ATHARVA EDUCATIONAL TRUST'S
ATHARVA COLLEGE OF HOTEL MANAGEMENT & CATERING TECHNOLOGY
(Recognized by Government of Maharashtra & Affiliated to University of Mumbai- Estd. 2007-2008)
ISO 9001:2015 ISO 22000:2018
NAAC Accredited

Department of Data Science

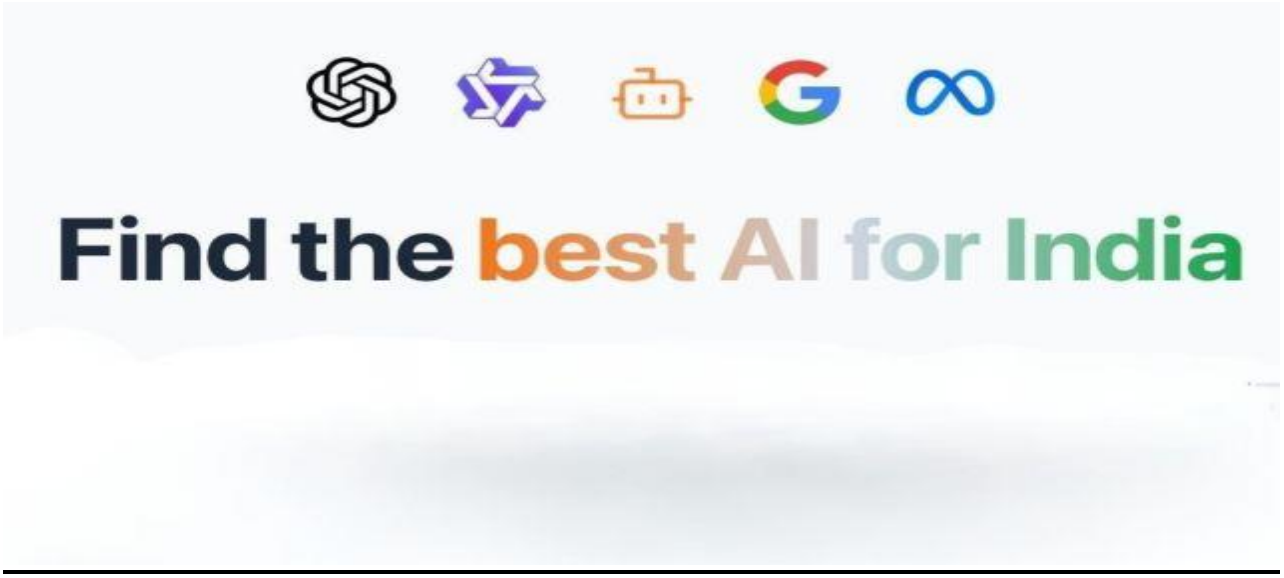
Weekly Data Science Bytes

'The possibility of human extinction': What keeps the 'Godfather of AI' awake at night

- Yoshua Bengio, also known as the Godfather of AI, acknowledges that while unchecked artificial intelligence (AI) was not the top of his concerns until a few years ago, a lot has changed since. Bengio, in his latest interview, shared his views about the risks of AI and his efforts to address them.
- "Whoever will control very advanced AIs in the future will have huge power. And they could use that power in ways that are good for them, maybe, but not for most of us," Bengio told Nature.com.
- Bengio, who currently serves as a computer scientist at the University of Montreal in Canada, won the AM Turing Award in 2019. In October, the 61-year-old became the first to top one million citations on Google Scholar. He is known as the pioneer of deep learning techniques that are the foundation of modern AI.

