

## Department of Computer Applications

# NEWS LETTER



Vol.1: Issue 5, March 2019

## TECHNICAL NEWS

WEEKLY EDITION

### Facebook, Telegram Working on Their Own Cryptocurrencies

More than 50 engineers at Facebook are reportedly busy giving shape to the social media giant's own cryptocurrency and CEO Mark Zuckerberg is quite bullish on the project. Not only Facebook, highly-encrypted mobile communications apps Telegram and Signal are also on the job to roll out new cryptocurrencies over the next year, The New York Times reported on Thursday.

"The most anticipated but secretive project is underway at Facebook. The company is working on a coin that users of WhatsApp, which Facebook owns, could send to friends and family instantly," said the report, citing people familiar with the project. Telegram, with an estimated 300 million users globally, is also working on a digital coin.

"Signal has its own coin in the works. And so do the biggest messaging applications in South Korea and Japan, Kakao and Line," the report mentioned. With Facebook's plan to merge its three platforms -- Messenger, WhatsApp and Instagram - the digital currency would reach nearly "2.7 billion people who use one of the three apps each month".

Last year, David Marcus, a long-time in-charge of Facebook Messenger, said in a blog post that he is setting up a small group to explore how to best leverage Blockchain across Facebook, starting from scratch. Facebook also promoted one of its senior engineers Evan Cheng as the Director of Engineering at its Blockchain division, signalling the importance of the project.

According to Zuckerberg, the users may soon login to Facebook with Blockchain-based authentication. In a public interview with Harvard Law professor Jonathan Zittrain late last month, Zuckerberg said he is "potentially interested" in putting the Facebook login on the Blockchain technology. "I'm thinking about going back to decentralised or Blockchain authentication. Although I haven't figured out a way to make this work out but this is around authentication and basically granting access to your information and to different services," Zuckerberg told Zittrain.

According to him, Blockchain could give users more powers when granting data access to third-party apps. "Like many other companies, Facebook is exploring ways to leverage the power of Blockchain technology," Facebook said in an earlier statement.

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## AI fake face website launched

A software developer has created a website that generates fake faces, using artificial intelligence (AI). [Thispersondoesnotexist.com](http://Thispersondoesnotexist.com) generates a new lifelike image each time the page is refreshed, using technology developed by chipmaker Nvidia. Some visitors to the website say they have been amazed by the convincing nature of some of the fakes, although others are more clearly artificial. And many of them have gone on to post some of the fake faces on social media. Nvidia developed a pair of adversarial AI programs to create and then critique the images, in 2017.

The company later made these programs open source, meaning they are publicly accessible.

Last week, the Elon Musk backed OpenAI research group [announced](#) it had created an artificially intelligent "writer". But the San Francisco group took the unusual step of not releasing the technology behind the project publicly. "It's clear that the ability to generate synthetic text that is conditioned on specific subjects has the potential for significant abuse," the group said in a statement to AI blog Synced.



## **Google, DeepMind uses AI to predict wind energy output**

Using a neural network trained on widely available weather forecasts and historical turbine data, the researchers configured the DeepMind system to predict wind power output 36 hours ahead of actual generation.

In collaboration with its Britain-based Artificial Intelligence (AI) subsidiary DeepMind, Google has developed a system to predict wind power output 36 hours ahead of actual generation.

Google said that these type of predictions can boost the value of wind energy and can strengthen the business case for wind power and drive further adoption of carbon-free energy on electric grids worldwide.

“Over the past decade, wind farms have become an important source of carbon-free electricity as the cost of turbines has plummeted and adoption has surged,” Sims Witherspoon, Programme Manager at DeepMind and Will Fadrhonc, Carbon Free Energy Programme Lead at Google wrote in a [blog post](#) this week. “However, the variable nature of wind itself makes it an unpredictable energy source - less useful than one that can reliably deliver power at a set time,” they said. In search of a solution to this problem, DeepMind and Google started applying machine learning algorithms to 700 megawatts of wind power capacity in the central US.

These wind farms - part of Google's global fleet of renewable energy projects - collectively generate as much electricity as is needed by a medium-sized city.

