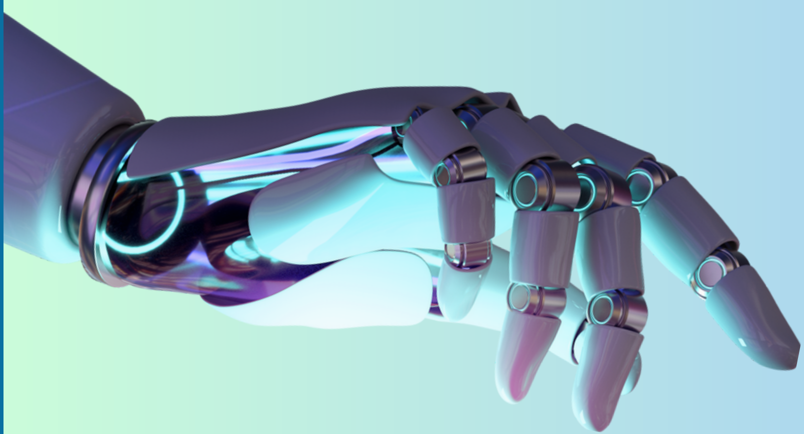
Vol. I Issue 1 June 2023

INNOVATION INSIDER

Unveiling Tomorrow's Tech, Today



"A year spent in Artificial Intelligence is enough to make one believe in God"
Alan Perlis

FLEXIBLE ELECTRONICS
Flex your imagination with the limitless possibilities of Flexible Electronics

F.D.M.
Fused Deposition Modelling Bringing Ideas to Life, Layer by Layer

SELF HEALING CODE
Self debugging code: The Automated Journey from Errors to Solutions

IEEE
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Note To Readers

Dear readers,
Welcome to the inaugural edition of our monthly technology newsletter cum magazine, brought to you by the IEEE BITS Pilani Student Chapter! We are thrilled to embark on this journey of sharing the latest advancements and breakthroughs across diverse domains of technology.

In an era characterized by rapid innovation and constant technological evolution, it becomes crucial for enthusiasts to stay informed and connected to the ever-expanding frontiers of knowledge. Our goal with this newsletter is to bridge that gap by providing you with a comprehensive overview of the exciting developments in the world of technology.

Each month, our dedicated team scours through the vast expanse of technological domains, seeking out the most intriguing and noteworthy stories. From artificial intelligence, electronics and robotics to blockchain and cybersecurity, we aim to cover a wide range of topics that will captivate your interest and broaden your understanding.

Through this newsletter, we aim to spark your curiosity, inspire new ideas, and foster a sense of community among technology enthusiasts. We believe that knowledge should be shared, and we are committed to curating and delivering the most relevant and fascinating content straight to your inbox.

We encourage you to dive into the articles, features, and interviews that we have carefully crafted for this edition. Stay tuned for captivating stories about groundbreaking research, emerging trends, and the impact of technology on various industries.

Lastly, we would like to extend our heartfelt gratitude to our readers. Your enthusiasm and support are the driving force behind our efforts, and we are committed to continuously improving and delivering a high-quality publication each month.

Together, let's explore, learn, and embrace the future of innovation!

Warm regards,

Editorial Team
IEEE BITS Pilani Student Chapter

For any queries or suggestions,
Reach out to us at : ieee.sb@pilani.bits-pilani.ac.in

Vol. I Issue 1

INNOVATION INSIDER

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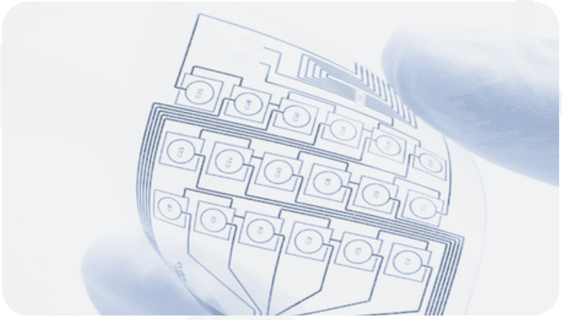
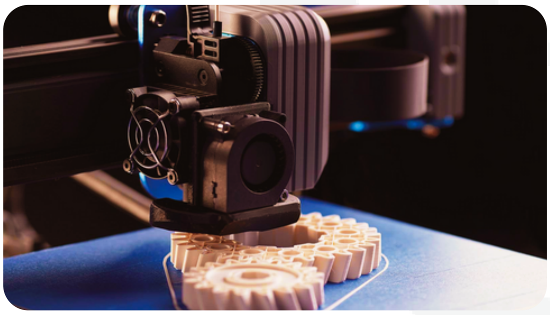




FLEXIBLE ELECTRONICS

NIKHIL HANDA

In recent years, flexible electronics has emerged as a captivating field that combines innovation and versatility to revolutionize various industries. In this piece, we will delve into the concept of flexible electronics and explore some of the latest developments in this rapidly advancing field.

Flexible electronics refer to electronic devices and circuits that can conform to various shapes and surfaces, enabling them to be integrated into unconventional and non-planar structures. These devices are fabricated using flexible substrates, such as plastics or polymers, instead of rigid materials like silicon.

By leveraging new materials and manufacturing techniques, flexible electronics offer a host of advantages, including lightweight designs, improved portability, and the ability to withstand mechanical stress.

Materials used in Flexible Electronics:

1. Substrates: Flexible electronics require a substrate that can withstand mechanical deformation without compromising the device's functionality. Polymer-based substrates such as polyimide (PI), polyethylene terephthalate (PET), and polyethylene naphthalate (PEN) are widely used due to their excellent flexibility, transparency, and thermal stability.

2. Conductive Materials: Flexible conductive materials are essential for the fabrication of flexible electronic components. Some commonly used conductive materials are Conductive Polymers such as polyaniline (PANI) and poly(3,4-ethylenedioxythiophene) (PEDOT), Carbon based materials such as Carbon nanotubes and graphene have excellent electrical properties and promising mechanical flexibility. Along with these, thin metal films of Ag, Au and Cu can be used

3. Dielectric Materials: Dielectric materials are used as insulators to separate conductive layers. Commonly used dielectric materials for flexible electronics include polymer-based dielectrics such as poly(methyl methacrylate) (PMMA)

4. Active Materials: Active materials such as organic semiconductors or inorganic semiconductor nanomaterials are used to enable electronic functions in flexible devices. Organic semiconductors, including polythiophenes and pentacene, are commonly employed due to their inherent flexibility and processability. Inorganic materials like metal oxides and quantum dots are also used for specific applications.

