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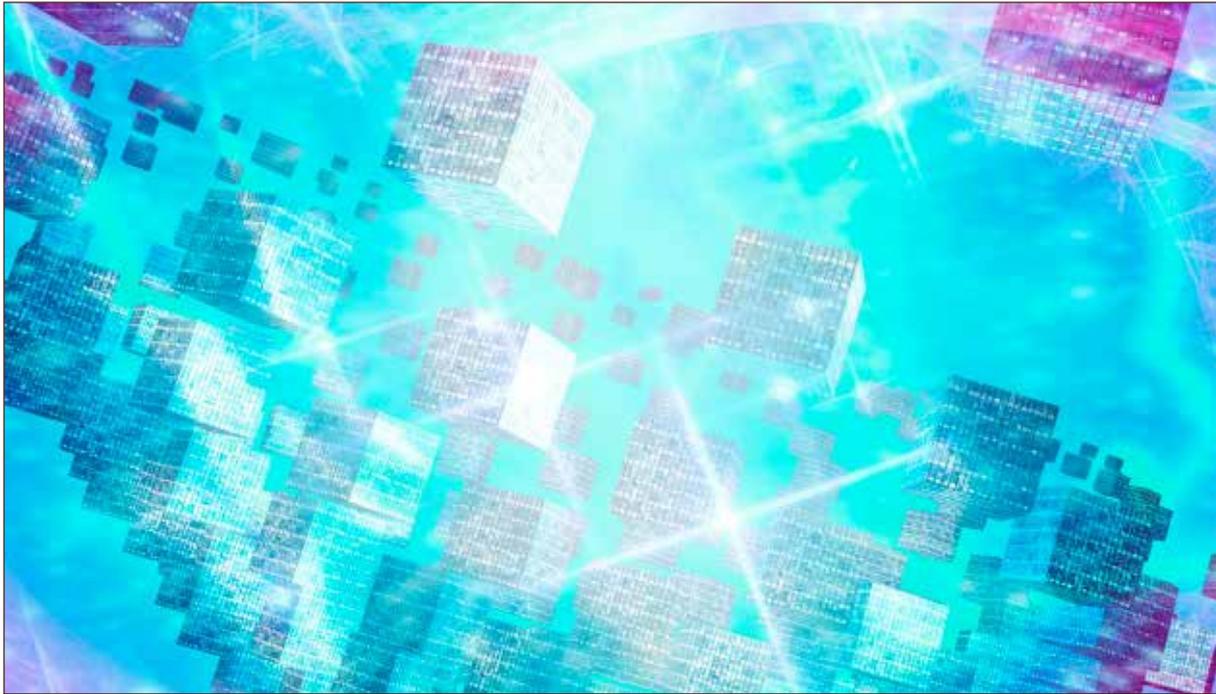
Newsletter

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The quantum computing apocalypse is imminent

In the ancient world, they used cubits as an important data unit, but the new data unit of the future is the qubit — the quantum bits that will change the face of computing.

Quantum bits are the basic units of information in quantum computing, a new type of computer in which particles like electrons or photons can be utilized to process information, with both "sides" (polarizations) acting as a positive or negative (i.e. the zeros and ones of traditional computer processing) alternatively or at the same time.

According to experts, quantum computers will be able to create breakthroughs in many of the most complicated data processing problems, leading to the development of new medicines, building molecular structures and doing analysis going far beyond the capabilities of today's binary computers.

The elements of quantum computing have been around for decades, but it's only in the past few years that a commercial computer that could be called "quantum" has been built by a company called D-Wave. Announced in January, the D-Wave 2000Q can "solve larger problems than was previously possible, with faster performance, providing a big step toward production applications in optimization, cybersecurity, machine learning and sampling."

IBM recently announced that it had gone even further — and that it expected that by the end of 2017 it would be able to commercialize quantum computing with a 50-qubit processor prototype, as well as provide online access to 20-qubit processors. IBM's announcement followed the September Microsoft announcement of a new quantum computing programming language and stable topological qubit technology that can be used to scale up the number of qubits.

Taking advantage of the physical "spin" of quantum elements, a quantum computer will

be able to process simultaneously the same data in different ways, enabling it to make projections and analyses much more quickly and efficiently than is now possible.

There are significant physical issues that must be worked out, such as the fact that quantum computers can only operate at cryogenic temperatures (at 250 times colder than deep space) — but Intel, working with Netherlands firm QuTech, is convinced that it is just a matter of time before the full power of quantum computing is unleashed.

"Our quantum research has progressed to the point where our partner QuTech is simulating quantum algorithm workloads, and Intel is fabricating new qubit test chips on a regular basis in our leading-edge manufacturing facilities," said Dr. Michael Mayberry, corporate vice president and managing director of Intel Labs. "Intel's expertise in fabrication, control electronics and architecture sets us apart and will serve us well as we venture into new computing paradigms, from neuromorphic to quantum computing."

