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INTRODUCTION TO COMPUTER ASSISTED LEARNING (CAL)

Computer assisted learning is the future, and that future is now. Education, as a process and discipline, is mainly concerned with imparting knowledge, methods of teaching, and providing/maintaining a conductive learning environment as opposed to informal education and other means of socialization. Computer assisted learning (CAL), as the name implies, is the use of electronic devices/computers to provide educational instruction and to learn. Computer assisted learning can be used in virtually all fields of education, ranging from TV/DVD play-learn program for kindergarten kids to teaching quadruple bypass surgery techniques in medicine. CAL is developed by combining knowledge from all fields of education/learning, human computer interaction (HCI) and cognition.

Today, classical education methods are rapidly being replaced with virtual education, online school, and distance learning systems. Boosted by improved visualization and data transmission technologies, it is now quite easy to create computer software programs that display and analyze graphic multidimensional data for human interpretation. This has become an integral part of education and is frequently used to develop and make attractive presentations in subjects that are difficult for students to understand without proper illustration.

With due regard to this work, we will simply define computer assisted learning as the tutoring, learning, and interacting process facilitated through the use of computers. The main edge/advantage that CAL has over education methods is interaction. Computers can stimulate and arouse the active interest of students during the learning process at multiple levels. For example, on one level, it facilitates the interest of students in the learning material or the content being taught (for example a DVD tutorial on how to handle spreading fire). On a higher level, computers can facilitate live/active teaching interaction between the students and the tutor or among the students themselves and moderated by the tutor. The concept of human interaction with computers has been on since the introduction of household electronic devices in the late 1980s. However, this only began to happen in the last decade due to aggressive mobile technology revolution and Internet that promotes inexpensive and reliable communication across the globe.

Computer assisted learning (CAL) is also known as computer assisted instruction (CAI). By playing and using materials stored on DVDs, mobile phones, and other web-based resources, learning becomes more attractive and dynamic, and offers the students entertaining avenues to showcase their listening and learning skills. It boosts the students'

confidence in solving the tasks they are assigned and therefore improves the quality of what they have learnt.

Ever since the CAL programs were introduced as a modern teaching method, as opposed to the traditional teacher-centered classroom system, a growing number of concerns have been raised about the efficiencies of the CAL teaching method. Sometimes, teachers do show anxiety about CAL because they fear the computers could take over their jobs. Secondly, most of the technologies used in CAL are new and therefore teachers need training to become familiar with the new technology. Teachers are required to test run the system before the class begins and to anticipate and fix technical glitches that might occur during the class. If the generation gap is taken into consideration, the teachers who volunteer to use the CAL program have to adjust their orientation and competence to what could seem a completely new teaching system.

Computer Assisted Learning Terminologies

Below are some of the terms and acronyms used in the field of Computer assisted learning, though the terms may vary according to domain or specificity.

Terminology	Meaning
CBT	Computer Based Training/Test
CAI	Computer Assisted Instruction
CAL	Computer Assisted Learning
WBT	Web Based Training/Tutorial
CALL	Computer Assisted Language Learning
WBI	Web Based Instruction

Basic Goal of Computer Assisted Learning

The use of computer information technology and networks is becoming indispensable in almost every profession. Recent changes in education concepts as well as new business and technical innovations are all computer-centered. As a result, educational institutions have to modify their curriculum and teaching methods to be computer-compliant. The basic goal of CAL is to stimulate and develop the assimilation/learning capacity of students, increase the effectiveness and productivity teachers with the help of computer based technology and update students' knowledge to current trends as most of the concepts outside the last decade are gradually getting out of date. Computer technology should therefore be an integrated part of the education system. Another objective of CAL is to develop easily understandable and attractive tutorials and demonstrations of the field they are employed in.

Computer Assisted Learning Assessment Tools

Multiple Choice Questions: Mainly used for computer based tests, this type of exercise is used to assess a students' understanding of things they have been taught. It is used for CBTs. Fill-in the Gap: Also used for CBTs, the student is required to type text in gaps/spaces where some of the words are missing. The student has to provide suitable words to solve the exercise. The test can be easily done within a few minutes and can be created with inexpensive software such as Hot Potato.

Find the Answers: In this test, the student(s) are given questions and they have to looks for the answers on their own in e-libraries or by using the Internet. The answers may be submitted to the teacher in various required submission formats. Scrabble/Crossword Puzzles: Crossword puzzles are mainly used in computer assisted language learning or at the basic education level. They can be created from the vocabulary that students have just been learning and the game can be played during leisure hours.

Online Interactive Chat: Group chats can be a good learning avenue for students and teachers to share ideas online through text or speech. It is pretty easy to set up a group chat server using a social media tool. However, it can sometimes be difficult to moderate and it can become boring if there are only few users online in the chat room. When run with tasks and suitable groups of students (age groups, interests, etc.) chats can result into exciting communication, especially when post chat task are issued in the end in the instructor.

Drills: Real life scenario drills can be computer simulated to prepare the students for real on-field challenges. Drills can be carried out using software programs specially formulated for the purpose. Computer simulated drills can be expensive to organize, particularly when special equipments are required and also require high level of computer skill.

WebQuest: A WebQuest is an exercise where the students are required to provide answers to questions on issues mostly found on the web. WebQuest is meant to develop the student's skill on using/analyzing provided information rather than looking for it. In this case, the teacher will provide the students with the needed internet links to the exercise.

Adventure Games: These are computer simulated role-plays where the student is presented with a situation that he/she has to deal with and pass. The student has to be fast in analyzing the game and inputting the result either as text, by manipulating the game's controls, or by clicking on certain options. At the end of the game, the program gives feedback on the player's performance.

