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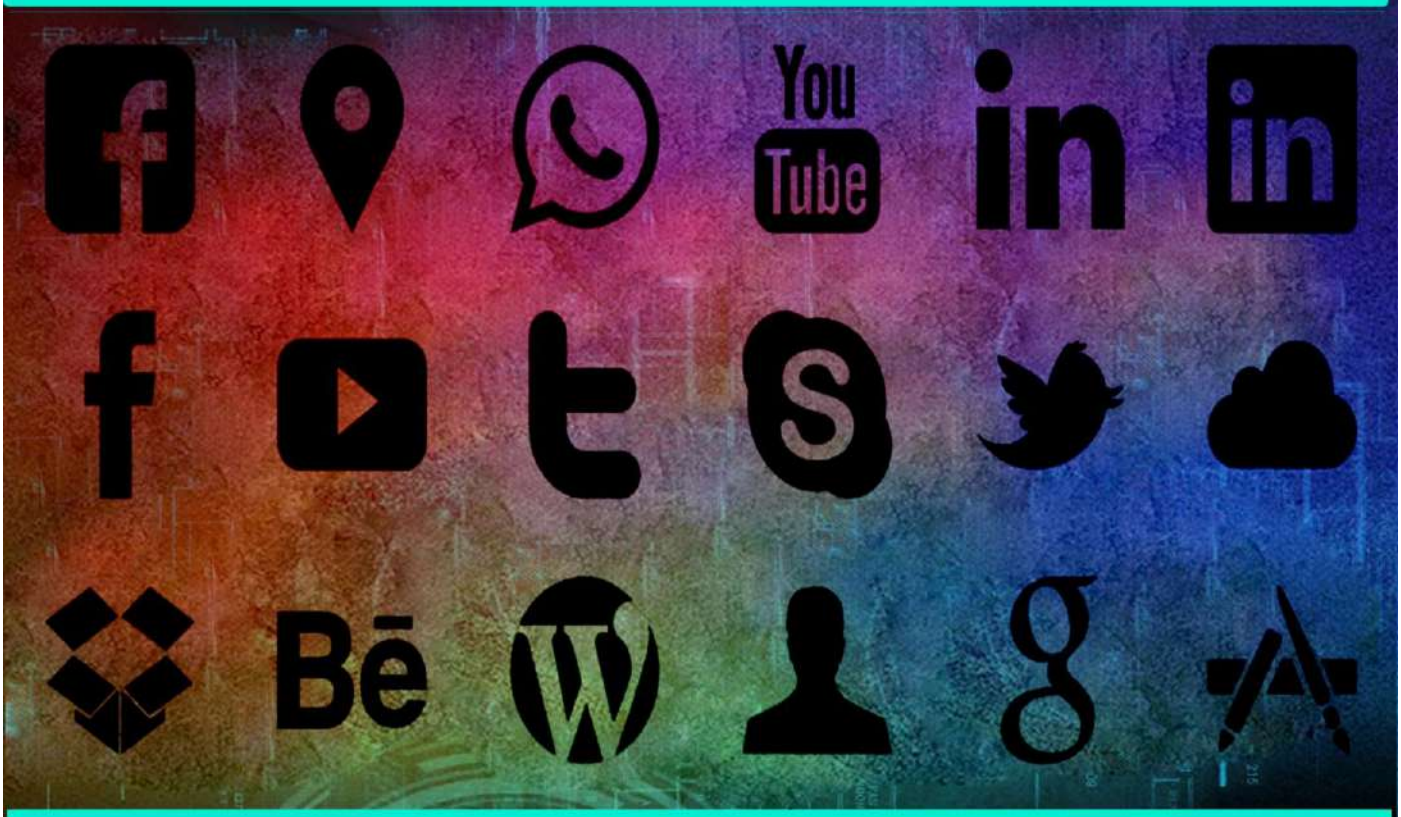

DEPARTMENT OF COMPUTER TECHNOLOGY AND INFORMATION TECHNOLOGY

KONGU ARTS AND SCIENCE COLLEGE

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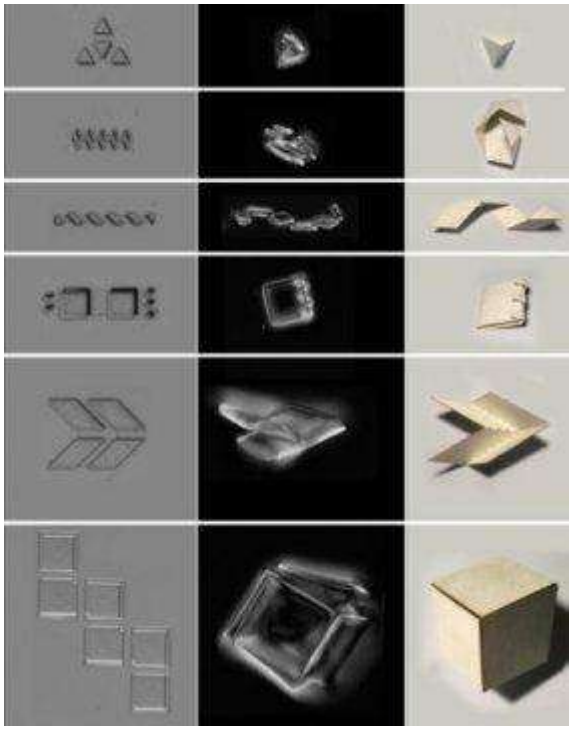
SHAPE-CHANGING AND CELL-SIZED ROBOTS

Robotics experts have made a robot exoskeleton that can rapidly change its shape upon sensing chemical or thermal changes in its environment. And, they claim, these micro scale machines equipped with electronic, photonic and chemical payloads could become a powerful platform for robotics at the size scale of biological microorganisms.



Graphene-glass bimorphs can be used to fabricate numerous micron-scale 3-D structures, including (top to bottom) tetrahedron, helices of controllable pitch, high-angle folds and clasps, basic origami motifs with bidirectional folding, and boxes.

With postdoctoral researcher Marc Miskin at the helm, the team has made a robot exoskeleton that can rapidly change its shape upon sensing chemical or thermal changes in its environment. And, they claim, these microscale machines equipped with electronic, photonic and chemical payloads could become a powerful platform for robotics at the size scale of biological microorganisms.

We are trying to build what you might call an 'exoskeleton' for electronics," said McEuen, the John A. Newman Professor of Physical Science and director of the Kavli Institute at Cornell for Nanoscale Science. Right now, you can make little computer chips that do a lot of information-processing but they don't know how to move or cause something to bend.

Their work is outlined in "Graphene-based Bimorphs for Micron-sized, Autonomous Origami Machines," published Jan. 2 in Proceedings of the National Academy of Sciences. Miskin is lead author other contributors included David Muller, the Samuel B. Eckert Professor of Engineering, and doctoral students Kyle Dorsey, Baris Bircan and Yimo Han.

The machines move using a motor called a bimorph. A bimorph is an assembly of two materials in this case, graphene and glass that bends when driven by a stimulus like heat, a chemical reaction or an applied voltage. The shape change happens because, in the case of heat, two materials with different thermal

responses expanded by different amounts over the same temperature change.

As a consequence, the bimorph bends to relieve some of this strain, allowing one layer to stretch out longer than the other. By adding rigid flat panels that cannot be bent by bimorphs, the researchers localize bending to take place only in specific places, creating folds. With this concept, they are able to make a variety of folding structures ranging from tetrahedra (triangular pyramids) to cubes.

In the case of graphene and glass, the bimorphs also fold in response to chemical stimuli by driving into the glass, causing it to expand. Typically this chemical activity only occurs on the very outer edge of glass when submerged in water or some other ionic fluid. Since their bimorph is only a few nanometers thick, the glass is basically all outer edge and very reactive.

