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VIDEO GAME PLAYERS SHOW ENHANCED BRAIN ACTIVITY, DECISION-MAKING SKILL STUDY

Frequent players of video games show superior sensorimotor decision-making skills and enhanced activity in key regions of the brain as compared to non-players, according to a recent study by Georgia State University researchers.

Video games are played by the overwhelming majority of our youth more than three hours every week, but the beneficial effects on decision-making abilities and the brain are not exactly known," said lead researcher Mukesh Dhamala, associate professor in Georgia State's Department of Physics and Astronomy and the university's Neuroscience Institute.

Video game playing can effectively be used for training for example, decision-making efficiency training and therapeutic interventions once the relevant brain networks are identified. The subjects laid inside an FMRI machine with a mirror that allowed them to see a cue immediately followed by a display of moving dots. Participants were asked to press a button in their right or left hand to indicate the direction the dots were moving, or resist pressing either button if there was no directional movement.

The study found that video game players were faster and more accurate with their responses. Analysis of the resulting brain scans found that the differences were correlated with enhanced activity in certain parts of the brain. These results indicate that video game playing potentially enhances several of the sub processes for sensation, perception and mapping to action to improve decision-making skills. The video game playing alters the brain in order to improve task performance and their potential implications for increasing task-specific activity.

B.THARNIKA

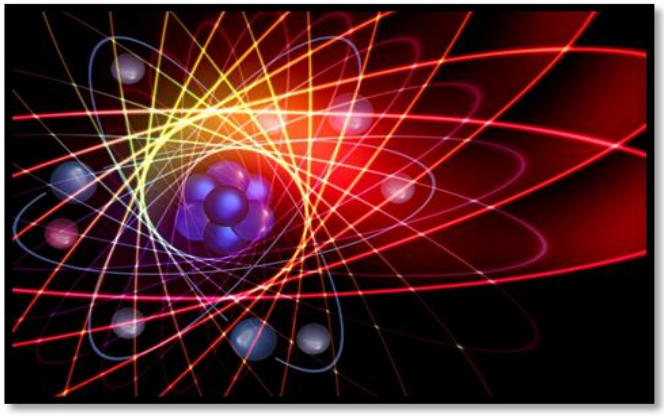
III B.Sc. (Information Technology)

SECURE COMMUNICATION WITH LIGHT PARTICLES

While quantum computers offer many novel possibilities, they also pose a threat to internet security since these supercomputers make common encryption methods vulnerable. Based on the so-called quantum key distribution, researchers at TU Darmstadt have developed a new, tap-proof communication network.

The new system is used to exchange symmetric keys between parties in order to

encrypt messages so that they cannot be read by third parties. In cooperation with Deutsche Telekom, the researchers led by physics professor Thomas Walther succeeded in operating a quantum network that is scalable in terms of the number of users and at the same time robust without the need for trusted nodes. In the future, such systems could protect critical infrastructure from the growing danger of cyberattacks. In addition, tap-proof connections could be installed between different government sites in larger cities.



The system developed by the Darmstadt researchers enables the so-called quantum key exchange, providing several parties in a star-shaped network with a common random number. Individual light quanta, so-called photons, are distributed to users in the communication network in order to calculate the random number and thus the digital key. Due to quantum physical effects, these keys are particularly secure.

The system distributes photons from a central source to all users in the network and establishes the security of the quantum keys through the effect of so-called quantum entanglement. This quantum-physical effect produces correlations between two light particles, which are observable even when they are far apart. The property of the partner particle can be predicted by measuring a property of the light particle from a pair.

Polarization is often used as a property, but this is typically disturbed in the glass fibers used for transmission due to environmental influences such as vibrations or small temperature changes. However, the Darmstadt system uses a protocol in which the quantum information is encoded in the phase and arrival time of the photons and is therefore particularly insensitive to such disturbances. For the first time, the group has succeeded in providing a network of users with quantum keys by means of this robust protocol.

The high stability of the transmission and the scalability in principle were successfully demonstrated in a field test together with Deutsche Telekom Technik GmbH. As a next step, the researchers at TU Darmstadt are planning to connect other buildings in the city to their system.

S.KAVIYA

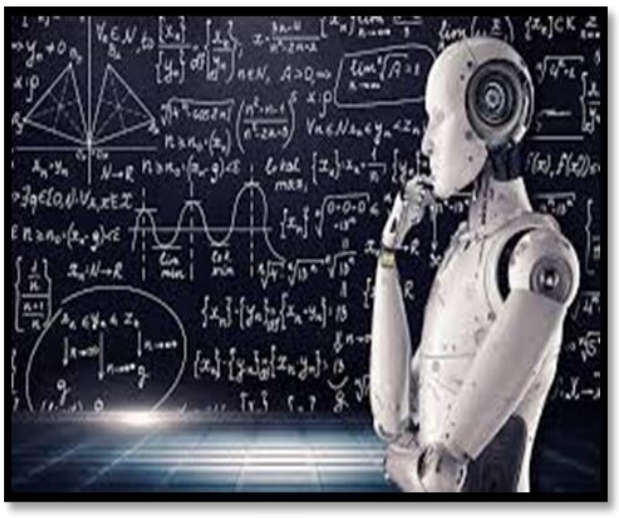
II B.Sc. (Computer Technology)

MATHEMATICAL PARADOXES DEMONSTRATE THE LIMITS OF AI

Humans are usually pretty good at recognizing when they get things wrong, but artificial intelligence systems are not. According to a new study, AI generally suffers from inherent limitations due to a century-old mathematical paradox.

Like some people, AI systems often have a degree of confidence that far exceeds their actual abilities. And like an overconfident person, many AI systems don't know when they're making mistakes. Sometimes it's even more difficult for an AI system to realise when it's making a mistake than to produce a correct result.

Researchers from the University of Cambridge and the University of Oslo say that instability is the Achilles' heel of modern AI and that a mathematical paradox shows AI's limitations. Neural networks, the state of the art tool in AI, roughly mimic the links between neurons in the brain. The researchers show that there are problems where stable and accurate neural networks exist, yet no algorithm can produce such a network. Only in specific cases can algorithms compute stable and accurate neural networks.



The next stage for the researchers is to combine approximation theory, numerical analysis and foundations of computations to determine which neural networks can be computed by algorithms, and which can be made stable and trustworthy. Just as the paradoxes on the limitations of mathematics and computers identified by Godel and Turing led to rich foundation theories describing both the limitations and the possibilities of mathematics and computations perhaps a similar foundations theory may blossom in AI.