Listening Exercises: For these exercises, the computer replaces the tape recorder. The computer is connected to a sound system. Students are required to listen attentively to an audio recording being played from the computer. Podcasts, audio CD/DVD, audio streams, etc., are often used. This exercise is used to promote listening skills in students. It can be followed immediately with multiple choice exercises if the students have grasped the content.

Visualization Tools for CAL

Visualization is an important aspect of CAL. Seeing is believing; that is, students grasp what they are taught better when the lecture is properly illustrated for them to see. 3D objects can easily be created and refined using 2D plots. Traditional tools for visual demonstration such as photographs, sketches, maps, and renderings are now grossly inadequate for teaching a subject/course that requires attention to detail. The new visualization tools include 3D computer models, video demonstration, animations, colored computer maps, etc.

Today, visual CAL tools are used in a wide range of disciplines to illustrate and demonstrate important concepts, for presentation as well as for teaching purposes. The visualization hardware should be portable, while the software should be able to run on most computers with minimal configuration. The teaching technique should be flexible for the students to visualize the demonstration comfortably. The students/user should be able to adjust the viewing angle and to expand/retract certain parts of the concept being viewed.

The most popular software tool for developing visual programs is JAVA. With JAVA, one can easily write and build software that can run on different platforms without much modification. JAVA can be combined with HTML and VRML to create portable and interactive web-based applications.

Below are some older recording formats and the digital formats they can be converted to:

Classic Format	Digital Format
Cassette tape	CD, MP3
VHS	CD, DVD
Paper books	e-books
Journals	Blog, website
Library	e-library

When students submit an assignment in electronic form, it would be lazy for the teacher just to print it out on paper and comment/mark it with red ink. It would be better if the teacher inserts red flagged comments into the submitted texts text using a word processor or other dedicated programs to perform e-correction/commenting.

Advantages of CAL

CAL provides many advantages to the education sector. These include

Self-Paced/ Self-Directed Learning: Since the students have greater control over the CAL process, they can decide on their pace of learning. Students can study as fast or as slowly as they like through a course. If they want to repeat some task or review some material again, they can do so as many times as they choose. They can also skip over a topic if they already know about it. This saves time and makes teaching more efficient. Similarly, students can choose what they want to learn and in what order, as students have different learning styles and strategies.

This offers a solution to the issue of slow and fast learners. With CAL, each student can study at his/her own pace. The slow learners will not feel frustrated if they are unable to keep up with the others since they can always review the lesson when it is opportune to study. While managing their own learning pace, students become more responsible and more aware of the implications of the learning style/strategy they choose to adopt. Web-based adaptive educational systems (WAES), for example, adapt to the student, and provide different levels of data, assessment, and feedback for the student's perusal.

Improved Computer Skill: By interacting often with computers, students who are not computer-literate will be compelled to develop/improve their computer skills and it also gives them a sense of collaboration when two or more students have to share a computer. As their computer competence gets better, the students will be encouraged to use computers more in doing their work.

Visualization: Naturally, a student becomes more alert when a computer-based learning/test is going on. There is a sense of anticipation that makes the student more attentive when learning the lesson. Students are better motivated visually by multimedia materials and listening is supported by seeing. This boosts students' natural way of learning.

Learning Efficiency: With CAL, students are better able to pick up concepts or skills faster and with less effort and also retain what they have learned longer. Consequently they would require less teacher time.

Sensory Stimulation: Humans are multi-sensory beings as we can receive and process information. According to Fletcher (1990), people remember 20% of what they hear, 40% of what they have seen and heard and 75% of what they see, hear and do. Since the computer can stimulate the various human senses and present data in a different media can spice up the learning process. Computers encourage learning as they promote enthusiasm and provide stimulating environment.

Communication Development: Chats and videoconference help in the development of writing, speaking, and communication skills. They provide speaking practice through debates and opinion chats. Sometimes, this does not involve the teacher's formal assessment.

Content/Lesson-Centered: Unlike a traditional class that is teacher-centered, the computer-based class shifts the student's attention from the teacher to the lesson/content being taught. The student benefits from a lesson-centered teaching approach. Students give direct attention to the computer(s) in front of them, which makes them feel more comfortable with their lesson.

Enthusiasm: Generally speaking, the use of computer technology in education makes the class more appealing and interesting. It maintains students' attention and stimulates their motivation to actively participate in the class.

Implements of CAL

The first time computers are introduced into the teaching process, the students may not be familiar with what is going to be presented before them and this may result in general anxiety. If the students (particularly older students) are not computer-literate, computer anxiety is another issue the teacher will have to deal with. In this environment, it would take considerable time before students become comfortably adapted to CAL.

In a computer-based self-assessment class where students have to be left on their own, they may become overwhelmed by the amount of data they are handling. As a result of this, excessive use of multimedia relays should be avoided at the first introduction of CAL and the teacher has to place more emphasis on the content being taught because often the students' attention is focused on the computer.

There is also an undesirable state when the students become so excited with what they are seeing on the computer that they hardly pay attention to what is being taught. They may get fascinated by the multimedia images to the point that, at the end of the class, they wouldn't have grasped the core concepts of the lesson or just half-heartedly do their follow the lecture as their mind is "far away." The younger the students, the more likely this will happen.

Agreed that providing attractive presentations is an integral part of CAL, the most important objective of the lecture is that the students learn and understand what is being taught; otherwise, the introduction of computers into the learning process will not be effective. The teacher should try to maintain equilibrium in student-computer interaction. The teacher should regularly check the students to make sure they are learning by asking questions on what is being taught. Though the

computer may stimulate students' interest and make them understand a course better, it is the teachers' duty to ensure that students learn and can expressively demonstrate what they have learnt confidently.

The impediments associated with computer assisted learning are not related to the computer programs, but how to teach with them. The snag with CAL is chiefly the low-level pedagogic (methods and activities of teaching) strategies of teaching/learning with ICT systems. A thorough pedagogical review should be initiated to provide guidelines on the use of computer technology in classes.