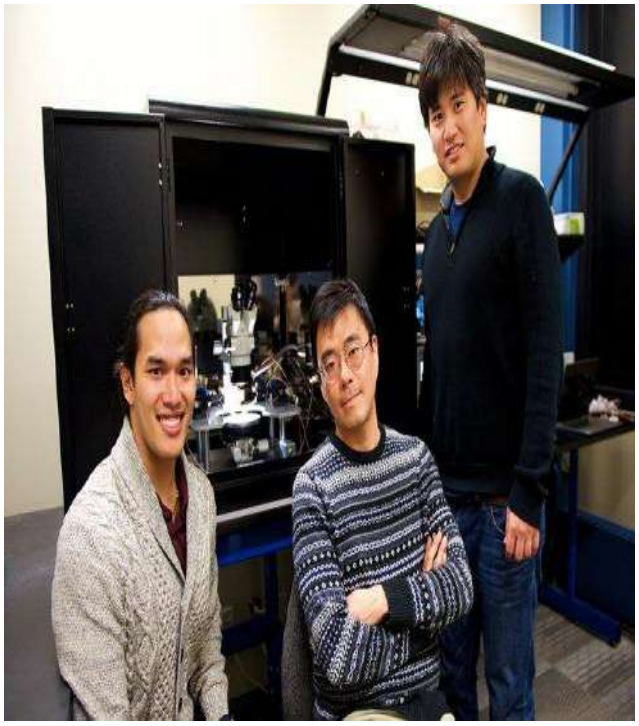
The bimorph is built using atomic layer deposition chemically "painting" atomically thin layers of silicon dioxide onto aluminum over a cover slip then wet-transferring a single atomic layer of graphene on top of the stack. The result is the thinnest bimorph ever made. One of their machines was described as being "three times larger than a red blood cell and three times smaller than a large neuron" when folded. Folding scaffolds of this size have been built before, but this group's version has one clear advantage. "Our devices are compatible with semiconductor manufacturing," Cohen said. "That's what's making this compatible with our future vision for robotics at this scale." And due to graphene's relative strength, Miskin said, it can handle the types of loads necessary for electronics applications. "If you want to build this electronics exoskeleton," he said, "you need it to be able to produce enough force to carry the electronics. Ours does that."

This work was performed at the Cornell NanoScale Facility for Science and Technology and supported by the Cornell Center for Materials Research, the National Science Foundation, the Air Force Office of Scientific Research and the Kavli Institute at Cornell.

KALIKKUMAR V
III B.Sc. (Computer Technology)

ARTIFICIAL SYNAPSE FOR BRAIN-ON-A-CHIP HARDWARE

Engineers have designed an artificial synapse in such a way that they can precisely control the strength of an electric current flowing across it, similar to the way ions flow between neurons. The team has built a small chip with artificial synapses, made from silicon germanium. In simulations, the researchers found that the chip and its synapses could be used to recognize samples of handwriting, with 95 percent accuracy.



Packed within the squishy, football-sized organs is somewhere around 100 billion neurons. At any given moment, a single neuron can relay instructions to thousands of other neurons via synapses the spaces between neurons, across which neurotransmitters are exchanged. There are more than 100 trillion synapses that mediate neuron signaling in the brain, strengthening some connections while pruning others, in a process that enables the brain to recognize patterns, remember facts, and carry out other learning tasks, at lightning speeds.

Researchers in the emerging field of "neuromorphic computing" have attempted to design computer chips that work like the human brain. Instead of carrying out computations based on binary, on/off signaling, like digital chips do today, the elements of a "brain on a chip" would work in an analog fashion, exchanging a gradient of signals, or "weights," much like neurons that activate in various ways depending on the type and number of ions that flow across a synapse.

In this way, small neuromorphic chips could, like the brain, efficiently process millions of streams of parallel computations that are currently only possible with large banks of supercomputers. But one significant hangup on the way to such portable artificial intelligence has been the neural synapse, which has been particularly tricky to reproduce in hardware.

Now engineers at MIT have designed an artificial synapse in such a way that they can precisely control the strength of an electric current flowing across it, similar to the way ions flow between neurons. The team has built a small chip with artificial synapses, made from silicon germanium. In simulations, the researchers found that the chip and its synapses could be used to recognize samples of handwriting, with 95 percent accuracy.

The design, published in the journal Nature Materials, is a major step toward building portable, low-power neuromorphic chips for use in pattern recognition and other learning tasks. The research was led by Jeehwan Kim, the Class of 1947 Career Development Assistant Professor in the departments of Mechanical Engineering and Materials Science and Engineering, and a

principal investigator in MIT's Research Laboratory of Electronics and Microsystems Technology Laboratories. Co-authors are Shinhyun Choi (first author), Scott Tan (co-first author), Zefan Li, Yunjo Kim, Chanyeol Choi, and Hanwool Yeon of MIT, along with Pai-Yu Chen and Shimeng Yu of Arizona State University.

Too many paths

Most neuromorphic chip designs attempt to emulate the synaptic connection between neurons using two conductive layers separated by a "switching medium," or synapse-like space. When a voltage is applied, ions should move in the switching medium to create conductive filaments, similarly to how the "weight" of a synapse changes.

But it's been difficult to control the flow of ions in existing designs. Kim says that's because most switching mediums, made of amorphous materials, have unlimited possible paths through which ions can travel a bit like Pachinko, a mechanical arcade game that funnels small steel balls down through a series of pins and levers, which act to either divert or direct the balls out of the machine.

Like Pachinko, existing switching mediums contain multiple paths that make it difficult to predict where ions will make it through. Kim says that can create unwanted nonuniformity in a synapse's performance. "Once you apply some voltage to represent some data with your artificial neuron, you have to erase and be able to write it again in the exact same way," Kim says. "But in an amorphous solid, when you write again, the ions go in different directions because there are lots of defects. This stream is changing, and it's hard to control. That's the biggest problem non-uniformity of the artificial synapse."

A perfect mismatch

Instead of using amorphous materials as an artificial synapse, Kim and his colleagues looked to single-crystalline silicon, a defect-free conducting material made from atoms arranged in a continuously ordered alignment. The team sought to create a precise, one-dimensional line defect, or dislocation, through the silicon, through which ions could predictably flow.

To do so, the researchers started with a wafer of silicon, resembling, at microscopic resolution, a chicken-wire pattern. They then grew a similar pattern of silicon germanium a material also used commonly in transistors on top of the silicon wafer. Silicon germanium's lattice is slightly larger than that of silicon, and Kim found that together, the two perfectly mismatched materials can form a funnel-like dislocation, creating a single path through which ions can flow.

The researchers fabricated a neuromorphic chip consisting of artificial synapses made from silicon germanium, each

synapse measuring about 25 nanometers across. They applied voltage to each synapse and found that all synapses exhibited more or less the same current, or flow of ions, with about a 4 percent variation between synapses a much more uniform performance compared with synapses made from amorphous material.

They also tested a single synapse over multiple trials, applying the same voltage over 700 cycles, and found the synapse exhibited the same current, with just 1 percent variation from cycle to cycle. This is the most uniform device we could achieve, which is the key to demonstrating artificial neural networks.

Writing, recognized

As a final test, Kim's team explored how its device would perform if it were to carry out actual learning tasks -- specifically, recognizing samples of handwriting, which researchers consider to be a first practical test for neuromorphic chips. Such chips would consist of "input/hidden/output neurons," each connected to other "neurons" via filament-based artificial synapses.

Scientists believe such stacks of neural nets can be made to "learn." For instance, when fed an input that is a handwritten '1,' with an output that labels it as '1,' certain output neurons will be activated by input neurons and weights from an artificial synapse. When more examples of handwritten '1s' are fed into the same chip, the same output neurons may be activated when they sense similar features between different samples of the same letter, thus "learning" in a fashion similar to what the brain does.

Kim and his colleagues ran a computer simulation of an artificial neural network consisting of three sheets of neural layers connected via two layers of artificial synapses, the properties of which they based on measurements from their actual neuromorphic chip. They fed into their simulation tens of thousands of samples from a handwritten recognition dataset commonly used by neuromorphic designers, and found that their neural network hardware recognized handwritten samples 95 percent of the time, compared to the 97 percent accuracy of existing software algorithms.