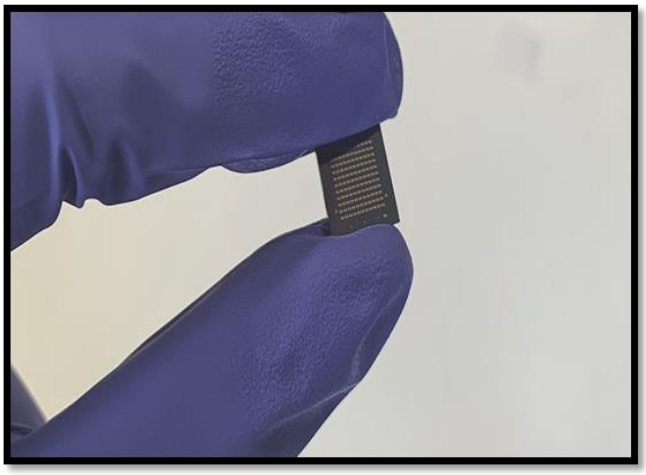
G.AAKASH

II B.Sc. (Information Technology)

ULTRA-FAST PHOTONIC COMPUTING PROCESSOR USES POLARIZATION

New research uses multiple polarization channels to carry out parallel processor enhancing computing density by several orders over conventional electronic chips. Light has

an exploitable property different wavelengths of light do not interact with each other a characteristic used by fibre optics to carry parallel streams of data. Similarly, different polarizations of light do not interact with each The research team developed a HAD (hybridized-active-dielectric) nanowire, using a hybrid glassy material which shows switchable material properties upon the illumination of optical pulses. Each nanowire shows selective responses to a specific polarization direction, so information can be simultaneously processed using multiple polarizations in different directions. Using this concept, researchers have developed the first photonic computing processor to utilize polarizations of light.



Photonic computing is carried out through multiple polarization channels, leading to an enhancement in computing density by several orders compared to that of conventional electronic chips. The computing speeds are faster because these nanowires are modulated by nanosecond optical pulses.

Since the invention of the first integrated circuit in 1958, packing more transistors into a given size of an electronic chip has been the go-to means of maximizing computing density the so-called 'Moore's Law'. However, with Artificial Intelligence and Machine Learning requiring specialized hardware that is beginning to push the boundaries of established computing, the dominant question in this area of electronic engineering has been 'How do we pack more functionalities into a single transistor?

For over a decade, researchers in Professor Harish Bhaskaran's lab in the Department of Materials, University of Oxford have been looking into using light as a means to compute. Professor Bhaskaran, who led the work, said: 'This is just the beginning of what we would like to see in future, which is the exploitation of all degrees of freedoms that light offers, including polarization to dramatically parallelize information processing. Definitely early-stage work, but super exciting ideas that combine electronics, non-linear materials and computing.

M. HARINI

I B.Sc. (Computer Technology)

HAPTICS DEVICE CREATES REALISTIC VIRTUAL TEXTURES

Human beings at capable of having five senses that we exercise in our everyday lives: sight or vision, hearing or audition, smell olfaction, taste gustation, and touch or tactition. This last sense, also known as tactile sensation, is an incredibly important part in how humans perceive their reality. While technology has allowed us to immerse ourselves in a world of sights and sounds from the comfort of our home.

In a recent study published in IEEE Transactions on Haptics, researchers at the USC Viterbi School of Engineering have developed a new method for computers to achieve that true texture with the help of human beings. Called a preference-driven model, the framework uses our ability to distinguish between the details of certain textures as a tool in order to give these virtual counterparts a tune-up. The research was carried out by three USC Viterbi Ph.D. students in computer science, Shihan Lu, Mianlun Zheng and Matthew Fontaine, as well as Stefanos Nikolaidis, USC Viterbi assistant professor in computer science and Heather Culbertson, USC Viterbi WiSE Gabilan Assistant Professor in Computer Science.

Using this preference-driven model, the user is first given a real texture, and the model randomly generates three virtual textures using dozens of variables, from which the user can then pick the one that feels the most similar to the real thing. Over time, the search adjusts its distribution of these variables as it gets closer and closer to what the user prefers. According to Fontaine, this method has an advantage over directly recording and "playing back" textures, as there's always a gap between what the computer reads and what we feel.

In the future, real textures may not even be required for the model, Lu explained. The way certain things in our lives feel is so intuitive that fine-tuning a texture to match that memory is something we can do inherently just by looking at a photo, without having the real texture for reference in front of us.

D.UDHYAKUMAR

III B.Sc. (Computer Technology)

SCIENTIFIC ADVANCE LEADS TO A NEW TOOL IN THE FIGHT AGAINST HACKERS

People have used codes and encryption to protect information from falling into the wrong hands for thousands of years. Today, encryption is widely used to protect our digital activity from hackers and cybercriminals who assume false identities and exploit the internet and our increasing number of digital devices to steal from us. As such, there is an ever-growing need for new security measures to detect hackers posing as our banks or other trusted institutions. Within this realm, researchers from the University of Copenhagen's Department of Mathematical Sciences have just made a giant leap.

There is a constant battle in cryptography between those who want to protect information and those seeking to crack it. New security keys are being developed and later broken and so the cycle continues. Until, that is, a completely different type of key has been found.", says Professor Matthias Christandl. For nearly twenty years, researchers around the world have been trying to solve the riddle of how to securely determine a person's geographical location and use it as a secure ID. Until now, this had not been possible by way of normal methods like GPS tracking.

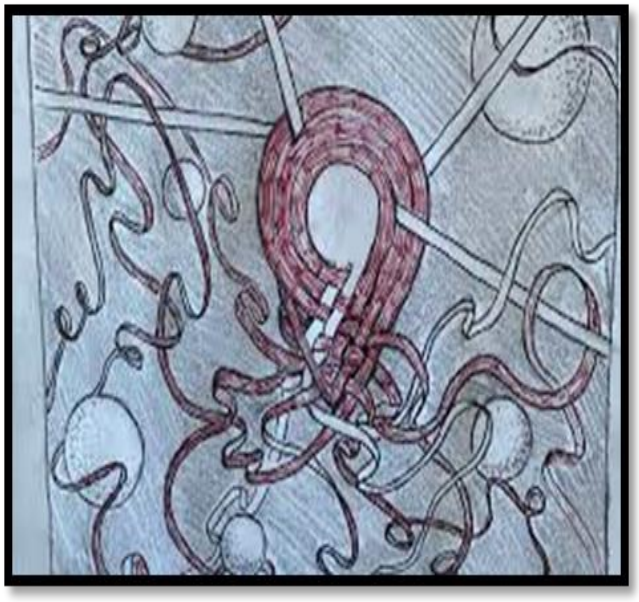
Today, there are no traditional ways, whether by internet or radio signals for example, to determine where another person is situated geographically with one hundred percent accuracy. Current methods are not unbreakable, and hackers can impersonate someone you trust even when they are far far away. However, quantum physics opens up a few entirely different possibilities says Matthias Christandl.

Quantum physics makes hacking impossible

Using the laws of quantum physics, the researchers developed a new security protocol that uses a person's geographical location to guarantee that they are communicating with the right person. Position-based quantum encryption, as it is called, can be used to ensure that a person is speaking with an actual bank representative when the bank calls and asks a customer to make changes to their account. The researchers' recipe for securing a person's location combines the information in a single quantum bit a qubit followed by classical bits, consisting of the ones and zeroes that we are familiar with from ordinary computers.