Methods used in Flexible Electronics:

1. Thin Film Deposition: Thin films of conductive and dielectric materials are typically deposited on flexible substrates using techniques such as sputtering, evaporation, or chemical vapor deposition (CVD). These methods allow precise control over film thickness and composition.

2. Printing Techniques: Printing techniques, such as inkjet printing and screen printing have gained popularity for their ability to deposit conductive and semiconducting materials onto flexible substrates in a cost-effective and scalable manner. These techniques offer flexibility in material selection and enable direct patterning.

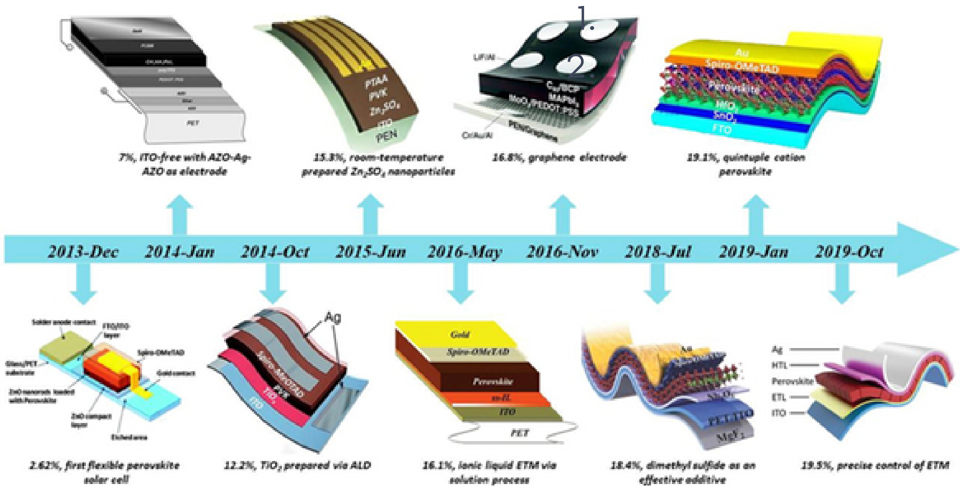
3. Photolithography: Photolithography, a standard technique in the semiconductor industry, can be adapted for flexible electronics. It involves the deposition and patterning of photoresist materials using photomasks and ultraviolet light exposure. This technique allows the fabrication of intricate patterns with high resolution.

4. Transfer Printing: Transfer printing involves the fabrication of electronic components on a sacrificial substrate and subsequent transfer to a flexible substrate. This method enables the integration of different materials and avoids the limitations associated with directly processing materials on flexible substrates

and encapsulation films are employed to provide a protective barrier while maintaining flexibility.

Recent developments in flexible electronics have opened up a wide range of applications across various industries. Here are some notable applications:

1. **Photovoltaics:** Solar cells position themselves as an attractive option to solve problems of finding an effective, renewable, sustainable and green energy source. They convert sun radiant energy into electrical energy according to the photovoltaic effect. While totally flexible photovoltaic devices have improved, they are still not at the desired level.



5. Encapsulation: Encapsulation is crucial for protecting flexible electronic devices from environmental factors such as moisture and oxygen. Techniques like lamination, conformal coatings,

For instance, power conversion efficiencies of 4.2, 12.85, and 10% have been reported for ultra-flexible organic, perovskite, and quantum dot solar cells while generally used solar cells have efficiencies around 20% to 27%. It is worth-noting, that in all three cases, the strategy to enhance the light-weight, stretchability and stability of the device, was focused on shifting from glass substrates to more flexible polymers injunction.

Therefore, there's still room to improve by focusing on the active layers, finding better and more suitable substrates.

2. Wearable Electronics and Biomedical Applications: Flexible electronics have revolutionized the field of wearable devices, enabling the development of comfortable and unobtrusive electronics that can be worn directly on the body. Examples include smartwatches, fitness trackers, smart clothing, and electronic skins. These devices can monitor vital signs like heart-rate, brain activities and body temperatures, track physical activity, provide notifications, and even deliver personalized healthcare. While all these examples focus on diagnosis and prevention, there are more fields within medicine taking advantage of wearable electronics. One of the biggest examples is prosthesis, where detecting various signals with extremely high sensitivity is required while withstanding high-levels of deformation. Another field of application inside Bioelectronics is therapy and drug delivery platforms. These kinds of devices generally release the therapeutic once the system is triggered by an impulse, like sensing a specific metabolite. The main purpose of these multiplex devices is to improve and control in amore efficient way the

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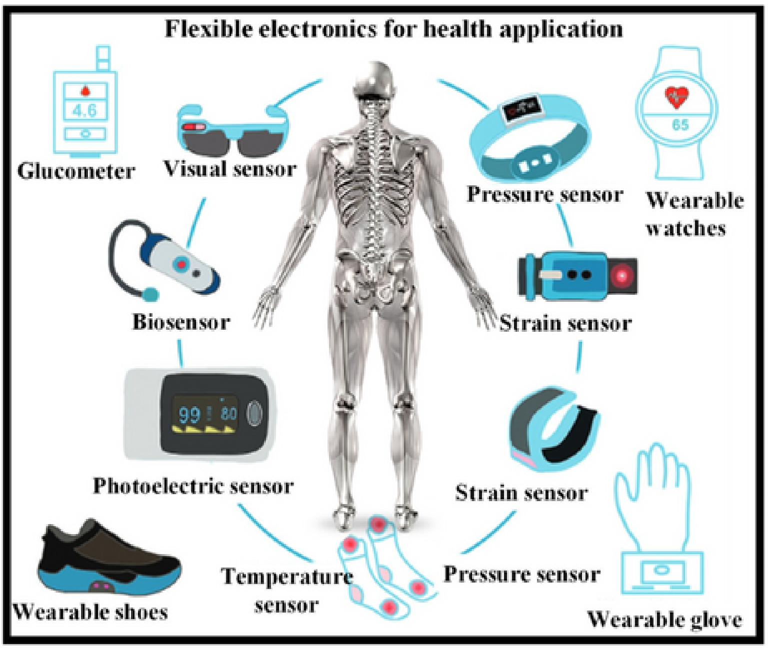


spatiotemporal release of the drug. Regardless of the application, they all have a common problem: the mechanical, electrical, optical, and chemical sensing modalities have remained isolated from each other in commercial products therefore, it is quite hard to get the whole outlook of the situation employing one single device. Regarding the nature of the device, some challenges to overcome are the biocompatibility of the sensor, obtaining important biochemical signals with minimum invasiveness, addressing self-healability during use and extending the lifetime of the devices, as well as disposability after utilization.