Using a neural network trained on widely available weather forecasts and historical turbine data, the researchers configured the DeepMind system to predict wind power output 36 hours ahead of actual generation. “Based on these predictions, our model recommends how to make optimal hourly delivery commitments to the power grid a full day in advance,” Witherspoon and Fadrhonc wrote. This is important, because energy sources that can be scheduled, or can deliver a set amount of electricity at a set time, are often more valuable to the grid. “To date, machine learning has boosted the value of our wind energy by roughly 20 per cent, compared to the baseline scenario of no time-based commitments to the grid,” the post said.

## Apple wants you to unlock your car using Face ID, Touch ID

**A**pple's new patent reveals a new technology that allows users to unlock cars using biometric authentication.

Technology companies and carmakers have been experimenting with new ways to unlock cars. A few cars allow users to unlock using their smartphones. Hyundai late last year introduced a [system](#) that allowed drivers to unlock cars using fingerprint sensors. Apple is now said to be working on a mechanism based on biometric authentication.

A new [patent](#) filed by Apple demonstrates how a vehicle can be unlocked using the company's biometric authentication such as Face ID. This essentially means you can unlock a car by just looking at it – similar to how users unlock their iPhone X and above using [Face ID](#).

In the document titled "System and Method for Vehicle Authorization", Apple said, "Vehicles may be accessed and operated using a key or key fob. Typically, the key fob may provide a remote keyless entry system that provides access to the vehicle by unlocking the doors and additional functionality such as starting the engine. However, most conventional key fobs or keyless entry systems are single factor security systems that offer only a low level of security."

"Moreover, some conventional remote keyless entry systems are vulnerable to man-in-the-middle attacks and other security issues. For example, the vehicle is unable to identify the person carrying the key or key fob, so anyone with the key fob can operate the vehicle," it added.



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## **Code used to reduce quantum error in logic gates for first time**

**S**cientists at the University of Sydney have for the first time demonstrated improvement in quantum computers by using codes designed to detect and discard errors in the logic gates of such machines. "This is really the first time that the promised benefit for quantum logic gates from theory has been realised in an actual quantum machine," said Dr Robin Harper, lead author of a new paper published this week in the journal, *Physical Review Letters*.

Quantum logic gates are formed by entangled networks of a small number of quantum bits, or qubits. They are the switches that allow quantum computers to run algorithms, or recipes, to process information and perform calculations.

Dr Harper and his colleague Professor Steven Flammia, from the School of Physics and University of Sydney Nano Institute, used IBM's quantum computer to test error detection codes. They demonstrated an order of magnitude improvement in reducing infidelity, or error rates, in quantum logic gates, the switches that will form the basis of fully functioning quantum computers.

Dr Jay Gambetta, IBM Fellow and principal theoretical scientist with IBM Q, said: "This paper is a great example of how scientists can use our publicly available cloud systems to probe fundamental problems. Here Harper and Flammia show that ideas of fault tolerance can be explored on real devices we are building and already deploying, today."

Quantum technologies are still in their infancy but promise to revolutionise computing in the 21st century by performing calculations thought to be beyond the ability of the largest and fastest supercomputers. They will do this using the unusual properties of matter at the quantum scale that allow them to process information using qubits. These are computing elements that utilise the fact that quantum objects can exist in an indeterminate state, known as superposition, and can become 'entangled', a phenomenon describing behaviour not seen in conventional computers.

However, electronic 'noise' easily disrupts these states, quickly producing errors in quantum computations, which makes development of useful machines very difficult. "Current devices tend to be too small, with limited interconnectivity between qubits and are too 'noisy' to allow meaningful computations," Dr Harper said. "However, they are sufficient to act as test beds for proof of principle concepts, such as detecting and potentially correcting errors using quantum codes." Whereas the classical switches in your laptop or mobile phone can run for many years without error, at this stage quantum switches begin to fail after just fractions of a second.

"One way to look at this is through the concept of entropy," said Professor Flammia. "All systems tend to disorder. In conventional computers, systems are refreshed easily and reset using DRAM and other methods, effectively dumping the entropy out of the system, allowing ordered computation," he said. "In quantum systems, effective reset methods to combat entropy are much harder to engineer. The codes we use are one way to dump this entropy from the system," said Professor Flammia, who today was awarded the Pawsey Medal by the Australian Academy of Science.

Using codes to detect and discard errors on IBM's quantum device, Dr Harper and Professor Flammia showed error rates dropping from 5.8 percent to 0.60 percent. So rather than one in 20 quantum gates failing, just one in 200 would fail, an order of magnitude improvement. "This is an important step forward to develop fault tolerance in quantum systems to allow them to scale up to meaningful devices," Dr Harper said.