Both types of bits are needed to send a message that is impossible for cybercriminals to read, hack or manipulate, and which can confirm whether a person is in your bank's office or in some far-off country. The quantum bit serves as a kind of lock on the message, due to the role of Heisenberg's Uncertainty Principle in quantum physics, which causes quantum information to be disrupted and impossible to decode when trying to measure

it. It is also due to what is known as the "no-cloning theorem," which makes quantum information impossible to intercept and secretly copy. This will remain the case for quite some time.



Could soon be a reality

The researchers highlight the fact that the new method is particularly handy because only a single quantum bit is needed for position verification. So, unlike many other quantum technologies that require further development, this new discovery can be put to use today. Suitable quantum sources that can send a quantum bit of light already exist. The particular strength of our technique is that it is relatively straightforward to implement. The security ID needs to be developed commercially, by a company for example, before it can be widely adopted.

The new research result is particularly useful in contexts where communications between two parties need to be extremely secure. This could be payments on the internet or transmission of sensitive personal data.

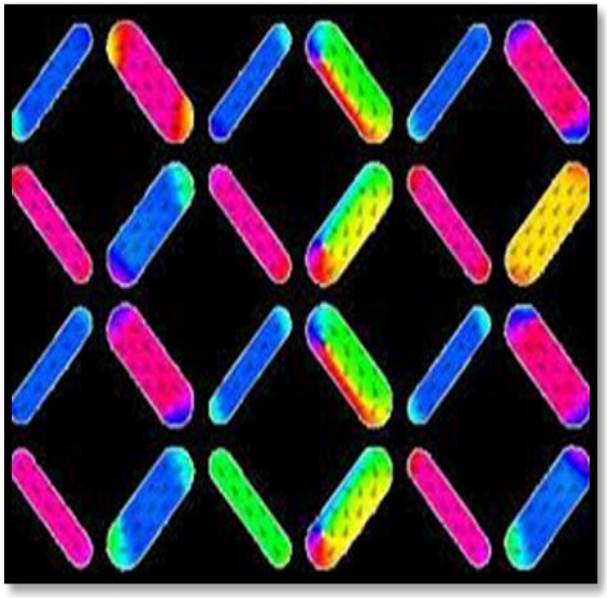
P.S. MOHANKUMAR

II B.Sc. (Computer Technology)

NANOMAGNETIC COMPUTING CAN PROVIDE LOW-ENERGY AI

The new method, developed by a team led by Imperial College London researchers, could slash the energy cost of artificial intelligence (AI). The researchers showed nanomagnets can be used for 'time-series prediction' tasks, such as predicting and regulating insulin levels in diabetic patients.

Artificial intelligence that uses 'neural networks' aims to replicate the way parts of the brain work, where neurons talk to each other to process and retain information. A lot of the maths used to power neural networks was originally invented by physicists to describe the way magnets interact, but at the time it was too difficult to use magnets directly as researchers didn't know how to put data in and get information out.



Instead, software run on traditional silicon-based computers was used to simulate the magnet interactions, in turn simulating the brain. Now, the team have been able to use the magnets themselves to process and store data cutting out the middleman of the software simulation and potentially offering enormous energy savings.

Nanomagnetic states

Nanomagnets can come in various 'states', depending on their direction. Applying a magnetic field to a network of nanomagnets changes the state of the magnets based on the properties of the input field, but also on the states of surrounding magnets.

Slashing energy cost

AI is now used in a range of contexts, from voice recognition to self-driving cars. But training AI to do even relatively simple tasks can take huge amounts of energy. For example, training AI to solve a Rubik's cube took the energy equivalent of two nuclear power stations running for an hour. Much of the energy used to achieve this in conventional, silicon-chip computers is wasted in inefficient transport of electrons during processing and memory storage. Nanomagnets however don't rely on the physical transport of particles like electrons, but instead process and transfer information in the form of a 'magnon' wave, where each magnet affects the state of neighbouring magnets.

This means much less energy is lost and that the processing and storage of information can be done together, rather than being separate processes as in conventional computers. This innovation could make nanomagnetic computing up to 100,000 times more efficient than conventional computing.

AI at the edge

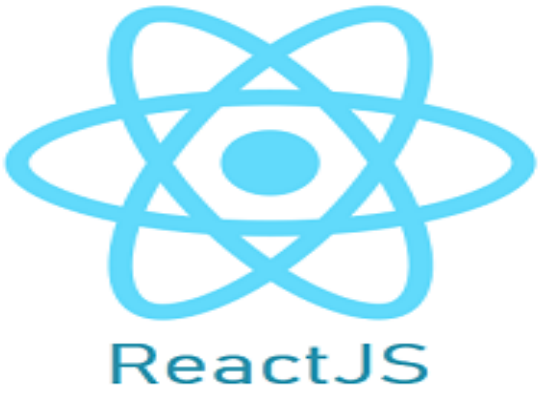
Their energy efficiency also means they could feasibly be powered by renewable energy, and used to do 'AI at the edge' processing the data where it is being collected, such as weather stations in Antarctica, rather than sending it back to large data centers. It also means they could be used on wearable devices to process biometric data on the body, such as predicting and regulating insulin levels for diabetic people or detecting abnormal heartbeats.

G.AAKASH

II B.Sc. (Information Technology)

REACTJS- A GLANCE

ReactJS tutorial provides basic and advanced concepts of ReactJS. Currently, ReactJS is one of the most popular JavaScript front-end libraries which has a strong foundation and a large community. ReactJS is a declarative**,** efficient**,** and flexible JavaScript library for building reusable UI components. It is an open-source, component-based front end library which is responsible only for the view layer of the application. It was initially developed and maintained by Facebook and later used in its products like WhatsApp & Instagram.



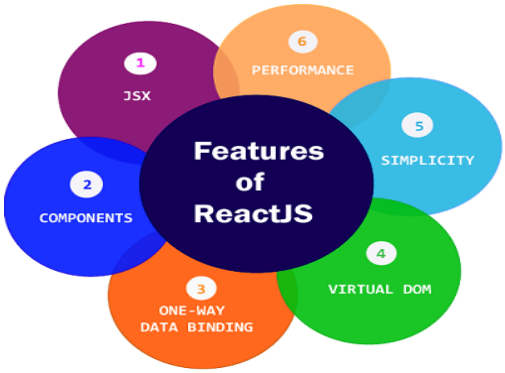
Why we use ReactJS?

The main objective of ReactJS is to develop User Interfaces (UI) that improves the speed of the apps. It uses virtual DOM (JavaScript object), which improves the performance of the app. The JavaScript virtual DOM is faster than the regular DOM. We can use ReactJS on the client and server-side as well as with other frameworks. It uses component and data patterns that improve readability and helps to maintain larger apps.

React Features

Currently, ReactJS gaining quick popularity as the best JavaScript framework among web developers. It is playing an essential role in the front-end ecosystem. The important features of ReactJS are as following.

