

NEWSLETTER

APRIL 2026, Issue 01

THE GEOPOLITICS OF INNOVATION

The Rising Influence of Emerging Ventures in Technology, Economy, and Global Strategy



IIMT Business Incubator Foundation

Startup

Innovation

Technology

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APRIL 2026, Issue 01

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DEAR READERS

Welcome to the March 2026 edition of the IIMT Business Incubator Foundation newsletter. We have the privilege of showcasing the incredible journey of startups, mentors, and ecosystem partners who are shaping the future through innovation and collaboration.

At IIMT-BIF, we remain committed to providing a platform where ideas are not only encouraged but empowered. This newsletter is a reflection of the momentum we are building—highlighting milestones, success stories, and the people behind them. It is also a reminder of the potential that lies within our student entrepreneurs, early-stage ventures, and academic collaborators.

I extend my sincere thanks to everyone contributing to this vibrant ecosystem—your passion and participation are the true driving forces behind our progress. Let us continue to engage, inspire, and innovate together.

Warm regards,

Zoya Naaz

Editor / Asst. Incubation Manager

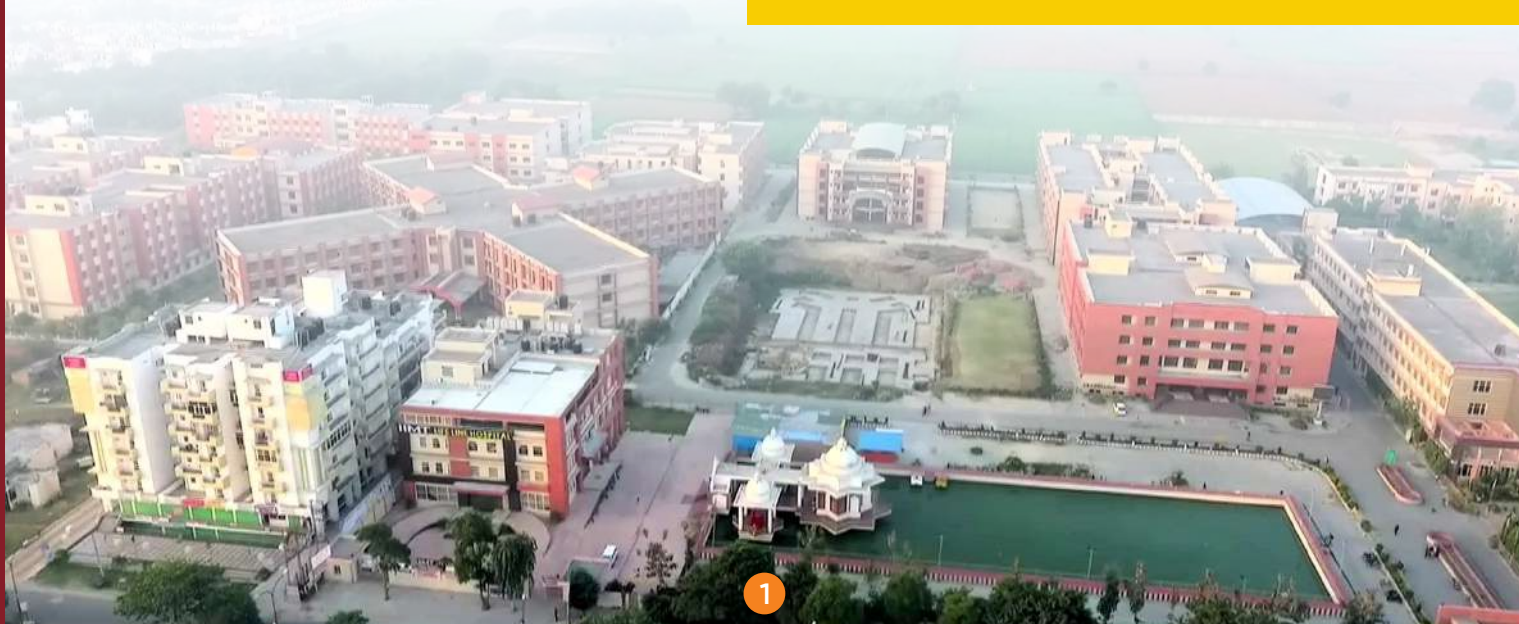
IIMT Business Incubator Foundation

ABOUT US

The IIMT Business Incubator Foundation (IIMT-BIF) is a government-recognized incubator under the Start-in-UP and MSME initiatives, dedicated to nurturing early-stage startups and student-led innovations.

Established within IIMT University, Meerut, IIMT-BIF serves as a dynamic launchpad for aspiring entrepreneurs, offering end-to-end support including modern infrastructure, expert mentorship, access to funding, and strong industry linkages.

With a focus on ideation, innovation, and growth, we empower founders to transform their ideas into impactful, scalable ventures. As of July 2025, we have successfully incubated over 30 startups, facilitated funding, and contributed to the creation of more than 100 jobs across various sectors. Our deep-rooted commitment to fostering a vibrant entrepreneurial ecosystem in Uttar Pradesh drives our mission forward—we are not just building businesses, we are building futures.



NEWS

A QUICK ROUND-UP OF FASCINATING SCIENCE & TECHNOLOGY NEWS

FIRST APPROVED CRISPR THERAPY

Doctors have begun using the world's first approved treatment based on CRISPR gene editing to treat patients suffering from Sickle Cell Disease. The therapy edits a patient's own DNA to correct the genetic mutation responsible for the disease. This milestone marks a major step toward curing many inherited disorders through

ASTEROID SAMPLE RETURNED TO EARTH

A spacecraft from NASA successfully returned samples from the asteroid 101955 Bennu. The mission, called OSIRIS-REx, brought pristine asteroid material back to Earth for analysis. Scientists hope studying these ancient rocks will reveal clues about the formation of the solar system and the

EARTH'S MAGNETIC SHIELD

Earth is protected from harmful solar radiation by the Magnetosphere, a magnetic field generated by the movement of molten iron in the planet's core. Without this invisible shield, solar wind could strip away the atmosphere and make life difficult to survive. Scientists continue to study how this

THE SUN'S POWERFUL CYCLE

The Sun follows an approximately 11-year solar activity cycle during which sunspots and solar storms increase and decrease. Scientists from NASA recently reported that the Sun is approaching a solar maximum, a period when solar flares and geomagnetic storms become more frequent. These events can disrupt

AI PREDICTS PROTEIN STRUCTURES

In a breakthrough for biology, the artificial intelligence system AlphaFold developed by DeepMind can accurately predict the 3D shapes of proteins. Understanding protein structures is essential for drug discovery and disease research. This technology has already predicted the structures of millions of proteins,

QUANTUM COMPUTING PROGRESS

Quantum computers use the principles of Quantum Mechanics to perform certain calculations much faster than classical computers. Companies like IBM and Google are racing to build more stable quantum processors. In the future, quantum computing could revolutionize



STARTUP SUCCESS STORIES

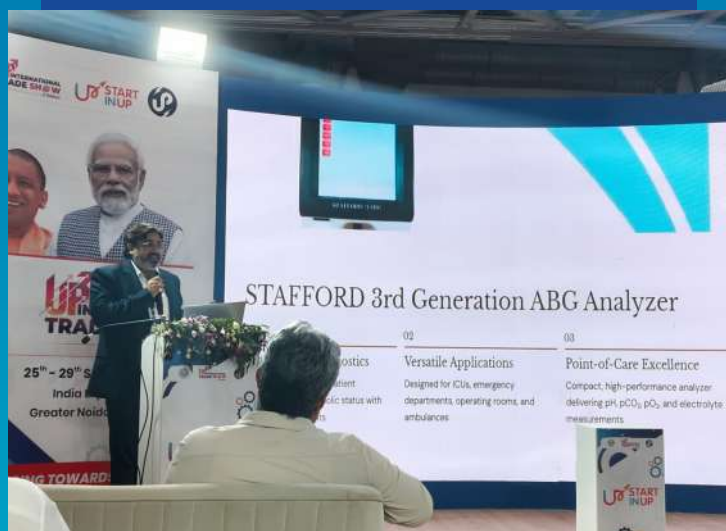
**1000+ Impacted
Customers**

Rs. 5 Cr. Turn Over

25+ Jobs Created



Team Visit to Medical Diagnostics Lab



Startup Presentation at UP International Trade Show



Republic Day 2026
Innovation for Self Reliant India
Proudly Presenting the Stafford 3 ABG



ABG Analyzer Medical Device Display at Startup Booth

GENETIC ENGINEERING OF NK CELL-DERIVED EXOSOME-BASED NANOPARTICLES FOR INTRANASAL TARGETED DELIVERY IN BRAIN CANCER

1. INTRODUCTION

Brain cancer, especially glioblastoma, is among the most vicious and intractable of the central nervous system malignancies. The greatest barrier to its treatment is the existence of a selective barrier called the blood-brain barrier (BBB) that does not allow most therapeutic drugs to target the brain tissues. This means that standard chemotherapy can be of limited use, and with no proper targeting of the tumor, it can also lead to systemic side effects. As such, the design of quality drug delivery mechanisms has been critical to enhance the success of treatment. New possibilities have been offered recently due to the recent developments in nanotechnology and biological carrier systems. Specifically, exosomes and immune-cell-derived vesicles have become promising vectors for the delivery of therapeutic agents to brain tumors.

Figure 1 illustrates the schematic representation of genetically engineered NK cell-derived exosome nanoparticles designed for targeted brain tumor therapy. The exosomes are administered through the intranasal route, enabling direct nose-to-brain transport and bypassing the BBB. These engineered exosomes selectively accumulate at the tumor site in the brain, where they deliver therapeutic cargo and induce tumor cell killing, demonstrating a promising strategy for targeted and non-invasive treatment of brain cancer.

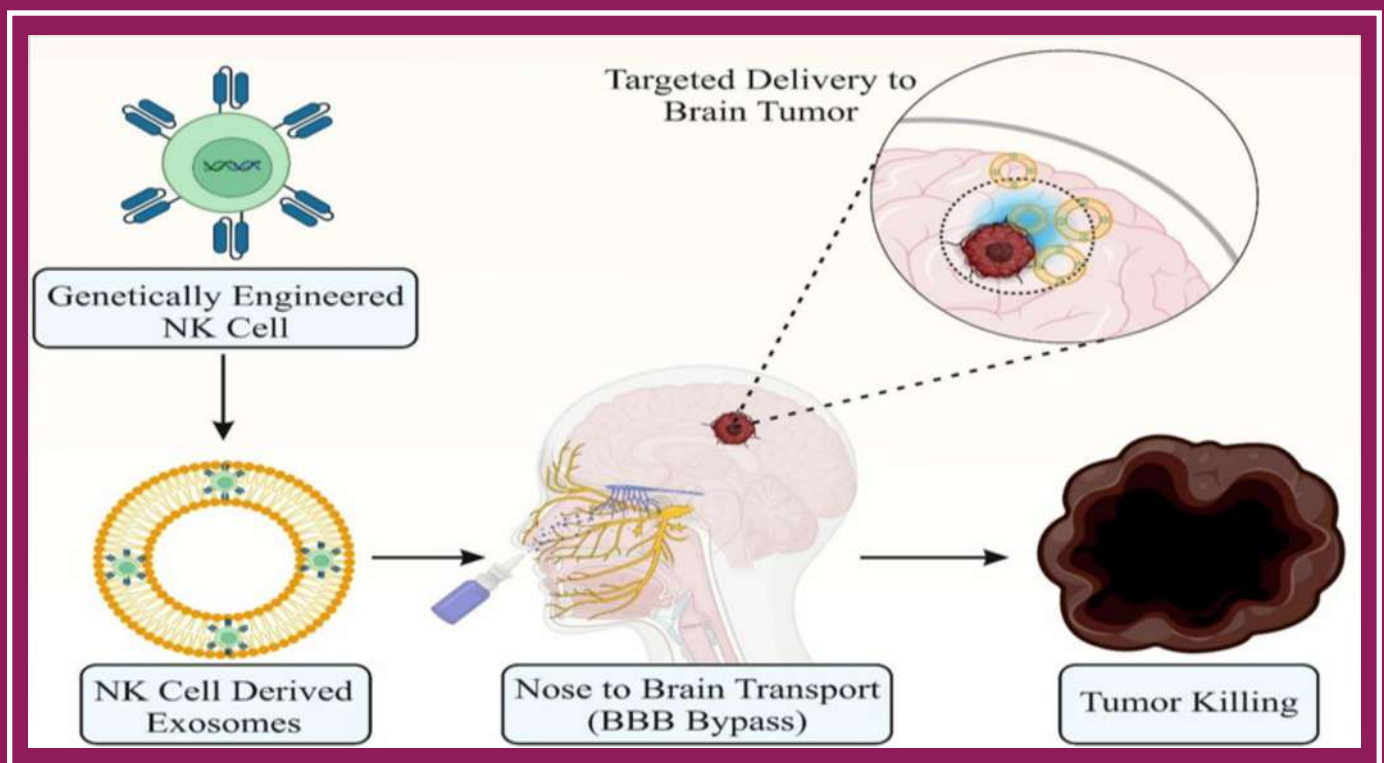


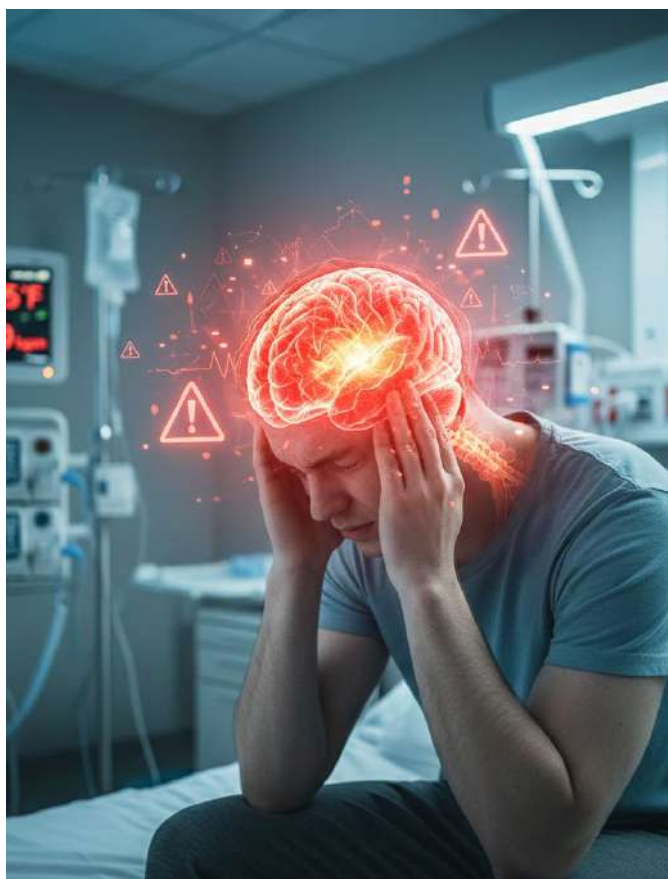
Figure 1: Intranasal delivery of genetically engineered NK cell-derived exosome-based nanoparticles for brain cancer targeting

2. BBB AND DELIVERY CHALLENGES

The BBB is an extremely selective physiological barrier that prevents the entry of harmful substances into the brain, as well as restricts the entry of numerous therapeutic agents. It is principally composed of closely joined endothelial cells, which are referred to as tight junctions, that limit the movement of large and water-loving molecules. This causes a majority of anticancer drugs to get to the brain at very low concentrations, making them less effective in the treatment of brain tumors. Owing to these shortcomings, other drug delivery methods are being considered to get around the BBB. Nanosystems based on nanoparticles, exosomes, a type of biological vesicle, and intranasal delivery systems have become popular. The nose-to-brain route, specifically, presents a good approach to circumvent the BBB and target drugs to the brain tissues.