The team is in the process of fabricating a working neuromorphic chip that can carry out handwriting-recognition tasks, not in simulation but in reality. Looking beyond handwriting, Kim says the team's artificial synapse design will enable much smaller, portable neural network devices that can perform complex computations that currently are only possible with large supercomputers.

VARSHA R

I B.Sc. (Information Technology)

APPLE REVEALS 6 HUGE IOS IMPROVEMENTS FOR 2018

Apple wants to energize ARKit development with a range of powerful new features in ARKit 1.5 and iOS 11.3, which are currently in beta testing. These important improvements will clear even more space between the company and competitors in the mobile space. They include:

- The capacity to recognize vertical surfaces (walls, doors, and such like). Until now, ARKit could recognize only horizontal surfaces.
- Image detection for signs, posters and other artwork
- Higher resolution (1,080p instead of 720p), enabling more realism in AR experiences.

These improvements should mean ARKit developers will be able to build better games (such as bouncing balls off of walls) and more immersive VR experiences, particularly in the education and museum sectors.

Health records for iPhones

Apple this morning also confirmed my many predictions that it is working to develop a health records system that is compatible with iPhones and iPads. These new features will be introduced as elements within the company's Health app. It will enable users to transfer clinical data like cholesterol levels and lists of medications prescribed by their doctors directly from their medical providers to their iPhones. There are dual advantages to this: Not only will patients be able to enjoy complete access and control of their own personal medical information, but it will make it much easier for them to source second opinions or secure appropriate and personalized help in an emergency or when travelling.

The report says the feature which will be introduced in beta form later this week is being introduced in cooperation with a dozen medical institutions. The great thing here is that Apple will have no insight into your medical data. I believe this is an important first step toward intelligent and personalized healthcare support through technology, including in future big data analysis of anonymized health records with potential value in public health management, treatment, prevention and cure. Apple acquired health records developer Gliimpse in 2016.

A smarter Siri

Apple this week introduced iOS 11.2.5. The update introduced the useful enhancements to Siri the company has developed in support of its soon-to-ship HomePod smart speaker solution. The team has worked to give Siri a deeper knowledge of music so that you can ask to play virtually anything from your personal favourites to the latest chart-topping releases, Apple's Phil Schiller said.

These improvements also include the capacity to play radio news from a variety of providers by asking Siri. The company seems to also suggest Siri will become much more capable of making accurate and useful music suggestions. “Siri, now actively used on over half a billion devices, has developed a deep knowledge of music and understands your preferences and tastes,” the company said in a press release.

Better with battery

A small but significant improvement, Apple confirmed that iOS 11.3 will introduce new battery health controls in Settings. These tools are Apple’s response to criticism that it quietly throttled device performance in recent iOS devices, ostensible to prevent unexpected shutdowns. It turned out that many iPhone users wanted a choice in such behaviors, so Apple’s new Battery Settings will enable us to turn this throttling off in order to enjoy full device performance.

Apple’s big in the enterprise

The final strand comes from Jamf, which confirmed that Apple’s big push into enterprise IT is very, very real. Jamf now manages over 9 million Mac, iPhone, iPad and Apple TV devices in the enterprise space. Customers include 17 of the 25 largest Fortune 500 firms and seven of the top 10 U.S. media companies.

Apple adoption will only increase as Apple and Cisco continue to develop ways to enhance iOS security within the enterprise space. iOS’s existing Mobile Device Management (MDM) compatibility with support for mobile security situation awareness tools, as such intelligent security awareness solutions will become more prevalent in 2018.

The bots are coming

Apple discussed a new iOS 11 feature it called Business Chat last year at WWDC. The idea is that customers will be able to Message enquiries to a small selection of companies (currently including Lowe's, Discover, Hilton, and Wells Fargo, with others expected to sign up by the time this feature ships spring). “With Business Chat, it's easy to have a conversation with a service representative, schedule an appointment or make purchases using Apple Pay in the Messages app,” the company said.

Enterprise users may also be interested to learn that LivePerson, Salesforce, Nuance and Genesys have already integrated with Business Chat, according to Apple.

S.GOKUL

II B.Sc. (Computer Technology)

COMCAST XFI ADVANCED GATEWAY MODEM/ROUTER

After realizing the challenges people face with their existing modems, Comcast established a goal to make their xFi modem/router easy to setup, easy to use, and easy to connect to the internet. Fraser Stirling, Comcast's SVP of Hardware Development, had this to say. And it seems that they may have accomplished just that with the interface of the xFi app. The app allows you to set up your WiFi, customize settings, create individual profiles and much more. You can even setup schedules to turn Wifi connection on and off all through the xFi app.

The result is an XFi Advanced Gateway modem that utilizes an 802.11ac Wave 2 Wi-Fi standard, which allows for the possibility of gigabit WiFi. The problem with this working properly is obstructions like walls and floors. This Gateway is designed to work across large areas via the 8x8 antenna array, which consists of eight antennas to transmit WiFi signals and another eight to receive them. The development team was able to achieve 1.2 to 1.3 GB per second speeds over WiFi in tests. These standards also support MU-MIMO (multiple input, multiple output), which provides connections for a larger number of devices more efficiently to a single network. To increase coverage for large homes, Comcast is working on a mesh WiFi system for early next year. As of today, Comcast is making the xFi Advanced Gateway modem/router available in every market where they offer gigabit internet.

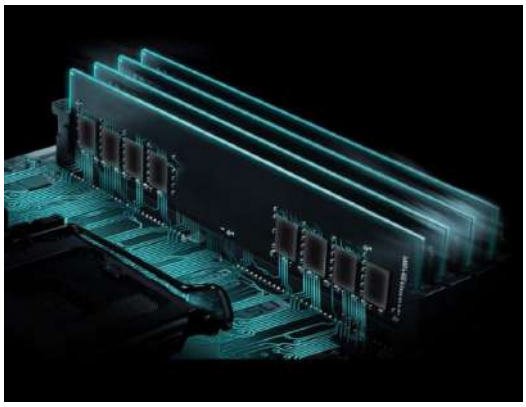
VISHNUVARDHAN A

I B.Sc. (Computer Technology)

ASROCK Z370 KILLER : POWERFUL VR READY MOTHERBOARD

The Z370 Killer SLI/ac by ASRock features support for 8th Generation Intel Core processor (Socket1151). Experience the full immersive world of Virtual Reality thanks to this Super Alloy motherboard that provides support for 8th Generation Intel Core Processors. This motherboard was designed with a power phase that provides smooth power delivery to the superior 8th Generation Intel Core Processors. This

facilitates unparalleled overclocking abilities, lower operating temperatures for extreme gaming, and strengthened system integrity for tackling laborious processing.