- JSX
- Components
- One-way Data Binding
- Virtual DOM
- Simplicity
- Performance



JSX

JSX stands for JavaScript XML. It is a JavaScript syntax extension. Its an XML or HTML like syntax used by ReactJS. This syntax is processed into JavaScript calls of React Framework. It extends the ES6 so that HTML like text can co-exist with JavaScript

react code. It is not necessary to use JSX, but it is recommended to use in ReactJS.

Components

ReactJS is all about components. ReactJS application is made up of multiple components, and each component has its own logic and controls. These components can be reusable which help you to maintain the code when working on larger scale projects.

One-way Data Binding

ReactJS is designed in such a manner that follows unidirectional data flow or one-way data binding. The benefits of one-way data binding give you better control throughout the application. If the data flow is in another direction, then it requires additional features. It is because components are supposed to be immutable and the data within them cannot be changed. Flux is a pattern that helps to keep your data unidirectional. This makes the application more flexible that leads to increase efficiency.

Virtual DOM

A virtual DOM object is a representation of the original DOM object. It works like a one-way data binding. Whenever any modifications happen in the web application, the entire UI is re-rendered in virtual DOM representation. Then it checks the difference between the previous DOM representation and new DOM. Once it has done, the real DOM will update only the things that have actually changed. This makes the application faster, and there is no wastage of memory.

Simplicity

ReactJS uses JSX file which makes the application simple and to code as well as understand. We know that ReactJS is a component-based approach which makes the code reusable as your need. This makes it simple to use and learn.

Performance

ReactJS is known to be a great performer. This feature makes it much better than other frameworks out there today. The reason behind this is that it manages a virtual DOM. The DOM is a cross-platform and programming API which deals with HTML, XML or XHTML. The DOM exists entirely in memory. Due to this, when we create a component, we did not write directly to the DOM. Instead, we are writing virtual components that will turn into the DOM leading to smoother and faster performance.

DINISH S

I B.Sc. (Computer Technology)

BEST WEBSITES FOR INTERNET DEVELOPERS

Internet Development has proven over the past few years to be a very steady career. Anyone who has chosen this as a career path or is interested in Internet development as a hobby knows that programming and information is constantly evolving. Therefore, it is important for anyone working in Internet development to stay on top of the latest trends and information. The staff at Best Computer Science Degrees is aware of this constant need for information and decided to compile a list of some great websites for Internet developers.

Associations

American Institute of Graphic Arts: The AIGA is an association for graphic artists, including those in the digital arts, such as Internet Developers and page designers.

Association for Women in Computing: The AWC is one of the first professional organizations for women in computing and is dedicated to promoting the advancement of women in computing.

Association of Information Technology Professionals: An association which seeks to advance the IT profession through professional development, support of IT education, and national policies on IT.

Association of Web Design Professionals: An association of Web design professionals to allow non-Web professionals to look for developers for work.

IEEE Computer Society: This society is a source for computer technology information, inspiration, and collaboration.

International Association of Computer - Science and Information Technology: The website for this professional organization with up-t0-date information about Internet developers.

International Webmaster's Association: This organization is the industry's recognized leader in providing educational and certification standards for Web professionals.

HTML Writer's Guild: A leading training organization for the Web design community.

Network Professional Association: The website of the leading organization for network computing professionals.

Society for Technical Communication: The website for the world's largest and oldest professional association dedicated to the advancement of the field of technical communication.

Web Professionals: An organization dedicated to the support of individuals who create, manage or market web sites.

Women in Technology: An organization promoting women in the technology field.

Websites-Magazines

Net Magazine: A magazine devoted to Web design.

PC Magazine: The website of the popular technology magazine.

Smashing Magazine: An online magazine for designers and developers, with a focus on

useful techniques and best practices in web design.

Speckyboy: A magazine for Web design news and resources.

Web Designer: A magazine about Web design and development news with free tutorials and guides.

Wired: The website of the magazine with technology news, trends and stories for computer scientists and programmers.

Blogs

Adaptive Path: A blog offering news about interface design.

Boxes and Arrows: A blog about design principals.

Cats Who Code: A blog about Web development.

Codea Tutorials: A blog about Codea and developing apps for the iPhone and iPad.

Coding Horror : A blog about Web development.

Creative Blog : The latest on Web design and related information.

CSS Globe: A blog about Web design news.

Digital Inspiration: A blog from top computer scientist Amit Agarwal, with how-to guides for computer software, consumer gadgets, and web apps.

Line 25: A blog about Web design.

Noupe: A blog about news and resources for Web development and design.

PHP Developer: News from sites and blogs about PHP, including tutorials.

John Resig : A blog from the JavaScript developer with thoughts about development of JavaScripts and Web applications.

Reefwing : A blog about coding and iPhone and iPad apps.

Signal vs. Noise: A blog by the company 37 Signals that discusses design and usability.

Snook: A blog about tips, tricks and bookmarks about Web development.

Spoongraphics : A blog focusing on graphics and Web design, which includes tutorials and free, downloadable resources.

Vandelay Design: A blog about Web design and development.

Wake Up Later: A website general web development related things, such as coding mistakes and improving productivity.

Web Designer Wall : A blog that features design ideas and elaborate, stunning tutorials, such as creating a CSS gradient Text Effect.

Webitect : A resource blog for Webmasters.

Web Monkey : A blog about HTML coding and the latest in website development news.

Women in Computing : A blog that supporting women in computing.

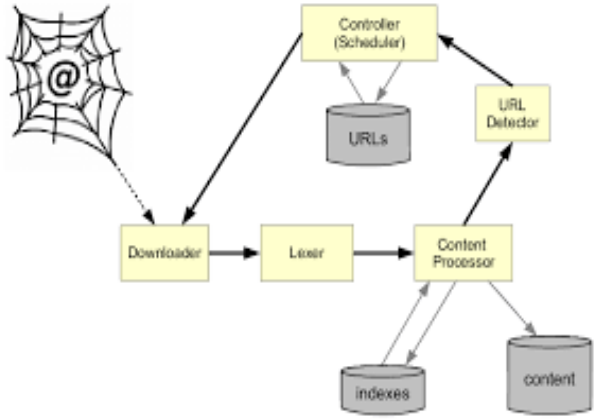
S.JAGADESH

III B.Sc. (Information Technology)

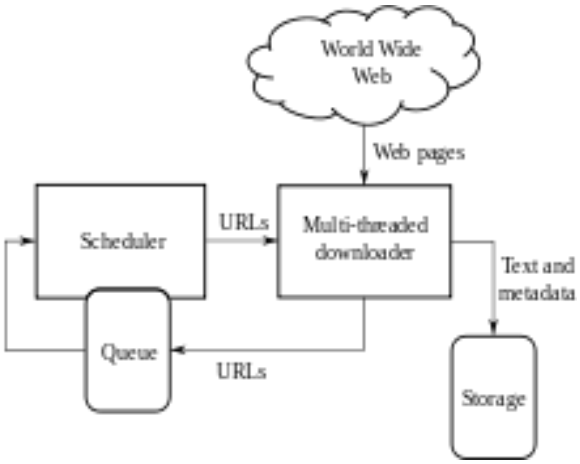
WEB CRAWLER

A web crawler (also known as a web spider or web robot) is a program or automated script which browses the World Wide Web in a methodical, automated manner. This process is called Web crawling or spidering. Many

legitimate sites, in particular search engines, use spidering as a means of providing up-to-date data.