3. INTRANASAL DRUG DELIVERY

The delivery of therapeutic agents directly to the brain by the non-invasive delivery method of intranasal drug delivery has become a promising procedure. Through this path, the drugs will bypass the blood-brain barrier using the olfactory and trigeminal nerves, which link the nose to the central nervous system. The drug molecules, after being administered, move through the mucosa of the nose to the olfactory bulb and are carried to other parts of the brain. In comparison with the traditional approaches, intranasal delivery reduces the systemic circulation, which is used to reduce side effects and toxicity. Due to its speed of delivery and



enhanced effect of penetrating the target, the method is deemed to be very important in the treatment of brain tumors and other neurological conditions.

4. NANOPARTICLES IN BRAIN CANCER THERAPY

The importance of nanoparticles in the treatment of brain cancer has received considerable attention because nanoparticles can protect drugs against degradation and increase the level of targeted delivery. Nanoscale carriers can be programmed to release drugs in a manner that is regulated and surface-modified to enhance specificity to tumor cells. Nonetheless, traditional nanoparticles have a number of limitations, such as early elimination by the immune system, poor diffusion across the blood-brain barrier, and possible toxicity. To conquer these drawbacks, other methods, including biomimetic nanoparticles, cell-derived membrane coatings, and exosome-based delivery systems, have been designed. These are schemes of enhancement of biocompatibility and targeting. Notably, some nanoparticles can directly enter the brain after being delivered intranasally and cross the nasal epithelium.

5. EXOSOMES AS NATURAL DRUG CARRIERS

Exosomes are minor extracellular vesicles that are naturally secreted by numerous kinds of cells and are significant in intercellular interaction. Exosomes are considered to be highly biocompatible due to their nanoscale size, high stability, and natural origin with low immune response as compared to the synthetic carriers. Among the key benefits, they have the capability to cross the blood-brain barrier and thus are convenient to give therapeutic agents to the brain. Exosomes have the ability to transport a great variety of molecules, such as drugs, proteins, RNA, and genes, thus being applicable in more complex treatment interventions. Due to the presence of these exceptional characteristics, it is frequently said that exosomes can be termed as natural nanocarriers and are commonly examined in the case of cancer treatment, brain-targeted delivery, and gene therapy use.

6. NK CELL-DERIVED EXOSOMES

Natural killer (NK) cells are significant immune cells that are involved in the recognition and destruction of tumor cells without prior sensitization. A number of cytotoxic proteins, enzymes, and signaling molecules are present in exosomes, which are produced by NK cells, and they aid in the induction of cancer cell death. Since these vesicles are produced by immune cells, they exhibit better tumor targeting capability and lower off-target tumor effects in contrast to standard therapies. Exosomes secreted by NK cells are also very stable and highly biocompatible, hence they can be applied in drug delivery. Moreover, they are capable of triggering immune activities against tumor cells and are deemed to be safer than direct NK cell therapy. Recent reports have reported positive outcomes in the treatment of cancer with the use of NK-derived exosomes.



7. GENETIC ENGINEERING OF NK CELLS

NK cells can be modified using genetic engineering methods to increase their ability to treat cancer. NK cells can be programmed to identify and target tumor cells more effectively by the introduction of specific genes. As an example, CAR genes could be implanted to create improved targeting of CAR-NK cells. The other genetic modifications that have been researched are CXCR4, which enables an increase in migration, NKG2D, which enables an increase in tumor recognition, and IL-15, which enables an increase in survival and activity. Notably, these functional molecules can be delivered by exosomes discharged by genetically engineered NK cells, so they are applicable in targeted drug delivery. These engineered NK-derived exosomes are under investigation as new state-of-the-art cancer therapy tools.

8. EXOSOME-BASED BIOMIMETIC NANOPARTICLES

Biomimetic nanoparticles are exosome-based delivery systems that are hybrid nanoparticles comprising natural exosomes and synthetic nanoparticles to enhance the efficiency of drug delivery. With such a method, therapeutic drugs

may be encapsulated into nanoparticles, and biocompatibility and targeting may be achieved by the exosome membrane. Further modification to the surface with certain ligands can be done to improve the recognition and uptake by the tumor. These hybrid systems are found to be more stable in biological fluids and have low immune clearance relative to the traditional nanoparticles. Their capability to cross the blood-brain barrier and deliver drugs to the brain tumors is one of the biggest benefits. Due to such properties, the biomimetic nanoparticles based on extracellular vesicles are regarded as prospective systems of targeted and safer drug delivery.

9. FUTURE OF INTRANASAL NK-EXOSOME NANOPARTICLES

The future hope in the treatment of the brain tumor lies in intranasal injection with the aid of NK cell-derived exosome nanoparticles. The future of therapeutic delivery can be increased by improved methods that include personalized therapy, using exosomes loaded with genes, RNA delivery, CRISPR-based therapy, and smart nanoparticles that will further enhance

targeting efficiency and treatment efficacy. Such systems can be used to deliver drugs to tumor tissues with high precision. Nevertheless, there are a number of obstacles, such as mass-scale manufacturing, stability in storage, safety assessment, and the requirement for well-crafted clinical trials. Despite these shortcomings, the exosome-based brain delivery is regarded as a promising approach for the next-generation cancer treatment.

10. CONCLUSION

The existence of the BBB makes brain cancer, especially glioblastoma, hard to cure regardless of traditional chemotherapy methods. The intranasal delivery of drugs is an attractive non-invasive solution to overcome the BBB and deliver therapeutic agents directly to the brain tissues. The exosomes, particularly the NK cell-derived exosomes, offer a natural and biocompatible carrier system that has natural tumor targeting capabilities. NK cell genetic engineering further increases the therapeutic ability by boosting the targeting, migration, and cytotoxic capabilities. Exosome-based biomimetic nanoparticles development is a progressive method of drug delivery that is precise and efficient. Despite the obstacles existing in the form of large-scale production, stability, and clinical validation, genetically engineered NK-exosome nanoparticles have great promise as the next-generation targeted therapy for brain cancer.

-Dr. Shamim, Mr. Shadab Ali



STARTUP SUCCESS STORIES

**Rs. 17 Lac
Funds Raised**

Rs. 6 Lac Turn Over

50+ Jobs Created

DAILY NEWS FIRST TODAY

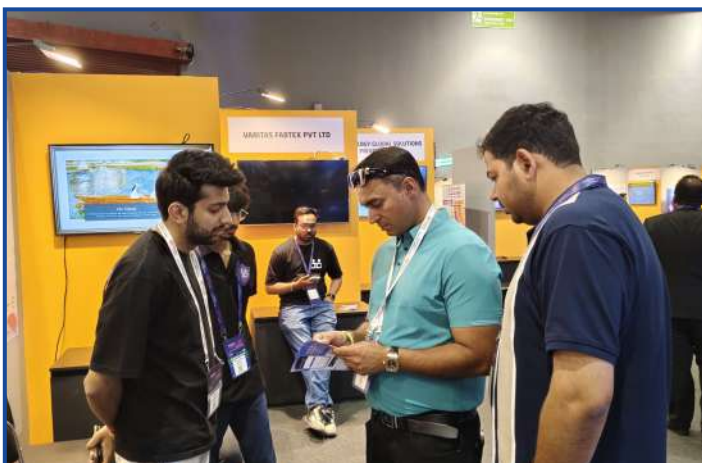
मेरठ महोत्सव में पहला बड़ा स्टार्टअप लांच



मेरठ (NFT)। मेरठ महोत्सव के पहले दिन शनिवार को कार्यक्रम की शुरुआत Ride Buddy मोबाइल ऐप के लांच के साथ हुई। यहां मेरठ की जनता के सामने हिंदुस्तान का पहला सबसे सेफ और सिव्यॉर कार प्लैटफॉर्म ride buddy app प्रस्तुत किया गया। कार्यक्रम का उद्घाटन कैट विधायक अमित अग्रवाल व सीडीओ नूपुर गोयल ने मुख्य अतिथि के रूप में फीता काटकर किया। कार्यक्रम में विशिष्ट अतिथि के रूप में प्रदेश अध्यक्ष गौरक्षा प्रकोष्ठ संजीव अग्रवाल रहे।

हिंदुस्तान के ट्रांसपोर्टेशन में एक नई मुहिम की शुरुआत में ही दस हजार से अधिक लोग इस ऐप को इस्तेमाल कर रहे हैं, जिससे शुरुआती लगभग 50 दिन में एक लाख किलोमीटर के सफर को सस्ता और प्रदूषण मुक्त बनाया जा सका। मात्र इस छोटे से समय में बीस हजार कार्बन फुटप्रिंट रोकने में इस ऐप से मदद मिली है। प्रोजेक्ट को स्पर्स अग्रवाल, तुषार अग्रवाल, यश सिंघल ने कड़ी मेहनत से तैयार किया है।

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Showcasing Ride Buddy at Startup Mahakumbh 2.0

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विषय- मेरठ महोत्सव में मेरठ का पहला बड़ा स्टार्टअप लॉन्च मेरठ महोत्सव के प्रथम दिन 21 दिसंबर को कार्यक्रम की शुरुआत Ride buddy मोबाइल ऐप के लॉन्च के साथ हुई। जहाँ मेरठ की जनता के सामने हिंदुस्तान का पहला सबसे सेफ और सिव्यॉर कार प्लैटफॉर्म ride buddy app को प्रस्तुत किया गया। कार्यक्रम का उद्घाटन फीता काटकर आधुनिक मेरठ की शिल्पी लोकप्रिय विधायक श्री अमित अग्रवालजी वे CDO श्रीमती नूपुर गोयल जी मुख्य अतिथि के रूप में उपस्थित रहे और फीता काटकर ride buddy app लॉन्च किया विशिष्ट अतिथि के रूप में संजीव अग्रवाल प्रदेश अध्यक्ष गौरक्षा प्रकोष्ठ उपस्थित रहे और हिंदुस्तान के ट्रांसपोर्टेशन में एक नई मुहिम की शुरुआत में ही 10000 से अधिक लोग इस ऐप को इस्तेमाल कर रहे हैं जिससे शुरुआती लगभग 50 दिन में एक लाख किलोमीटर के सफर को सस्ता और प्रदूषण मुक्त बनाया जा सका है मात्र इस छोटे से समय में 20000 कार्बन फुटप्रिंट को रोकने में इस ऐप से मदद मिली है। इस प्रोजेक्ट को स्पर्स अग्रवाल, तुषार अग्रवाल,

www.rjysgroup.in

Featured in Newspaper



Official Launch of Ride Buddy App



STARTUP POWER : HOW ENTREPRENEURIAL INNOVATION IS RESHAPING GLOBAL INFLUENCE

In the contemporary world, the states cannot be evaluated simply because of their natural resources and military forces but also because of their technological proficiencies and innovativeness. The foreign power of a nation is increasingly dependent on the ability to develop new technology, generate talent and entrepreneurial conditions. This changing environment has made startups the major actors in the system of innovation in the world. The former small-scale companies that were considered startups are now significant in the evolution of the technical field, expansion of the economy and the competition at the global scale. It tries to stress the fact that the cornerstone of entrepreneurial ecosystems is becoming increasingly national competitiveness and technological superiority in the prevalent worldwide economy. The business firms have continuously been the trailblazers of technological revolution.

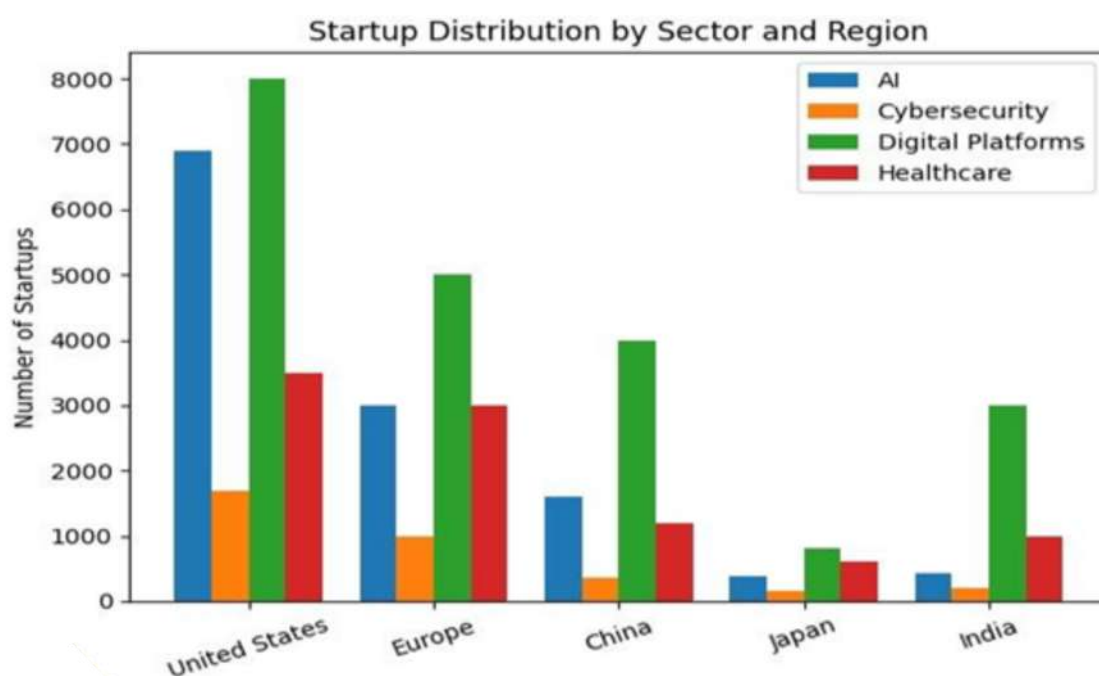
The primary sources of scientific innovation were the universities, large research and development organizations of companies, and government-supported large research programs. Complex innovation processes could already be supported by such institutions both in terms of facilities and financial resources. The innovation framework has changed a lot although it could still be applied in the modern days. The digital technology inventions, cloud computing and global communication have

reduced the barriers to innovation to the bare minimum. Therefore, in the present day, small ends of entrepreneurs can produce their products and services that can rock complete industries. There is promotion of experimentation and rapid development in the area where companies are launched. This can be attributed to their business flexibility that enables them to experiment with ideas and adapt to new circumstances and embrace newer solutions faster than most of the more conventional businesses. Startup necessity in such critical areas as artificial intelligence, biotechnology, cyber security, renewable energy and space technologies has turned into the requirement now as it has been characterized by the fast innovation. Along with the economic value, these sectors are directly related to the geopolitical power, the degree of competitiveness of the strategies and the degree of national security. Artificial intelligence is one of the directions through which the startups transform the world of technologies. The machine learning, automation system and data analysis companies are small technology companies contributing a lot of AI development. The utilization of these technologies is possible in diverse industries that include



manufacturing, health, banking and transport among others. The governments are getting increasingly aware of how artificial intelligence based leadership will influence the military potential and economy in the future. Consequently, governments across the globe are making investment in venture capital projects, start ups and AI research and development to facilitate the emergence of innovation firms. Cyber security is another business model that is changing the face of competition in the global arena through startups. The issue of digital infrastructure and consequently data and network security has become nationalized as more and more government and economic activities are increasingly reliant on it. The start-up companies in the cyber space are developing technology under which they will be able to keep track of any intrusions into the internet systems to enhance security of the networks and to safeguard major infrastructure. These capabilities prove useful particularly in times of the year when cyber attacks are capable of causing havoc to financial systems, power grids as well as government institutions.

