with containers?
Containers give your team the underlying technology needed for a cloud-native development style, so you can get started with DevOps, CI/CD and even go serverless across various workloads and use cases.

You can also deploy integration technologies in containers, so you can easily scale how you connect apps and data, like real-time data streaming through Apache Kafka. If you're building a microservices architecture, containers are the ideal deployment unit for each microservice and the service mesh network that connects them.

When your business needs the ultimate portability across multiple environments, using containers might be the easiest decision ever.

Kubernetes by itself is an open source software that automates deploying, managing, and scaling containers. Organizations need to manually integrate many other capabilities such as automation, monitoring, log analytics, service mesh, serverless, developer productivity tools, etc. to make it an enterprise ready platform. Users still need to integrate other components like networking, ingress, load balancing, storage, monitoring, logging, multi cluster management, CI/CD and more to accelerate the development and delivery of containerized applications—at scale. We at Galaxy assist our customers on this journey by helping them adopt Red Hat OpenShift platform which offers these components with Kubernetes at their core because—by itself— Kubernetes is not enough.

Galaxy has been working steadfastly to bring the benefits of containerization technology to its customers. In order to do so we have been working with key Open source partners like RedHat over the past few years.

By providing Red Hat's container-focused solutions its our endeavor to give our customers, the infrastructure platform, control, and knowledge to take advantage of everything containers have to offer.

Galaxy engineers in our RedHat practice help to implement relevant features, by providing reliability and security to make sure your containers perform and remain stable. Talk to our experts, email us at **marketing@goapl.com**

Tech News

India data center capacity to double in 3 years, capex requirement Rs 50,000 crore

Indian data center industry set to double capacity with substantial investments. High data usage. Rising cost per MW. Industry players see revenue growth. New players expected to enter. Exciting times ahead for the sector.

India has a data center capacity share of only 3% globally despite generating 20% of the global data. While mobile data usage in India is highest globally when compared with exabytes usage per month. The ratings agency expects data localization, tax incentives, and costs saving sops issued by the states to help attract robust investments.

"The growth plans have also created substantial investment prospects and as per our estimates a capex of Rs 50,000 crore in this space over the next three years till 2026. However, the project execution challenges, in terms of land and equipment availability and management of vendor ecosystem needs to be addressed for the fructification of the planned capacity addition planned," said Puja Jalan, Associate Director, CareEdge Ratings

The data center capacity growth in India has been complemented by the increased absorption. CareEdge Ratings in its report has cited that the absorption levels have gone up from 82% in 2019 to 93% in 2023. As capacity was added, industry players' revenue increased by nearly 25% CAGR from 2016-17 to 2022-23.

Going forward, cost competencies, innovative designs to accommodate scalability and adoption of newer technologies to meet ever rising energy and cooling requirements are critical success factors for the industry. Over the next three to four years, revenue growth is anticipated to continue, and the ratings agency expects a 32% CAGR growth during 2023-24–26. It is anticipated that the operating margins are likely to remain stable in the next three years.

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OpenAI announces general availability of GPT-4 model

Microsoft-owned OpenAI has announced the general availability of its latest text-generating model GPT-4, through its API (Application Programming Interface).

"All paying API customers have access to GPT-4. In March, we introduced the ChatGPT API, and earlier this month we released our first updates to the chat-based models. We envision a future where chat-based models can support any use case," OpenAI said in a blogpost.

Now all existing API developers with a history of successful payments can access the GPT-4 API with 8,000 contexts, plus the company plans to open up access to new developers by the end of this month, and then start raising rate limits after that depending on compute availability.

"Millions of developers have requested access to the GPT-4 API since March, and the range of innovative products leveraging GPT-4 is growing every day," OpenAI said.

Moreover, the company announced the deprecation plan for older models of the Completions API and recommended that users adopt the Chat Completions API.

According to the company, the Chat Completions API's structured interface (e.g., system messages, function calling) and multi-turn conversation capabilities enable developers to build conversational experiences and a broad range of completion tasks. It also helps lower the risk of prompt injection attacks, since user-provided content can be structurally separated from instructions.

OpenAI is also making the GPT-3.5 Turbo, DALL·E and Whisper APIs generally available. The company is working on safely enabling fine-tuning for GPT-4 and GPT- 3.5 Turbo and expects this feature to be available later this year.

https://tinyurl.com/3haz63vj

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