Web crawlers are mainly used to create a copy of all the visited pages for later processing by a search engine that will index the downloaded pages to provide fast searches. Crawlers can also be used for automating maintenance tasks on a Web site such as checking links or validating HTML code. Also, crawlers can be used to gather specific types of information from Web pages such as harvesting e-mail addresses (usually for spam).



Crawlers consume resources on visited systems and often visit sites without approval. Issues of schedule, load, and "politeness" come into play when large collections of pages are accessed. Mechanisms exist for public sites not wishing to be crawled to make this known to the crawling agent. For example, including a robots.txt file can request bots to index only parts of a website or nothing at all.

The number of Internet pages is extremely large; even the largest crawlers fall short of making a complete index. For this reason, search engines struggled to give relevant search results in the early years of the World Wide Web, before 2000. Today, relevant results are given almost instantly.

Crawling policy

The behavior of a Web crawler is the outcome of a combination of policies:

- **re-visit policy** which states when to check for changes to the pages,
- **politeness policy** that states how to avoid overloading websites.
- **parallelization policy** that states how to coordinate distributed web crawlers.

While most of the website owners are keen to have their pages indexed as broadly as possible to have strong presence in search engines, web crawling can also have unintended consequences and lead to a compromise or data breach if a search engine indexes resources that shouldn't be publicly available or pages revealing potentially vulnerable versions of software.

Apart from standard web application security recommendations website owners can reduce their exposure to opportunistic hacking by only allowing search engines to index the public parts of their websites (with robots.txt) and explicitly blocking them from indexing transactional parts (login pages, private pages, etc.).

Crawler Identification

Web crawlers typically identify themselves to a Web server by using the User-agent field of an HTTP request. Web site administrators typically examine their Web servers' log and use the user agent field to determine which crawlers have visited the web server and how often. The user agent field may include a URL where the Web site administrator may find out more information about the crawler. Examining Web server log is tedious task and therefore some administrators use tools to identify track and verify Web crawlers. Spambots and other malicious Web crawlers are unlikely to place identifying information in the user agent field, or they may mask their identity as a browser or other well-known crawler.

It is important for Web crawlers to identify themselves so that Web site administrators can contact the owner if needed. In some cases, crawlers may be accidentally trapped in a crawler trap or they may be overloading a Web server with requests and the owner needs to stop the crawler. Identification is also useful for administrators that are interested in knowing when they may expect their Web pages to be indexed by a particular search engine.

Crawling the deep web

A vast amount of web pages lie in the deep or invisible web.[43] These pages are typically only accessible by submitting queries to a database, and regular crawlers are unable to find these pages if there are no links that point to them. Google's Sitemaps protocol and mod oai are intended to allow discovery of these deep-Web resources.

Deep web crawling also multiplies the number of web links to be crawled. Some crawlers only take some of the URLs in `<a href="URL">` form. In some cases, such as the Googlebot, Web crawling is done on all text contained inside the hypertext content, tags, or text.

Strategic approaches may be taken to target deep Web content. With a technique called screen scraping, specialized software may be customized to automatically and repeatedly query a given Web form with the intention of aggregating the resulting data. Such software can be used to span multiple Web forms across multiple Websites. Data extracted from the results of one Web form submission can be taken and applied as input to another Web form thus establishing continuity across the Deep Web in a way not possible with traditional web crawlers.

Pages built on AJAX are among those causing problems to web crawlers. Google has proposed a format of AJAX calls that their bot can recognize and index.

Visual Vs Programmatic crawler

There are a number of visual web scraper/crawler products available on the web which will crawl pages and structure data into columns and rows based on the users requirements. One of the main difference between a classic and a visual crawler is the level of programming ability required to set up a crawler. The latest generation of "visual scrapers" remove the majority of the programming skill needed to be able to program and start a crawl to scrape web data.

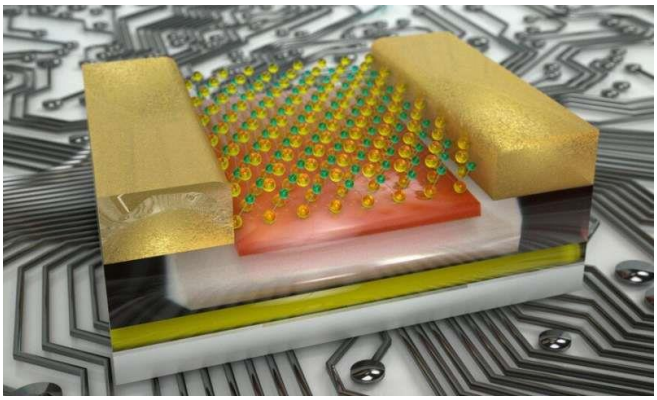
The visual scraping/crawling method relies on the user "teaching" a piece of crawler technology which then follows patterns in semi-structured data sources. The dominant method for teaching a visual crawler is by highlighting data in a browser and training columns and rows. While the technology is not new, for example it was the basis of needle base which has been bought by Google, there is continued growth and investment in this area by investors and end-users.

K. DURAIMURUGAM

I B.Sc. (Computer Technology)

COMPUTER CHIP WITH TWO HEADS

EPFL engineers have developed a computer chip that combines two functions logic operations and data storage into a single architecture, paving the way to more efficient devices. Their technology is particularly promising for applications relying on artificial intelligence.



It's a major breakthrough in the field of electronics. Engineers at EPFL's Laboratory of Nanoscale Electronics and Structures (LANES) have developed a next-generation circuit that allows for smaller, faster and more energy-efficient devices which would have major benefits for artificial-intelligence systems. Their revolutionary technology is the first to use a 2-D material for what's called a logic-in-memory architecture, or a single architecture that combines logic operations with a memory function. The research team's findings appear today in Nature.

Until now, the energy efficiency of computer chips has been limited by the von

Neumann architecture they currently use, where data processing and data storage take place in two separate units. That means data must constantly be transferred between the two units, using up a considerable amount of time and energy.

By combining the two units into a single structure, engineers can reduce these losses. That's the idea behind the new chip developed at EPFL, although it goes one step beyond existing logic-in-memory devices. The EPFL chip is made from MoS2, which is a 2-D material consisting of a single layer that's only three atoms thick. It's also an excellent semi-conductor. LANES engineers had already studied the specific properties of MoS2 a few years ago, finding that it is particularly well-suited to electronics applications. Now the team has taken that initial research further to create their next-generation technology.