To overcome computer anxiety, the use of computers should be encouraged among students and teachers and practical computer skill classes should be infused in the educational curriculum. Depending on the resources available, post-nursery/primary computer should be made mandatory in order to speed up the level of computer literacy among all students.

B. A. AKSHAYA SHREE
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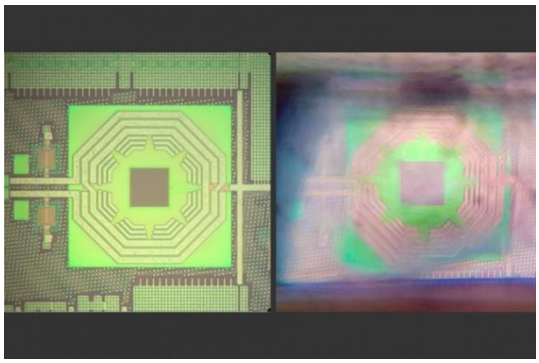
QUANTUM SENSING ON A CHIP



Researchers integrate diamond-based sensing components onto a chip to enable low-cost, high-performance quantum hardware. MIT researchers have, for the first time, fabricated a diamond-based quantum sensor on a silicon chip. The advance could pave the way toward low-cost, scalable hardware for quantum computing, sensing, and communication.

"Nitrogen-vacancy (NV) centers" in diamonds are defects with electrons that can be manipulated by light and microwaves. In response, they emit colored photons that carry quantum information about surrounding magnetic and electric fields, which can be used for biosensing, neuroimaging, object detection, and other sensing applications. But traditional NV-based quantum sensors are about the size of a kitchen table, with expensive, discrete components that limit practicality and scalability.

The researchers demonstrated the sensor's use for magnetometry, meaning they were able to measure atomic-scale shifts in the frequency due to surrounding magnetic fields,

which could contain information about the environment. With further refining, the sensor could have a range of applications, from mapping electrical impulses in the brain to detecting objects, even without a line of sight. “It’s very difficult to block magnetic fields, so that’s a huge advantage for quantum sensors,” says co-author Christopher Foy, a graduate student in the Department of Electrical Engineering and Computer Science (EECS). “If there’s a vehicle traveling in, say, an underground tunnel below you, you’d be able to detect it even if you don’t see it there.”

Shrinking and stacking

NV centers in diamonds occur where carbon atoms in two adjacent places in the lattice structure are missing one atom is replaced by a nitrogen atom, and the other space is an empty “vacancy.” That leaves missing bonds in the structure, where the electrons are extremely sensitive to tiny variations in electrical, magnetic, and optical characteristics in the surrounding environment.

The NV center essentially functions as an atom, with a nucleus and surrounding electrons. It also has photoluminescent properties, meaning it absorbs and emits colored photons. Sweeping microwaves across the center can make it change states positive, neutral, and negative which in turn changes the spin of its electrons. Then, it emits different amounts of red photons, depending on the spin.

A technique, called optically detected magnetic resonance (ODMR), measures how many photons are emitted by interacting with the surrounding magnetic field. That interaction produces further, quantifiable information about the field. For all of that to work, traditional sensors require bulky components, including a mounted laser, power supply, microwave generator, conductors to route the light and microwaves, an optical filter and sensor, and a readout component.

The researchers instead developed a novel chip architecture that positions and stacks tiny, inexpensive components in a certain way using standard complementary metal-oxide-semiconductor (CMOS) technology, so they function like those components. “CMOS technologies enable very complex 3-D structures on a chip,” Ibrahim says. “We can have a complete system on the chip, and we only need a piece of diamond and green light source on top. But that can be a regular chip-scale LED.”

NV centers within a diamond slab are positioned in a “sensing area” of the chip. A small green pump laser excites the NV centers, while a nanowire placed close to the NV centers generates sweeping microwaves in response to current. Basically, the light and microwave work together to make the NV centers emit a different amount of red photons with the difference being the target signal for readout in the researchers’ experiments.

Below the NV centers is a photodiode, designed to eliminate noise and measure the photons. In between the diamond and photodiode is a metal grating that acts as a filter that absorbs the green laser photons while allowing the red photons to reach the photodiode. In short, this enables an on-chip ODMR device, which measures resonance frequency shifts with the red photons that carry information about the surrounding magnetic field. But how can one chip do the work of a large machine? A key trick is simply moving the conducting wire, which produces the microwaves, at an optimal distance from the NV centers. Even if the chip is very small, this precise distance enables the wire current to generate enough magnetic field to manipulate the electrons. The tight integration and codesign of the microwave conducting wires and generation circuitry also help. In their paper, the researchers were able to generate enough magnetic field to enable practical applications in object detection.

Only the beginning

The sensor could be used even in neuro imaging applications. That means putting the sensor near neurons, where it can detect the intensity and direction of firing neurons. That could help researchers map connections between neurons and see which neurons trigger each other.

S.HARITHA
II B.Sc. (Computer Technology)

FOG COMPUTING

Fog computing is a service started by networking giant, CISCO. It would be very difficult to define fog computing without first defining cloud computing, since fog computing is basically an extension of the cloud.

Cloud computing is the process of running ICT tasks and services and storing computer resources over the Internet. This makes it possible for people and businesses to make use of third-party hardware and software hosted online. Cloud computing makes it quite easy to access information and computer resources from anywhere so far as internet connection is available. With the all-round availability of shared/pooled computing resources, cloud computing offers advantages over traditional on-site hosted services in terms of speed, cost, and efficiency.