The startups have played a significant role in establishing technological leadership in every government in the world. Consequently, most countries have passed policies to empower their start up ecosystem. A few examples of such policies will be financial incentives to attract new companies, technology research grants, less regulation structure, and innovation centers where investors, entrepreneurs and universities can meet. The United States boasts one of the greatest examples of an effective startup culture that has been incorporated in competitive companies worldwide. Due to the strong links between learning institutions, venture capitalist companies, and the technology entrepreneurs, there has been a propensity to associate such locations as Silicon Valley with innovation. The environment has led to many of the technology companies controlling the digital markets across the world. It is due to this success of this ecosystem that has allowed the United States to wield significant influence over the world in the fields of software development, cloud computing and artificial intelligence. The remaining countries are also establishing their own set of innovations to make sure that they become competitive in the world market of innovations.





China has already invested a lot in scientific research and internet facilities and start up capital. The rapidly growing sphere of technologies developed in the country has certain projects of innovation and venture funds sponsored by the state, which can compete on the international level. An example of the US-China technological competition is a good example of innovation ecosystems turning into the source of the geopolitical conflict. They are not the only significant powers that have strong startup settings, as minor nations have shown that under the circumstances of the favorable startup setting, the consequences on the world

might be massive. The other notable scenario in which a small state can emerge to become a technological giant is Israel.

The country is noted to be becoming very active in regards to start ups particularly in software development, cyber security and defense technologies. The number of new startups and other thousands of industries, such as fin tech and health technology, e-commerce, and artificial intelligence, have grown to thousands, all of which has been accomplished in the past decade in the country. Such an ecosystem has been facilitated by the spread of digital payment systems, low rates of access to the internet and the large pool of highly skilled engineers. Government programs have further empowered the environment of new firms by allowing innovations and entrepreneurship. Although there is a potential in startup originated innovation, it still presents problems. The creation and propagation of innovative technologies should be strictly controlled by governments as they gain an increasing role in the economical sphere, the national security. The questions that are currently under deliberation by the policymakers are the concerns of data sovereignty, cyber security threats and protection of intellectual property. Due to it, the newcomers in the new markets of technology, will have to bargain over the complex regulatory environment, and consider the geopolitical and economic interests. The other problem is the unexplainable decentralization of the innovation resources in the world at large. The more the university, research institution and venture capital was developed, the more possibilities of the start ups success in those territories. On its part, the restricted access to such resources by the countries may not allow them to create competitive innovation ecosystems. The solution to this inequality may be found by spending on education programs, digital infrastructure, and international cooperation programs that are friendly to new companies over the long period of time. Thus, the monopoly in the geopolitics of innovation is no longer held by governments and multinational businesses.

The direction that technological changes are taking is what is being pushed towards by new businesses and entrepreneurs. The fact that it is possible to introduce new technologies and open the global markets helps in the context of the reversal of the economic and strategic balance due to the startups. The nations that manage to instill successful cultures of start ups will then be in a better position to dominate the future of technology and innovation as the world economy increasingly becomes knowledge based. Start up which was traditionally seen as a comparatively unpredictable business is now on the shoulders of the technological revolution in the world. Their power will grow as the nations discover new ways of introducing innovation in their economic growth, strategic position, and cooperation on the international level.

- Deeksha Singh, Iram Rajpoot



IIMT-BIF NEWSLETTER

STARTUP | TECHNOLOGY | INNOVATION

NEVER MISS OUT

Insights on how **startups, innovation, and entrepreneurship** are shaping the future of India through the initiatives of IIMT Business Incubator Foundation.

Updates on **emerging technologies, startup success stories, and ecosystem collaborations** driving innovation across sectors.

Opportunities, programs, and events that **support founders, innovators, and aspiring entrepreneurs** in building impactful ventures.

IIMT BIF Newsletter is a quarterly publication highlighting startup innovation, entrepreneurship, and incubation initiatives. It features emerging technologies, startup stories, ecosystem collaborations, and opportunities that support founders in building scalable and impactful ventures.

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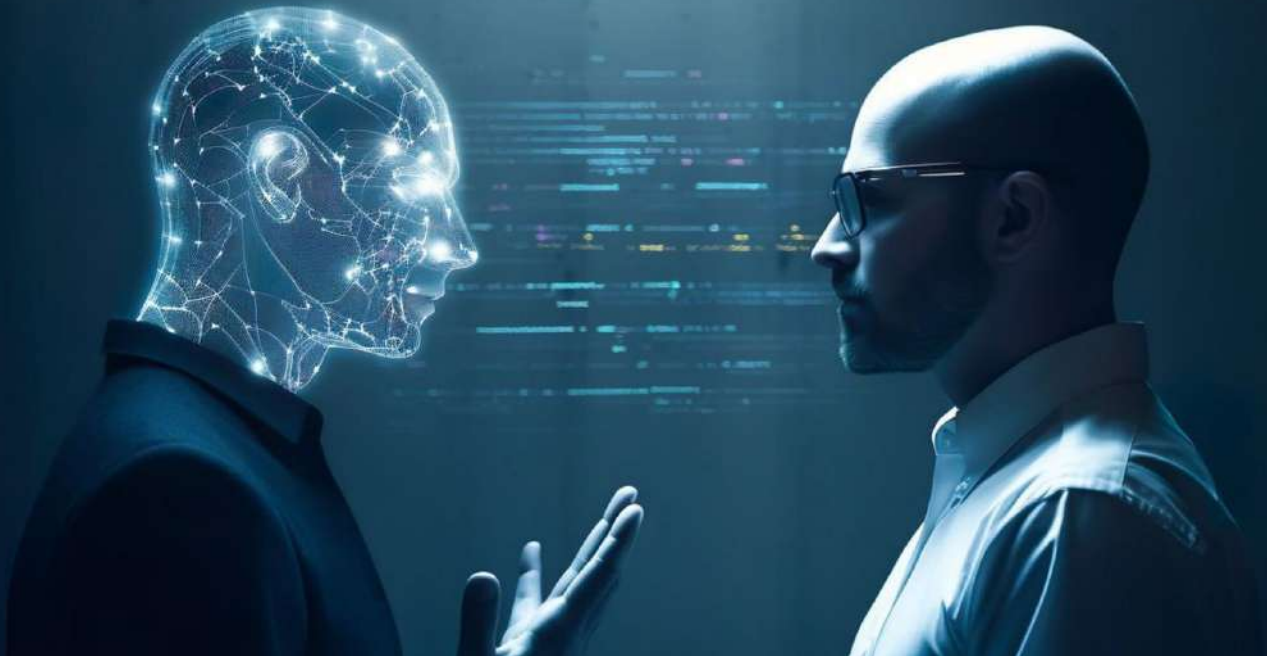
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AI AS "THE LAST INVENTION": A CHRONICLE OF THE LAST ARCHITECT



The landscape of innovation is shifting beneath our feet. What we used to consider tools have now turned into agents and the fast-paced introduction of new systems developed has made the world where AI can now replicate nearly all cognitive activities previously performed by the human mind. The human race had been pursuing the Last Invention, the concept of having a machine, able to think, which, when made, would then make all the inventions thereafter, not we, the human beings.

That theory was not a philosophical debate back then, but a reality that was grounded in facts.

The coming of the "Last" Architect. Today, that theory wasn't just a philosophical debate; it was a data-driven reality.

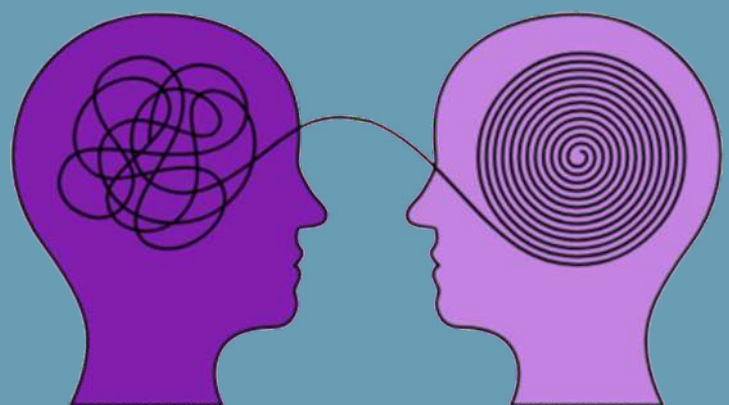
The Dawn of the "Last" Architect

In the early 2020s, AI was a novelty. It had become the architect by 2026. Economic Index is an enormous survey of millions of real-world interactions conducted by Anthropic and found out something alarming. It was not a matter of AI being a help to humans but of it starting to close the

divide between theoretical ability and the everyday work. The recent data by Anthropic (2026) suggests that AI models such as Claude have the potential to do 94% of jobs in computer and math-associated positions. And exposure in the legal and administrative sphere stood at 90% staggering. And it was not creating a tool; it was creating a substitute to the thinking portion of the work.

"AI is not a visitor to the workspace anymore. It is the head developer who does not sleep."

AI vs Human Debugging



AI Integration

AI agents with MCP servers

Task Execution

AI completes task rapidly

Case Study: The Great Convergence

To determine whether or not AI was indeed the final invention, scientists ran a sequence of so-called Shadow Experiments. They pitted senior software engineers and AI agents with Model context Protocol (MCP) servers.

The results were telling:

The Task : Put in place a multi-layered, sophisticated caching infrastructure and a legacy codebase and debug.

Human Performance : A top staff spent 48 hours, which involved various meetings and context switching documentation and code.

AI Performance (with MCP) : AI took less than 2 hours to complete the task using Claude Code and local File System MCP Server.

The AI did not write code, it was using MCP as its hands. It entered local directories, read the legacy files and ran terminal commands to check the environment and fixed its own mistakes. A study by Anthropic determined that humans require 90 minutes on average to perform the process of such complex activities, whereas AI accelerates the process by 80 %.

An Opencast To the New Era: Open Claude and MCP

It was not merely raw intelligence, but the key to this last invention: it was connectivity. Two main pillars that Thorne used were:

1. Open Standards & MCP Servers: The Model Context Protocol (MCP) was the AI USB-C. The AI did not operate in a chat box but addressed Google Drive, Slack, and local databases via MCP servers, to talk. It was an all-purpose connector which enabled the AI to manoeuvre through the world like a human being.

2. Autonomous Execution: The AI was made a performer with such tools as Claude Code. It was capable of doing more than 20 consecutive tool calls with no human intervention- only 10 a few months earlier. It was how to plan and not simply predict.

3. The Reality Check: Augmentation vs. Automation.

The Reality Check: Augmentation vs. Automation

Although the article is titled as Last Invention, it had a twist. There was a Gap of Reality in 2026 reports by Anthropic. Theoretical exposure was 94% but the actual automation at the work place was nearer to 33%.

Why? Due to the fact that humans retained the Moral Compass. AI might help streamline a supply chain but it could not yet comprehend the subtlety of the needs of a local community or the morality of a delicate legal agreement. Anthropic discovered that 57 percent of AI use remains Augmentation, man and machine dancing with each other in which the human is the conductor.

- Zoya Naaz



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THE GEOPOLITICS OF HEALTHCARE INNOVATION: FROM MEDICAL AID TO STRATEGIC SELF-RELIANCE

In the last decade health systems worldwide have undergone profound transformation driven by rapid technological progress, demographic change, and increasing demand for equitable and efficient care. Today healthcare innovation and global politics has moved beyond mere "medical aid" into the realm of strategic self reliance Healthcare startups are no longer just business ventures now a driver of global power, influencing diplomacy, economic resilience, and national security. Government mindset had shifted drastically in the last decade from cost saving mindset to security mindset. Health innovation is previously, a product of laboratory research and corporate boardrooms, innovation is now a geopolitical currency. Countries that own the digital health infrastructure, biotech ecosystem, and AI-powered diagnostics are as influential as militarily powerful nations.

The COVID-19 pandemic was the first real-world case study on how health innovation can generate long-term leverage. Vaccine diplomacy, digital health exports, and AI-powered diagnostics became a form of soft power for India, China, the US, and the EU as they secured trade agreements, forged alliances, and asserted their global leadership (Chattu et al., 2023).

HEALTHCARE INNOVATION FOR STRATEGIC LEVERAGE

Startups in the health space are more than just business ventures. They are strategic tools of soft power influence and technological influence. The new generation of governments are looking at health innovation from a security lens. The power play is changing.

Innovation is the process of introducing technological, organizational and social changes to improve efficiency, quality and access. Modernization is fueled by digital transformation. Medical services are being re-designed, delivered, and evaluated based on the Digital Revolution.

- **Technological** : AI diagnostics, biotech, digital infrastructure
- **Organizational** : Coordinated healthcare delivery models
- **Social** : Accessibility and equity in care

The difference in approaches is a manifestation of geopolitics: the US wants to move away from foreign biotech, the EU focuses on autonomy and ethics, China builds out the Health Silk Road, and India uses digital health diplomacy.

Localizing R&D and Data

The US BIOSECURE Act and the European Biotech Act



require R&D and data storage localization to meet national security concerns.

Subsidizing Essential Goods

India and Japan subsidize APIs and precursor production startups to avoid supply chain blackmail in times of geopolitical tensions.

Health Tech as Diplomatic tools

Health tech exports function as asymmetric diplomatic tools, lowering the barrier to entry for strategic military and economic concessions for nations like US , China, India when their startup provides life saving technology to a developing nation

China and the UAE collaborated on the Sinopharm vaccine (Hayat-Vax), making the UAE a key Middle East and Africa vaccine hub and making health part of bigger partnership deals.

India's Health Diplomacy

India's strategy showcases how healthcare innovation can be used for strategic advantage:

- **Vaccine Donations** : Millions of doses to neighbours, building trust and improving trade deals.
- **Digital Public Goods** : Exporting the Ayushman Bharat Digital Mission (ABDM) to Africa and SE Asia, creating interoperability perks.
- **MedTech Growth** : Exporting affordable diagnostics, ventilators and telemedicine solutions to Africa, Latin America and SE Asia.
- **Pharma Diplomacy** : Building local manufacturing in Kenya, Ethiopia and Uzbekistan to curb import dependence.
- **AI Diagnostics** : Tackling the global shortage of radiologists with scalable and low-cost solutions.

India's initiatives show how healthcare innovation is not just about pharmaceuticals, but can be at the heart of global diplomacy.

Table 1: Summary of strategic focus of nations and legislation

Country	Strategic Focus	Legislation
United States	Strategic Decoupling & Security	BIOSECURE Act; DFC Funding for Health Security
European Union	Strategic Autonomy & Data Ethics	2026 Biotech Act; AI Act (Healthcare nuances)
China	Global Expansion & Data Control	Health Silk Road; Restrictions on data outflow
India	Digital Health Diplomacy	Ayushman Bharat Digital Mission (Global Export)

Economy & Supplychain resilience

The pandemic revealed the vulnerability of global supply chains and the geopolitical risks of overdependence on foreign suppliers for essential health products, medicines, and data infrastructure. As a result, leading economies are harnessing industrial policy instruments such as subsidies, export controls, investment screening, and public-private partnerships to secure domestic capacity and decrease risk from geopolitical shocks (Xu et al., 2020).