The difficulty in achieving a cold enough environment for a quantum computer to operate is the main reason they are still experimental, and can only process a few qubits at a time — but the system is so powerful that even these early quantum computers are shaking up the world of data processing. On the one hand, quantum computers are going to be a boon for cybersecurity, capable of processing algorithms at a speed unapproachable by any other system.

By looking at problems from all directions — simultaneously — a quantum computer could discover anomalies that no other system would notice, and project to thousands of scenarios where an anomaly could turn into a security risk. Like with a top-performing supercomputer programmed to play chess, a quantum-based cybersecurity system could see the "moves" an anomaly could make later on — and quash it on the spot.

The National Security Agency, too, has sounded the alarm on the risks to cybersecurity in the quantum computing age.

"Quantum computing will definitely be applied anywhere where we're using machine learning, cloud computing, data analysis. In security that [means] intrusion detection, looking for patterns in the data, and more sophisticated forms of parallel computing," according to Kevin Curran, a cybersecurity researcher at Ulster University and IEEE senior member.

But the computing power that gives cyber-defenders super-tools to detect attacks can be misused, as well. Last year, scientists at MIT and the University of Innsbruck were able to build a quantum computer with just five qubits, conceptually demonstrating the ability of future quantum computers to break the RSA encryption scheme.

That ability to process the zeros and ones at the same time means that no formula based on a mathematical scheme is safe. The MIT/Innsbruck team is not the only one to have developed cybersecurity-breaking schemes, even on these early machines; the problem is significant enough that representatives of NIST, Toshiba, Amazon, Cisco, Microsoft, Intel and some of the top academics in the cybersecurity and mathematics worlds met in Toronto for the yearly Workshop on Quantum-Safe Cryptography last year.

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in the quantum computing age. The NSA's "Commercial National Security Algorithm Suite and Quantum Computing FAQ" says that "many experts predict a quantum computer capable of effectively breaking public key cryptography" within "a few decades," and that the time to come up with solutions is now.

According to many experts, the NSA is far too conservative in its prediction; many experts believe that the timeline is more like a decade to a decade and a half, while others believe that it could happen even sooner.

And given the leaps in progress that are being made on almost a daily process, a commercially viable quantum computer offering cloud services could happen even more quickly; the D-Wave 2000Q is called that because it can process 2,000 qubits. That kind of power in the hands of hackers makes possible all sorts of scams that don't even exist yet.

For example, forward-looking hackers could begin storing encrypted information now, awaiting the day that fast, cryptography-breaking quantum computing-based algorithms are developed. While there's a possibility that the data in those encrypted files might be outdated, there is likely to be more than enough data for hackers to use in various identity theft schemes, among other things.

It's certain that the threats to privacy and information security will only multiply in the coming decades.

In fact, why wait? Hackers are very well-funded today, and it certainly wouldn't be beyond their financial abilities to buy a quantum computer and begin selling encryption-busting services right now. It's likely that not all the cryptography-breaking algorithms will work on all data, at least for now — this is a threat-in-formation — but chances are that at least some of them will, meaning that even now, cyber-criminals could utilize the cryptography-breaking capabilities of quantum computers, and perhaps sell those services to hackers via the Dark Web.

That NSA document that predicted "decades" before quantum computers become a reality was written at the beginning of 2016, which shows how much progress has been made in barely a year and a half. The solution lies in the development of quantum-safe cryptography, consisting of information theoretically secure schemes, hash-based cryptography, code-based cryptography and exotic-sounding technologies like lattice-based cryptography, multivariate cryptography (like the "Unbalanced Oil and Vinegar scheme"), and even supersingular elliptic curve isogeny cryptography.

These, and other post-quantum cryptography schemes, will have to involve "algorithms that are resistant to cryptographic attacks from both classical and quantum computers," according to the NSA. Whatever the case, it's certain that the threats to privacy and information security will only multiply in the coming decades, and that data encryption will proceed in lockstep with new technological advances

Source: https://techcrunch.com/2018/01/05/ the-quantum-computing-apocalypse-is-imminent/

Hyperscale data centers reached over 390 worldwide in 2017

Hyperscale operators are defined as enormous companies like Amazon, Apple, Facebook and Google that need to provide computing on a massive scale. You would think that there would be a limited number of this type of highly specialized data center, but recent research from Synergy Research found that 2017 was actually a breakout year for new hyperscale data centers across the world — with no sign of slowing down in 2018.

Synergy reported that the year closed with over 390 web-scale data centers worldwide, up from 300 in just one year. Google was particularly active. Chinese companies Tencent and Baidu also built hyperscale data centers this year. Still, the vast majority are in the US with 44 percent of the total. China is second way back with 8 percent, followed by Japan and the UK with 6 percent each and Australia and Germany with 5 percent each.