ASRock Z370 Killer SLI/ac	
Processor	- Supports 8th Generation Intel® Core™ Processors (Socket 1151) - Digi Power design - 10 Power Phase design - Supports Intel® Turbo Boost 2.0 Technology - Supports Intel® K-Series unlocked CPUs - Supports ASRock BCLK Full-range Overclocking
Operating System	- Microsoft® Windows® 10 64-bit
Graphics	- Supports Intel® UHD Graphics Built-in Visuals : Intel® Quick Sync Video with AVC, MVC (S3D) and MPEG-2 Full HW Encode1, Intel® InTru™ 3D, Intel® Clear Video HD Technology, Intel® Insider™, Intel® UHD Graphics - DirectX 12 - HWA Encode/Decode: VP9 8-bit, VP9 10- bit (Encode only), VP8, HEVC (MPEG-H Part2, h.265), AVC (MPEG4, h.264), MPEG2-Part2 (h.262), JPEG/MJPEG,VC-1 - Max. shared memory 1024MB - Dual graphics output: Support DVI-D and HDMI ports by independent display controllers - Supports HDMI with max. resolution up to 4K x 2K (4096x2160) @ 30Hz - Supports DVI-D with max. resolution up to 1920x1200 @ 60Hz - Supports Auto Lip Sync, Deep Color (12bpc), xvYCC and HBR (High Bit Rate Audio) with HDMI Port (Compliant HDMI monitor is required) - Supports HDCP with DVI-D and HDMI Ports - Supports 4K Ultra HD (UHD) playback with HDMI Port
Memory	- Dual Channel DDR4 Memory Technology - 4 x DDR4 DIMM Slots - Supports DDR4 4266+(OC) / 4133(OC) / 4000(OC) / 3866(OC) / 3800(OC) / 3733(OC) / 3600(OC) / 3200(OC) / 2933(OC) / 2800(OC) / 2666 / 2400 / 2133 non-ECC, un-buffered memory - Supports ECC UDIMM memory modules (operate in non-ECC mode) - Max. capacity of system memory: 64GB

	- Supports Intel® Extreme Memory Profile (XMP) 2.0 - 15µ Gold Contact in DIMM Slots
Storage	- 6 x SATA3 6.0 Gb/s Connectors, support RAID (RAID 0, RAID 1, RAID 5, RAID 10, Intel® Rapid Storage Technology 15), NCQ, AHCI and Hot Plug - 2 x Ultra M.2 Sockets (M2_1 and M2_2), support M Key type 2230/2242/2260/2280 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s) If M2_1 is occupied by a SATA-type M.2 device, SATA_5 will be disabled. If M2_2 is occupied by a SATA-type M.2 device, SATA_0 will be disabled. Supports Intel® Optane™ Technology Supports NVMe SSD as boot disks Supports ASRock U.2 Kit
Ports	- 2 x Antenna Ports - 1 x PS/2 Mouse/Keyboard Port - 1 x DVI-D Port - 1 x HDMI Port - 1 x Optical SPDIF Out Port - 5 x USB 3.1 Gen1 Type-A Ports (Supports ESD Protection) - 1 x USB 3.1 Gen1 Type-C Port (Supports ESD Protection) - 1 x RJ-45 LAN Port with LED (ACT/LINK LED and SPEED LED) - HD Audio Jacks: Rear Speaker / Central / Bass / Line in / Front Speaker / Microphone

Audio	- 7.1 CH HD Audio with Content Protection (Realtek ALC892 Audio Codec) - Premium Blu-ray Audio support - Supports Surge Protection - Nichicon Fine Gold Series Audio Caps
Ports	- 2 x Antenna Ports - 1 x PS/2 Mouse/Keyboard Port - 1 x DVI-D Port - 1 x HDMI Port - 1 x Optical SPDIF Out Port - 5 x USB 3.1 Gen1 Type-A Ports (Supports ESD Protection) - 1 x USB 3.1 Gen1 Type-C Port (Supports ESD Protection) - 1 x RJ-45 LAN Port with LED (ACT/LINK LED and SPEED LED) - HD Audio Jacks: Rear Speaker / Central / Bass / Line in / Front Speaker / Microphone
Connectivity	- Intel® 802.11ac WiFi Module - Supports IEEE 802.11a/b/g/n/ac - Supports Dual-Band (2.4/5 GHz) - Supports high speed wireless connections up to 433Mbps - Supports Bluetooth 4.2 / 3.0 + High speed class II

J.JANSI RANI
II B.Sc. (Computer Technology)

SAFER BRICKLAYING WITH ARTIFICIAL INTELLIGENCE

Bricklaying is repetitive and strenuous. It takes a toll on your body, potentially spraining, tearing and straining ligaments and muscles. But new technology is now helping to identify the safer techniques master masons use, gaining insights that can improve training. Musculoskeletal injuries like sprains and strains account for a third of all illnesses and injuries among general construction work, according to the U.S. Bureau of Labor Statistics. They cause workers to miss time and, in some cases, to leave the industry all together depleting an aging and already shrinking workforce.

Improved safety measures over the last couple decades have led to a steep drop in injuries due to accidents. But reducing injuries caused by cumulative stress on joints and muscles is much trickier. "It's something that people weren't aware of," said Carl Haas, a civil engineer at the University of Waterloo in Canada. As awareness has grown, he said, new tools are now available to identify the source of these injuries and how they can be prevented.

These tools include motion-capture suits, which are often used in the movie industry and in sports research. They've become relatively inexpensive. Recently, Haas and a team of engineers used the suits to learn how masons can work more safely, tracking the workers' body postures. After analyzing the data with artificial intelligence software, the researchers discovered that experienced masons have developed efficient techniques that place a lighter load on their joints, lowering the risk of injury.

"If somebody has been doing it for 25 years, they've found a way to do it safely," said Eihab Abdel-Rahman, a systems design engineer at the University of Waterloo, and an author of the study, published in the journal Automation in Construction.

For the study, the researchers observed 21 masons including longtime professionals, complete novices and those with one or three years of experience at an apprentice program in Ontario. The experts averaged five times the experience of the others. Artificial-intelligence software identified subtle-but-notable differences among the groups.

When lifting bricks, the researchers found, expert masons don't bend their backs as much as less experienced bricklayers. Experts also carry bricks closer to their bodies. Both techniques result in lighter loads on the individuals' lower backs and shoulder joints.

The researchers are already passing on these tips to masons-in-training. They have partnered with the Canadian Concrete Masonry Producers Association and the Canada Masonry Design Centre, who in turn work with apprenticeship programs across Canada, to

develop a list of do's and don'ts. "There is a way to save a lot of careers," Abdel-Rahman said.

The results also help explain a curious pattern. According to the U.S. Bureau of Labor Statistics, construction injuries tend to rise in the first few years of a worker's career. But after the fifth year, the injury rate drops.

The researchers saw a similar trend in a previous study on masonry. Using video cameras to measure bricklaying postures, they calculated the load placed on joints. They found that experts feel lighter loads on their joints but so did novices. Those with an experience level between expert and novice masons who had been working a couple years felt heavier loads. "That is not expected because you would expect that as they gained experience, they would do it in way that protects themselves," Abdel-Rahman said.

One explanation, which the new study supports, is that novices are less confident, so they're more careful and work slower. "But what we're finding is that the second or third-year apprentices, in order to keep up with master masons in terms of productivity, begin to move and work in physically unhealthy ways," Haas said. These second and third-year apprentices gain confidence and work faster, but their technique remains poor. Only after yet more years of experience do they figure out the subtler and safer tricks of a master. If they don't, they might hurt themselves and be forced to change careers.

The new approach, which can also be applied to other construction work, has enabled researchers to quantify and visualize safe and unsafe positions for the first time, said SangHyun Lee, a civil engineer at the University of Michigan in Ann Arbor who collaborated on the older study but not the new one. "This allows us to understand how and why an experienced mason is more efficient and more safe," he said.

Most recently, the researchers performed a similar study on rebar tying, which involves tying bars of reinforcement steel together for laying concrete. According to the initial data, Abdel-Rahman said, one particular technique results in twice as much force on the lower back as another. The technology is there to keep workers healthy, which is good both for them and the company, he said. "It's doable, and it's not just for bricklaying."

V. MOHANAPRIYA
III B.Sc. (Computer Technology)

INTERVIEW PEDIA

Verbal Reasoning

VR Types

A basic aspect of verbal reasoning, a proposition is a statement that expresses a judgement, opinion or fact about something. A

simple statement such as "sharks are dangerous" is a form of proposition.

A premise is a proposition that will follow or induce a conclusion. For example, a statement such as "John has no car and therefore won't be able to go to work today," has two premises which form the conclusion that John won't be at work.

A syllogism is an argument that consists of premises in order to arrive at a truth. For example, "Mary is a woman. All women have hair, therefore Mary has hair". The validity of a syllogism also depends on how truthful or factual the premises are.

Verbal analogies are comparison between two subjects or concepts based on their relations (ex. similarities). An example of a verbal analogy is, "A car to a garage is like a ship to a shipping dock".