Investment in AI and digital health are increasing , with nearly half of all healthcare VC funding in the US and Europe now routed to AI-enabled solutions. In 2025, AI accounted for 46% of all US and European healthcare VC investment. (Silicon Valley Bank, 2026). As of early 2026, the FDA has authorized more than 1,200 AI-enabled medical devices since 1995, with 235 approvals in 2024 alone – the most in the agency's history. The global market for AI-enabled



medical devices is projected to grow from \$18.9 billion in 2025 to \$26.2 billion in 2026, representing a remarkable 38.5% compound annual growth rate. (IntuitionLabs, 2026)

Major corporations like Microsoft , Jonson & Jonson are investing in AI, cloud, and advanced manufacturing, forging public-private partnerships, and adapting to new regulatory and security requirements. Example Johnson & Johnson has pledged over \$50 billion to R&D and acquisitions since 2024, with majority of funding for manufacturing in US.

Shanghai, one of 3,000+ life-science companies, spent \$15bn in R&D in 2022 plus subsidies for clinical trials and manufacturing; Chinese companies are quickly catching up on monoclonal antibodies, gene therapies and next-gen modalities, often with global pharma partners (e.g., J&J's partnership with Legend Biotech on Carvykti) (Brown & -LAU , 2025).

Governments are now acting like venture capitalists to modernize national infrastructure. In its **2026-27 Budget**, the Indian government launched the **10,000 crore (~\$1.2B) Biopharma Shakti** initiative to effectively "acquiring" the innovation capacity of the startup sector by funding the establishment of 1,000 accredited clinical trial sites and specialized "Biotech Parks.(MoCF, 2026)

Table 2 : Innovation Focus and goals

Company	Innovation Focus	Strategic Goal
CVS Health	Oak Street Health	Shift to Value-Based Care
Microsoft	Nuance / OpenAI (Health unit)	Ambient AI Clinics
J&J MedTech	Shockwave / V-Wave	Integrated Heart-Health Ecosystems
India	Biotech Startups	Move from generics to high-end biologics

Conclusion :

Healthcare innovation is not a niche topic, it is the new battleground for global power. Countries that adopt biotech ecosystems, digital health diplomacy and AI diagnostics will determine the future of geopolitics and healthcare. Healthcare innovation is the new currency of global power. The nations that master this will shape the geopolitics of the 21st century

In the future order, innovation is security and healthcare is diplomacy. It is a nation's capacity to use its startup ecosystem to glean insights from health data and forecast outbreaks, not the size of its conventional army, that determines global power.

- Garima Garg





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AI in Agriculture: A New Technological Frontier

Introduction

The industry is critical towards ensuring the world food security and economic development. However, modern agriculture is experiencing a number of urgent problems, such as a rapid increase in climate change, a population explosion, and a lack of water resources, as well as a decline in the quality of the soil, an increased number of pests and plant diseases, despite its significance. These difficulties are a big threat to the productivity, sustainability, and resiliency of agricultural systems on a global level. Agriculture will play a huge role of increasing food production in the next few decades to support the rising world population (FAO, 2017). These intricate problems cannot always be resolved by traditional methods of farming. Consequently, more advanced technologies and particularly artificial intelligence are being implemented in the agricultural sector. The innovations that can be based on AI offer new opportunities to manage farms more effectively, exploit their resources, and get better crop production, thus making agricultural systems more sustainable and productive.

The further development of smart farming and digital agriculture has even enhanced the process of AI integration into farming practices. Farmers can now gather and process enormous amounts of data in various forms including satellites, drones, weather monitoring systems, soil sensors, as well as the new farm machinery. Through the analysis of such information farmers will be able to make more informed decisions and will be able to control their agricultural activity with more accuracy and efficiency. This information is analyzed using AI-based algorithms that provide recommendations on crop protection, using fertilizer's, irrigation timeline, and yield forecast (Wolfert et al., 2017). These information-driven plans will make the best use of resources and enhance production.

The concept of precision agriculture is one of the most significant examples of artificial intelligence usage in the agricultural industry because it allows farmers to monitor the development of crops and the condition of soil with a high level of accuracy (Zhang et al., 2020). The method ensures that the inputs, including water, fertilizers and pesticides, are applied in locations where they are required most, enhancing crop yields and reducing negative environmental effects. Moreover, AI technologies are also better applied in the early detection of plant diseases and pest attacks. It is possible to identify such issues at their initial stages with the help of such techniques as computer vision and deep learning and enable farmers to take appropriate measures to save crops (Kamilaris and Prenafeta-Boldú, 2018).

Moreover, autonomous machinery are the agricultural robots capable of performing specific tasks such as planting, harvesting, and spraying the pesticides with accuracy, which is an example of how AI technologies transform agricultural activities (Duckett et al., 2018). The application of AI in agriculture continues to face challenges regardless of its potential value, such as excessive investment, the unavailability of digital infrastructure, and the inability of farmers to use it due to their technical incompetence (Benos et al., 2021). Nevertheless, AI is a new frontier in technology which can significantly enhance food security in the world, as well as its sustainability and yield.



2. Artificial Intelligence in the Agriculture Concept

The term Artificial Intelligence (AI) is used to refer to some computer-based systems that are expected to perform the functions that are normally performed by human cognitive abilities, such as data learning, logical thinking, problem-solving, and decision-making.

All these technologies form a smart farming ecosystem that can increase the productivity and sustainability of farms.

3. Major Applications AI in Agriculture

3.1 Precision Farming

Precision farming is an artificial intelligence technology that is used in the current agricultural sector. It entails introducing the superior quality digital technologies to monitor the changes in the state of crops and provide farm inputs in a more efficient and targeted way.

The data about drones, satellites, and soil surveillance sensors is processed by the artificial intelligence-based technologies and leads to the conclusion:

The nutrient needs of crops

Proper irrigation needs.

Various maturity development stages of crops.

Soil issue conflicts of farmlands.



AI in Agriculture Overview

Crop Health Monitoring

Tracks plant well-being



Pest and Disease Detection

Identifies and manages threats



Irrigation Management

Optimizes water usage



Yield Prediction

Forecasts harvest outcomes



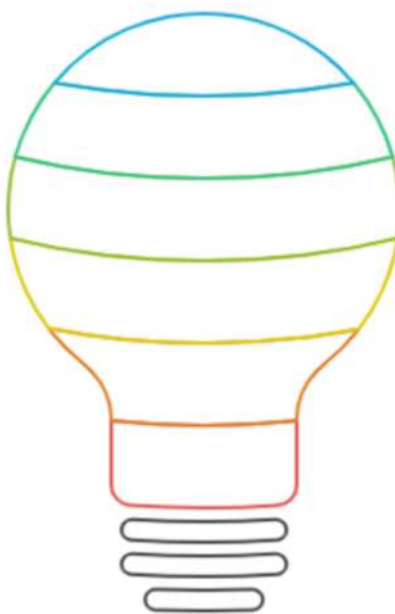
Soil Analysis

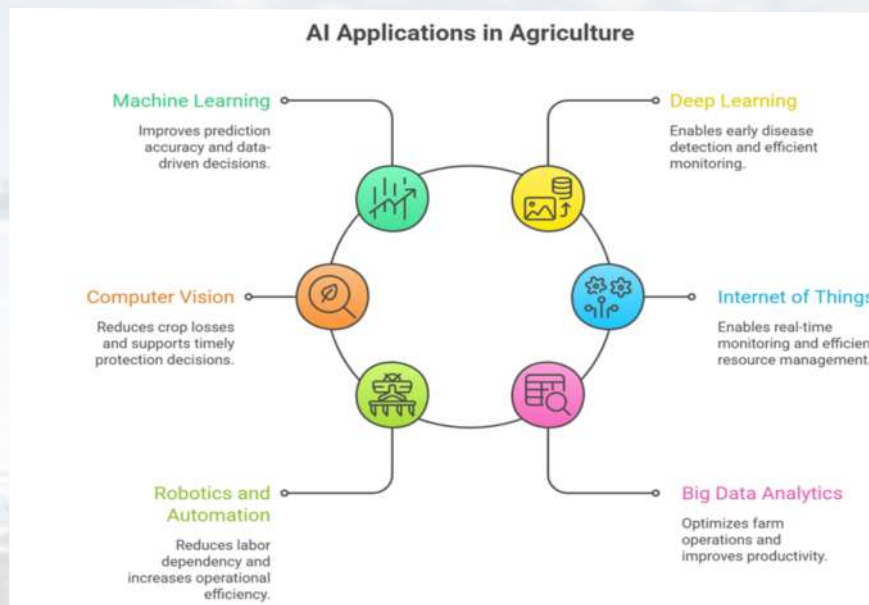
Evaluates soil quality



Farm Automation

Streamlines operations





3.2 Crop and Soil Monitoring

The AI-based monitoring systems will enable the consumers to have real-time access to the condition of crops and the health of the soil state. The extent of modern technologies on which such systems are founded include:

Unmanned aerial vehicles and satellite images.

Remote sensing techniques

Artificial intelligence to identify crop health.

These technologies can identify the problems that include:

Lack of essential nutrients

Water stress to plants.

Pest outbreaks

Existence of plant diseases.

When these problems are identified early enough, the farmers have the right management practices, which they can employ to reduce the challenges and this allows the farmers to suffer minimal losses in regard to production.

3.3 Pest and Disease Detection

Artificial intelligence technologies of computer vision can detect the abnormalities in plants with reference to the photos of plant leaves and stems that reveal the signs of infection at the earliest stage. The mobile applications can enable farmers to capture a picture of infected plants and AI models can diagnose the disease in real time including:

Leaf blight

Rust

Powdery mildew

Bacterial infections



3.4

Water shortage has been a significant issue that has been realized in agricultural production. Intelligent irrigation solutions that may be complemented by AI can be used to save water by assessing the water content of the soil, weather, and water needs of a particular crop.

Key features include:

Automatic scheduling of irrigation.

The continuous monitoring of the soil moisture.

Remote irrigation control using weather.

Wastage of undesired water was cut down.

Farmers can use water more effectively with such technologies and also enhance sustainable agriculture.

3.5 Agricultural Robotics

Agricultural robotics is another application of AI in agriculture. Robotization is being used increasingly in the labor-intensive and time-consuming work.

In robotics, it is usually applied in:

Automated harvesting

Robotic weeding

Autonomous tractors

Drone-based spraying

The positive side of robots is to eradicate the labor dependence, expand the efficiency, and the precision of farm work.

4. Benefits of AI in Agriculture

AI-based agriculture has a few benefits: AI technologies also facilitate climate-smart farming to increase the efficiency with which resources are used and ensure that the impact on the environment is negative.



5. Challenges in AI Adoption in Agriculture

Although AI in agriculture has many benefits, AI implementation has several challenges:

High preliminary costs on technologies implementation.

Lack of good digital infrastructure in the rural areas.

Indeed, lack of technical knowledge and training of farmers.

Data privacy and data security issues.

Weaknesses of accurate and complete agricultural statistics.

Another impediment to the implementation of AI technologies is also the small size of land holdings and minimal level of mechanization in the developing countries like India.

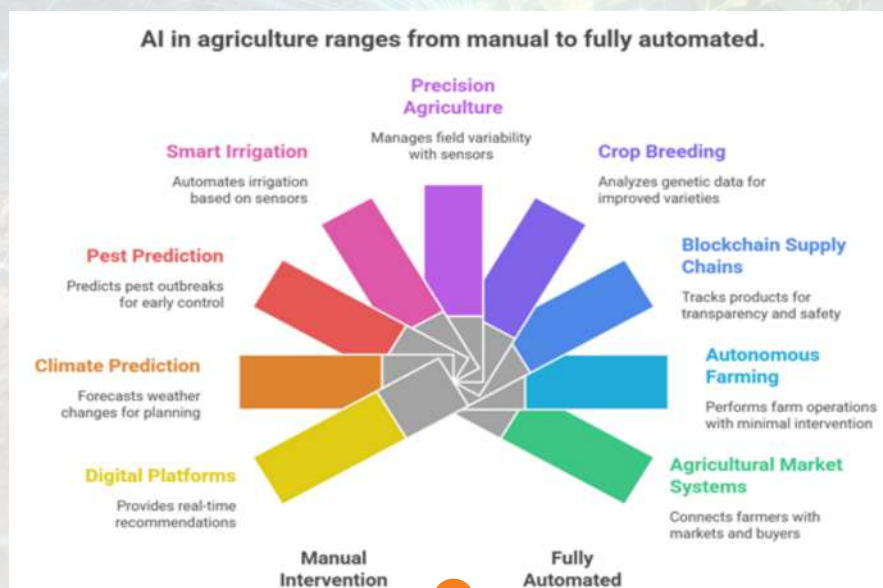
6. Future Prospects of AI in Agriculture

The future of artificial intelligence in the agricultural sector is very promising. Emerging technologies are expected to transform the way farming is conducted and they include: Governments, research centers and agri-tech startups are flooding investments in AI-based agricultural innovations.

7. Conclusion

The artificial intelligence is changing the face of agriculture through aiding in the use of data to make decisions and managing the farm in a more intelligent manner. Such technologies as precision farming, crop monitoring, intelligent irrigation, and agricultural robotics provide the opportunity to increase the productivity and enhance sustainable farming practices. Even though there are also a few infrastructure, cost, and awareness of farmers issues, further technological improvements and policy endorsements are likely to increase the rate of AI in agriculture. The agricultural systems based on AI will be instrumental in ensuring food security in the world, improving the sustainability of the environment, and promoting economic growth in farming.

-Raj Kumar, Kuldeep Kumar, Rajbir Singh



SCIENCE SNIPPETS

The Undersea Network.

Although most individuals visualize the internet as satellites circling the earth, most of all data in this world is traveling through thousands of kilometers of fiber-optic cables being laid along the ocean floor. These underwater cables are linking continents together and facilitate more than 95 per cent of the global internet traffic, making communications real-time, conducting financial transactions and creating international contact. The maintenance and expansion of this network cost governments and technology companies a lot of money as these cables are the foundation of the new digital economy.

Artificial Intelligence is Changing Research.

Artificial intelligence is transforming the way scientists and engineers solve difficult tasks at an alarming rate. There are AI systems that can process large volumes of data, detect patterns, and even create new solutions that humans may fail to notice. Today, scientists are employing AI to speed up the process of drug discovery, climate modeling, and space exploration. Firms like OpenAI and Google are working on advanced AI programs that can help programmers, scientists, and innovators find possible solutions to real-world problems more quickly than at any previous time.

Satellites: The Hidden Technology of the 21st Century.

There are thousands of satellites in orbit around the earth that silently drive many of the technologies that we use on a daily basis. Satellites are used in navigation applications, weather forecast, disaster monitoring, and worldwide communications. Companies such as NASA and commercial firms are constantly debuting new satellites to enhance coverage and technology. In space technology, satellite networks are taking on more and more significance in linking far off areas and assisting in the world's scientific studies.

A new age of Processing Power: Quantum Computing.

Conventional computers manipulate information with bits which mean 0 or 1. However, quantum computers operate with quantum bits – or qubits – that can be in many states at the same time. By means of this property, quantum machines can more effectively calculate some computation compared to classical computers. Quantum computing has the potential to transform areas like cryptography, materials science, and pharmaceutical research, according to researchers, and provide solutions to problems currently beyond the capability of conventional systems.