Source:https://indianexpress.com/article/technology/artificial-intelligence/the-possibility-of-human-extinction-what-keeps-the-godfather-of-ai-awake-at-night-10362300/?ref=technology_pg

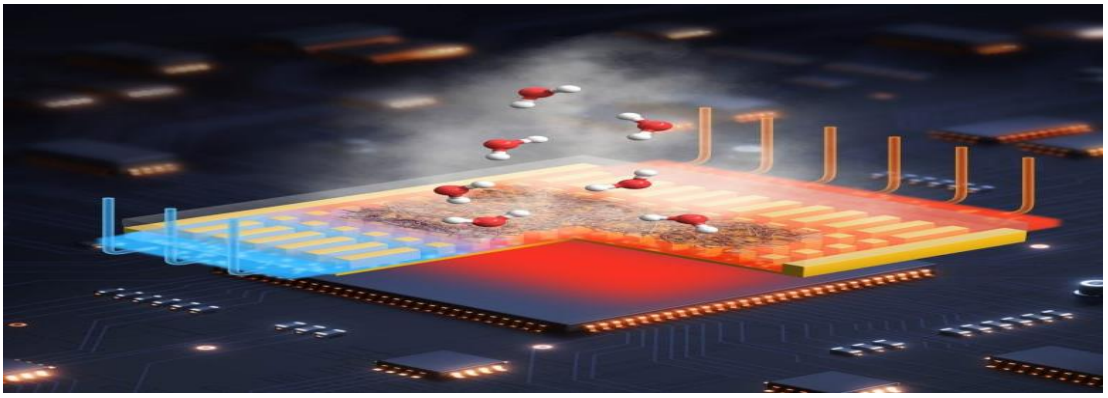
IIT Madras' AI4Bharat unveils new benchmark test for Indian languages



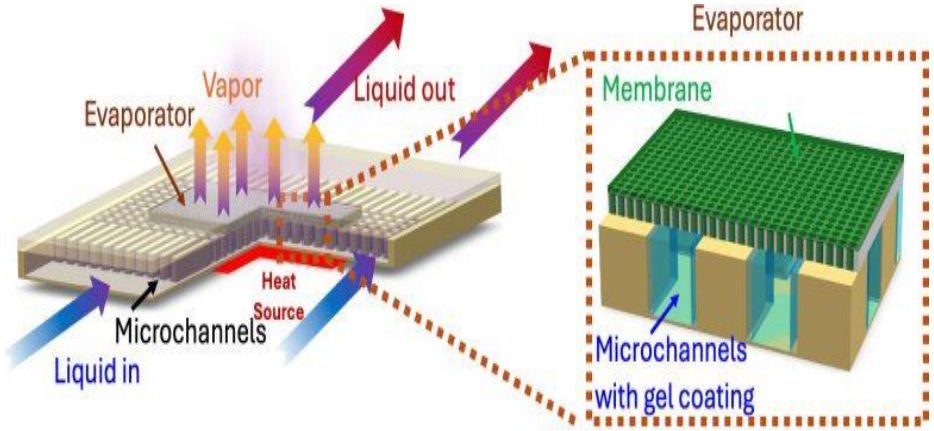
- AI4Bharat, a research lab at Indian Institute of Technology (IIT) Madras, has introduced a new, open-source benchmark test specifically designed to assess the performance of large language models (LLMs) on Indian languages as well as Indian context and safety.
- Developed with support from Google Cloud, the Indic LLM-Arena benchmark is a crowd-sourced platform that evaluates LLMs on the basis of votes cast by thousands of anonymous users. The models are then ranked on a "human-in-the-loop" leaderboard, AI4Bharat said in a blog post on Monday, November 10. https://indianexpress.com/article/technology/artificial-intelligence/iit-madras-ai4bharat-benchmark-ai-indian-languages-10360996/?ref=technology_pg

Source: https://indianexpress.com/article/technology/artificial-intelligence/iit-madras-ai4bharat-benchmark-ai-indian-languages-10360996/