Who uses VR tests?

Verbal reasoning tests have become an invaluable tool for recruiters in a wide range of fields. That's because many roles require employees to comprehend, analyze and draw conclusions from a huge amount of written material, regardless of the industry they're employed in. There is recognition that communication skills are increasingly important, even for graduates in more technical roles. As a result, they are now incorporated into the recruitment and interview process in most industries at one stage or another. We can definitely expect them in application process for graduate jobs in consulting, investment banks and management.

SHL is perhaps the most well known producer of verbal reasoning tests, and the most widely used. There are other providers, including Talent Q, Kenexa, Saville and Cubiks.

Intelligence Tests in VR

Verbal Reasoning tests of intelligence provide an assessment of an individual's ability to think reason and solve problems in different ways.

These tests are often used as entrance examinations by schools, colleges and universities to select the most able applicants. They are also used by a growing number of employers as part of the selection/recruitment process.

Large graduate training schemes are increasingly using verbal reasoning tests, to distinguish between the applicants. The types of verbals candidates face in these assessments are typically looking to assess understanding and comprehension skills.

Law School Admission Test (LSAT)

This is a classic measure that evaluates the verbal reasoning ability of participants who are applying to a graduate law school.

The multiple choice sections are broken up into three parts:

Reading Comprehension - ability to understand complex language material like paragraphs or passages and able to answer questions regarding them.

Analytical reasoning - ability to understand relationships in language material like statements or passages and being able to draw reasonable conclusions from them.

Logical reasoning - Using critical thinking to assess and complete an argument given on the test.

Tips on VR

The following seven tips are well worth remembering before you take the verbal reasoning test for real:

1. Remember that the test is timed
2. Practice in advance
3. Read the questions first
4. Don't use general knowledge
5. Take things literally
6. If you can't see it, it's not there
7. You can change your answers

NIVEDHA N

I1I B.Sc. (Computer Technology)

AMAZON WEB SERVICES

Amazon Web Services (AWS) is Amazon's cloud web hosting platform that offers flexible, reliable, scalable, easy-to-use, and cost-effective solutions. This tutorial covers various important topics illustrating how AWS works and how it is beneficial to run your website on Amazon Web Services.

In 2006, Amazon Web Services (AWS) started to offer IT services to the market in the form of web services, which is nowadays known as cloud computing. It need not plan for servers and other IT infrastructure which takes up much time in advance. Instead, these services can instantly spin up hundreds or thousands of servers in minutes and deliver results faster. To pay only for what to use with no up-front expenses and no long-term commitments, which makes AWS cost efficient.

Today, AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud that powers multitude of businesses in 190 countries around the world.

What is Cloud Computing?

Cloud computing is an internet-based computing service in which large groups of remote servers are networked to allow centralized data storage, and online access to computer services or resources. Using cloud computing, organizations can use shared computing and storage resources rather than building, operating, and improving infrastructure on their own.

Cloud computing is a model that enables the following features.

- Resources can be scaled up or down automatically, depending on the load.
- Resources are accessible over a network with proper security.

- Cloud service providers can enable a pay-as-you-go model, where customers are charged based on the type of resources and per usage.

Types of Clouds

There are three types of clouds: Public, Private, and Hybrid cloud.

Public Cloud

In public cloud, the third-party service providers make resources and services available to their customers via Internet. Customer's data and related security is with the service providers' owned infrastructure.

Private Cloud

A private cloud also provides almost similar features as public cloud, but the data and services are managed by the organization or by the third party only for the customer's organization. In this type of cloud, major control is over the infrastructure so security related issues are minimized.

Hybrid Cloud

A hybrid cloud is the combination of both private and public cloud. The decision to run on private or public cloud usually depends on various parameters like sensitivity of data and applications, industry certifications and required standards, regulations, etc.

Cloud Service Models

There are three types of service models in cloud : IaaS, PaaS, and SaaS.

IaaS

IaaS stands for **Infrastructure as a Service**. It provides users with the capability to provision processing, storage, and network connectivity on demand. Using this service model, the customers can develop their own applications on these resources.

PaaS

PaaS stands for **Platform as a Service**. Here, the service provider provides various services like databases, queues, workflow engines, e-mails, etc. to their customers. The customer can then use these components for building their own applications. The services, availability of resources and data backup are handled by the service provider that helps the customers to focus more on their application's functionality.

SaaS

SaaS stands for **Software as a Service**. As the name suggests, here the third-party providers provide end-user applications to their customers with some administrative capability at the application level, such as the ability to create and manage their users. Also some level of customizability is possible such as the customers can use their own corporate logos, colors, etc.

Advantages of Cloud Computing

- **Cost-Efficient** − Building our own servers and tools is time-consuming as well as expensive as we need to order,

pay for, install, and configure expensive hardware, long before we need it. However, using cloud computing, we only pay for the amount we use and when we use the computing resources. In this manner, cloud computing is cost efficient.

- **Reliability** − A cloud computing platform provides much more managed, reliable and consistent service than an in-house IT infrastructure. It guarantees 24x7 and 365 days of service. If any of the server fails, then hosted applications and services can easily be transited to any of the available servers.
- **Unlimited Storage** − Cloud computing provides almost unlimited storage capacity, i.e., to need not worry about running out of storage space or increasing our current storage space availability. To access as much or as little as we need.
- **Backup & Recovery** − Storing data in the cloud, backing it up and restoring the same is relatively easier than storing it on a physical device. The cloud service providers also have enough technology to recover our data, so there is the convenience of recovering our data anytime.
- **Easy Access to Information** − Once you register yourself in cloud, you can access your account from anywhere in the world provided there is internet connection at that point. There are various storage and security facilities that vary with the account type chosen.

Disadvantages of Cloud Computing

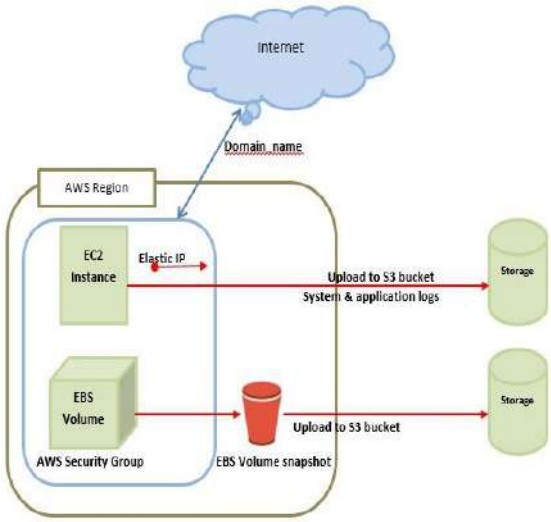
Although Cloud Computing provides a wonderful set of advantages, it has some drawbacks as well that often raise questions about its efficiency.

Security issues

Security is the major issue in cloud computing. The cloud service providers implement the best security standards and industry certifications, however, storing data and important files on external service providers always bears a risk. AWS cloud infrastructure is designed to be the most flexible and secured cloud network. It provides scalable and highly reliable platform that enables customers to deploy applications and data quickly and securely.

Technical issues

As cloud service providers offer services to number of clients each day, sometimes the system can have some serious issues leading to business processes temporarily being suspended. Additionally, if the internet connection is offline then we will not be able to access any of the applications, server, or data from the cloud.



This is the basic structure of **AWS EC2**, where **EC2** stands for Elastic Compute Cloud. EC2 allow users to use virtual machines of different configurations as per their requirement. It allows various configuration options, mapping of individual server, various pricing options, etc. To discuss these in detail in AWS Products section. Following is the diagrammatic representation of the architecture.

Amazon Cloud-front

It is responsible for content delivery, i.e. used to deliver website. It may contain dynamic, static, and streaming content using a global network of edge locations. Requests for content at the user's end are automatically routed to the nearest edge location, which improves the performance. Amazon Cloud-front is optimized to work with other Amazon Web Services, like Amazon S3 and Amazon EC2. It also works fine with any non-AWS origin server and stores the original files in a similar manner.