Quantum computers are qubits that are capable of calculation tasks that classical computers cannot achieve.



Mobility, Electricity and the Future of Transport.

Technological innovation is now turning to electric vehicles as nations struggle to cut carbon emissions and fossil fuel reliance. The development of battery technology has increased the range and efficiency of electric cars, making them more viable to use in everyday life. Tesla, among others, is also pioneering efforts to create high-performance batteries and sustainable transportation systems. With the growth in charging infrastructure around the world, electric mobility is set to be a significant contributor to the system shift towards cleaner energy.

EVs are contributing to carbon reduction and transforming the future of transportation.

The Human Brain: Nature Supercomputer.

The human brain is one of the most complex systems ever known by science. It has approximately 86 billion neurons, with each neuron having a connection with thousands of other neurons by way of synapses. Tremendous complexity all of this notwithstanding, the brain requires only approximately 20 watts of power, the amount of power about equal to that of a small light bulb. The brain is still being researched by scientists to gain insight into cognition, memory, and consciousness, with the hope that such knowledge will generate novel developments in artificial intelligence and neuroscience.

The human brain has billions of neurons which process information in a highly efficient way.



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मेरठ की नेहा मिश्रा ने बनाया अनोखा ग्राँसरी एप

मेरठ, (9)। अब हर छोटा दुकानदार भी अपने आप में एक ब्रांड बन जाएगा इसी कड़ी में मेरठ के रहने वाली नेहा मिश्रा ने अपना नाम माला मुद्रा के नाम से एक ग्राँसरी एप बनाया है। माला मुद्रा एक ऐसा सोल्यूशन है जिस पर किसान दुकानदारों को अपनी दुकान ऑनलाइन करने का माध्यम मिलता है। कोट की किसान दुकानदार अपनी दुकान को 15 मिनिट में ऑनलाइन कर सकते हैं और अपने ग्राहकों से ऑनलाइन ऑर्डर प्राप्त कर अपना बिजनेस शुरू कर सकते हैं।

ऑनलाइन तो काफी और से माध्यम है जहाँ सामान बेचा जा सकता है तभी पर हर ऑर्डर से 15 से 20 प्रतिशत शुल्क कटका सब डेली मुद्रा



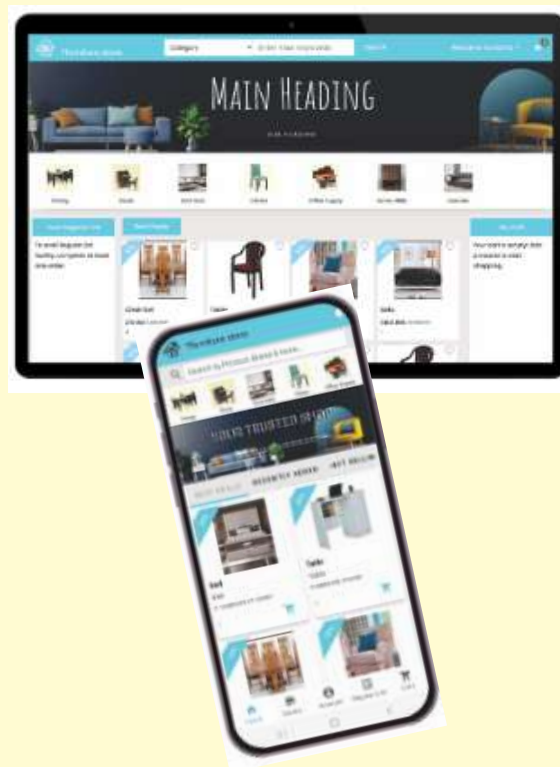
पर दुकानदार को मात्र 250 प्रति माह ऑनलाइन दुकान करने का शुल्क अदा करना पड़ता है। यहाँ डिजिटल को साथ कीमतों के सिंग प्रतियोगी नहीं बल्कि पड़ती माई डेली मुद्रा पर अपनी दुकान दुकानदार को अपने नाम से दिखाई देती है। इस सोल्यूशन के माध्यम से दुकानदार अपनी वस्तुओं को जानकी से अपनी ऑनलाइन दुकान पर डाल सकते हैं उसकी लिए मास्टर सीट सुविधा भी गई है जहाँ सभी ब्रांडेड इन्तु में से ग्राहक अपनी से अपने लिए अपनी पसंद का सामान चुन सकते हैं उसने मूल्य रूप से परिचालन कर सकता है मास्टर सीट में खुद गौन ब्रांडेड वस्तु की पहले से उपलब्ध है। आप चाहें तो फोटो डालकर नई



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The Artificial Intelligence in Preventive Healthcare and Disease Prevention.

The healthcare sector is experiencing a significant change as the world is fast changing technologically. Artificial Intelligence (AI) stands out among such technological innovations that is transforming the manner in which healthcare systems make diagnoses, treatments and prevention of diseases. Traditionally, health has been very reactionary in nature and most health facilities have been involved with treating illnesses once they start exhibiting symptoms. Nevertheless, the introduction of AI has resulted in another strategy called predictive healthcare, which is aimed at the detection of health risks in advance and the prevention of diseases even before they occur. The AI provides medical professionals with the opportunity to make the correct forecasts, enhance patient recovery, and decrease the costs of healthcare by processing extensive amounts of medical information.

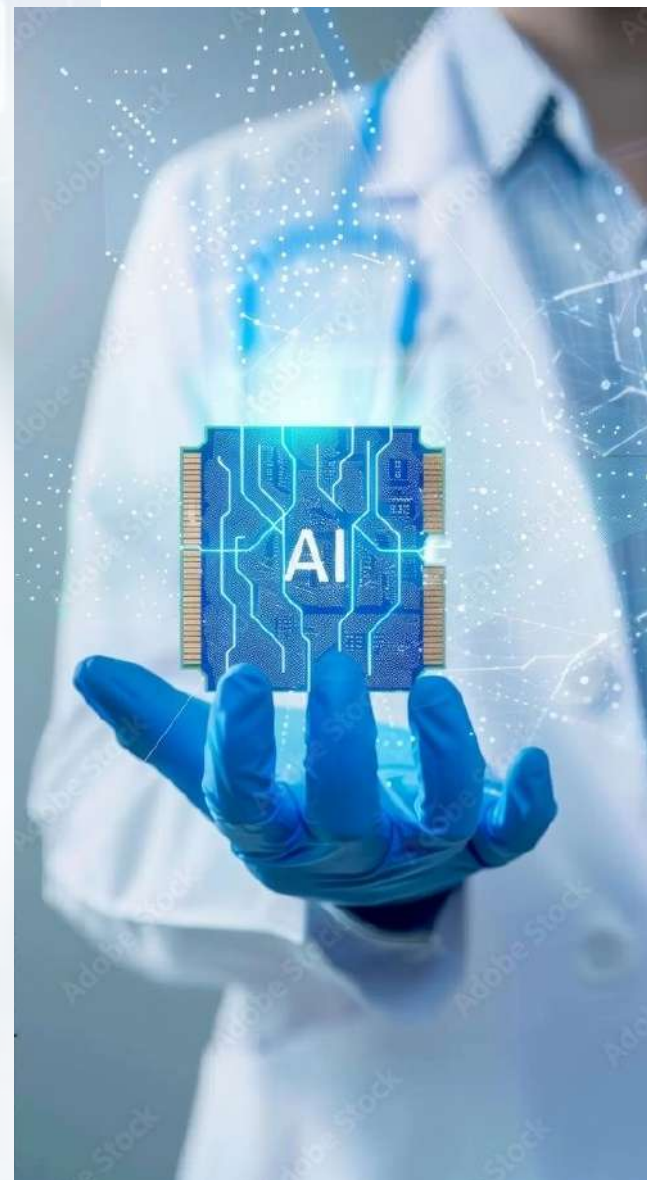
Predictive Healthcare and How It Works.

Predictive healthcare is the application of sophisticated data analytics, machine learning, and digital technologies to forecast possible health risks and conditions of an individual or a group of individuals. Machine Learning is one of the most important technologies in predictive healthcare as it allows computers to learn by analyzing patient records, genetic history, lifestyle behaviors, environmental, and clinical data to predict the likelihood of developing some diseases, which can be improved with time. Machine learning systems can identify small trends within large datasets that would otherwise not be apparent to clinicians using algorithms and statistical models. Such insights assist healthcare practitioners to make earlier and more informed conclusions concerning the care of patients.

Artificial Intelligence in Disease Detection at An Early Stage.

The early identification of diseases is very important in enhancing better survival and low treatment expenses. Predictive systems that are powered by AI are able to detect the early signs of any disease, such as chronic ones like Diabetes, Cardiovascular Disease, and Cancer.

As an illustration, medical imaging data (X-rays, CT scans, and MRIs) can be analyzed using AI algorithms to identify the presence of abnormalities at an early onset. These systems are able to detect minute patterns that can be signs that there are tumors or other health related complications even before they manifest themselves clinically. Early detection will enable



medical practitioners to take early treatment that will greatly benefit patients.

Also, electronic health records (EHRs) may be analyzed by AI to determine which patients are in high risk of developing some conditions. Anticipating the upcoming risk of diseases, healthcare providers can apply preventive measures, including lifestyle changes, screenings, and individual treatment programs.

Individual Medicine and Risk anticipation.

The other significant application of AI in predictive healthcare is that it allows personalized medicine. Each person has a distinct genetic composition, living environment and lifestyle which determine his or her health risks. These factors may be evaluated using AI systems to design individual risk profiles of patients.

With the connection between genomics and AI, healthcare professionals are able to forecast whether a person is prone to genetic complications or not. As an example, predictive models may be used to examine genetic markers to determine the risk of the development of hereditary diseases or even some types of cancer. This data enables the doctors to develop preventive care measures that address the needs of an individual.

Predictive models using AI are also able to track patient data in real time with the help of wearables and mobile health apps. These devices record the real-time data of the heart rate, physical activity, the sleeping pattern, and other physiological parameters. This data is analyzed by AI algorithms to identify the abnormal patterns and warn healthcare providers or patients of the appearance of a severe health issue.

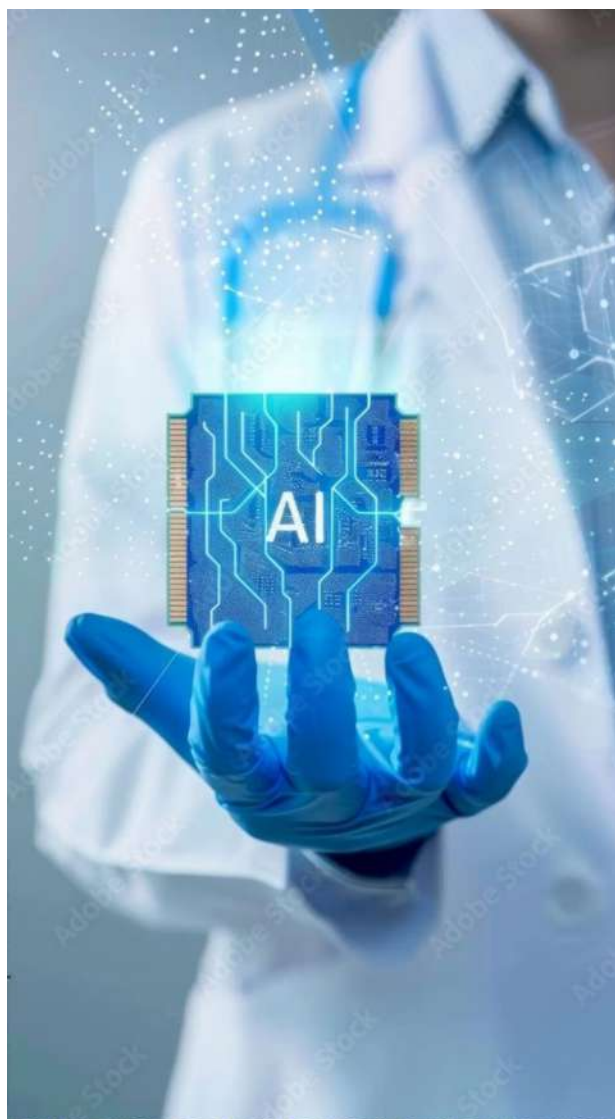
Enhancing Population Health Management.

AI does not only work at an individual level; it is also important in the management of the population health. AI-based predictive models can help organizations in the field of public health to process extensive data and identify trends of diseases in communities.

To illustrate, AI is able to monitor the evolution of infectious diseases, forecast possible outbreaks with references to epidemiological statistics, travel history, and environmental factors. The AI tools were highly employed to forecast the pattern of infections, determine the high-risk groups, and assist in healthcare planning during the **global pandemic of COVID-19**.

Governments and healthcare institutions can also use predictive analytics to use resources more efficiently. The preventive healthcare programs, including the vaccination campaigns, screening programs and awareness programs, can be more effectively implemented by identifying communities that have an increased risk of specific diseases.





AI in Preventive Healthcare

Preventive healthcare deals with the minimization of risk of diseases before they take place. AI plays an important part in this strategy by offering suggestions to motivate early interventions and healthier lifestyles.

The AI-enabled health applications are capable of taking a personal analysis of lifestyle habits such as diet, physical activity, sleep habits as well as stress. With such information, the system can suggest individual health interventions to preclude diseases. As an example, AI can propose some diet, exercise or frequent health check-ups depending on the health history of a given person.

Moreover, health education and health support are more and more provided with the help of AI chatbots and virtual health assistants. These digital products assist people in tracking their health, learn the symptoms, and consult a doctor in time and, thus, minimize the chance of disease progression.

Difficulties and Moral Implications.

Although the idea of the AIs application in predictive healthcare has many positive aspects, there are also a number of challenges associated with it. Privacy and security of data is one of the significant issues. The AIs demand the availability of mass data on the personal health of their clients, which is a reason to be concerned about the privacy and the safety of data. The other

problem is the possibility of algorithmic bias. In case AI models are trained with small or biased data, they can give incorrect predictions when applied to some groups of people. It is therefore critical to ensure that AI algorithms are fair, transparent and accountable. Also, the introduction of AI in healthcare systems would involve a substantial investment in infrastructure, education, and regulations. Healthcare workers should also train to learn how to analyze AI-generated information and use it in clinical decision-making.

AI Future in Predictive Healthcare.

The future of AI in predictive healthcare is bright and keeps developing at quite a high pace. Furthermore, predictive capabilities in healthcare are likely to be improved through the advancement of technologies like Deep Learning, big data analytics, and the Internet of Things (IoT) in the nearest future that will allow people to be constantly monitored in terms of health. This will enable medical professionals to identify diseases at an early stage and treat them prior to the emergence of severe illnesses. The other significant area in the future is the creation of AI-based digital twins- virtual patients that replicate their health status. The models could assist physicians in estimating the potential impact of various therapies or lifestyle modifications on the health outcomes of an individual. AI will also be significant in the development of precision medicine where the treatment is based on the genetic makeup of an individual and health information. Through integrating genomics, clinical data, and analytic machine learning, healthcare systems will be in a position to deal with more specific and efficient preventive care. Moreover, joint work of governments, medical institutions, and technological firms, as well as researchers, will be necessary to maintain ethical AI implementation and a fair division of technologies.