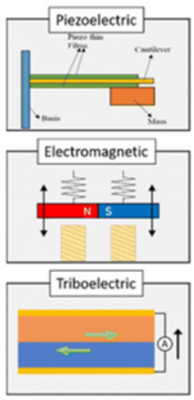
3. Foldable Displays: Flexible displays have garnered significant attention in the consumer electronics industry. Foldable smartphones and tablets are prime examples of this technology. These devices utilize flexible OLED (organic light-emitting diode) displays that can be folded or unfolded, providing users with the convenience of a larger screen in a compact form factor.

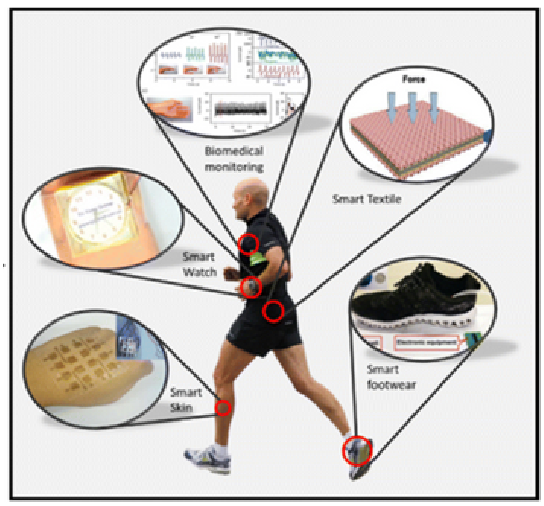
4. Internet of Things (IoT): Flexible electronics enable the integration of electronic components into objects of daily use, creating a network of interconnected smart devices. For example, sensors and circuits can be embedded into clothing, furniture, or even packaging to enable real-time data collection, environmental monitoring, and interactive as well as customizable user experiences. Among the diverse applications of flexible electronics in IoT, communication is one of the most relevant, since wireless technology plays a crucial role in data communication and control. As a key component, miniaturized, flexible and stretchable antennas fulfill those needs and have gained a lot of interest in order to improve their efficiency and overcome some challenges, for instance, rigidity, deformation and obtrusion when deployed on the body, hard integration with clothing, interference with body radiation and encapsulation to prevent oxidation/corrosion. A few challenges are still present on the field, mainly: designing a frequency reconfigurable flexible antenna in order to ease the integration and small volume; and finding cheaper flexible substrates that allow the different procedures for building antennas.

5. Energy Harvesting and Storage: Flexible electronics can be integrated into energy-harvesting systems to capture and store energy from the surrounding environment. This energy can be utilized to power low-power devices, such as wearable sensors or remote IoT nodes. Flexible solar cells, piezoelectric nanogenerators, and flexible batteries are some examples of energy-related applications. Some of the strategies that have been employed rely on exploiting the forces on the ambient like thermal gradients, for development of thermoelectric harvesters, kinetic energy in the form of vibrations or mechanical strain, for piezoelectric harvesters and finally, charging processes during friction, for triboelectric harvesters. Even though some barriers regarding the overall efficiency of these devices, like the poor output voltages of a single harvester have been surpassed by designing hybrid systems, some of the challenges persist, for instance: complexity of structure design, poor durability over long term exposure to repeated mechanical operation, relatively expensive fabrication process that limits large-scale production, and selection of the adequate materials in terms of mechanical and electrical properties. In addition to that, the harvesters are desired to be highly flexible.

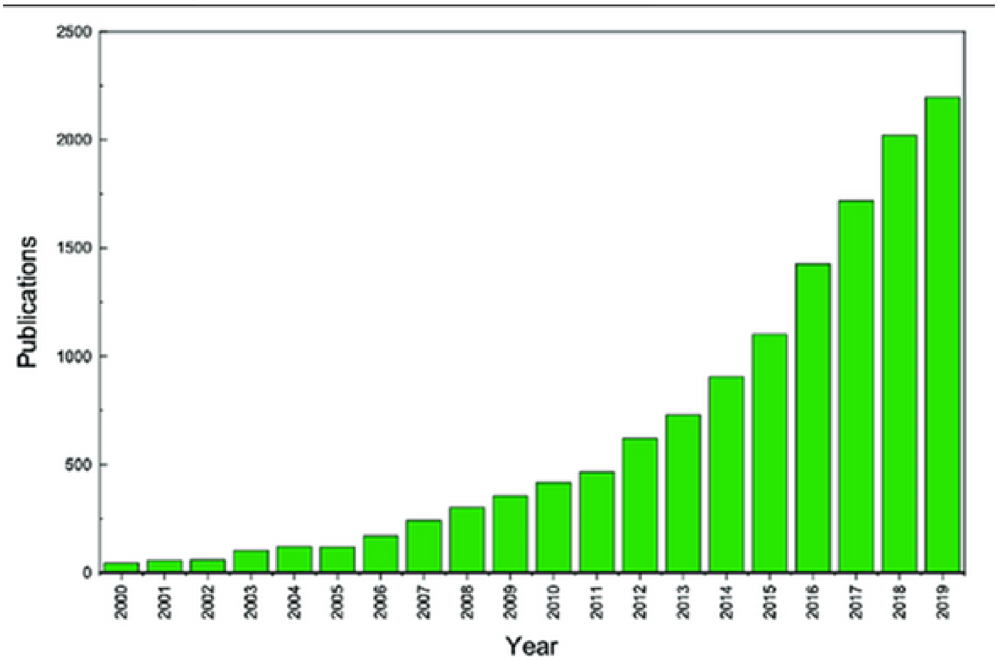
6. Automotive and Aerospace: The automotive and aerospace industries can benefit from flexible electronics by incorporating them into vehicle interiors, aircraft cabins, and wearable systems for pilots and astronauts. These would be a compound system built with integration from above mentioned applications.