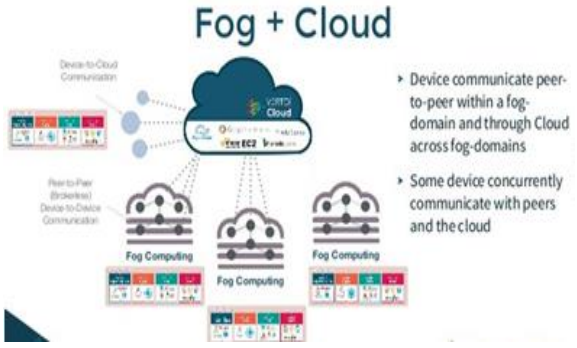
Though cloud computing works just fine presently, it relies heavily on the bandwidth made available, which depends on the capacity of the network service provider. With billions of users processing, sending and receiving data in and out of the cloud, the system becomes increasingly cogged up.

Fog computing (also known as fogging), on the other hand, is the extension or lowering of cloud computing capabilities to the bottom/edge of the network in order to provide faster ICT (communication, storage, software, etc.) services to the lower end users. Therefore,

what distinguishes fog computing from cloud computing is its closer proximity to small end users, its wider consumer reach, and better mobility.

Rather than requiring devices to go through the network backbone infrastructure, fog computing permits devices to connect directly with their destination with ease and allows them to handle their connections and tasks any way they deem fit. As a result, fog computing improves quality of service, reduces latency, and gives a more satisfactory user experience.

Fog computing smoothly supports the emerging internet of things (IoE) properties (vehicles, home appliances, and even clothes) that are embedded with sensors to enable them to send/receive data. Fog computing can be implemented using a basic communication system as opposed to being implemented using a heavy backbone network. As a result, it has a denser coverage. This advantage makes it easier to run a real-time, big-data operation with the ability to support billions of nodes in highly dynamic, diverse environments.



Fog computing expands cloud computing by serving as an intermediate between mobile devices and the cloud. This gives rise to three layer architecture as shown below:

The middle fog layer consists of servers that are installed at the edge of IP networks. It is supported by limited data storage, computer and wireless communication tools. The basic role of fog servers is to connect the cloud directly to mobile users. Fog servers can directly connect with mobile devices using wireless means such as Bluetooth or Wi-Fi. They are independently able to provide ready on-demand service to IoT devices without falling back on an IP network, as they have their own data processing capabilities with pre-cached contents. ISO/IEC 20248 has made available an identification system for IoT-capable devices to be detected using automated identification data carriers (AIDCs), RFID tags or barcodes that can be read and verified to enable connection to the fog.

Potential for New Application Services

Fog computing has the potential to support a new set of innovative applications and services:

- **Smart Switching Systems:** Devices that require constant switching to alternative service providers in case of their main service provider becomes unavailable can automatically switch to

alternative service if the sensor embedded in the device feels the need to do so. For example, if a network gateway is becoming congested, the device will automatically switch to another network.

- **Smart Cities:** The use of self-regulating technological systems to keep an area well organized would give rise to smart cities. For example, traffic light sensors that spot holdups on a particular road can delay/divert traffic to less congested roads in order to free up the congested road.
- **Smart Home Appliances:** Sensors embedded in self-maintaining home appliances can enable them to monitor their components and environment. If they detect anomalies, they send an automatic alert to the owner with a detailed report of the problem.

With fully deployed fog computing systems, business service providers across industries can develop, run, and manage their assets directly through networked devices. This includes IP video cameras, switches, and hardened routers.

Fog computing makes it much easier to manage the large amount of data that will be generated in a fully connected world. It will result in the introduction of better products and services, such as self-regulating, self-organizing, and self-diagnosing products. For now, some parts of the world are already using reliable 4G technologies, while the rest of the world is gradually catching up. We now have mobile devices that can rival many PCs in terms of processing power.

It is therefore imperative for us to move from relying on traditional network service providers having huge data flow back and forth over networks to central data centers, in order to avoid looming bandwidth and latency bottlenecks. It makes sense to build an intermediate layer on the edge of the network to support backbone network infrastructure. Fog computing does not aim to replace, but to help reduce processing and bandwidth burden of cloud systems.

Advantages of Fog Computing

Unified Expanded Coverage: IoT devices are usually distributed over large areas, including mobile environments such as vehicles, railways, and utility substations. Fog nodes can be comfortably installed on all these devices without the need for extensive configuration.

This way, a large unified fog platform is developed to cover a wide area. Any device can connect to the fog so long as it is within the range of the fog node.

Efficient Data Management: Fog computing systems can be programmed to control, reduce, and organize data produced by IoT devices. Required data is collected, analyzed, and cached at the network edge, while less sensitive data is sent to the cloud for backup or further analysis.

Redundancy and Failover: Fog servers, routers, and switches are built with hi-intelligence technology. This enables network-wide intelligence and resilience to enable its scale and manage millions of new endpoints and applications. Fog computing increases reliability and availability of service for IoT devices and data.

Improved Security and Privacy: Cisco security systems are extended from the cloud down to the fog. Biometric authentication checks such as fingerprint, face, keystroke, touch-based or other authentication methods in mobile and cloud computing are also applicable to fog computing. Privacy protection cryptology such as differential privacy can be implemented between the fog and cloud to ensure non-disclosure of personal records. Hence organizations can reap benefits of the fog without sacrificing customer security and privacy.

Lower Operating Expenses: Fog data services conserve network bandwidth, as less of the data is analyzed and stored. Also, as a result of the automatic maintaining and self-troubleshooting capabilities of IoT devices, organizations' operating expenses are drastically reduced.

New Opportunities and Innovation: Fog services will increase business opportunities by spawning development of new services. Business owners can accurately monitor their assets deployed in the field, closely study customer behavior, introduce new trends, and ultimately generate more revenue as quality of service is improved.