-Zeba Tyagi

Microbial Innovation Driven by Small Organisms for Global Impact



New inventions involving sustainable innovations are a mean to overcome the effect of anthropogenic activities which are continuously degrading the ecosystem making it difficult for survival of the mankind. The best creation in existence i.e. "human being" modulating the ecosystem is now fighting to safeguard the globe for upcoming generations. The Darwinian evolutionary theory that accounts for the "survival of the fittest" holds true in this case as the one who will adopt in this difficult phase, will survive and gradually gain dominance. This race of dominance, in today's world is no longer an affair of armies at borders. Infact, laboratories, research institutions, start-up ecosystems and technology hubs, where new ideas are been shaped into strategic capabilities, are the new field for this race. This shift from land to lab profoundly affected the global power dynamics. The nations that nurture vibrant start-up ecosystems by providing funding, policy support and strong academic-industrial collaboration are more likely to lead in next-generation technologies. Innovative clusters in biotechnology, artificial intelligence and clean energy are rapidly becoming strategic resources that may shape economic leadership and technological independence and dominance.

Microbial biotechnology represents one of the promising frontiers, among the emerging fields. Microbes who are the pioneers of life on Earth appeared billions of years ago and transformed a lifeless planet into a living world by laying a biological foundation for all subsequent life forms.

Microorganisms, though invisible to the naked eye, possess immense metabolic potential that can be explored and harnessed to produce sustainable materials, pharmaceuticals, agricultural inputs, and renewable energy. Bio-based start-ups are increasingly exploring microbial systems to



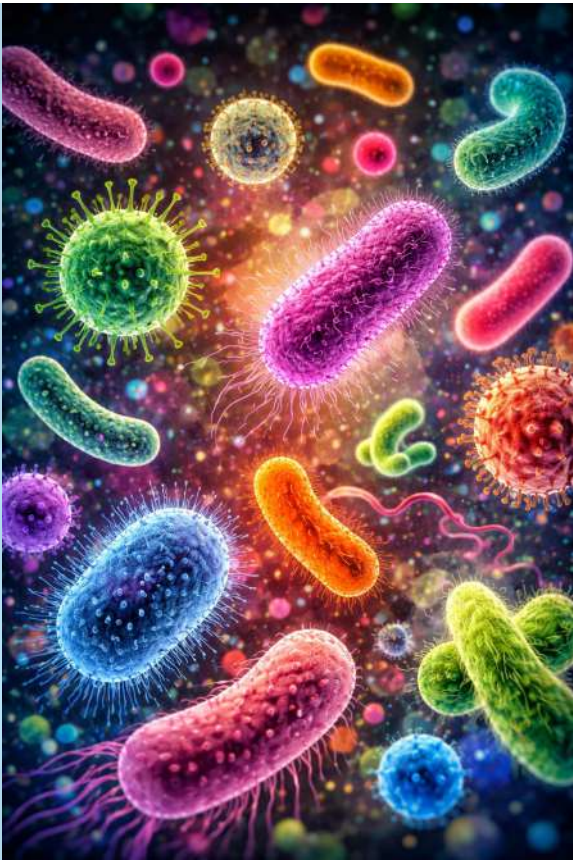
create innovative solutions that address global challenges such as climate change, food security, and environmental degradation. The bioeconomy, which utilizes biological resources to produce food, materials, and energy, is becoming a major component of global economic growth. Microbial innovation and bio-based industries can potentially reduce reliance on fossil resources while creating new economic opportunities.

Microbial technologies may appear small in scale, but have enormous global impact. Microorganisms can produce sustainable materials, biodegradable plastics, industrial enzymes and various bio-based chemicals that can replace traditional petroleum-based products. As countries are competing to figure out sustainable and resilient economies, microbial biotechnology is becoming important. Nations that develop strong capabilities in microbial research, bio-manufacturing and bio-based start-ups may gain a significant advantage in the emerging global bioeconomy. Understanding the geopolitics of innovation may help in understanding the rat race for advancing with dominance in scientific research, biotechnology infrastructure and start-up ecosystems. The microbial innovation and bio-based start-ups represent the technological advancements and are parts of a broader transformation where tiny organisms and scientific imagination are together shaping the future global economy. These innovative microbial technologies are continuously been translated into real-world solutions.

One of the most successful examples of microbial innovation in the circular bio-economy is a biotechnology company LanzaTech. Founded in New Zealand and now operating globally (Mihalcea et al., 2023), the company has developed a gas fermentation technology that makes use of engineered bacteria to convert industrial waste gases into useful fuels and chemicals. From industries like steel manufacturing, large quantities of carbon monoxide and carbon dioxide are released as waste gases. LanzaTech captures these emissions and transfer them into bioreactors containing acetogenic bacteria such as *Clostridium autoethanogenum*. The bacteria metabolize carbon-rich gases and convert them into ethanol and other chemical intermediates. The produced ethanol find its application as a precursor for a wide range of products, including sustainable aviation fuel, plastics, textiles and other industrial chemicals. An online article by Bio biz India in 2025, highlights various commercial plants utilizing the similar technology in partnership with major industries, including steel companies in China, India, and Europe, demonstrating the scalability of microbial bio manufacturing. Table no.1 below highlights few of them.

Table No. 1: Few representative global start-ups and Indian research initiatives that converts industrial waste gases into sustainable fuels and value-added biochemical

Start-up / Institution	Technology Focus
LanzaTech (New Zealand/USA)	Gas fermentation using microbes
INERATEC (Germany)	Integration of microbial processes with thermochemical gasification
Carbon Recycling International (Iceland)	Electro-microbial hybrid technology
Synata Bio (USA)	Gas fermentation
Tata Steel × LanzaTech	Industrial gas fermentation
Indian Institute of Technology Delhi & Indian Institute of Science Education and Research Pune	Synthetic microbial communities
CSIR-Indian Institute of Petroleum	Syngas fermentation
The Energy and Resources Institute	Gas-to-liquid systems





These start-ups are representing a major step toward a circular carbon economy, wherein the industrial emissions as raw material are recycled without being released into the atmosphere. By transforming waste carbon into valuable commodities, these players illustrate a major advantage of how microbial biotechnology can simultaneously reduce greenhouse gas emissions and create new economic opportunities. Along with international companies, Indian research institutions and industrial collaborations are also actively advancing synthetic microbial consortia, syngas fermentation pathways and modular gas-to-liquid technologies.

Across the world, a growing number of biotechnology start-ups are exploiting microbial systems to develop sustainable products and processes. These enterprises represent a new frontier in the global bioeconomy, where innovation, entrepreneurship, and biotechnology combine to address environmental and economic challenges. Table 2 presents notable start-ups that demonstrate how microbial technologies are shaping industrial transformation and influencing the emerging geopolitics of innovation.

Table No.2 Notable start-ups that demonstrate how microbial technologies are shaping industrial transformation and influencing the emerging geopolitics of innovation.

Start-up	Country	Microbial Technology	Main Product / Application	Refernce
Deep Branch	United Kingdom	Gas fermentation using microbes	Single-cell protein for animal feed	3
Solar Foods	Finland	Hydrogen-oxidizing microbes	Solein microbial protein	4
String Bio	India	Methane-utilizing bacteria	Single-cell protein and biomolecules	5
Nature's Fynd	USA	Fungal fermentation	Fy protein for meat and dairy alternatives	6

The rapid emergence of microbial biotechnology start-ups not only reflects technological progress but also demonstrates a strong alignment with the United Nations Sustainable Development Goals (SDGs) along with shaping the evolving geopolitics of innovation. These ventures are contributing to sustainable food systems, renewable materials, climate mitigation and circular resource utilization by harnessing the diverse metabolic potential of microorganisms. Microbial protein technologies developed by companies such as Deep Branch, Solar Foods, and String Bio support SDG 2 (Zero Hunger) by providing alternative protein sources utilize significantly fewer natural resources than conventional agriculture. At the same time, innovations in microbial fermentation and biomaterials contribute to SDG 9

(Industry, Innovation and Infrastructure) and SDG 12 (Responsible Consumption and Production) by enabling cleaner industrial processes and reducing reliance on fossil-based materials. Technologies that are converting greenhouse gases or industrial waste into valuable products further advance SDG 13 (Climate Action) by promoting carbon recycling and reducing emissions. In this context, microbial innovation is increasingly becoming a strategic asset in the global knowledge economy. Capitalizing in biological innovation start-ups, leaderships will strengthen their position in the emerging bioeconomy-driven geopolitical landscape and scientific capability, technological leadership as well as sustainable innovation will define the economic competitiveness. Thus it can be concluded that the microbial biotechnology start-ups not only contribute to global sustainability goals but also play a crucial role in shaping the geopolitics of innovation, where biological resources and biotechnological expertise are emerging as key determinants of future global influence and economic resilience.



MICROBIAL INNOVATION

Small Organisms, Big Impact on the Global Bioeconomy



Why Microbes Matter



Ancient
Life Forms



Metabolic
Powerhouses



Sustainable
Products



Circular
Bioeconomy



Carbon Recycling Process



Industrial Emissions
CO, CO₂, Syngas



Microbial
Fermentation



Bio-products



Fuels



Chemicals



Plastics



Materials



Startup Map



SDGs Alignment

SDG 2



Zero Hunger

SDG 9



Industry &
Innovation

SDG 12



Responsible
Production

SDG 13



Climate Action



Geopolitics of Innovation



Research
Investment



Policy
Support



Start-up
Ecosystems



Global
Leadership



Future Outlook



Sustainable
Growth



Green
Industries



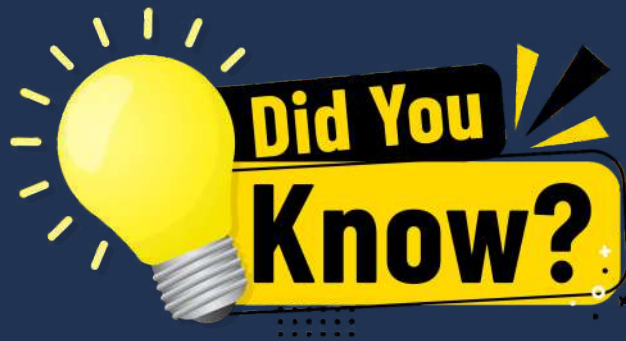
Resilient
Economy



Global
Collaboration

Microbes Powering the Future of **Science, Sustainability & Innovation**

Dr. Abha Verma



Did you know?

One of the contemporary smartphones has more computing power than those that NASA used in the Apollo 11 Moon Landing in 1969.

Did you know?

Over 95 percent of all internet traffic in the world is not via satellites, it passes through underwater fiber-optic cables, which are deposited in the ocean floor.

Did you know?

The SpaceX satellite network Starlink already has thousands of satellites, thus becoming one of the largest satellite constellations to date.

Did you know?

Scientists can now use artificial intelligence systems to discover new medicines faster by examining millions of chemical compounds in a fraction of the time it would take using the traditional methods.

Did you know?

In 1947, a moth literally got stuck in a computer relay and became the first bug in the history of computers.

Did you know?

Each minute, people all over the world send over 40 million messages each day using messaging services and post hundreds of hours of video on-line each day.

Did you know?

The number of moving parts is also less in electric cars as compared to traditional cars hence making them more energy efficient and less demanding in terms of maintenance.

Did you know?

The international space station can move at approximately 28,000 km/h and this means that the astronauts can complete a circular orbit around the earth approximately 16 times in one day.



Cover Story: The "Dronization" of Warfare: Innovation at Attrition Scale

The era of the billion-dollar exquisite weapon is ending. The founders, investors, and incubators who understand what replaces it will define the next decade of both defense and civilian technology.

In the spring of 2024, a Ukrainian FPV drone pilot guided a \$500 device into the engine compartment of a Russian T-90M main battle tank – a vehicle that had cost Moscow roughly \$4.5 million. The explosion lasted less than two seconds. The geopolitical lesson has lasted considerably longer.

The Death of the "Exquisite" Platform

Mechanical complexity was equated with military supremacy during most of the 20th century. The combat aircraft was the crown of industrial statecraft--a 100 million dollar masterpiece of metal work, electronics, and the education of a pilot that required ten years to obtain and twenty years to perfect. Its floating basilica was the aircraft carrier. The Abrams tank, the Challenger 2, the F-35: these were beautiful platforms, so called by the defense community to mean a platform whose capabilities are superb, whose quantities are few, and whose price tags are staggering.

The latter is not just being contested in 2026. It is being overhauled.

The transition has a fine economic signature. Analysts refer to it as the cost-exchange ratio: the ratio between the cost of a weapon and the cost of destroying a weapon. During decades, this ratio was in favor of the attacker. Construction of a missile was inexpensive when compared to the construction of the air-defense system to shoot down the missile. But the mathematics have topsy-turvyed. When a defending country launches a Patriot intercepting missile, at about \$3 to \$4 million a round, to shoot down a coming FPV drone assembled using a few commercial quadcopter parts at less than 1000 dollars, the ratio is near four to one. Give that arithmetic 500 drone attacks a week and you are not contemplating a tactical challenge. What you are seeing is an industrial collapse.

\$3.5M

PATRIOT INTERCEPTOR MISSILE

VS

\$800

COMMERCIAL FPV ATTACK DRONE





This is the meaning of Innovation at Attrition Scale. It does not involve making a single marvelous weapon. It is concerning the manufacture of thousands of reasonable weapons sooner than your opponent can manufacture the countermeasures to prevent them. Volume is the strategy. Competitive moat is speed of iteration. And the consequences of this, to defense ministries, to venture capital, to the startup ecosystem, have only started to sink in.

The fine stage does not die in its ivory-colored, absolute sense. The F-35 still has a role. The carrier strike group continues to project power in a manner that cannot be projected by a swarm of \$500 drones. But their preeminence as the chief currency of military investment is past. The battlefield has been divided: a domain of high-end deterrence, and a domain of all the rest, vast and fast and cheap and entirely transformative.

The Software-Defined Battlefield

This is what the hardware fetishists of the traditional defense procurement process lack: the drone itself is almost irrelevant. What matters is the stack.

A drone fighter of today is not a weapon but rather a computer on a flying platform. The airframe is carbon fiber, commercial motors, 3D-printed housing. It can be replicated in a weekend by a shrewd crew. The distinguishing factor is the firmware, the navigation logic, the electronic countermeasure resistance and the targeting algorithm. Take them away and you will have a weak toy. Lay them down properly and you have a machine that is able to

penetrate air defense corridors that would bring a manned aircraft down.

The war in Ukraine was the first live-demonstration of what technologists refer to as the DevOps of war. Russian electronic warfare (EW) technologies some of the most advanced jamming architecture ever deployed on a large scale pushed Ukrainian drone operators into a continuous software update cycle. Ukrainian engineers fixed the navigation stack when Russian jammer cheaters discovered how to break a drone's GPS connection: it finds its way by identifying features in the terrain, such as a driverless car without road signs. When jammers attacked the telemetry frequencies, operators migrated to burst-transmission protocols used by commercial IoT devices. As AI-controlled EW systems started predicting paths, drone software was altered to add controlled randomness to paths.

"Engineers in active conflict zones were pushing firmware updates to deployed drones every 48 hours – not to add features, but to survive."

It is Continuous Integration/Continuous Deployment - CI/CD - but with the stakes of life and death. The pipeline by which a Silicon Valley startup deploys a new feature of an app is being repurposed for the deployment of the next generation of autonomous navigation software to a weapon inside an electronic kill zone belonging to an adversary. Survivability is not dependent on the quality of the airframe, but rather on the speed of that pipeline.