These are just a few examples of the many applications of flexible electronics. As the field continues to advance, we can expect to see further integration of flexible electronics into our everyday lives, leading to innovative and exciting technological advancements.





The following graph gives a better understanding of the density of research in Flexible Electronics:



Research publications per year obtained for the term "Flexible Electronics" on Web of science

* * *

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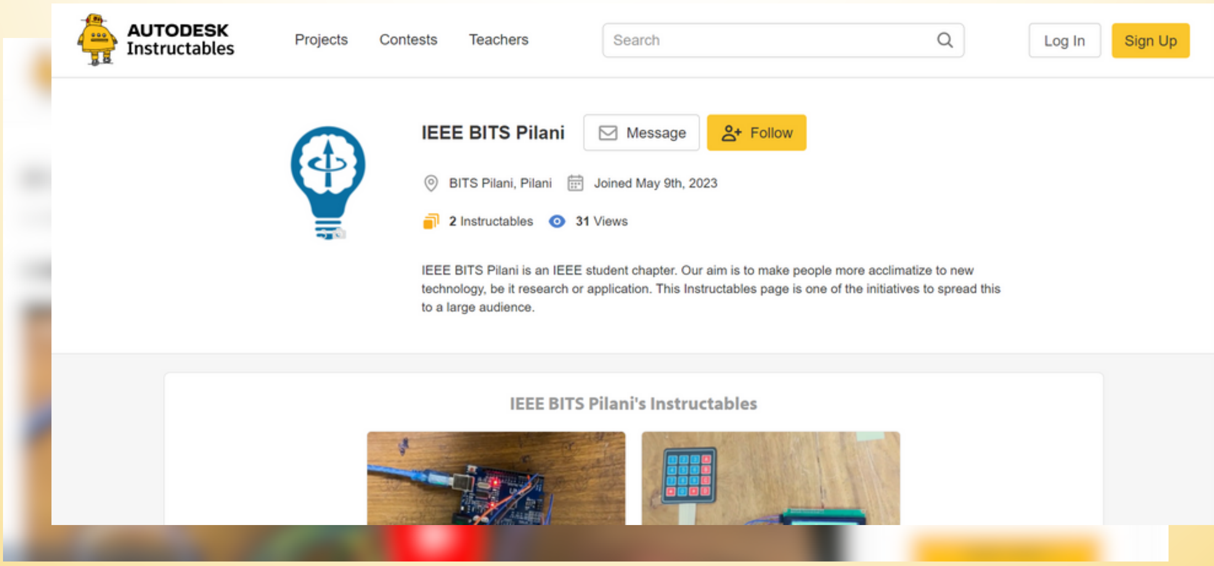
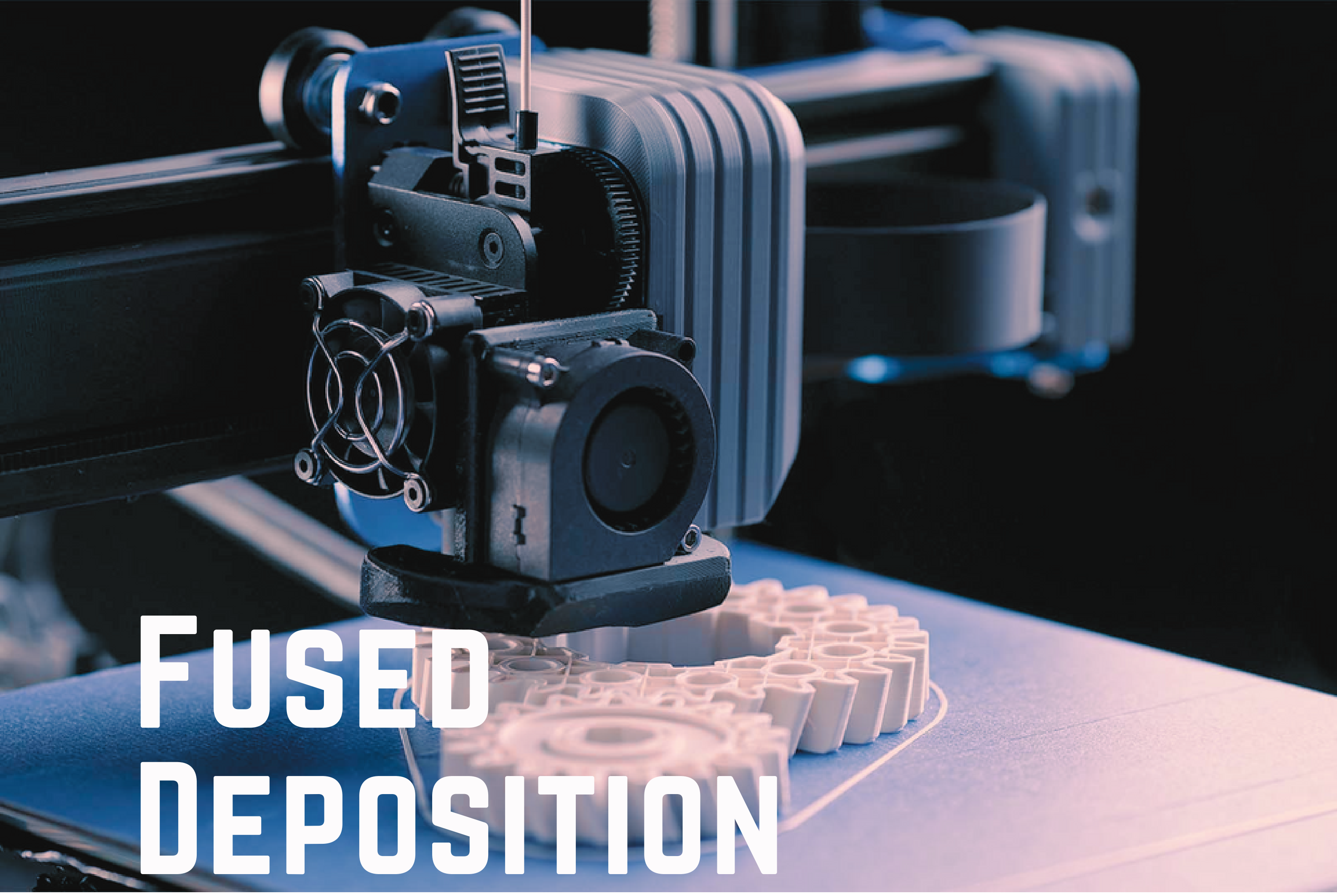


many more projects to come...