AI Is Overheating. This New Technology Could Be the Fix

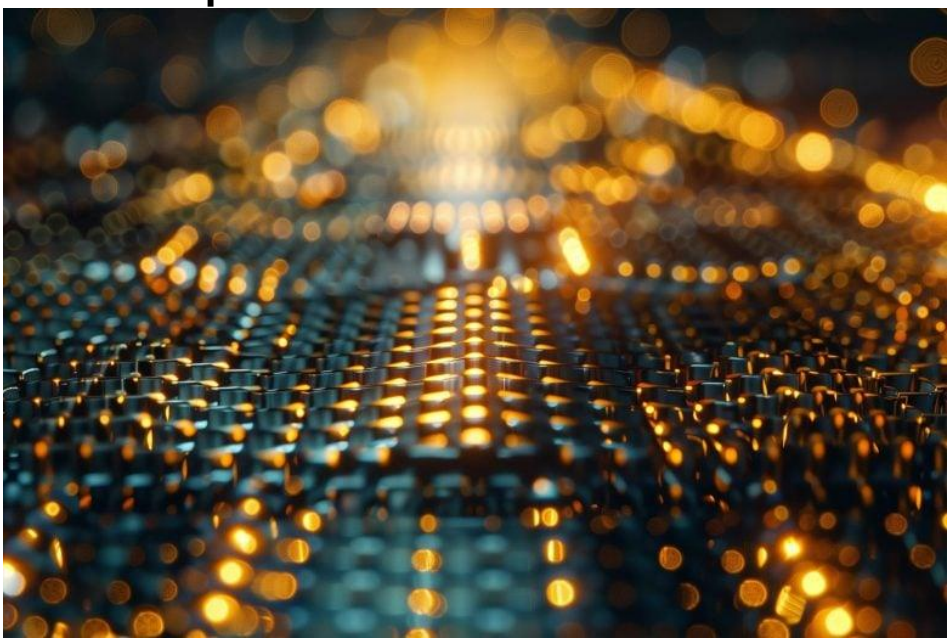


Engineers at the University of California San Diego have created an innovative cooling system designed to greatly enhance the energy efficiency of data centers and high-performance electronic devices. This new approach relies on a specially engineered fiber membrane that naturally removes heat through evaporation. It provides an effective and energy-saving alternative to conventional cooling methods such as fans, heat sinks, and liquid pumps, while also potentially reducing the large amounts of water used by many existing systems.



Source: https://scitechdaily.com/ai-is-overheating-this-new-technology-could-be-the-fix/

This Quantum Electron Breakthrough Could Make Computers Faster Than Ever Before



- Imagine a future where factories produce new materials and chemical compounds more quickly, more efficiently, and at lower cost. Picture laptops that handle complex computations in seconds or supercomputers that can learn and adapt almost like the human brain. These kinds of breakthroughs all depend on one thing: how electrons behave inside matter.

- Researchers at Auburn University have developed an entirely new class of materials that gives scientists precise control over these tiny particles. Their work, published in *ACS Materials Letters*, introduces a way to adjust interactions between isolated-metal molecular complexes known as solvated electron precursors, where electrons move freely through open spaces instead of remaining attached to atoms.

Source:https://scitechdaily.com/this-quantum-electron-breakthrough-could-make-computers-faster-than-ever-before/

India's startup story has long been told through food delivery apps, quick-commerce platforms, and digital wallets. But a deeper narrative is emerging: The rise of deeptech startups built on hard science and engineering breakthroughs. Part-I explores why deeptech lagged in India, what's finally changing, and the hurdles ahead. Part-II profiles the builders — their ideas, technologies, and ambitions. The question that runs through both parts is simple but seismic: Can India's deeptech leap deliver on its promise?

From dorm rooms to orbit

SHELLEY SINGH
New Delhi, 8 September

"The train has already left the station," says Rajan Anandan, managing director at Peak XV and Surge, over Google Meet. "Deeptech is the final frontier for the Indian startup ecosystem. Now, we need to accelerate the development of deeptech companies."

For years, India's startup landscape was dominated by consumer-facing ventures — food delivery apps, ride-sharing platforms, and payment startups. But something different is happening.

In labs, dorm rooms, and co-working spaces across the country, a new generation of founders — many of them PhDs — is building satellites, hydrogen electrolyzers, bio-manufacturing platforms, and even technologies to clear space debris.

The ecosystem that gave us household names like Swiggy, Flipkart, Ola, PhonePe, Paytm, Meesho, and Zomato is pivoting — slowly but surely — to innovations that cut deeper, take longer, and could reshape industries entirely.

A shift in the ecosystem

The numbers tell their own story.

According to the report *India's Deep Tech Revolution* by Speciale Invest and Oister Global, Indian deeptech startups raised just $36 million in 2016. By 2023, that figure had risen to $677 million. Nearly a quarter of all venture capital ($12–14 billion) in India now flows into deeptech.