Amazon RDS

Amazon RDS (Relational Database Service) provides a similar access as that of MySQL, Oracle, or Microsoft SQL Server database engine. The same queries, applications, and tools can be used with Amazon RDS. It automatically patches the database software and manages backups as per the user's instruction. It also supports point-in-time recovery. There are no up-front investments required,

Key Considerations for Web Hosting in AWS

No physical network devices needed

In AWS, network devices like firewalls, routers, and load-balancers for AWS applications no longer reside on physical devices and are replaced with software solutions. Multiple options are available to ensure quality software solutions. For load balancing choose Zeus, HAProxy, Nginx, Pound, etc. For establishing a VPN connection choose OpenVPN, OpenSwan, Vyatta, etc.

No security concerns

AWS provides a more secured model, in which every host is locked down. In Amazon EC2, security groups are designed for each type of host in the architecture, and a large variety of simple and tiered security models can be created to enable minimum access among hosts within your architecture as per requirement.

Availability of data centers

EC2 instances are easily available at most of the availability zones in AWS region and provides model for deploying your application across data centers for both high availability and reliability.

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FROM 4G TO 5G

What is 4G?

Have you ever wondered what the "G" means in 2G, 3G, 4G and in the widely anticipated 5G ? Drum roll. It's "generation". 4G refers to our current generation, the "fourth generation" of cellular communications. Since the early days of mobile phones in the 1980s, several generations of cellular technologies have come and gone, with the market requiring more powerful technology roughly every 10 years. The rapid rise in the use of mobile phones brought about second generation systems (2G) in the 90s, such as "GSM" or "IS-95". Then came "Mobile broadband" data in the 2000s with the arrival of smartphones and 3G systems, such as "UMTS" or "CDMA 2000" then became the norm. Since 2010, operators have moved on to deploying 4G radio-mobile networks, mainly based on LTE technology.

What changes with each generation ?

Each new generation aims to improve network performance, both from the point of view of the operator and subscribers. 4G is estimated to be 10 times faster than its predecessor for example.

From 4G to 5G, what's new ?

5G promises to further improve the quality of service even further, by guaranteeing some users a constant quality of service throughout the coverage area for example and helping networks to cope with connected objects. With the IoT revolution the Internet of Things, the number of connected objects in the next few years will grow rapidly, as with them the number of sensors. Each object will not necessarily require high flows, but will need high levels of energy autonomy: a sensor must be able to operate for several years on batteries.

Furthermore, 5G will be critical in technology requiring rapid exchanges of information. It is an important technological brick for the development of on-board safety systems, for example to make the autonomous car a reality.

Why study 4G ?

Studying 4G remains just as relevant now as it was a few years ago. Firstly, the technology behind each mobile generation is based on those of previous generations. The access network eUTRAN and the evolved Packet core for example, both introduced with the 4G architecture, will remain substantially the same in a 5G network system. As a result, mastering the technology behind 4G is highly advised in order to understand 5G.

Furthermore, an operator deploying a new-generation system relies on part of its existing network and gradually upgrades its equipment. 4G will therefore still be around for a while until 5G is 100% generalized.

Why study cellular communications in the first place ?

The apps and devices we use every day all need to be compatible with the latest cellular communications technology. Network engineers, sales engineers, application developers, and many other telecoms pros, all need to master the fundamentals of the current cellular generation to be able to develop new connected technology.

IYSWARIYA R
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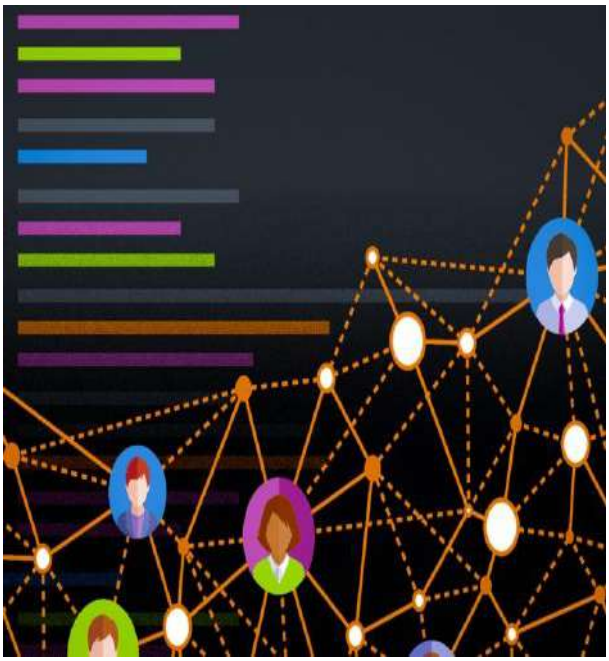
CROWDSOURCING BIG-DATA ANALYSIS



In the analysis of big data sets, the first step is usually the identification of “features” data points with particular predictive power or analytic utility. Choosing features usually requires some human intuition. For instance, a sales database might contain revenues and date ranges, but it might take a human to recognize that average revenues revenues divided by the sizes of the ranges is the really useful metric.

MIT researchers have developed a new collaboration tool, dubbed FeatureHub, intended to make feature identification more efficient and effective. With FeatureHub, data scientists and experts on particular topics could log on to a central site and spend an hour or two reviewing a problem and proposing features. Software then tests myriad combinations of features against target data, to

determine which are most useful for a given predictive task.

In tests, the researchers recruited 32 analysts with data science experience, who spent five hours each with the system, familiarizing themselves with it and using it to propose candidate features for each of two data-science problems.

The predictive models produced by the system were tested against those submitted to a data-science competition called Kaggle. The Kaggle entries had been scored on a 100-point scale, and the FeatureHub models were within three and five points of the winning entries for the two problems.

But where the top-scoring entries were the result of weeks or even months of work, the FeatureHub entries were produced in a matter of days. And while 32 collaborators on a single data science project is a lot by today's standards, Micah Smith, an MIT graduate student in electrical engineering and computer science who helped lead the project, has much larger ambitions.

FeatureHub like its name was inspired by GitHub, an online repository of open-source programming projects, some of which have drawn thousands of contributors. Smith hopes that FeatureHub might someday attain a similar scale.

"We can facilitate having thousands of people working on a single solution for predicting where traffic accidents are most likely to strike in New York City or predicting which patients in a hospital are most likely to require some medical intervention," he says. "To think that the concept of massive and open data science can be really leveraged for areas where there's a strong social impact but not necessarily a single profit-making or government organization that is coordinating responses."

FeatureHub's user interface is built on top of a common data-analysis software suite called the Jupyter Notebook, and the evaluation of feature sets is performed by standard machine-learning software packages. Features must be written in the Python programming language, but their design has to follow a template that intentionally keeps the syntax simple. A typical feature might require between five and 10 lines of code.

The MIT researchers wrote code that mediates between the other software packages and manages data, pooling features submitted by many different users and tracking those collections of features that perform best on particular data analysis tasks.

In the past, Veeramachaneni's group has developed software that automatically generates features by inferring relationships between data from the manner in which they're

organized. When that organizational information is missing, however, the approach is less effective. Still, Smith imagines, automatic feature synthesis could be used in conjunction with FeatureHub, getting projects started before volunteers have begun to contribute to them, saving the grunt work of enumerating the obvious features, and augmenting the best performing sets of features contributed by humans.

J.JANSI RANI
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ENERGY-EFFICIENT ENCRYPTION FOR THE INTERNET OF THINGS

Most sensitive web transactions are protected by public-key cryptography, a type of encryption that lets computers share information securely without first agreeing on a secret encryption key. Public-key encryption protocols are complicated, and in computer networks, they're executed by software. But that won't work in the internet of things, an envisioned network that would connect many different sensors embedded in vehicles, appliances, civil structures, manufacturing equipment, and even livestock tags to online servers. Embedded sensors that need to maximize battery life can't afford the energy and memory space that software execution of encryption protocols would require.