The EPFL chip is based on floating-gate field-effect transistors (FGFETs). The advantage of these transistors is that they can hold electric charges for long periods; they are typically used in flash memory systems for cameras, smartphones and computers. The unique electrical proprieties of MoS2 make it particularly sensitive to charges stored in FGFETs which is what enabled the LANES engineers to develop circuits that work as both memory storage units and programmable transistors. By using MoS2, they were able to incorporate numerous processing functions into a single circuit and then change them as desired.

In-depth expertise

"This ability for circuits to perform two functions is similar to how the human brain works where neurons are involved in both storing memories and conducting mental calculations," says Andras Kis, the head of LANES. "Our circuit design has several advantages. It can reduce the energy loss associated with transferring data between memory units and processors, cut the amount of time needed for computing operations and shrink the amount of space required. That opens the door to devices that are smaller, more powerful and more energy efficient."

ARUNPRAKASH S

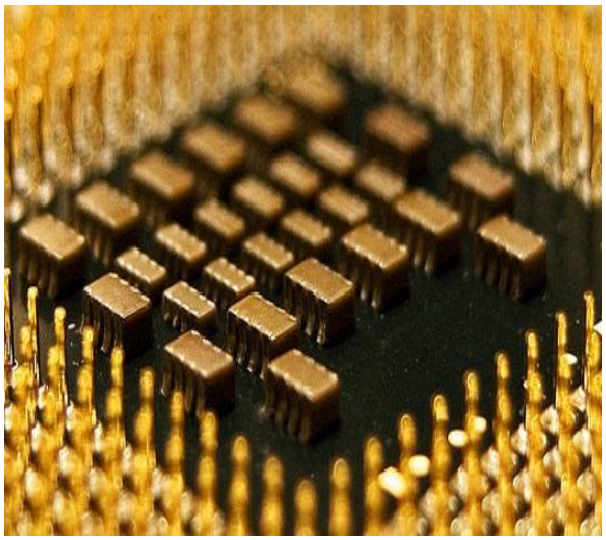
II B.Sc. (Information Technology)

PHASE-CHANGE MATERIALS INCREASE THE SPEED LIMIT FOR COMPUTERS

By replacing silicon with phase-change materials, new research shows that computers could be capable of processing information up to 1,000 times faster than currently models. The present size and speed limitations of computer processors and memory could be

overcome by replacing silicon with 'phase-change materials' (PCMs), which are capable of reversibly switching between two structural phases with different electrical states one crystalline and conducting and the other glassy and insulating in billionths of a second.

Modeling and tests of PCM-based devices have shown that logic-processing operations can be performed in non-volatile memory cells using particular combinations of ultra-short voltage pulses, which is not possible with silicon-based devices.In these new devices, logic operations and memory are co-located, rather than separated, as they are in silicon-based computers. These materials could eventually enable processing speeds between 500 and 1,000 times faster than the current average laptop computer, while using less energy.



The processors, designed by researchers from the University of Cambridge, the Singapore A*STAR Data-Storage Institute and the Singapore University of Technology and Design, use a type of PCM based on a chalcogenide glass, which can be melted and recrystallized in as little as half a nanosecond (billionth of a second) using appropriate voltage pulses. The calculations performed by most computers, mobile phones and tablets are carried out by silicon-based logic devices. The solid-state memory used to store the results of such calculations is also silicon-based. "However, as demand for faster computers continues to increase, we are rapidly reaching the limits of silicon's capabilities," said Professor Stephen Elliott of Cambridge's Department of Chemistry, who led the research.

The primary method of increasing the power of computers has previously been to increase the number of logic devices which they contain by progressively reducing the size of the devices, but physical limitations for current device architectures mean that this is quickly becoming nearly impossible to continue. Currently, the smallest logic and memory devices based on silicon are about 20 nanometers in size approximately 4000 times thinner than a human hair – and are constructed in layers. As the devices are made ever smaller in order to increase their numbers on a chip, eventually the gaps between the layers will get so small that electrons which are stored in certain regions of flash non-volatile memory devices will be able to tunnel out of the device,

resulting in data loss. PCM devices can overcome this size-scaling limit since they have been shown to function down to about two nanometers.

An alternative for increasing processing speed without increasing the number of logic devices is to increase the number of calculations which each device can perform, which is not possible using silicon, but the researchers have demonstrated that multiple calculations are possible for PCM logic/memory devices. First developed in the 1960s, PCMs were originally used in optical-memory devices, such as re-writable DVDs. Now, they are starting to be used for electronic-memory applications and are beginning to replace silicon-based flash memory in some makes of smartphones.

The PCM devices recently demonstrated to perform in-memory logic do have shortcomings: currently, they do not perform calculations at the same speeds as silicon, and they exhibit a lack of stability in the starting amorphous phase. However, the Cambridge and Singapore researchers found that, by performing the logic-operation process in reverse starting from the crystalline phase and then melting the PCMs in the cells to perform the logic operations – the materials are both much more stable and capable of performing operations much faster.

The intrinsic switching, or crystallization, speed of existing PCMs is about ten nanoseconds, making them suitable for replacing flash memory. By increasing speeds even further, to less than one nanosecond (as demonstrated by the Cambridge and Singapore researchers in 2012), they could one day replace computer dynamic random-access memory (DRAM), which needs to be continually refreshed, by a non-volatile PCM replacement.

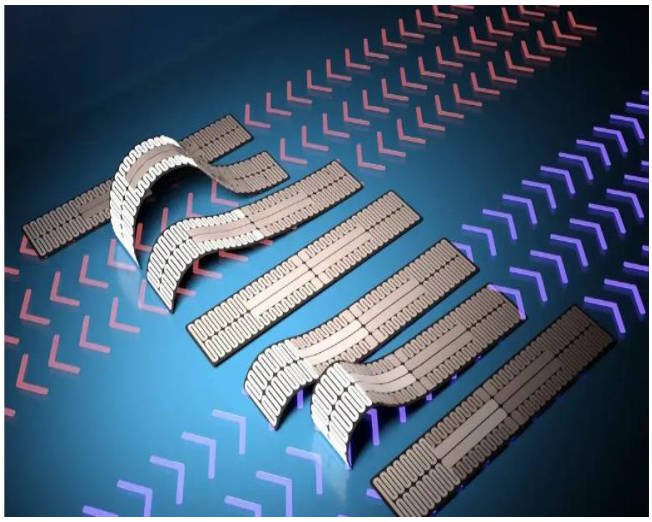
"Eventually, what we really want to do is to replace both DRAM and logic processors in computers by new PCM-based non-volatile devices," said Professor Elliott. "But for that to need switching speeds approaching one nanosecond. Currently, refreshing of DRAM leaks a huge amount of energy globally, which is costly, both financially and environmentally. Faster PCM switching times would greatly reduce this, resulting in computers which are not just faster, but also much 'greener'."