Advocates of cloud computing might boast that majority of the world's computing operations will be done from the cloud in the near future. What they do not disclose is that sending data in and out of remote cloud servers can be very tasking and requires heavy bandwidth provided by an expensive, high-speed IP network backbone. As device manufacturers begin to churn out IoT-compliant devices, everything from baking ovens to commuter buses are being embedded with sensors. At the rate data is being generated presently, mobile networks will soon be unable to cope with demand for faster bandwidth.

Fog computing solves this problem by forming a bridge between IoT devices and the cloud. Fog computing was developed to satisfy the predictable service demands of mobile

users. Fog servers are developed with three-dimensional hardware resources (communication, compute, and storage) required to discharge their duties efficiently. Fog computing also brings with it improved service delivery, better bandwidth, and network management and improved security and privacy. Therefore, fog computing is the future deal-breaker.

S.AISWARYA

III B.Sc. (Computer Technology)

MACHINE LEARNING PREDICTS BEHAVIOR OF BIOLOGICAL CIRCUITS

Biomedical engineers have devised a machine learning approach to modeling the interactions between complex variables in engineered bacteria that would otherwise be too cumbersome to predict. Their algorithms are generalizable to many kinds of biological systems.

In the new study, the researchers trained a neural network to predict the circular patterns that would be created by a biological circuit embedded into a bacterial culture. The system worked 30,000 times faster than the existing computational model.

To further improve accuracy, the team devised a method for retraining the machine learning model multiple times to compare their answers. Then they used it to solve a second biological system that is computationally demanding in a different way, showing the algorithm can work for disparate challenges.

The results appear online on September 25 in the journal Nature Communications."This work was inspired by Google showing that neural networks could learn to beat a human in the board game Go," said Lingchong You, professor of biomedical engineering at Duke.

"Even though the game has simple rules, there are far too many possibilities for a computer to calculate the best next option deterministically," You said. "I wondered if such an approach could be useful in coping with certain aspects of biological complexity confronting us."

The challenge facing You and his postdoctoral associate Shangying Wang was determining what set of parameters could produce a specific pattern in a bacteria culture following an engineered gene circuit.

In previous work, You's laboratory programmed bacteria to produce proteins that, depending on the specifics of the culture's growth, interact with one another to form rings. By controlling variables such as the size of the growth environment and the amount of nutrients provided, the researchers found they

could control the ring's thickness, how long it took to appear and other characteristics.

By changing any number of dozens of potential variables, the researchers discovered they could do more, such as causing the formation of two or even three rings. But because a single computer simulation took five minutes, it became impractical to search any large design space for a specific result.

For their study, the system consisted of 13 bacterial variables such as the rates of growth, diffusion, protein degradation and cellular movement. Just to calculate six values per parameter would take a single computer more than 600 years. Running it on a parallel computer cluster with hundreds of nodes might cut that run-time down to several months, but machine learning can cut it down to hours.

"The model we use is slow because it has to take into account intermediate steps in time at a small enough rate to be accurate," said You. "But we don't always care about the intermediate steps. We just want the end results for certain applications. And we can (go back to) figure out the intermediate steps if we find the end results interesting."

To skip to the end results, Wang turned to a machine learning model called a deep neural network that can effectively make predictions orders of magnitude faster than the original model. The network takes model variables as its input, initially assigns random weights and biases, and spits out a prediction of what pattern the bacterial colony will form, completely skipping the intermediate steps leading to the final pattern.

While the initial result isn't anywhere close to the correct answer, the weights and biases can be tweaked each time as new training data are fed into the network. Given a large enough "training" set, the neural network will eventually learn to make accurate predictions almost every time.

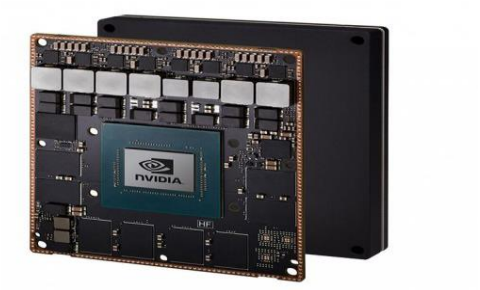
To handle the few instances where the machine learning gets it wrong, You and Wang came up with a way to quickly check their work. For each neural network, the learning process has an element of randomness. In other words, it will never learn the same way twice, even if it's trained on the same set of answers.

The researchers trained four separate neural networks and compared their answers for each instance. They found that when the trained neural networks make similar predictions, these predictions were close to the right answer.

The researchers are now trying to use their new approach on more complex biological systems. Besides running it on computers with faster GPUs, they're trying to program the algorithm to be as efficient as possible.

ARTIFICIAL INTELLIGENCE FOR EVERYONE

Artificial Intelligence (AI) is based on algorithms, and thus, being software, it can run on any hardware with the appropriate power. For this reason, some experts say that it's wrong to talk about "AI chips". However, this is precisely the field in which several of the main technological leaders are working: microprocessors that can more effectively handle AI algorithms such as deep learning**.**



At the Consumer Electronics Show (CES) Intel has revealed that it is working in collaboration with Facebook to produce a new AI chip during the second half of this year. The Intel microprocessor promises compatibility with leading AI software systems and greater efficiency for automated learning tasks than generic chips. However, experts warn that Intel will have to compete with the processor launched by Nvidia last year, as well as with other leading companies and small startups that this year will also begin to flood the market with new specialised chips.