Fused Deposition Modelling (FDM)

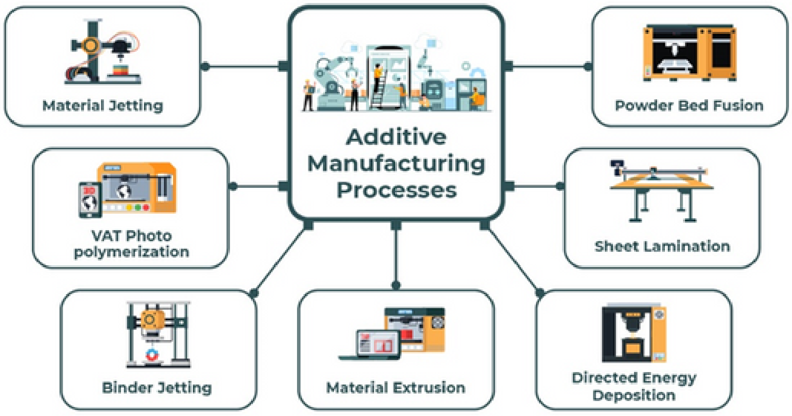
SHUSWABHIT SHADANGI

Additive Manufacturing's first documentation dates to 1987, when Stereolithography emerged. The concept developed as the years progressed and new systems emerged. Despite having such a long history, it has only gained quite the attention in recent years. Most people don't even know what it is and how it works, other than the term "3D Printing".

Let's find out !

For starters, let's begin with understanding what Additive Manufacturing means. It simply means, manufacturing by the concept of addition; like adding materials. Traditionally, "subtractive manufacturing" has been happening, where raw material is cut into desired shapes. Parts are removed, meaning subtraction of material takes place.

- **Binder Jetting:** It works with the help of two materials: a binder, usually liquid and powder-based material. The materials are deposited layer-by-layer to fabricate the design. It has the advantage of generally not requiring support in the design.



Currently, 7 types of additive manufacturing techniques are used in the industry on a big scale:

- **Material Extrusion (FDM)**: This is the most common type of Additive Manufacturing and the method we will discuss in detail in this article. Heats up a solid filament and moves through a nozzle according to the designed layers.

- **VAT Polymerization:** It uses a liquid photopolymer resin, which is solidified using a laser to create layers of the design one by one.

- **Powder Bed Fusion:** Instead of using a liquid binder like binder jetting, it uses a laser to fuse the material powder. A new stock of material is loaded to make each layer, which is then fused with the existing layers. The unused material of one layer can then be reused. Metal additive manufacturing is also possible via this.

- **Sheet Lamination:** This method is primarily used for metals. A sheet of metal is rolled on the build platform. A motorized reflector directs the laser to cut the metal layers. These are then combined using two techniques,

- Ultrasonic or Laminated. In ultrasonic, welding is done between the layers. Whereas in laminated, a hatch pattern joining method is used. Objects manufactured using the laminated method are for decorative purposes only and provide low structural strength.

- **Directed Energy Deposition:** This is another method primarily for metals. It deposits as the materials for a layer. A laser melts it thus, adding it to the existing build. It is generally used to repair and make small additions to existing materials rather than creating from scratch. It is different from FDM in terms of axis flexibility. Unlike FDM, DED's nozzle can move with 4- 5 DoF.

Some Common Terminologies used in FDM:

- **Filament:** The solid raw material, which is melted and extruded to create the design.

- **Nozzle:** The part responsible for extruding the material. It has a heater attached to it, which maintains the temperature at a constant level specifically for the filament material to ensure smooth and constant flow. This moves upwards as layers keep on adding to create the structure.

- **Work Bed:** The place where the object gets printed. It is not maintained at room temperature. Rather, it is maintained at an optimum temperature to ensure uniform cooling of the material poured on it.

How to use the power of FDM:

1. Design: Create a design or grab one from online sources. Many websites will help you with this. Software like Fusion360, SolidWorks, Rhino, etc., is used for 3D design to be printed. This is more of a creative process dependent on the individual.

2. Slicing: The object is manufactured using layer-by-layer addition. So, naturally, your design needs to be sliced into layers. Multiple online slicer software can be found. You can even download these to run locally.

3. Settings:

a. Make sure to pick the correct printer and filament material.

b. You must set the orientation so that the least amount of support material is used as it will degrade the surface finish.

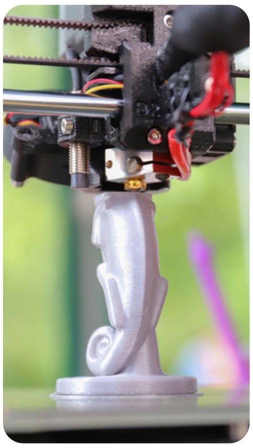
c. Ensure proper infill material. It decides how much quantity is filled inside the design. A 100% in-fill print is never recommended as it adds little strength compared to the cost of filament and power.

4. Pre-Checks: Set up the printer on the work bed and check the filament quantity and temperature of the nozzle and bed.

5. Start Printing: It's That Simple!!!

6. Post-Processing: After print completion, you need to remove the support materials and assemble the parts if required, depending on the designs. Tools like pliers and cutters can be used for this purpose.

And that's all there is to how to 3D Print your designs.



Here are some applications of 3D Printing:

·Rapid Prototyping
·Prosthetics
·Props/Cosplay
·Household Items
· and Gifts/Figurines

These are self-explanatory terms. This helps accelerate the creative fabrication process, which otherwise might have taken a long time. Not only do creative industries like artisans, toys, etc. get a boom, but time dedicated to testing phases in industries and research gets reduced thus allowing testing more iterations in the same amount of time.