Neha Singh, cofounder of Tracxn, observes: "In 2024, around $1.2 billion was invested across nearly 340 rounds. In the first half of this year alone, $900 million has already been deployed. So the dollar amount is going to be higher this year. Commercial drones, spacetech, battery swapping, biotech, and semiconductors are all attracting interest."

Mumbai-based Avaana Capital sees opportunities in frontier technology areas like energy, spacetech, robotics, artificial intelligence (AI), biotech, advanced materials, nanotechnology, and precision manufacturing. "With a robust STEM (acronym for Science, Technology, Engineering, and Mathematics) base, growing investor interest, and policy support, India is well positioned to lead the global technology narrative," says Anjali Bansal, founding partner at Avaana.

The government is also stepping in.

In July, the Cabinet approved the ₹1 trillion Research, Development, and Innovation (RDI) scheme, designed to fund early research and help scale ventures, with a focus on sectors like semiconductor, aerospace, and biotech.

On RDI, Anandan says, "This is a game changer. We'll look back at the RDI fund the way we look at the India Stack for digital payments — a catalytic moment that changes the trajectory of a nation."

Bansal believes that the RDI boost "strengthens our investment thesis by addressing critical gaps in deeptech — the gaps in enabling infrastructure, blended finance mechanisms (equity, debt, venture, etc.), and support across technology readiness levels (TRLs)".

TRL is a nine-point scale that measures how mature a technology is, ranging from TRL 1 (basic research) to TRL 9 (actual system operations proven). Developed by Nasa, this standard provides a common parameter for researchers and investors to assess the readiness of a technology for deployment and to help investors make decisions about funding.

The rise of builders

Across India, young engineers and researchers are rejecting the comfort of safe, high-paying corporate jobs to build deeptech ventures.

At the Indian Institute of Technology (IIT) Madras, home to India's most vibrant deeptech incubator, student-led teams are working on battery recycling, green hydrogen, and electric aircraft. "We're a bunch of nerds," laughs Professor Satya Chakravarthy, founder of The ePlane Co., which is developing electric aircraft for short-haul, intracity commutes.

"There was no conscious strategy to build deeptech. It's just the culture here."

Interestingly, Chakravarthy, 56, professor of aerospace engineering at IIT Madras, decided to start the ePlane venture after observing the shift to electric vehicles (EVs).

The IIT Madras Incubation Cell — often called the country's "deeptech factory" — has spawned Ather Energy, Mindgrove, and Sarvam AI. Last year alone, it incubated 100 new deeptech startups.

But it's not just academia.

Many founders returning from stints at SpaceX, Nvidia, and Qualcomm are choosing to build in India. "Talent that understands global systems is coming back home," says Arjun Rao, partner at Speciale Invest.

"These are hard problems. You can't put out something that doesn't work. You have to refine the science, technology, and product — and nail the hardware too."

Speciale started investing in deeptech eight years ago and across two funds totalling ₹500 crore, it has so far invested in 40 ventures. These include AgniKul Cosmos, which designs, builds, and launches orbital-class rockets for micro and nanosatellites. Another venture, InspeCity Space Laboratories, is focusing on servicing and repairing satellites, while Inbound Aerospace is doing drug discovery and research in space.

In many of these ventures, there are multiple investors. For example, Inbound Aerospace, an IIT Madras-incubated spacetech startup, raised over $1 million in a pre-seed funding round in July led by Speciale Invest, with participation from Piper Serica.

Venture capital investors are also learning to think differently when it comes to deeptech. "With consumertech, you identify an unmet user need or a whitespace, build fast, launch, and then iterate. Speed is paramount. With deeptech, you're focusing on technical and scientific breakthroughs. These take much longer, and more often than not there are regulatory risks and market risks. Deeptech is materially more difficult given these differences and will always take longer to launch," explains Anandan.

Investors evaluate startups by their TRL. Specialist firms like Speciale often enter at TRL 4 or 5 — when an idea is still in the lab — while larger, diversified funds step in at TRL 7 or 8, closer to commercialisation.

Take NewTrace Energy, a green hydrogen startup that is developing membrane-free electrolyzers. When Peak XV's Surge invested, NewTrace had a working 1-kilowatt prototype in a co-working lab.