VARSHA R

III B.Sc. (Information Technology)

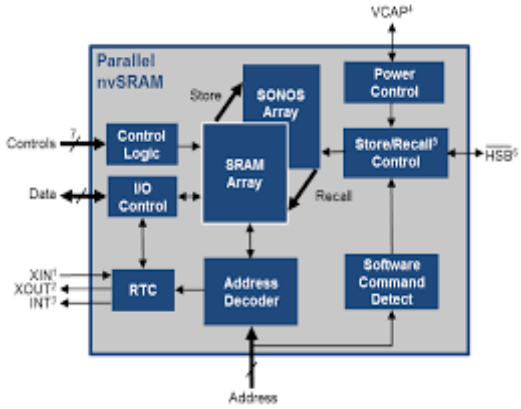
nvSRAM

vSRAM is a type of non-volatile random-access memory (NVRAM). It is similar in operation to static random-access memory (SRAM). nvSRAM is one of the advanced NVRAM technologies that is fast replacing the BBSRAMs; battery-backed static random-access memory, especially for applications that need battery free solutions and long term retention at SRAM speeds. nvSRAMs are used in a wide range of situations networking, aerospace, and medical, among many others where the preservation of data is critical and where batteries are impractical. Some products named nvSRAM are available from Cypress Semiconductor, which is a combination of SRAM and SONOS based non-volatile memory. But they seem to have different internal structure from the memory cells in referenced books.

It is faster than EPROM and EEPROM solutions. There are other nvSRAM products from Maxim Integrated, those are essentially BBSRAMs. They have a lithium battery built into the SRAM package. These are faster than EPROM and EEPROM solutions. Externally, nvSRAM looks like standard SRAM. However, on the inside, an nvSRAM is capable of doing more than a standard SRAM. While SRAM can read and write, nvSRAM can read, write, store and recall. The additional operations center around the non-volatile part of nvSRAM. When reading and writing, an nvSRAM acts no

differently than a standard async SRAM. The attached processor or controller sees an 8-bit SRAM interface and nothing else. The STORE operation stores data that is in a SRAM array in the non-volatile part. Cypress and Simtek nvSRAM have three ways to store data in the non-volatile area. They are:

1. Autostore
2. Hardware store
3. Software



Autostore happens automatically when the data main voltage source drops below the device's operating voltage. When this occurs, the power control is switched from Vcc to the capacitor. The capacitor will power the chip long enough to store the SRAM contents into the non-volatile part. The HSB (Hardware Store Busy) pin externally initiates a non-volatile hardware store operation. Using the HSB signal, which requests a non-volatile hardware STORE cycle, is optional. Software store is initiated by a certain sequence of operations. When the defined operations are done in sequence, the software store is initiated.

Applications

Data logging is one main area where nvSRAMs are needed. POS terminals/smart terminals are now able to approve payment transactions without having to obtain approval from a remote server. Because secure data resides in the terminal, a lot of time could be saved in terms of the over-the-air verification which is slow as well as intrusion prone. Motor vehicle crash boxes are another area where nvSRAMs could be employed effectively. The vehicle state data at the time of the crash can go a long way in validating the claims and finding the reason of the crash. This has huge financial implications in the insurance industry, and the concept of having crash boxes in passenger/commercial vehicles could become a de facto standard in near future. nvSRAMs with their fast read/write capabilities is a good fit for this application.

Similar critical applications such as medical equipment and high end servers can use nvSRAMs to store their data. In case of external power failure, or unforeseen calamities, nvSRAM can hold the data without external intervention (autostore feature). Hence it would provide the flexibility of an EEPROM but at SRAM speeds. Applications in environments where field service is not possible/costly such as data loggers spread across geographies, routers, equipment in inhospitable conditions can use nvSRAMs, because nvSRAM does not use batteries, which

have a risk of exploding/releasing harmful chemicals in harsh environments. In short, nvSRAMs are suited for applications that need to store critical data, but no field service.

SINDUJA T

III B.Sc. (Computer Technology)

DevOps

What is DevOps?

DevOps is a set of practices that automates the processes between software development and IT teams, in order that they can build, test, and release software faster and more reliably. The concept of DevOps is founded on building a culture of collaboration between teams that historically functioned in relative siloes. The promised benefits include increased trust, faster software releases, ability to solve critical issues quickly, and better manage unplanned work.

At Atlassian, DevOps is the next most famous portmanteau (combining of two words) next to Brangelina (Brad Pitt and Angelina Jolie), bringing together the best of software development and IT operations. And like our jokes, it requires some explaining. At its essence, DevOps is a culture, a movement, a philosophy. It's a firm handshake between development and operations that emphasizes a shift in mindset, better collaboration, and tighter integration. It unites agile, continuous delivery, automation, and much more, to help development and operations teams be more efficient, innovate faster, and deliver higher value to businesses and customers.

History of DevOps

The DevOps movement started to coalesce sometime between 2007 and 2008, when IT operations and software development communities got vocal about what they felt was a fatal level of dysfunction in the industry. They railed against the traditional software development model, which called for those who write the code to be organizationally and functionally apart from those who deploy and support that code.

Developers and IT/Ops professionals had separate (and often competing) objectives, separate department leadership, separate key performance indicators by which they were judged, and often worked on separate floors or even separate buildings. The result was siloed teams concerned only with their own fiefdoms, long hours, botched releases, and unhappy customers.

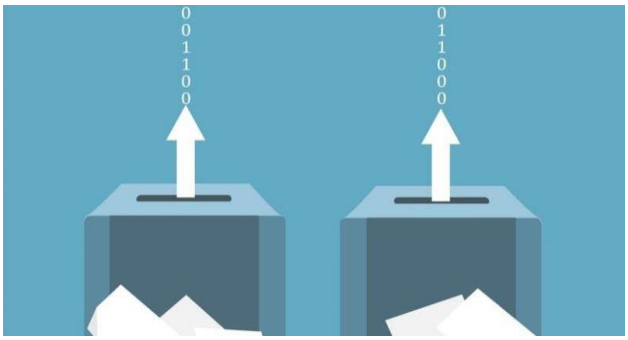
Surely there's a better way, they said. So the two communities got together and started talking with people like Patrick Dubois, Gene Kim, and John Willis driving the conversation. What began in online forums and local meet-ups is now a major theme in the software zeitgeist, which is probably what brought you here! You and your team are feeling the pain caused by siloed teams and broken lines of communication within your company.