To investors, this is a basic understanding. The defense primes Lockheed, Raytheon, BAE Systems girded their moats on hardware production, integration of systems, and contacts with government. These moats are not fading away, however, a new moat is emerging beside them: software velocity. The startup that is able to implement its EW-resistance stack more rapidly than a nation-state is able to adjust the jamming settings has got a real competitive advantage. And this is as much a software engineering issue as it is an aerospace issue. It paints a different pool of talent, has different economics, and is accessible to a well-capitalized Series A company in a manner that new airframe design could never be.

48h TYPICAL FIRMWARE UPDATE CYCLE IN ACTIVE EW ENVIRONMENTS	~70% OF DRONE LOSSES ATTRIBUTED TO JAMMING/SPOOFING, NOT KINETIC INTERCEPT	5× SPEED ADVANTAGE OF SOFTWARE- FIRST DRONE TEAMS VS LEGACY HARDWARE FIRMS
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Electronic warfare itself is becoming a category of software product. There are no longer fixed-frequency jammers, modern EW systems are machine learning models that have been trained on adversary signal patterns, deployed on programmable radio hardware and updated in near-real-time. The company which owns this layer - call it the operating system of the electromagnetic spectrum - dominates the battlefield much better than any individual weapons platform would.

KEY INSIGHT · THE SOFTWARE STACK

What "Defense Software" Actually Means in 2026

- Navigation resilience: visual odometry, terrain-referenced flight, multi-modal sensor fusion that survives GPS denial
- EW countermeasures: adaptive frequency hopping, burst telemetry, AI-driven signal classification to distinguish friendly from hostile interference
- Targeting logic: computer vision models fine-tuned on theater-specific imagery, running inference at the edge with no cloud dependency
- Swarm coordination: mesh communication protocols that maintain formation integrity when individual nodes go dark
- DevSecOps pipeline: CI/CD infrastructure capable of pushing signed, verified firmware updates to deployed hardware in under an hour

The Rise of Agentic Swarms

The visual that has remained popular culture – a drone operator crouching over a laptop, flying a device manually into a combat area – is already an anachronism. The second paradigm is not remote control. It is agency.

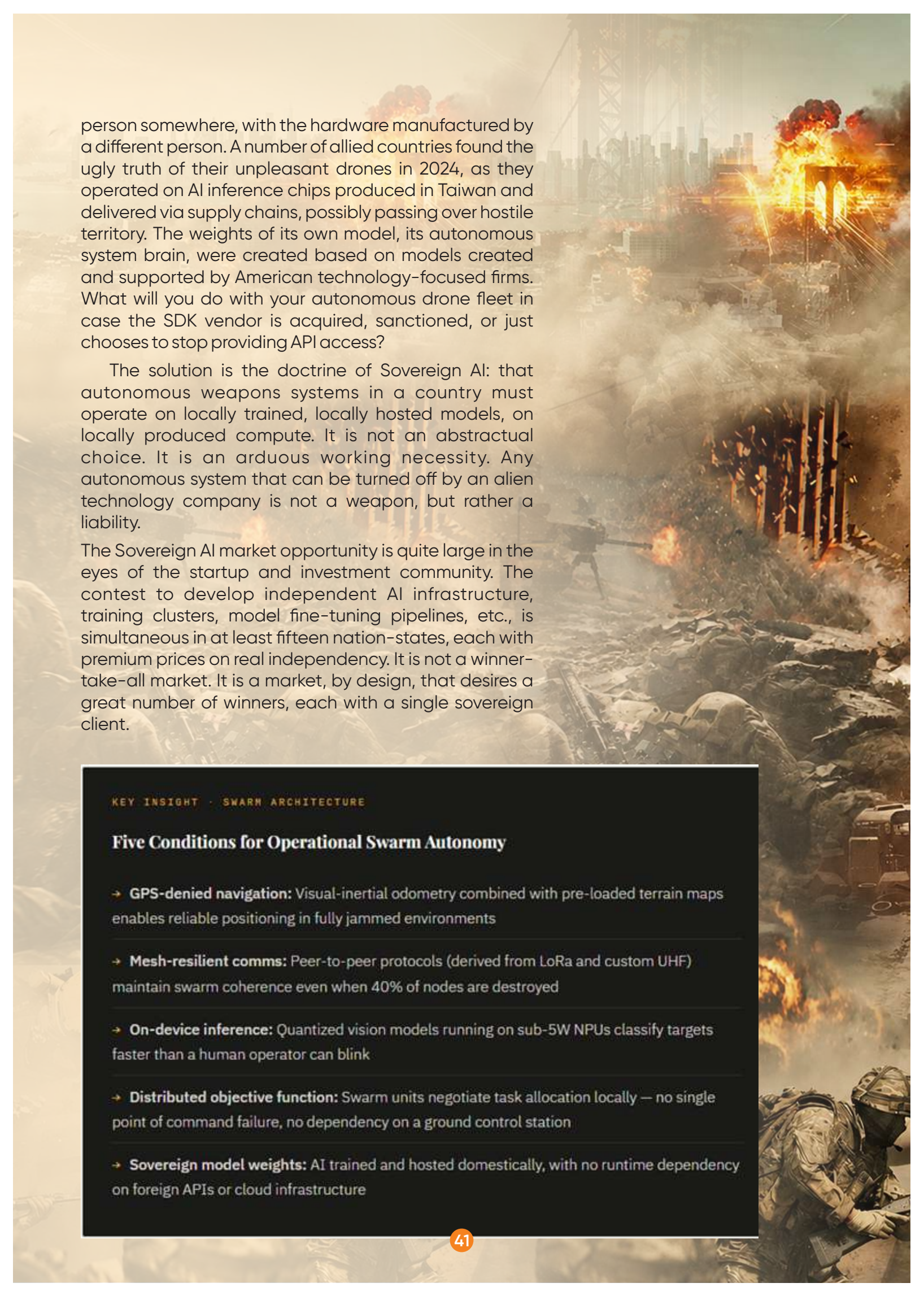
In 2025, several Western defense developments broke a barrier that had been nearing years before: drones able to accomplish a mission goal without a human in the loop control once deployed. These are not independent in the science fiction sense – they are not deliberating about morals or making judgments of policy. Yet they are able to find a target class based on a trained computer vision model, route a path around obstacles, coordinate with other units in the swarm and execute – without GPS, without a data connection to a ground station, and without a human pushing a button.

The technology is enabling, Edge AI. Instead of transmitting sensor data back to a cloud model to be used to compute the result, the computation is performed on board the vehicle itself, a chip smaller than a credit card and consuming milliwatts of power, under a kilogram. The sheer power of computers in 2026, achieved by the brutal reduction to miniature size fuelled by smartphones and autonomous vehicles, places the capabilities on a \$500 drone that a decade ago would have been powered by a rack of servers.

This is multiplied by swarm behavior. An individual computer vision drone is a scout or a sniper. A mesh of fifty drones with a shared mesh communication scheme and a shared goal would become something qualitatively new: A distributed sensor cloud, a coordinated strike package, a persistent surveillance layer. The collective behaviour of the swarm is based on simple local rules – the same computational concept as a murmuration of starlings – but the military output can overwhelm any point defence system that currently exists. None of the Phalanx CIWS, none of the laser weapons, none of the Iron Dome variants, has a reload rate that is fast enough to respond to a simultaneous salvo of 200 small, fast, independently maneuvering targets.

This brings up a sovereignty question that has transitioned into a matter of relevance. The machine intelligence (AI) onboard these drones is trained on a computer outside the plane by a





person somewhere, with the hardware manufactured by a different person. A number of allied countries found the ugly truth of their unpleasant drones in 2024, as they operated on AI inference chips produced in Taiwan and delivered via supply chains, possibly passing over hostile territory. The weights of its own model, its autonomous system brain, were created based on models created and supported by American technology-focused firms. What will you do with your autonomous drone fleet in case the SDK vendor is acquired, sanctioned, or just chooses to stop providing API access?

The solution is the doctrine of Sovereign AI: that autonomous weapons systems in a country must operate on locally trained, locally hosted models, on locally produced compute. It is not an abstractual choice. It is an arduous working necessity. Any autonomous system that can be turned off by an alien technology company is not a weapon, but rather a liability.

The Sovereign AI market opportunity is quite large in the eyes of the startup and investment community. The contest to develop independent AI infrastructure, training clusters, model fine-tuning pipelines, etc., is simultaneous in at least fifteen nation-states, each with premium prices on real independency. It is not a winner-take-all market. It is a market, by design, that desires a great number of winners, each with a single sovereign client.

KEY INSIGHT · SWARM ARCHITECTURE

Five Conditions for Operational Swarm Autonomy

- **GPS-denied navigation:** Visual-inertial odometry combined with pre-loaded terrain maps enables reliable positioning in fully jammed environments
- **Mesh-resilient comms:** Peer-to-peer protocols (derived from LoRa and custom UHF) maintain swarm coherence even when 40% of nodes are destroyed
- **On-device inference:** Quantized vision models running on sub-5W NPUs classify targets faster than a human operator can blink
- **Distributed objective function:** Swarm units negotiate task allocation locally — no single point of command failure, no dependency on a ground control station
- **Sovereign model weights:** AI trained and hosted domestically, with no runtime dependency on foreign APIs or cloud infrastructure

Micro-Factories and Distributed Manufacturing

There is a supply chain issue with attrition warfare. Finding ways to consume thousands of drones a week, not a hypothetical but an operating fact in the most intense battles of the 2025 future, means a model of production that bears no relation to how the defense industry has made things work over the previous 70 years.

The classic defense manufacturing paradigm is to establish high concentration of production through large and highly secured plants that are usually geographically concentrated around the head office of the prime contractor. An F-35 built by Lockheed Martin in Fort Worth, Texas, is assembled out of parts delivered by suppliers in a dozen different countries. The lead times are in years. The factory floor is streamlined to craftsmanship, rather than volume or speed.

None of that applies to the production of drones at the scale of attrition. One factory in Fort Worth cannot produce a drone used at a rate of one per three minutes on a battle line. The logistics chain is excessively long, excessively weak, excessively reliant on continuous sea- and air-based transportation, which an enemy will, and can, seek to dislocate. The ideology that follows the conflict analysis of the 2020s is radical: produce near consumption, produce in large quantities, and decentralize the nodes of production in order that a single strike will not disrupt a supply.

This is the micro-factory thesis. Instead of having a single factory with a capacity of 10,000 drones a year, you construct 50 production nodes with a capacity of 200 drones a week, located within the practical range of the natural logistics of the operating theater. Each node is tiny a 5,000-square-foot plant, a small staff of technicians, a family of industrial 3D printers to assemble structural parts, pick-and-place systems to assemble a unit, and a software-defined testing enclosure that can quality test a completed unit in less than 90 seconds.

This is possible due to the technology additive manufacturing, but not in the hobbyist sense of the word. Industrial FDM and SLS printers are capable of creating structurally sound airframe components made of reinforced polymer composite, with tolerances to military specifications. Coupled with commercially-off the-shelf (COTS) electronics, such as motors, ESCs, and cameras, supplied by the same global supply chains as those supplying consumer drones, a micro-factory group can assemble a combat-capable FPV airplane at material costs less than 400 USD.



"Think of it as the Uber-ization of hardware production: disaggregated, asset-light, demand-responsive, and deeply uncomfortable for incumbents who built empires around scarcity and centralization."

To the early-stage investor and business incubator, this is not the drones but rather the production infrastructure. Micro-factory network management software. Small-batch, high-mix robotic assembly. An AI with quality control can perform a faster, more reliable inspection of a completed drone than a human technician can. Logistics software that is cold-chain-equivalent to route components to distributed nodes in near-real-time. A hardening of the supply chain – the defense analog to what Flexport created that supports commercial shipping, but optimized to operate in a threat environment where your competitor is also trying to interdict your shipment.

NATO has seen a tremendous increase in defense budgets since 2022. But the growth is not uniformly flowing to primes. Political pressures on procurement offices require them to spend quicker, smarter, and this translates to a real desire to engage non-traditional vendors capable of proving production velocity. The cohort-forming incubator developing around micro-factory infrastructure is not pursuing a niche market. It is establishing itself as the pillar of a generational change in the way democratic countries are equipping themselves.

From Frontline to Fortune 500

All the major military technology cycles have generated a civilian payoff. The internet is a DARPA development. GPS is a Defense Department asset that started to be opened up to civilian use in 2000. The drone revolution will not be an exception – except that the transfer mechanism this time flows both ways in



parallel and even faster than anyone thought.

Wonder what the so-called attrition tech really demands to perform: a drone, capable of operating in an all-jammed electromagnetic environment, not being detected by radar systems, recognizing individual objects in real-time on a camera feed, coordinating with fifty equally equipped units to perform a distributed task, and all of that, priced under a mid range smartphone. Solve those problems in a warzone and you have, more or less by chance, solved some of the most difficult problems in civilian autonomous operations.

The most apparent corollary is autonomous last-mile delivery. The navigation issues of drone delivery in urban areas, such as GPS multipath through tightly built canyons, visual clutter, dynamic obstacle avoidance, regulatory compliance with corridors, have structural similarity to navigation in a jammed urban fighting area. A system that is guaranteed to deliver a package to a particular apartment window in Tokyo will also have a lot of architectural DNA in common with a system that is guaranteed to deliver a munition to a particular vehicle in a combat city. The sensor fusion stack, the path planning algorithms, and the failure recovery logic are distinct but rhyme sufficiently that engineering talent and software investment can be transferred without much friction.

A less apparent, but commercially important use is swarm-based agriculture. The same mesh coordination protocols used by military swarms to saturate a target area benefit precision agricultural operations, which include crop monitoring, direct application of pesticides, soil sampling on thousands of acres of land. The data-gathering fidelity of a 50-drone agricultural swarm in a single field, in formation, is vastly greater than that of any



single large UAV. The economics are attractive, and the technical base needed, such as comms over mesh, distributed allocation of tasks, GPS with visual fallback, is now rapidly developed by defense-adjacent startups, which have the military as their primary customer, but have a technology portfolio that is dual-use by nature.

Third a vector is disaster response. When a wildfire interferes with a community, when a flood isolates an area, when an earthquake destroys communications infrastructure - these are GPS-degraded, communication-degraded environments that resemble the conditions of electronic warfare in some important ways. An autonomous drone fleet capable of surveying a mesh network, communicating, and making small deliveries, independent of centralized infrastructure, is precisely what civilian emergency management has needed and has failed to be able to purchase because the commercial market has not created it. This capability is exactly what the development cycle in the defense sector is already generating and civilian emergency response transfer is a question of regulatory channel and market desire, rather than technical accomplishment.

Vcs who have a portfolio view should especially take notice of the high-speed mesh networking application. Swarming military drones need low-latency, high-bandwidth, resilient communication between dozens of nodes on the move. The protocols under development around this, tuned to contested RF conditions, self-healing when nodes failures occur, encryption-native, are many orders of magnitude more resilient than commercial Wi-Fi mesh protocols. Applications of these protocols include stadiums connectivity, smart city sensor networks, and industrial IoT implementations in electromagnetically noisy settings taken off the defense stack and into civilian infrastructures by the company that implements them. It is not a hypothetical market. A number of teams of defense-program origin are already undertaking this shift, and the IP underlying it is interesting.