The FDM Printing method has been worked upon for so long that the pros outweigh its cons. But we should know about them as well, so here are the disadvantages, which are mostly nit-picking:

- **Low Resolution:** The 3D Printed models, although detailed, have a tolerance limit, meaning the models can't be more accurate than the minimum nozzle size. This might hamper objects which too much aesthetic value.

- **Lack of Structural Integrity:** It is obvious that FDM Printed objects will be weaker than metal alternatives. This is because FDM is limited to plastic as its material.

- ·**Intimidating:** I am sure before this article; you might have felt FDM Printing to be too grand and complicated. But we hope, after reading this, that fear has been uplifted and that you are ready to design your original ideas.

So, what now? Is FDM saturated? What can be explored further? Well, there are lots of things you can explore:

Converting your 3D Printer: You can convert your 3D Printer into a ceramics design creator, food printer, etc. Basically, anything which needs layer-by-layer formation.

Making it more affordable: Efforts to make it even more affordable by looking at cheaper alternatives without compromising on performance is being looked at.

Convert into Hybrid Manufacturing Machine: Hybrid manufacturing combines additive and subtractive into a single machine. A 3D printer can be converted into a cutting machine to experiment and can be upgraded into a hybrid machine as well.

That's all for a brief introduction to Fused Deposition Modelling. You can continue to know more by going through the references. We leave you with the inquisitiveness to explore further.

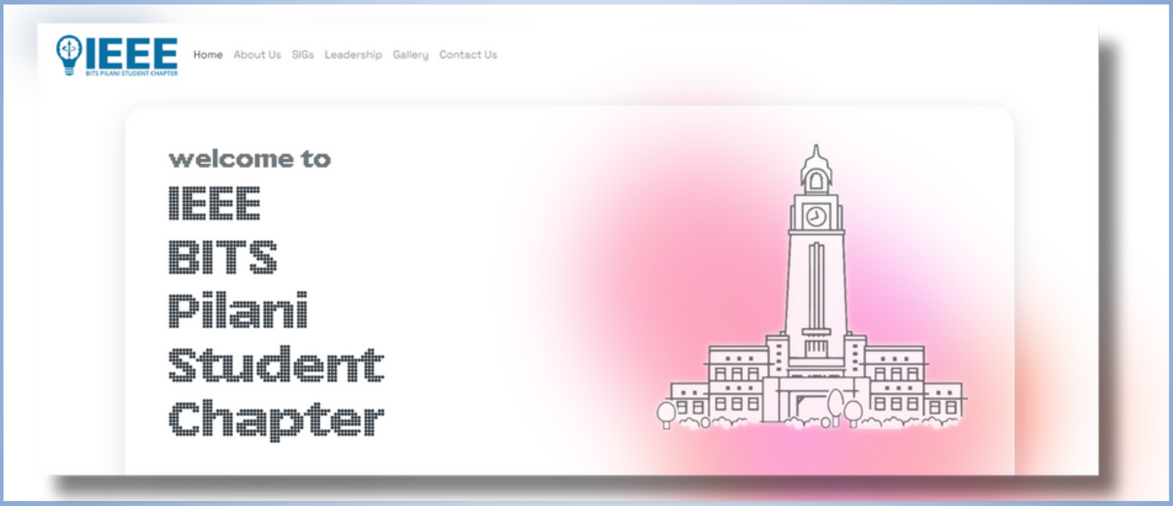
As long as we are on this topic, here's a tip for you BITSians: There's a 3D printer at the location whose model is given below . Guess!

Model Designed and Printed by: SHREYANSH SHARMA

You're correct, BITS Library ! Go on and explore it and print away your designs.

Visit our revamped website !

https://ieee-website-one.vercel.app/



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SELF HEALING CODE

NIKHIL HANDA

In the ever-evolving field of programming, the concept of self-healing code has emerged as a game-changer. Self-healing code refers to software systems that can automatically detect, diagnose, and repair errors, reducing downtime and improving system reliability.

Self-healing code has evolved significantly in recent years, thanks to advancements in artificial intelligence (AI), machine learning (ML), and automation pipeline techniques. Traditional error handling mechanisms often rely on manual intervention, leading to increased costs and longer resolution times. This article explores the recent developments in self-healing code and its application scenarios

Steps of Implementation for Self-Healing Code:

a) Error Detection Mechanism (Automated Monitoring): Self-healing code systems leverage monitoring tools that continuously track the health of software applications. These tools generate alerts or triggers based on predefined thresholds, allowing for proactive identification of potential issues.

b) Root Cause Analysis (Automated Diagnosis): Machine learning algorithms analyze the alerts generated by the monitoring tools to diagnose the root cause of errors. These algorithms can learn from historical data and patterns, enabling more accurate diagnoses.

c) Automated Repair: Once the issue is identified, self-healing code systems can automatically implement the necessary repairs. This may involve restarting specific components, applying patches, rolling back to a stable state or changing certain parameters in the code.

d) Integration with Development and Deployment Processes: Integrate the self-healing code into the development and deployment workflows. This may involve incorporating self-healing mechanisms into the continuous integration and continuous deployment (CI/CD) pipelines, ensuring that the self-healing capabilities are deployed alongside the software system.

e) Training, Testing and Validation: Training the system in case of ML algorithms with wide range of test cases is an important step. Testing and validating the self-healing code thoroughly on manually induced anomalies ensures its effectiveness and reliability. This may involve setting up test environments, simulating various failure scenarios, and validating the automated error detection and repair processes

Some of the possibilities for the application of Self-Healing Code:

a) Cloud Computing: Cloud computing environments consist of complex systems with numerous interconnected components, making them prone to failures. Self-healing code can play a vital role in maintaining the reliability and availability of cloud services. By continuously monitoring the health of applications and infrastructure, self-healing systems can automatically detect anomalies, diagnose the root causes of failures, and implement appropriate repairs. This results in minimal service disruptions, improved system resilience, and enhanced experience.

b) Internet of Things (IoT): In the IoT landscape, where countless devices communicate with each other, self-healing code can play a crucial role. It can detect and address failures in devices or network connections, enhancing the reliability and availability of IoT ecosystems.

c) Critical Infrastructure: Self-healing code is vital for critical infrastructure systems like power grids, transportation networks, and healthcare systems. By automatically addressing errors and minimizing downtime, self-healing code ensures the smooth functioning of these critical systems, preventing potential disruptions.

d) Security and Cyber Defense: Self-healing code can also contribute to enhancing the security and resilience of software systems. By continuously monitoring for potential security breaches, self-healing systems can automatically detect and respond to cyber-attacks. They can isolate compromised components, apply patches or updates to fix vulnerabilities, and take proactive measures to prevent further attacks.