You're using agile methodologies for planning and development, but still struggling to get that code out the door without a bunch of drama. You've heard a few things about DevOps and the seemingly magical effect it can have on teams and think "I want some of that magic." The bad news is that DevOps isn't magic, and transformations don't happen overnight. The good news is that you don't have to wait for upper management to roll out a large-scale initiative. By understanding the value of DevOps and making small, incremental changes, your team can embark on the DevOps journey right away. Let's look at each of these benefits in detail.

S.P VISHVA

I B.Sc. (Information Technology)

BLOCKCHAIN VOTING: VULNERABLE TO HACKERS, SOFTWARE GLITCHES, BAD ID PHOTOS



A developing technology called "blockchain" has gotten attention from election officials. There are a few steps in a blockchain-based voting system, which uses technology to mirror the process of in-person voting.

First, the system needs to verify a voter's identity often by having the user upload a photo of a government-issued ID and then a photo or video self-portrait. The system confirms the ID's validity, and facial recognition software makes sure the person in the self-portrait is the person on the ID. Then the user is authenticated as eligible to cast a vote.

Only at that point does blockchain technology actually enter the process. The system gives each authenticated voter a digital token that represents the person's vote and a list of the digital addresses to which he or she can send that token. Each address indicates a vote for a particular candidate or an answer to a ballot question.

The tokens do not indicate who cast them. So votes remain anonymous. When a voter sends a token, a record of that act is stored simultaneously on several different computers, making it much harder for hackers to alter the vote records. After casting the ballot by sending the token, the user receives a unique code that they can use to look at the anonymized online vote tally to confirm their vote was counted as they intended.

Small-scale trials

Early results show that blockchain systems may increase voter turnout, though it's not yet clear why. Many of the tests have been for informal ballots, like student government groups and community projects. However, several election officials in the U.S. have held small-scale trials of blockchain voting, allowing members of the military who are stationed overseas to vote electronically, rather than by mail.

M.BHAVAN

I B.Sc. (Computer Technology)

A MODEL TO DETERMINE THE IMPACT OF DDOS ATTACKS USING TWITTER DATA

Distributed denial of service (DDoS) attacks, which are designed to prevent legitimate users from accessing specific network systems, have become increasingly common over the past decade or so. These attacks make services such as Facebook, Reddit and online banking sites extremely slow or impossible to use by exhausting network or server resources (e.g., bandwidth, CPU and memory).

Researchers worldwide have been trying to develop techniques to prevent DDoS attacks or rapidly intervene in order to reduce their negative effects. An important step in counteracting such attacks is the prompt collection of feedback from users to determine their impact and come up with targeted solutions. With this in mind, a team of researchers at the University of Maryland have developed a machine-learning model that could help to determine the scale of impact of DoS attacks as they are happening based on tweets posted by users. Their study, recently pre-published on arXiv, was funded by a UMBC-USNA Cyber Innovation Grant.

"The research was based on the observation that when there are difficulties in accessing network services, customers sometimes share that information the social

networks," Dr. Tim Oates, one of the researchers who carried out the study, told TechXplore. "Our main objective was to develop a system that tracks network denial-of-service (DoS) attacks by analyzing their ripple effects through social media posts."

To begin with, Dr. Oates and his colleagues collected a curated set of tweets about DoS attacks based on a historical timeline of attacks that occurred in the past. Looking at these tweets, in which users described the problems they were experiencing during an attack, the researchers were able to identify 'language patterns' (i.e., relevant keywords). They then trained a decision-tree classifier to detect DDoS attacks based on these keywords.

"We hypothesized that impacted customers use similar language on social media to describe problems during a DDoS attack such as the system or product being slow or crawling," Chi Zhang, another researcher involved in the study told TechXplore. "Thus, when new tweets are collected (historically or in real-time), the model first finds out the topics (a set of keywords that broadly define an area of discussion) of the tweets collected in that time window."

Subsequently, the classifier developed by Dr. Oates, Zhang and their colleagues ranks the tweets based on how much the keywords differed from language patterns observed in user posts during past DDoS attacks. Finally, the model uses the number of detected DDos-related tweets to compute the scale of impact of an attack.

When the researchers evaluated their model, they found that it achieved similar results to supervised state-of-the-art approaches to determine the scale of DDoS attacks. A great advantage of their classifier, however, is that it is weakly supervised, thus it requires very little human labeling of training data. "We were able to develop a weakly supervised model for new event detection that performs nearly as well as supervised models," Zhang said. "Its weakly supervised nature means that only a small amount of human labeled data is needed, thus it saves a lot of resources in terms of human labor, as asking people to annotate potentially thousands of Tweets is typically quite expensive."

In the future, their weakly supervised model could help to determine the scale of DDoS attacks rapidly and more effectively, solely based on Twitter data. It could also be adapted and applied to other tasks that might benefit from the analysis of user tweets in real-time. In their next studies, the researchers plan to develop their model further in order to analyze tweets written in other languages. Eventually, they would also like to change its classification layer to test its performance in determining the scale of impact of other types

of events, such as disease outbreaks (e.g., Ebola).