S. MIRUNALINI
III B.Sc. (Computer Technology)

A NEW APPROACH TO LOCOMOTION FOR SOFT ROBOTICS

Scientists at North Carolina State University have showcased a soft robot, designed like a caterpillar, capable of moving forward, backward, and squeezing through

tight spaces. The movement of this caterpillar-inspired robot is powered by a unique pattern of silver nanowires that use heat to regulate its bending, giving users the ability to direct the robot in any desired direction.



"A caterpillar's movement is controlled by local curvature of its body its body curves differently when it pulls itself forward than it does when it pushes itself backward," says Yong Zhu, corresponding author of a paper on the work and the Andrew A. Adams Distinguished Professor of Mechanical and Aerospace Engineering at NC State. "We have drawn inspiration from the caterpillar's biomechanics to mimic that local curvature, and use nanowire heaters to control similar curvature and movement in the caterpillar-bot.

Engineering soft robots that can move in two different directions is a significant challenge in soft robotics," Zhu says. "The embedded nanowire heaters allow us to control the movement of the robot in two ways. We can control which sections of the robot bend by controlling the pattern of heating in the soft robot. And we can control the extent to which those sections bend by controlling the amount of heat being applied."

The caterpillar-bot consists of two layers of polymer, which respond differently when exposed to heat. The bottom layer shrinks, or contracts, when exposed to heat. The top layer expands when exposed to heat. A pattern of silver nanowires is embedded in the expanding layer of polymer. The pattern includes multiple lead points where researchers can apply an electric current. The researchers can control which sections of the nanowire pattern heat up by applying an electric current to different lead points and can control the amount of heat by applying more or less current.

"The researchers also demonstrated that the caterpillar-bot's movement could be controlled to the point where users were able to steer it under a very low gap similar to guiding the robot to slip under a door. In essence, the researchers could control both forward and backward motion as well as how high the robot bent upwards at any point in that process.

"This approach to driving motion in a soft robot is highly energy efficient, and we're interested in exploring ways that we could make this process even more efficient," Zhu says. "Additional next steps include integrating this approach to soft robot locomotion with

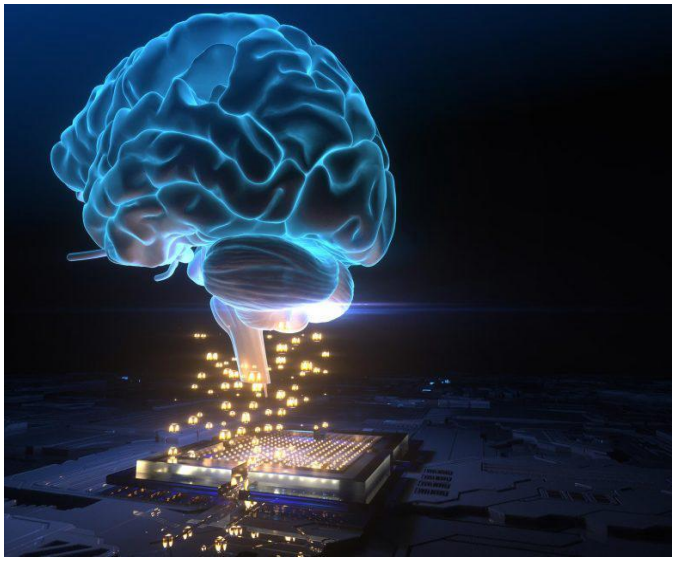
sensors or other technologies for use in various applications such as search-and-rescue devices."

J.KAVYA SHREE

II B.Sc. (Information Technology)

BRIDGE THE GAP BETWEEN HUMAN AND MACHINE VISION

Researchers identify a property that helps computer vision models learn to represent the visual world in a more stable, predictable way. *MIT* researchers found that adversarial training improves perceptual straightness in computer vision models, making them more similar to human visual processing and enabling better prediction of object movements.



Imagine sitting on a park bench, watching someone stroll by. While the scene may constantly change as the person walks, the human brain can transform that dynamic visual information into a more stable representation over time. This ability, known as perceptual straightening, helps us predict the walking person's trajectory. Unlike humans, computer vision models don't typically exhibit perceptual straightness, so they learn to represent visual information in a highly unpredictable way. But if machine-learning models had this ability, it might enable them to better estimate how objects or people will move.

MIT researchers have discovered that a specific training method can help computer vision models learn more perceptually straight representations, like humans do. Training involves showing a machine-learning model millions of examples so it can learn a task. The researchers found that training computer vision models using a technique called adversarial training, which makes them less reactive to tiny errors added to images, improves the models' perceptual straightness.

The team also discovered that perceptual straightness is affected by the task one trains a model to perform. Models trained to perform abstract tasks, like classifying images, learn more perceptually straight representations than those trained to perform more fine-grained tasks, like assigning every pixel in an image to a category. For example, the nodes within the model have internal activations that represent "dog," which allow

the model to detect a dog when it sees any image of a dog. Perceptually straight representations retain a more stable "dog" representation when there are small changes in the image. This makes them more robust.

By gaining a better understanding of perceptual straightness in computer vision, the researchers hope to uncover insights that could help them develop models that make more accurate predictions. For instance, this property might improve the safety of autonomous vehicles that use computer vision models to predict the trajectories of pedestrians, cyclists, and other vehicles.

S.M HARI VISHNUII
B.Sc. (Information Technology)

PUZZLES AND COMPUTATIONAL THINKING

Computational Thinking : exaHexaFlexagon Automata

- Make a red and yellow hexahexaflexagon by folding and gluing a multicoloured paper strip, following the algorithm. Once made you start to explore it. As you fold it up and unfold it, you magically reveal new sides as the flexagon changes colour. To explore it fully, you need a map. A graph seems a good representation, which you create as you explore.
- Learn about graphs, graph exploration algorithms, finite state machines (also called automata), specification, computational thinking, abstraction, data representation, computational modelling, generalisation and pattern matching, algorithmic thinking, evaluation, logical thinking.

Computational Thinking: Cut Hive Logic Puzzles

- Learn how to solve Cut Hive puzzles, simple logic puzzles that involve filling a hexagonal 'hive' with numbers so that no number appears next to itself. See how by deriving new general rules that extend the rules of the puzzle you unlock the power of pattern matching.
- Learn about logical thinking, deduction, rewrite rules, pattern matching, abstraction, generalisation and computational thinking.

Computational Thinking: Cut Block Logic Puzzles

Learn how to solve Cut Block puzzles, simple logic puzzles that involve filling a grid with numbers so that no number appears next to itself. See how by deriving new general rules that extend the rules of the puzzle you unlock the power of pattern matching.

Puzzle / Activity Sheets

- Sequencing and Looping Puzzles

Put events from life cycles in to a flow chart structure

- Learn about sequences, loops and design stages of coding
- Aimed at KS1 pre-coders

Pattern Matching Puzzles

- Pattern matching: spot them, complete them and spot the odd one out
- Learn about pattern matching and algorithmic thinking
- Puzzles for KS1-precoders upwards to KS5

Word Searches

- Solve word search puzzles and learn about computational thinking and search algorithms.
- Learn about linear search, algorithmic thinking, computational thinking.