MIT researchers have built a new chip, hardwired to perform public-key encryption, that consumes only 1/400 as much power as software execution of the same protocols would. It also uses about 1/10 as much memory and executes 500 times faster. The researchers describe the chip in a paper they're presenting this week at the International Solid-State Circuits Conference.

Like most modern public-key encryption systems, the researchers' chip uses a technique called elliptic-curve encryption. As its name suggests, elliptic-curve encryption relies on a type of mathematical function called an elliptic curve. In the past, researchers including the same MIT group that developed the new chip have built chips hardwired to handle specific elliptic curves or families of curves. What sets the new chip apart is that it is designed to handle any elliptic curve.

"Cryptographers are coming up with curves with different properties, and they use different primes," says Utsav Banerjee, an MIT graduate student in electrical engineering and computer science and first author on the paper. "There is a lot of debate regarding which curve is secure and which curve to use, and there are multiple governments with different standards coming up that talk about different curves. With this chip, we can support all of them, and hopefully, when new curves come along in the future, we can support them as well."

Modular reasoning

To create their general-purpose elliptic-curve chip, the researchers decomposed the cryptographic computation into its constituent parts. Elliptic-curve cryptography relies on modular arithmetic, meaning that the values of the numbers that figure into the computation are assigned a limit. If the result of some calculation exceeds that limit, it's divided by the limit, and only the remainder is preserved. The secrecy of the limit helps ensure cryptographic security.

One of the computations to which the MIT chip devotes a special-purpose circuit is thus modular multiplication. But because elliptic-curve cryptography deals with large numbers, the chip's modular multiplier is massive. Typically, a modular multiplier might be able to handle numbers with 16 or maybe 32 binary digits, or bits. For larger computations, the results of discrete 16- or 32-bit multiplications would be integrated by additional logic circuits. The MIT chip's modular multiplier can handle 256-bit numbers, however. Eliminating the extra circuitry for integrating smaller computations both reduces the chip's energy consumption and increases its speed.

Another key operation in elliptic-curve cryptography is called inversion. Inversion is the calculation of a number that, when multiplied by a given number, will yield a modular product of 1. In previous chips dedicated to elliptic-curve cryptography, inversions were performed by the same circuits that did the modular multiplications, saving chip space. But the MIT researchers instead equipped their chip with a special-purpose inverter circuit. This increases the chip's surface area by 10 percent, but it cuts the power consumption in half.

The most common encryption protocol to use elliptic-curve cryptography is called the datagram transport layer security protocol, which governs not only the elliptic-curve computations themselves but also the formatting, transmission, and handling of the encrypted data. In fact, the entire protocol is hardwired into the MIT researchers' chip, which dramatically reduces the amount of memory required for its execution.

The chip also features a general-purpose processor that can be used in conjunction with the dedicated circuitry to execute other elliptic-curve-based security protocols. But it can be powered down when not in use, so it doesn't compromise the chip's energy efficiency. "They move a certain amount of functionality that used to be in software into hardware," says Xiaolin Lu, director of the internet of things (IOT) lab at Texas Instruments. "That has advantages that include power and cost.

KEERTHANA R
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ADAPTIVE CYBER SECURITY DECISION SUPPORT TO PREVENT CYBER ATTACKS

Recognising the complexity of cyber attacks and the multi-stakeholder nature of tackling cyber security are the key components of a new data-driven cyber security system being developed by experts led by the University of Nottingham. The aim is to support organisations of all sizes in maintaining adequate levels of cyber security through a semi-automatic, regularly updated, organisation-tailored security assessment of their digital infrastructures.

The 1 million project, funded by the Engineering and Physical Sciences Research Council (EPSRC) and the National Cyber Security Centre (formerly CESG), will establish the foundations for a digital 'Online Cyber Security System' decision support service (OCYSS) which is designed to rapidly bring together information on system vulnerabilities and alert organisations which may be affected.

The interdisciplinary project brings together academics in different areas of cyber security, information integration and decision making from the University of Nottingham, UK and Carnegie Mellon University, USA. They will be working closely with the UK's National Cyber Security Centre.

Dr Christian Wagner, from the School of Computer Science at the University of Nottingham, who is currently also a visiting professor at Michigan Technological University, USA, is the lead academic. He said: "While the UK has access to some of the world's leading experts in cyber security, the scale and variety of systems in UK organisations, both public and private, make it extremely challenging to flag potential system threats in a timely fashion. This international collaborative project targets a novel approach to semi-automatically identify system vulnerabilities, thus greatly increasing the efficiency and capacity to respond to emerging threats." Also involved as co-investigators are Prof. Garibaldi, who has previously worked with the team at CESG on modelling expert decision making, and Prof. McAuley, who is Director of the Horizon Digital Economy Hub and has specific expertise in security and privacy research.

The UK cyber security sector already has world-leading capabilities and is worth over £6 billion, employing 40,000 people. Cyber attacks are increasing in severity and sophistication and companies are struggling to recruit the expertise needed to defend their organisations.

Cyber security underpinned with scientific expertise

The system will be designed to directly address the acute shortage of availability and access to highly qualified cyber security experts by small-to-large scale organisations from government to industry.

Dr Wagner notes: "The lack of sufficient access to highly trained and experienced cyber security experts is a key challenge for the UK. It prevents a range of users from establishing and maintaining continuously adequate levels of protection of their assets in a rapidly changing security landscape. To view this challenge as a multi-stakeholder problem because a number of human stakeholders, from users and IT managers, with varying levels of expertise, to cyber security and software providers, need to effectively communicate and work together in order to deliver systems with an appropriate level of cyber security assurance."

This new, semi-automatic, data-driven approach is underpinned by novel research on integrating information from a number of different sources while managing discord and potential dependencies of individual components within systems. The aim is to enable systems which are capable of maximizing the utility of the available cyber security insights and to rapidly deliver user-tailored, up-to-date threat analysis and decision support to help organisations mitigate potential cyber attacks before they happen.

Dr Travis Breaux, from the School of Computer Science at Carnegie Mellon University in Pittsburgh, is supporting the project and is especially concerned about the challenge of system composability. Dr Breaux notes: "Increasingly, computer systems are built from hundreds, if not thousands, of hardware and software components that interact with one another. To improve security, system analysts must pay special attention to how these components interact, and they must place these interactions in the context of specific threats. The number of configurations and possible cyber threats is simply insurmountable for human analysts to effectively comprehend and evaluate on their own, which necessitates a semi-automated approach that can stay ahead of emerging technology. Our goal is to empower these analysts to comprehend a larger attack surface without being overwhelmed by increasingly complex systems."

A system tailored to real-world cyber security challenges

Expertise to assess the level of security of a particular IT system is not commonly available in one location. In addition, knowledge on vulnerabilities in systems develops rapidly, making it essential for organisations to maintain up-to-date awareness

of their systems' potential exposure. The proposed approach is designed to capture and integrate security assessments, including associated uncertainty, from a number of sources, including government services such as the NCSC and third party security providers. The key challenge here is to develop ways to gather and model this often complex information effectively, while also dealing systematically with discord in the security assessments provided by individual sources.

By building up a continuously evolving database of system vulnerabilities, the OCYSS framework is designed to provide organisations with an up-to-date threat assessment, incl. associated uncertainty, tailored to their specific systems, thus supporting them in their decision making on threat mitigation.

A key aspect here is that the OCYSS approach is designed to avoid delays in threat detection and potential mitigation by providing a direct pathway for newly emerging vulnerabilities arising from individual system components or their interactions.

Dr Wagner said: "Going beyond the scope of theoretical research and developing advances in data science and human computer interaction, the project will also deliver a functioning prototype of the OCYSS framework, enabling us to conduct an exceptional level of evaluation tailored to real-world cyber security challenges, working closely with our partners at the UK's National Cyber Security Centre. The idea is to deliver both internationally published novel science and re-usable open source software, thus facilitating the reproduction of results, as well as substantially boosting the potential of commercial up-take of the project outcomes."