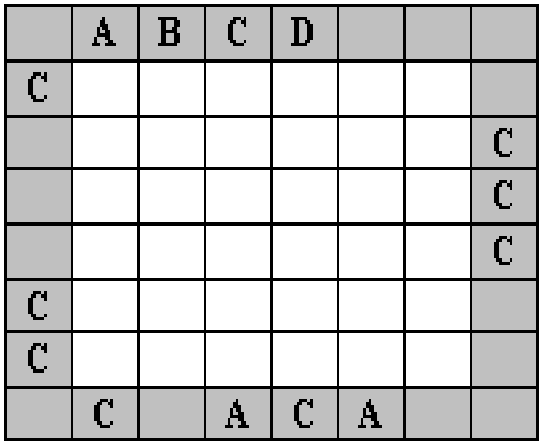
"We realized that people have many ways to describe problems on Twitter," Ashwinkumar Ganesan, another researcher who carried out the study, told TechXplore. "Hence, there is a need to build a larger cache of tweets and better models that handle this variation in language. In addition, attacks are not restricted to targets in the English speaking world, so designing the system so it can be scaled to other languages is very important too."

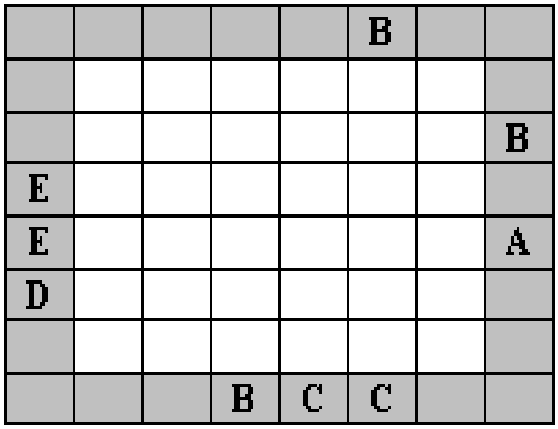
K.SURESHKUMAR

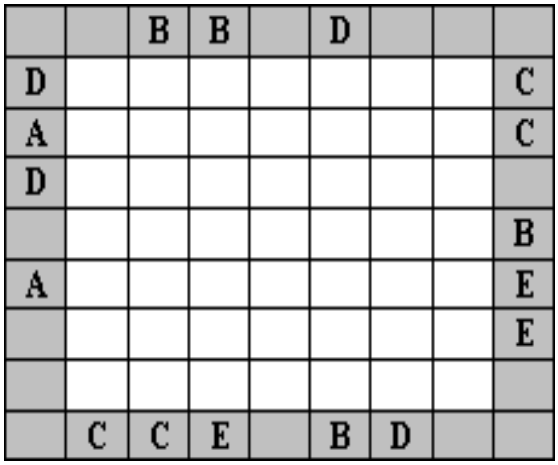
II B.Sc. (Computer Technology)

PUZZLES

1. Enter the letters A, B, C, D, E once in each row and column (in the first picture just A, B, C, D). The clues outside the grid indicate which letter appears first from that direction. In the third puzzle, for example, D must be the leftmost letter in both the first and third rows, and C must be the bottommost letter in the first and second columns.







Answer

	A	B	C	D			
C			C	D	B	A	
	A			B	D	C	C
	D	B		A	C		C
	B	A	D	C			C
C		C	B		A	D	
C	C	D	A			B	
	C		A	C	A		

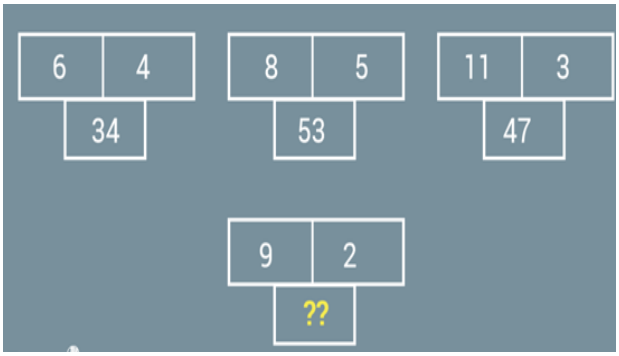
					B		
	B	C	E	A		D	
	C	A	D	E	B		B
E	E	B		D	A	C	
E		E	C	B	D	A	A
D	D		A	C	E	B	
	A	D	B		C	E	
			B	C	C		

		B	B		D			
D	D	B		E		A	C	C
A	A	E	B		D	C		C
D		D		C	E	B	A	
	E		C	D	A		B	B
A		A	D	B	C	E		E
	B	C	A			D	E	E
	C		E	A	B		D	
	C	C	E		B	D		

A.TAMILHARIHARAN

III B.Sc. (Computer Technology)

2.



Answer

In each diagram multiply top two values and add their sum to give the bottom value.

In first rectangle, (6 * 4) + (6 + 4) = 34

In second rectangle, (8 * 5) + (8 + 5) = 53

Similarly, in last rectangle, (9 * 2) + (9 + 2) = 29

So, answer is 29

3. Imagine that you have 26 constants, labeled A through Z. Each constant is assigned a value in the following way: A = 26^1, B = 25^2, C = 24^3, D = 23^2 and so on till Z = 1^26. Find the exact numerical value to the following equation: (Y - A) * (Y - B) * (Y - C) * ... * (Y - Z).

Answer

(Y - A) * (Y - B) * (Y - C) * ... * (Y - Y) * (Y - Z) equals 0 since (Y - Y) is zero.

4. The secret agency Tycoon emailed some code to its agent 006. They are "RACECAR, MURDRUM, SAGAS, ATTACK, and REPAPER". Leaving one which is fake, all other words have something in common. Can you help in finding the fake word?

Answer

The fake code-word is ATTACK.

All the code-words except ATTACK are Palindromes.

5. How many times can you subtract the number 5 from 35?

Answer

After the first calculation, you will be subtracting 5 from 30, then 5 from 25, and so on.

N.R SHARMILA

I B.Sc. (Information Technology)

I BELIEVE OS/2 IS DESTINED TO BE THE MOST IMPORTANT OPPERATING SYSTEM, AND POSSIBLY PROGRAM, OF ALL TIME

- BILL GATES