Kriss-Kross Puzzles

- Solve these word puzzles as a way to develop logical thinking and pattern matching skills needed to enjoy both computing and maths, while practicing spelling.

Bakuro

- Solve simple logical thinking puzzles and gain a deeper understanding of binary and how it is based on powers of two.
- Learn about binary representation of numbers, logical thinking, computational thinking.

Number Hive Puzzles

- Solve simple logical thinking puzzles and gain a deeper understanding oflogical thinking and pattern matching.
- Learn about logical thinking, deduction, rewrite rules, pattern matching, abstraction, generalisation and computational thinking.

Cut Block Puzzles

- Solve simple logical thinking puzzles and gain a deeper understanding of logical thinking and pattern matching.
- Learn about logical thinking, deduction, rewrite rules, pattern matching, abstraction, generalisation and computational thinking.

Pixel Puzzles

- Solve simple logical thinking puzzles and gain a deeper understanding of image representation and compression.
- Learn about pixel representation of images, compression algorithms, data representation, logical thinking, computational thinking.

Compression Code Puzzles

- Solve simple puzzles about words that involve decoding compressed messages.
- Learn about compression algorithms, data representation, pattern matching, computational thinking.

Code Cracking Puzzles

- Solve code breaking puzzles and learn not just about codes but also language,

calculating frequencies and percentages.

- Learn about cryptographic algorithms, frequency analysis, algorithmic thinking, computational thinking.

The Chocolate Turing Machine

- Create "instruction tables" that solve computational problems.
- Learn about Turing machines, computation, symbol manipulation, low-level programming, data representation.

The Tour Guide Activity

- Devise a tour that gets a tourist from their hotel to all the city sights and back to their hotel.
- Learn about algorithms, sequences of instructions, graphs, data representation, computational thinking, requirements.

The Knight's Tour Activity

- Solve a puzzle where you must find a way for a knight to visit every square on a board exactly once.
- Learn about graphs, data representation, generalisation, abstraction, pattern matching computational thinking, graph traversal algorithms algorithms.

Magic: The Teleporting Robot Activity

- You put together a jigsaw that has 17 robots, but then put it together again and now it only has 16.
- Learn about computational thinking, human-computer interaction, usability, designing to prevent error.

The Swap Puzzle Activity

- Solve a puzzle, coming up with an algorithm that your team can follow faster than anyone else.
- Learn about algorithms, computational thinking, testing, efficiency.

Sherlock Syllogisms

- You just need very clear thinking to solve these pure logical thinking puzzles.Learn about: logical thinking

Lost Tomb Puzzles

- Work out where the lost tombs are without digging

Logical ThinkingComplexity of algorithms: Tantrix Rotation Puzzles

- Learn about the complxity of algorithms and the most famous equation in computer science.

SOWMIYA A
B.Sc. (Information Technology)

ALGORITHMIC TRADING

The capital market is quite a risky business. To tame the skill of trading, we need to develop an algorithm that simplifies the risk quantum in the financial market. Algo trading is an evolving concept which is already in place at the stock market companies. Let's

have a quick look on what is algorithmic trading and what does it do in resolving financial issues.

- Algorithmic trading is an automated trading strategy.
- It is a set of rules for the computer to execute the buy and sell stocks in the Financial Market.
- The trade engine is developed to generate profits at high speed and frequency with at most accuracy.
- Huge Volume of historical data is processed and compared to produce competitive gains.
- The factors influencing the trading algorithm are Time, Price, Volume and the Mathematical Model.

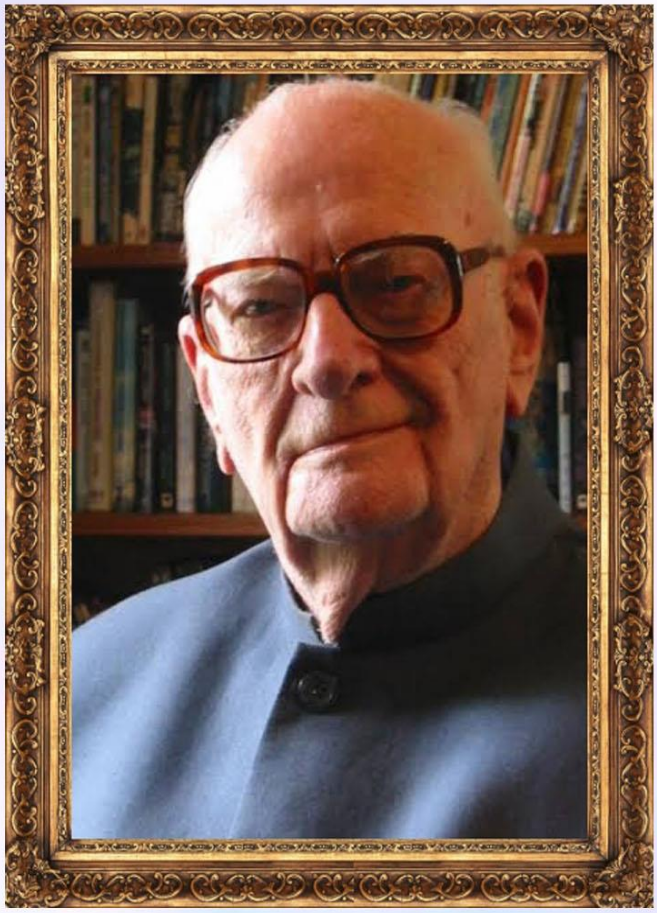
ALGO trading in the Financial Market

- Risk Management is achieved to a greater extent.
- Human error and emotional activity is completely discarded.
- A high volume of data is processed at a faster rate which is not possible for the human trader.
- Achieved at high speed with sharp accuracy.
- Highly efficient in processing the historical data which is backdated for 10 years.

Programming languages for ALGO Trading

The performance of the library functions, the complexity of development, testing and resilient, separation of concerns, widely used, maintenance, density of source code, licensing costs and the overall achievement rate are to be considered while choosing a programming language. A trading engine is a tool that will be updating for every nuance of market changes. The programming language which is capable of adapting to various market changes with a rich scientific library will be suited for the trading platform. The languages such as C++, C#, Julia, Java, Python, R, and MatLab possess high-performance libraries and packages for essential data structure and algorithmic manipulation. C++ loaded with the Standard Template Library, whereas Python comes with NumPy/SciPy and pandas. Usual mathematical functions can be found in these libraries. It is a rare case to write a new computational model.

Thus Algorithmic trading provides a new system of trading which makes the financial markets, being technologically sound with data manipulation and backtesting. It is so made possible by creating curative program modules to land in enormous economic gain.



ANY SUFFICIENTLY ADVANCED TECHNOLOGY IS INDISTINGUISHABLE FROM MAGIC

- ARTHUR C CLARKE