G.LOKESHWAR
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WHATSAPP TURNS ITS ATTENTION TO BUSINESS

Facebook-owned messaging platform WhatsApp has unveiled plans to develop standalone versions of its mobile app aimed at connecting businesses and their customers more easily. WhatsApp Business will be free for small businesses, with a paid-for enterprise version targeted at those with a global customer base an indication of one way Facebook plans to monetize the app, which now has a billion daily users.

In a blog post Tuesday, the company said the proposed enterprise app will allow large organizations including airlines, e-commerce sites, and banks to contact customers with notifications, such as “flight times, delivery confirmations, and other updates”. WhatsApp has been steadily enhancing its business-to-consumer capabilities for some time now. Last week, the firm announced a business verification system, with a green badge indicating WhatsApp has confirmed a phone number belongs to an authenticated business account - similar to Facebook’s own grey badge for business pages. WhatsApp has previously announced plans to allow businesses to contact customers with marketing messages.

In its blog post, WhatsApp said it will work with business users as part of a closed pilot program to test additional new services ahead of a wider launch. One of the companies testing the enterprise service, UK-based ecommerce firm Yoox Net-a-Porter, said in a blog post that many of its customers prefer to use WhatsApp rather than email to complete transactions and get product suggestions. The company, which also has operations in the U.S., said it has completed single item sales of up $104,000. WhatsApp is now integrated with its order management system application, and is being tested as a notification system for order shipping confirmations.

The announcement serves to highlight the growing acceptance of the consumer messaging app by business users. WhatsApp claimed that many small businesses are already using its platform to interact with customers, though acknowledged that kind of connection is “pretty rudimentary.”

WhatsApp is also increasingly being used in large and small organizations as a collaboration tool for staff. for example, that doctors in the UK’s National Health Service have been using WhatsApp and video messaging tool SnapChat to send sensitive patient information despite a strict ban on such use, while British diplomats apparently use it for confidential discussions both examples of "shadow IT," where employees side-step outdated systems in favor of modern messaging tools. The prospect of more widespread use of WhatsApp at work could pose problems for enterprise IT admins because the messaging software is clearly aimed at individual users with no focus yet on corporate security or compliance features.

P.VIJAYA SHREE
I B.Sc. (Information Technology)

RIDDLES

1. I am a word of 5 letters!
   Everybody eats me!
   If you remove my first letter, I will be a form of energy!!!
   If you remove my first 2 letters, I will be needed for living!!!
   If you remove my first 3 letter, I will be a preposition and near you!!!
   If you remove my 4 first letters, I will be a drink for you!!!

Answer : WHEAT

I am a word of 5 letters -WHEAT

Everybody eats me..

If you remove my first letter, I will be a form of energy- HEAT

If you remove my first 2 letters, I will be needed for living-EAT

If you remove my first 3 letter, I will be a preposition and near you-AT

If you remove my 4 first letters, I will be a drink for you-T(tea)

2. I am a word of 8 letters

   If you remove my last 4 words, I'll be a question.

   If you remove my first and last 4 words, I will be needed for protecting your head.

   My 7th and 8th words are same.

   5 6 7 word is a liquid in tree

   Guess Who I am?

   Answer: WHATSAPP

   If you remove my last 4 words, I'll be a question: WHAT

   If you remove my first and last 4 words, I will be needed for protecting your head- HAT

   My 7th and 8th words are same -PP

   5 6 7 word is a liquid in tree - SAP

3. **Identify the names of various bikes Given in Image below :**

Answers:

1. Fiero
2. Scooty
3. Fazer
4. Discover
5. Splendor
6. Wego
7. Dazzler
8. Unicorn
9. Passion plus

10. Thunderbird
11. Star City
12. Shine
13. Rajdoot
14. 390
15. Pulsar
16. Samurai
17. RX
18. Shogun
19. Twister
20. KTM

POORANI G
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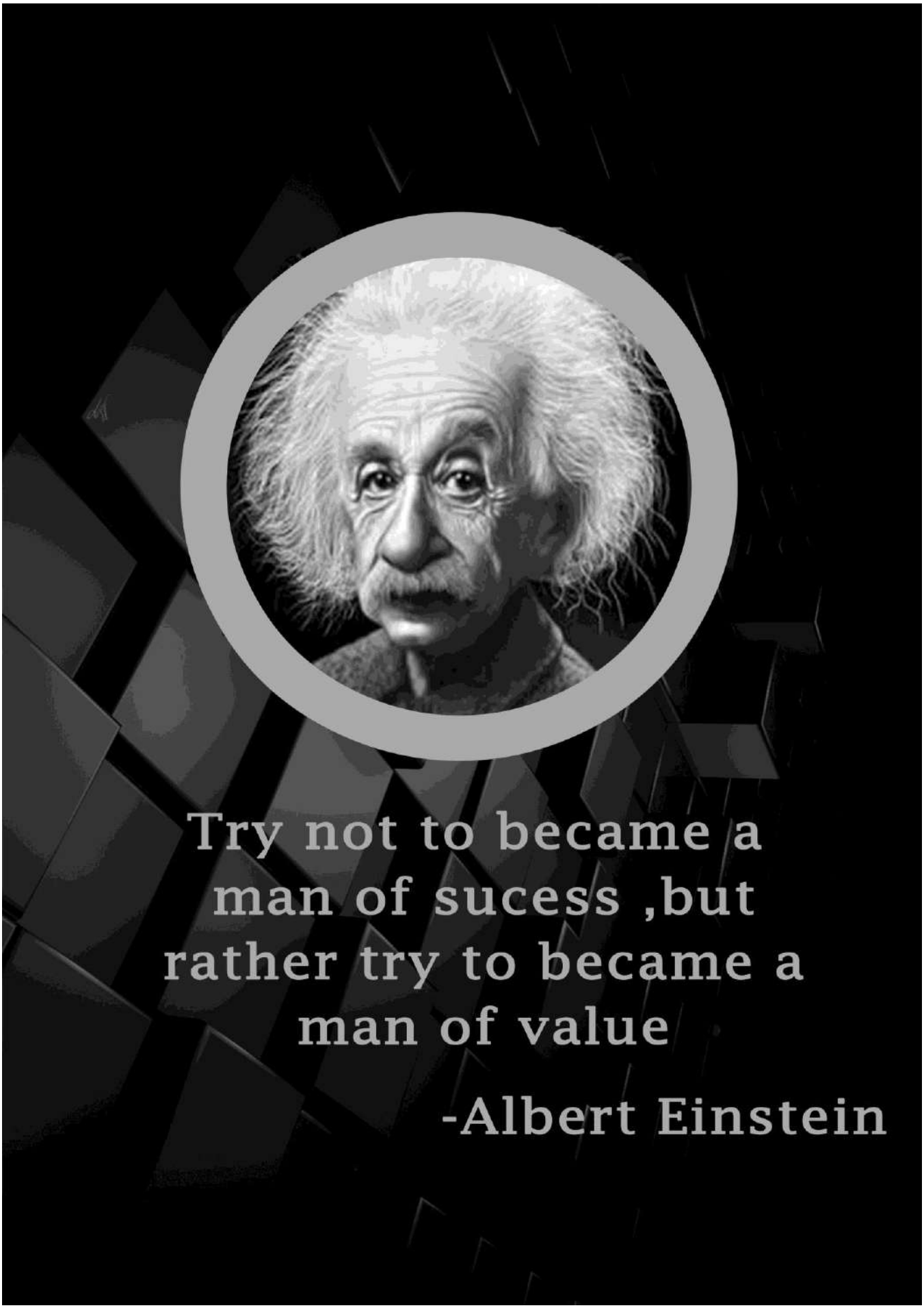
Try not to became a
man of sucess ,but
rather try to became a
man of value
-Albert Einstein