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## **Robots track moving objects with unprecedented precision**

A novel system developed at MIT uses RFID tags to help robots home in on moving objects with unprecedented speed and accuracy. The system could enable greater collaboration and precision by robots working on packaging and assembly, and by swarms of drones carrying out search-and-rescue missions.

In a paper being presented next week at the USENIX Symposium on Networked Systems Design and Implementation, the researchers show that robots using the system can locate tagged objects within 7.5 milliseconds, on average, and with an error of less than a centimeter.

In the system, called TurboTrack, an RFID (radio-frequency identification) tag can be applied to any object. A reader sends a wireless signal that reflects off the RFID tag and other nearby objects, and rebounds to the reader. An algorithm sifts through all the reflected signals to find the RFID tag's response. Final computations then leverage the RFID tag's movement -- even though this usually decreases precision -- to improve its localization accuracy.

The researchers say the system could replace computer vision for some robotic tasks. As with its human counterpart, computer vision is limited by what it can see, and it can fail to notice objects in cluttered environments. Radio frequency signals have no such restrictions: They can identify targets without visualization, within clutter and through walls.

To validate the system, the researchers attached one RFID tag to a cap and another to a bottle. A robotic arm located the cap and placed it onto the bottle, held by another robotic arm. In another demonstration, the researchers tracked RFID-equipped nanodrones during docking, maneuvering, and flying. In both tasks, the system was as accurate and fast as traditional computer-vision systems, while working in scenarios where computer vision fails, the researchers report.

"If you use RF signals for tasks typically done using computer vision, not only do you enable robots to do human things, but you can also enable them to do superhuman things," says Fadel Adib, an assistant professor and principal investigator in the MIT Media Lab, and founding director of the Signal Kinetics Research Group. "And you can do it in a scalable way, because these RFID tags are only 3 cents each."

In manufacturing, the system could enable robot arms to be more precise and versatile in, say, picking up, assembling, and packaging items along an assembly line. Another promising application is using handheld "nanodrones" for search and rescue missions. Nanodrones currently use computer vision and methods to stitch together captured images for localization purposes. These drones often get confused in chaotic areas, lose each other behind walls, and can't uniquely identify each other. This all limits their ability to, say, spread out over an area and collaborate to search for a missing person. Using the researchers' system, nanodrones in swarms could better locate each other, for greater control and collaboration.

"You could enable a swarm of nanodrones to form in certain ways, fly into cluttered environments, and even environments hidden from sight, with great precision," says first author Zhihong Luo, a graduate student in the Signal Kinetics Research Group.

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## SpaceX set for crew demo launch

The US is about to take a major step towards being able to fly its astronauts into space once again.

California's SpaceX firm is performing a demonstration of a new rocket and capsule combination, which, if it works well, will be approved to carry people. Routine crew missions to the space station could start later this year. Not since the retirement of the shuttles in 2011 has America been able to put humans in orbit. It's had to pay to use Russian Soyuz vehicles instead. SpaceX's Falcon 9 rocket and Dragon crew capsule are scheduled to lift off from Florida's Kennedy Space Center at 02:49 EST Saturday (07:49 GMT).

The launch will occur from the historic Pad 39A where Apollo left for the Moon and Atlantis began the very last shuttle ascent. Because this is just a demonstration, there are no astronauts aboard - but there will be a space-suited mannequin. This test dummy, nicknamed Ripley after the Sigourney Weaver character in the Alien movies, will be covered in sensors. These will record the forces and the environment experienced inside the capsule.

For SpaceX, this flight is a key milestone in its 17-year history. It was set up by entrepreneur Elon Musk with the specific intention of taking people beyond Earth. "Human spaceflight is basically the core mission of SpaceX," explained Hans Koenigsmann, the company's vice president of build and flight reliability.

"There is nothing more important for us than this endeavour, and we really appreciate the opportunity from Nasa to do this." The Falcon rocket is the same vehicle the company uses to loft cargo to the International Space Station and to put satellites in orbit. It's gone through many iterations down the years and now has an extensive flight history.

The crew capsule is based on the ISS cargo freighter but incorporates life-support systems and more powerful thrusters to push the vessel to safety if something goes wrong with the rocket. It also has four parachutes instead of the freighter's three to control the descent to Earth. Dragon crew capsules will splashdown in the Atlantic not far from Kennedy.