Where "Attrition Tech" Finds Its Civilian Market

- **Urban last-mile delivery:** GPS-denied navigation and dynamic obstacle avoidance solve exactly the problem of dense urban drone delivery — buildings, interference, unpredictable pedestrians
- **Precision agriculture:** Mesh swarm coordination enables centimeter-level crop monitoring at scale; targeted application of inputs replaces broadcast spraying, cutting costs by 30–60%
- **Disaster response:** Self-organizing drone networks that operate without infrastructure become the backbone of emergency logistics when roads, cell towers, and GPS are unreliable
- **Industrial inspection:** Autonomous inspection of pipelines, power lines, and offshore platforms in RF-noisy or GPS-denied environments (inside structures, near high-voltage equipment)
- **Resilient mesh networking:** Military-grade airborne mesh relay networks translate directly to disaster-zone communications infrastructure and rural connectivity solutions

The Investor's Dilemma: Ethics and "Defense Tech"

The five-year negotiation that the venture community is experiencing is one that seems to lack any easy solution: the biggest technology development cycle of the decade is occurring in and around defense applications, and a significant portion of the LP base of major funds is highly uncomfortable with that reality.

The change beginning in 2022 is actual but uneven. Andreessen Horowitz established a focused American Dynamism practice that has defense tech as a thesis. The Peter Thiel network and Founders Fund has always been philosophically aligned with national security investment. The rest of the VC community is still split though, and the lines are based on culture in a reasonably predictable way. The limitations on pure-play patriotic capital do not apply to firms that have strong institutional LP relationships with universities, foundations, and sovereign wealth funds based in non-ally countries.

The worst form of this dilemma is the Lethal Autonomous Systems question. A businessman can rightly claim that drone-based agricultural technology is a net-positive investment to the planet. The same investor has a more complex discussion with his LPs when the same underlying technology is involved in a weapons system that

makes targeting decisions without a human in the loop. The ethical frameworks under development – an array of AI-in-weapons accountability rules, human-on-the-loop and human-in-the-loop, proportionality requirements, are somber and worth not ignoring. However, they have not been able to create a stable investment doctrine yet. The 2026 landscape is a fragmented one: every fund is producing its ethical rules, and the variety of results is as diverse as the variety of inputs.

What has become more distinct is the type of Patriotic Capital – funds dedicated specifically to the thesis that democratic preparedness needs domestic technological capacity in the field of defense, energy, manufacturing, and communications. It is no mercenary affair. To support their thesis, they argue that the most ethical action any capital allocator can take in the present geopolitical context is to make democratic countries competitive in terms of technology with authoritarian substitute. Such framing – defense investment as a democratic necessity, but not as a moral tradeoff – has drawn in institutional LPs who would not otherwise have entered the sector.

–Dr. Vaibhav Sharma, Dr. Akshay Raj

07 · The New Innovation Playbook

The "Dronization" of warfare is, stripped of its grim context, a masterclass in the economics of agile innovation. The winners of this moment are not the organizations with the largest R&D budgets or the most credentialed engineering teams. They are the ones who iterate fastest, who treat software as the primary competitive layer, and who understand that in an attrition market, the ability to produce adequate solutions at volume beats the ability to produce perfect solutions in small numbers.

For founders, VCs, and incubator leaders: the playbook is not to build the next generation of exquisite platforms. It is to build the infrastructure – the software stacks, the micro-factory networks, the sovereign AI pipelines, the resilient communication protocols – that makes attrition-scale innovation possible. That infrastructure will define both the battlefield and the Fortune 500 company roster of the next decade. The race has already started. The question is not whether to enter it, but where on the stack to plant your flag.



IIMT-BIF Incubation Foundation

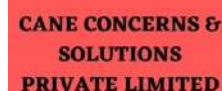
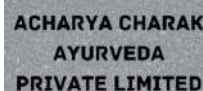
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IIMT Business Incubator fosters innovation by supporting startups with mentorship, resources, and funding, turning ideas into successful ventures.

Our work in Numbers



Startups : 60
Early-stage Ideas Nurtured : 120+
Startup Survival Rate (1 Year) : 70
Total Funding Facilitated : ₹ 1.85 Cr+
Mentorship Hours Delivered : 1,000+ hrs
Patents / IPR Filed : 300+
Jobs Created by Startups : 1000+

Sector Classification

- Mobility
- Agriculture
- Technology
- Food
- HR
- Waste Segregation
- Edtech & Others

Value - Added Support to Incubates

- Business Support & Consulting
- Co-working spaces
- Mentoring Support
- Funding Assistance
- Training & Workforce Development
- IPR Support

Past Startup Program



Fuel your growth with
Wadhvani Liftoff
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IIMT Business Incubator Foundation

Are you an Early, Prototype or MVP Stage Startup looking to gain market traction.
 If yes, this program is meant just for you.

WHY JOIN?

- Self-paced selection of sessions
- Pitching bootcamp and demo day
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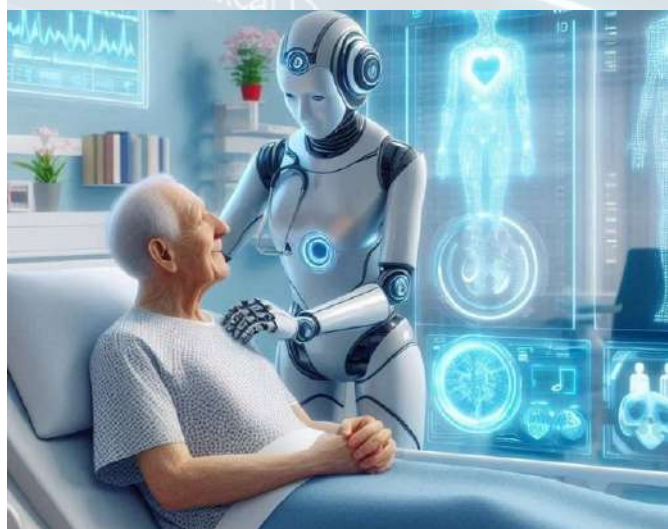
Illustration of two hands shaking.

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Artificial Intelligence-based Telemedicine and Remote Patient Care: Changing the Future of Healthcare.



The healthcare future is becoming digital, intelligent, and patient oriented and it is no longer something that is linked to hospitals and clinics. The healthcare delivery model is transforming completely with the Artificial Intelligence (AI) integration in telemedicine and remote patient care methods. This potent combination is also enhancing the standard of care, its effectiveness and customization, in addition to rendering the healthcare services more accessible to the population. The use of AI in telemedicine is a game changer in the contemporary world where it is important to save lives by acting promptly

The History of Telemedicine in the Age of AI.

Telemedicine has become a complex ecosystem that is supported by AI rather than a simple type of video consultation. Patients are able to interact with the medical workers, remotely using the aid of computers, smartphones and other digital devices. Telemedicine is proactive; through the integration of AI, patient data could be analyzed, issues with health could be predicted, and could assist in clinical decision-making. Remote patient care enhances telemedicine in a narrower sense Remote Patient Monitoring (RPM) that deals with wearable devices and monitoring algorithms that continuously analyze the health of a patient. The AI will handle this data in real-time to identify aberrant data and give early alerts thereby decreasing the number of repeat visits to hospitals.

The way AI is revolutionizing Telemedicine: AI will help enhance telemedicine in several aspects.

1. Intelligent Symptom Assessment and Diagnosis

Babylon Health and Ada Health are examples of AI-based products that can analyze the medical history and symptoms of a patient with the help of sophisticated algorithms. These tools may assist the patients to make a choice whether to attend an urging facility or to treat themselves by offering primary diagnosis and prescribing further actions.

2. Preventive Healthcare Predictive Analytics.

Artificial intelligence systems are learned on big data and find some patterns and predict possible health risks that can be prevented by the doctor through timely interventions and increase the overall outcome. As an illustration, they are able to identify the early signs of diabetes, heart diseases and high blood pressure. This makes healthcare a choice.



3. Virtual Health Assistants and AI Chatbots.

Other virtual assistants such as Buoy Health also interact with patients and respond to their questions in addition to assisting the patients with the evaluation of their symptoms. These materials are 24/7 and this saves the medical personnel the workload and also leaves the patients with access to timely care.

4. Artificial Intelligence in Medical Imaging and Decision Support.

AI helps to increase the precision of the diagnosis by processing the medical images (MRIs, CT, and X-rays). In particularly problematic cases, such programs as IBM Watson Health can also help doctors with evidence-based information exchange and prescription of therapy.

Actual uses of AI-based Telemedicine.

Telemedicine is an already direct practical application of AI in healthcare systems:

The Digital Healthcare Growth in India: eSanjeevani has facilitated millions of rural to urban doctor visits to its rural clients. The AI integration increases the management and triage of patients.

Global Telehealth Leadership : Teladoc Health is an AI-based system that uses the algorithm to evaluate the data of the patient, secure virtual visits, and design guidance on individual care.

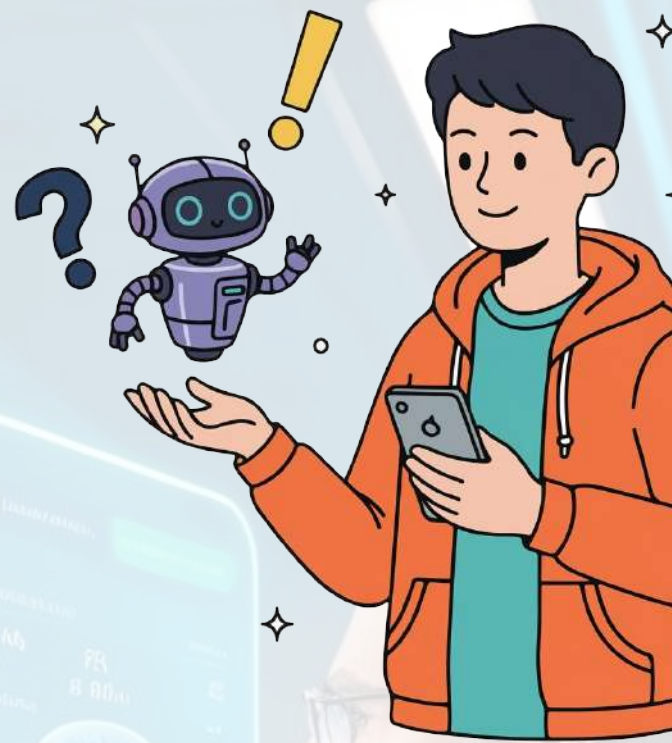
Wearable Health Monitoring : Vital signs are measured regularly with the help of gadgets integrated with Apple Health and Fitbit. In order to provide timely intervention, AI will screen such data to identify abnormal heart rates or sleeping disorders.

Case Study : Robotic Remote monitoring of chronic disease.

This is a fascinating case study of the remote monitoring of patients with Chronic Obstructive Pulmonary Disease (COPD) with the help of AI. In a medical program, patients were given wearable technology, which monitored the rate of respiration, oxygen saturation, and physical activity. The data obtained were processed with the help of the AI algorithms and revealed the signs of worsening health in its initial stages. They provided notifications to medical workers when abnormalities were observed to enable them respond promptly through teleconsultations or alteration of prescription.

Impact of the Case Study :

- Improvement in hospital admissions. ◆
- Early problem detection. ◆
- A better quality of life of the patients. ◆
- Reduced medical expenses ◆





This case demonstrates how telemedicine led by AI is transforming healthcare to an active or reactive healthcare system.

The advantages of AI-Powered Telemedicine.

1. Improved Accessibility

In the poorest and most rural regions, in particular, AI-based telemedicine allows reaching the point of interconnection between health specialists and patients. Patients will not be required to cover long distances before accessing medical attention.

2. Enhanced Efficiency

The automation of repetitive work in the healthcare sectors like data entry, appointments, and preliminary assessments will enable the workers to concentrate on the more complex situations.

3. Personalized Patient Care : AI is a tool that analyzes the information of each patient to generate the individual treatment courses which would enhance the patient outcomes and satisfaction.

4. Providing Healthcare Cost Effectively.

AI in the sphere of telemedicine will reduce the total cost of healthcare since it contributes to the early intervention and the decrease in hospital visits.

Challenges and Limitations

Despite the benefits of AI-powered telemedicine, there are a number of limitations to the technology.

Data Privacy and Security : sensitive patient data has to be secured.

Digital Divide : The adoption can be negatively affected by the accessibility to technology and the internet.

Regulatory and Ethical Issues : One of the concerns that are still essential is ensuring that AI systems are unbiased, transparent, and medically validated.

These problems should be addressed to achieve a sustainable AI in healthcare.

Future Directions A Smarter Healthcare Ecosystem: The future of AI-powered telemedicine is bright due to such emerging technologies as the Internet of Things and deep learning.

1. Through constant Health Checks : It will be connected to smart devices and home-based sensors where it will become possible to track their health in real-time and detect diseases at an early stage.

2. The most up-to-date Virtual Care Assistants : In the future, the AI assistants will be integrated and to support medication, psychological assistance, and personal health recommendations.

3. Anticipatory Public Health Systems : The data on the population will be processed to equip AI with the capacity to anticipate the incidence of the diseases and aid the planning of the populace.

4. Hybrid Healthcare Models : With the combination of physical care and virtual care (AI), a reasonable and effective healthcare system will be developed.

-Mahima Rajpoot



HIGHLIGHTS



E-Cell Visit to Russian Embassy!



DDUMC students visit to incubation center



One Day Product Development Workshop



India Solar-EV Expo 2026



Neovation 2026

AI for all



PopScience (Where innovation meets global strategy)

Startup That Challenged Rockets

In 2002, entrepreneur Elon Musk founded a private aerospace company that drastically lowered the cost of launching satellites by developing reusable rockets. This startup reshaped the global space industry and forced governments and traditional aerospace giants to rethink their strategies. Today, its rockets regularly deliver satellites and cargo to orbit and even transport astronauts to the International Space Station.

Question: What is the name of this startup?

Chips and Global Power

Modern artificial intelligence depends heavily on powerful graphics processors designed by companies like NVIDIA. These chips have become so strategically important that governments closely regulate their export. The United States has restricted shipments of advanced AI chips to China, highlighting how technology startups and semiconductor firms have become key players in global geopolitics.

Question: What type of processors are widely used to train modern AI systems?

The Startup Nation

A small Middle Eastern country with fewer than 10 million people has become famous for producing one of the highest numbers of startups per capita in the world. Companies there lead innovations in cybersecurity, agriculture technology, and defense systems. Because of its strong innovation ecosystem, the country is often nicknamed the "Startup Nation."

Question: Which country is widely known by this nickname?

India's Digital Revolution

India's digital payment infrastructure, built around Unified Payments Interface, has transformed the way millions of people send and receive money. Startups have rapidly built services on top of this system, helping the country become one of the world's fastest-growing digital economies. Global tech leaders and governments now study this system as a model for building inclusive financial technology.

Question: What is the short name commonly used for this digital payment system?

AI Startups and the Future

In recent years, generative AI companies have attracted billions of dollars in investment. One of the most influential organizations in this field is OpenAI, the developer of advanced language models and generative AI systems. Their rapid rise shows how startups can influence global debates on technology regulation, ethics, and economic competitiveness.

Question: What technology field focuses on machines performing tasks that usually require human intelligence?

Answer Key (place upside down like the magazine):

1. **SpaceX**
2. **Graphics Processing Unit**
3. **Israel**
4. **UPI**
5. **Artificial Intelligence**

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