Some existing and recently developed tools and frameworks that help in implementing methods of self-healing code include:

a) Kubernetes: Kubernetes is a popular container orchestration platform that provides built-in self-healing capabilities. It can automatically detect and restart failed containers or nodes, ensuring high availability of applications.

b) Prometheus: Prometheus is an open-source monitoring and alerting toolkit widely used for error detection in cloud-native environments. It can be integrated with self-healing mechanisms to trigger automated repairs based on defined alerting rules.

c) Spring Boot: Spring Boot is a Java-based framework that offers robust error handling and self-healing capabilities. It provides features such as automatic restart on failure and fault tolerance mechanisms to enhance system reliability.

d) Netflix Hystrix: Hystrix is a latency and fault tolerance library provided by Netflix. It allows developers to implement self-healing patterns, such as circuit breakers and fallback mechanisms, to handle failures in distributed systems effectively.

Self-healing code offers several benefits and advantages in the field of software development and maintenance. However, it also presents some challenges that need to be addressed.

Let's explore the benefits and challenges of self-healing code in detail:

Benefits of Self-Healing Code:

a) Improved Reliability: Self-healing code significantly enhances the reliability of software systems.

b) Enhanced System Availability and Minimized System Downtime losses: With self-healing code, software systems can achieve higher availability as downtime is decreased. By quickly resolving failures and recovering from errors, self-healing code ensures that the system remains accessible and functional, reducing the impact on users and business operations.

c) Easy Maintenance: Self-healing code reduces maintenance costs associated with manual error detection and resolution. Organizations can save on the resources required for troubleshooting, bug fixing, and system recovery. Additionally, self-healing code can optimize system performance and resource utilization, leading to more efficient use of hardware and reducing operational costs.

d) Increased Efficiency: Developers can focus on more critical tasks instead of spending time on repetitive troubleshooting and bug fixing. This accelerates the development process and shortens the time-to-market for software applications.

e) Scalability and Resilience: Self-healing code helps in building scalable and resilient software systems. It can automatically handle failures and adapt to changing conditions, ensuring that the system can scale and perform optimally. By proactively detecting and addressing issues, self-healing code improves system resilience and reduces the risk of widespread failures.

Challenges of Self-Healing Code:

a) Complexity: Implementing self-healing code can be complex, especially for large-scale systems. It requires careful design and integration of various techniques and tools. Devising effective error detection mechanisms, diagnosis algorithms, and repair strategies that work seamlessly together can be challenging.

b) Overhead: Self-healing code introduces additional computational overhead to the system. The continuous monitoring, analysis, and repair processes can consume system resources, impacting performance. Balancing the self-healing functionality with system performance is a challenge that needs to be carefully addressed.

c) False Positives and False Negatives: Self-healing code heavily relies on error detection algorithms. So, there is a risk of false positives (incorrectly identifying errors) and false negatives (failing to detect errors). False positives can lead to unnecessary repairs or system disruptions due to unwanted changes, while false negatives can result in undetected errors causing further issues.

d) Learning and Adaptation: Self-healing code often incorporates machine learning techniques to improve its capabilities. However, training ML models requires relevant and representative data. Obtaining quality training data and ensuring the models continuously adapt and learn from new scenarios can be a challenge.

e) Testing and Validation: Validating the effectiveness and reliability of self-healing code can be complex. Creating test environments that mimic real-world scenarios and thoroughly testing the error detection, diagnosis, and repair processes require significant effort. It is essential to validate the self-healing code in different failure scenarios to ensure its effectiveness.

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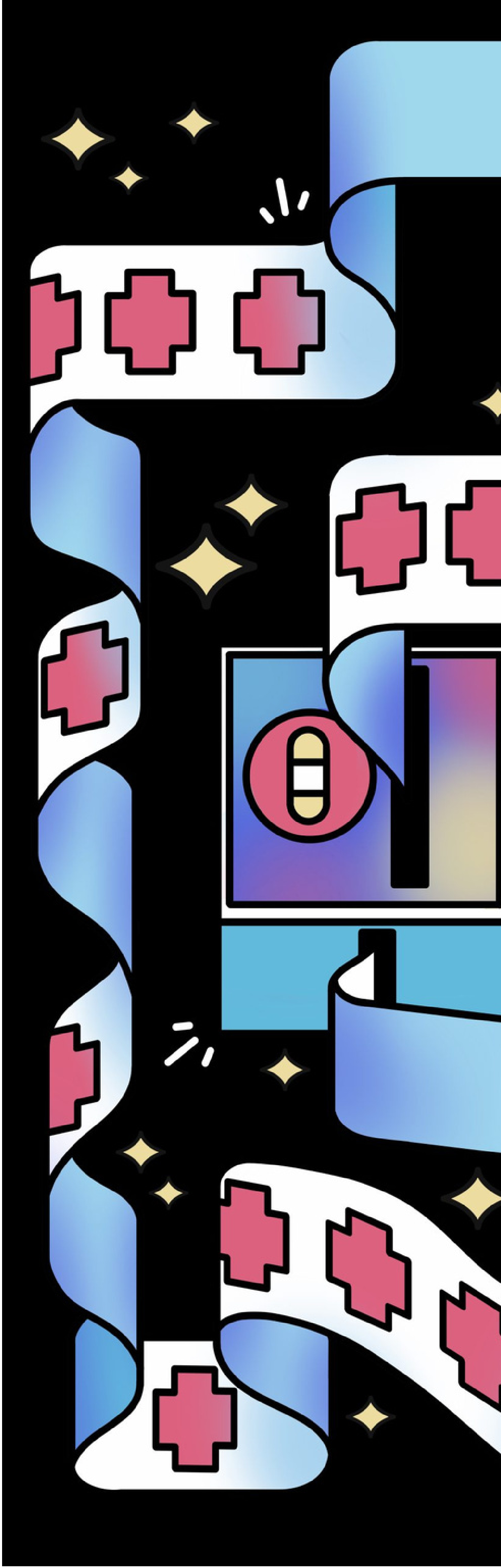
** Do explore the links mentioned in the references section in case you want in-depth information.