Challenges along the way

Deeptech ventures are not for the faint of heart.

Timelines are long, capital needs are heavy, and commercialisation is a grind. An electric plane or satellite can't be prototyped in a quarter. These are six-, eight-, or 10-year journeys.

Funding, while improving, still lags global peers. Chinese startups attract 12 times the capital of their Indian counterparts; the UK draws nearly four times as much. Corporate India spends just 0.3 per cent of revenue on research and development (R&D) — far below global averages.

Chipmaker Nvidia, which is powering the AI revolution, alone spent $34 billion on R&D last year. India's R&D spend stands at 0.65 per cent of gross domestic product, compared to China's 2.5 per cent, the US at 3.5 per cent, and Israel at 4 per cent.

Sandeep Singhal, cofounder of Nexus Venture Partners, says, "The government has a role. Attractive tax planning in R&D is one of the things that the US tax code has done very well. They give benefits for R&D expenses. We need to replicate some of that."

Though he points out that the ecosystem is changing even with the funding that's available at present. Take ventures like Ethereal Machines, founded in 2014. The Bengaluru-based company produces computer numerical control (CNC) machines. CNC machines are automated manufacturing tools controlled by computers, using pre-programmed software to perform tasks like cutting, drilling, and milling. They are used to create precision parts from various materials with high accuracy and efficiency. There are fewer than 10 companies in the world that can make such machines.

India now ranks among the top 10 countries globally in deeptech funding. Spacetech startups have grown from one in 2014 to over 220 in 2024. Biotech startups have exploded from 50 in 2015 to more than 2,000 today.

For all the momentum, India is still in the early innings. Most deeptech startups are pre-unicorn, with a few exceptions that went public, like EV maker Ather Energy and drone manufacturer IdeaForge. But investors are bullish that more will follow.

"In the next three to four years, several of the deeptech ventures will break out," says Rao. Exits will take multiple forms — initial public offerings, strategic acquisitions, and global partnerships.

The ingredients for acceleration of India's deeptech venture are in place now: a strong STEM talent base, increasing pools of venture capital, global exposure, a supportive policy framework, and ₹1 trillion RDI funding.

But scaling to global relevance will require world-class science and technology, patience, persistence, and significant investments. "We'll reinvent every industry. It took India almost a decade to go from zero to global leadership in digital payments. Deeptech will be the same," says Anandan.

In 2015, India had two spacetech startups; today, there are over 200. India's deeptech moment may finally be here.

The writer is a New Delhi-based independent journalist

INDIA'S DEEPTECH MOMENT-I

IN LABS, DORM ROOMS, AND CO-WORKING SPACES ACROSS THE COUNTRY, A NEW GENERATION OF FOUNDERS — MANY OF THEM PhDs — IS BUILDING SATELLITES, HYDROGEN ELECTROLYZERS, BIO-MANUFACTURING PLATFORMS, AND EVEN TECHNOLOGIES TO CLEAR SPACE DEBRIS

THE INGREDIENTS FOR ACCELERATION OF INDIA'S DEEPTECH VENTURE ARE IN PLACE NOW: A STRONG STEM TALENT BASE, INCREASING POOLS OF VENTURE CAPITAL, GLOBAL EXPOSURE, A SUPPORTIVE POLICY FRAMEWORK, AND ₹1 TRILLION RDI FUNDING

Changing contours of deeptech ecosystem

Chapter One: The makers of tomorrow

- Deeptech ventures are startups built on scientific or engineering breakthroughs. Unlike typical tech startups, they require long R&D cycles, heavy capital, and aim to reshape industries or create entirely new ones

Chapter Two: The decade we lost

- India's early focus was on consumertech. With no homegrown semiconductor giants or robotics majors, and limited risk capital, deeptech never got its due

Chapter Three: The game changers

- Today, the government's ₹1 trillion RDI fund, coupled with nearly 25 per cent of VC capital now flowing into deeptech, is rewriting the rules. The number of ventures is rising fast

Chapter Four: The long road ahead

- The challenges remain steep: Long gestation periods, high capital requirements, and India Inc's modest R&D budgets compared to global peers