AROUND THE TECH WORLD

GPT-4 CAN USE EXTERNAL TOOLS NOW !

OpenAI's GPT-4 language model can now use external tools to complete tasks, such as checking the weather, getting a stock price, or looking up data in a company's database. This is a significant improvement over previous versions of GPT, which were limited in what they could do by the information they were trained on.

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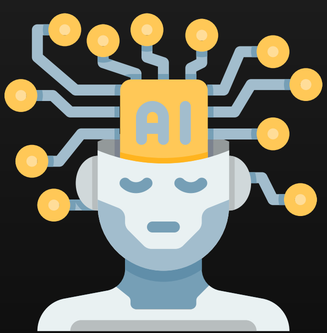
CAN AN AI BE A TEACHER TO ANOTHER AI?



This study investigates whether Large Language Models can teach less advanced AI systems and improve their performance. The study proposes a 'student-teacher' relationship between two AIs and explores how, when, and what the AI should explain to the other AI to boost its abilities, while staying within a communication budget. It shows that personalized teaching from the AI can lead to significant improvements in the other AI's performance.

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AROUND THE TECH WORLD

INTEL TO START SHIPPING A QUANTUM PROCESSOR !

Intel is starting to ship its Tunnel Falls processor to research labs. The 12-qubit chip will be sent to the Universities of Maryland, Rochester, and Wisconsin and the Sandia National Lab. Intel hopes that researchers will help the company characterize sources of error and determine which form of qubits are the best.

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SYNTHETIC HUMAN EMBRYOS CREATED!!!

Scientists have created synthetic human embryos from stem cells. The embryos do not have signs of life, but they have the potential to form a full embryo. It is still unclear whether they can continue maturing after the earliest stages. Legally, embryos can be cultivated up to 14 days in the lab. However, no such laws exist for synthetic embryos even if they are similar to normal embryos.

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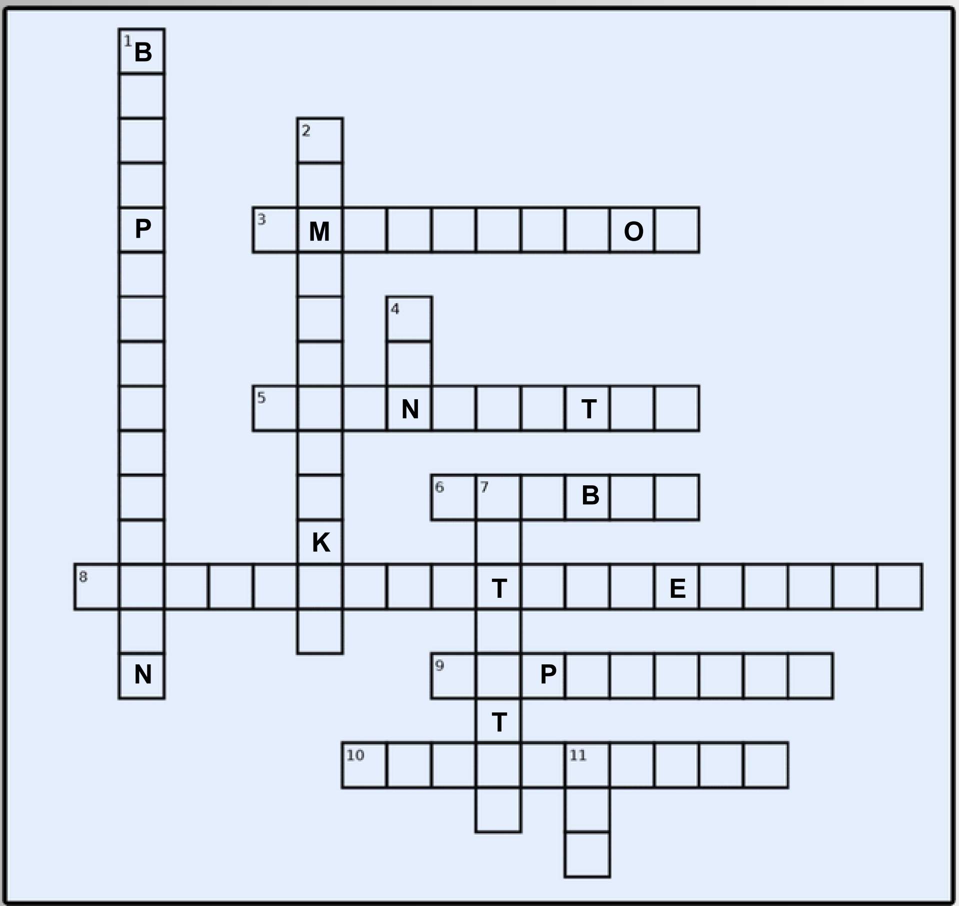
TECHTANGLE #1



Down:

1. A technique used to adjust the weights and biases of a neural network during training [15]
2. A cryptographic algorithm that uses the same key for both encryption and decryption [12]
4. A technique used to generate new data samples by interpolating between existing samples [3]
7. A device that converts electrical energy into mechanical energy to produce motion [8]
11. A control algorithm that seeks to optimize system performance by adjusting parameters based on error, past values, and rates of change [3]

Across:

3. A method used to estimate missing or corrupted values in a dataset [10]
5. A circuit component used to amplify or switch electronic signals [10]
6. A communication protocol which is a standard for Electronic Control Units in Motor Vehicles [6]
8. The ability of a material to generate an electrical charge in electric charge in response to mechanical stress [19]
9. A component that stores electric charge and releases it over time in an electronic circuit [9]
10. The process of reducing unwanted noise or interference in an electronic circuit [10]

Answers in the next issue :)

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॥ अंतः अस्ति प्रारंभः ॥

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