Synergy reports that on average, the 24 hyperscale firms have 16 data centers each. The companies with the largest number won't come as a surprise to anyone with Amazon/AWS, Microsoft, IBM and Google each having at least 45 worldwide.

The definition of hyperscale varies, but IDC says it requires at least 5000 servers and 10,000 square feet of available space, but is often much larger. Synergy defines it having "several hundreds of thousands of servers — or sometimes millions."

These operators often build their own equipment to deal with the specific needs of their immense computing requirements. By designing their own hardware and software, these companies can control every aspect of the computing experience to squeeze out the maximum amount of efficiency, which is crucial when you are dealing with the massive scale of these organizations.

To do this, they need to understand and be able to manipulate every configurable element, something that is typically not possible when buying equipment off the shelf. Because of these unique demands, it limits the number of companies who build these kinds of data centers to the largest technology companies in the world.

As these companies in this exclusive club continue to grow, they will continue to require additional hyperscale presence throughout the world and Synergy reports 69 additional facilities were in various stages of planning or construction, but not completed, as the year closed. At the current pace, Synergy predicts there will be over 500 worldwide by the end of 2019.

Source: https://techcrunch.com/2017/12/30/hyperscale-data-centers-reached-over-390-worldwide-in-2017/

How augmented and virtual reality will reshape the food industry

Augmented reality content can be found on everything from wine bottles to IKEA's catalog and virtual reality experiences are much more detailed, with rich layers of interactivity from hand controllers to gaze triggers, and a VR film has even won an Oscar. With Apple and Google both debuting augmented reality platforms (ARKit and ARCore, respectively), Facebook heavily invested in its Oculus headset and Amazon unveiling augmented shopping features, AR and VR is primed to change many parts of our everyday lives.

Within the food industry, AR and VR have also begun to make headway. Although development costs are still high, more and more F&B businesses are beginning to realize the potential of AR/VR and see it as a worthwhile investment. Three main areas – human resources, customer experiences, food products – have seen the most concentration of AR/VR development so far and will likely continue to push the envelope on what use cases AR & VR have within the industry.

Streamlining Employee Training

One of the most tangible payoffs of AR/VR technology is using it for consistent and thorough employee training. The current process of developing training materials can not only be costly, but also vary in quality by team, store, or region. Many times, human resources face the conundrum of choosing between low-touch, high-efficiency (i.e. mass group workshops with the potential downside of low retention and lackluster individualized learning) or high-touch, high-cost (i.e. small group sessions with in-store, real-time training).

Enter virtual reality. Virtual reality can create a detailed visual world for employees to safely interact with their to-be everyday job surroundings and mentally and physically learn the tasks required. These VR lessons range from managing Walmart's holiday rush to cooking noodles at Honeygrow to perfecting the espresso pull.

On the flip side, augmented reality allows for side-by-side training and execution by layering

additional information on top of an employee's direct view. For instance, a research study found AR to be effective in helping subjects visually estimate serving sizes. Maintenance and repair, a necessary evil of the food world, has benefited from equipping technicians with AR headsets to disassemble and reassemble products without being on-site.

These new possibilities for learning and development for businesses small and large not only increase the effectiveness of training material, but also allow companies to employ a wider breadth of workers with different needs and learning styles. As headsets begin to decrease in price and more developers pour into AR/VR, it's likely more and more companies will begin to trial and A/B test these new learning platforms. Perhaps one day, we'll even view former mass conference workshops with the same nostalgia as the milk delivery man.

"Experiential marketing" has fundamentally changed the purpose and construction of food and hospitality driven events. Millennials especially view experiences as a means of social capital, and sharing their attendance and participation at an en vogue experience is an important piece of their curated social identities. The success of events such as the Museum of Ice Cream and 29 Rooms have convinced many brands – Grey Goose, Red Bull, Zappos, to name a few – to begin reallocating advertising dollars to experiences and sponsorships.

Augmented and virtual reality play naturally into this shift. Both are vehicles to activate all senses and immerse the consumer within a specific branded experience. VR experiences in particular have seen growing traction for use during food & beverage events. A great example is the "Boursin Sensorium", a CGI-based VR experience that paired motion (through moving chairs), scents and tasting samples of Boursin cheese. Patron tequila used 360 video to showcase the behind-the-scenes making process at its event booths and Innis & Gunn beer used coordinated VR footage to complement the taste of its beer. Restaurants and bars are also taking notice: Baptise & Bottle in Chicago unveiled a VR tour to pair with physical scotch; SubliMotion in Ibiza lets diners go skydiving in Samsung Gear VR; Space Needle has launched a sky-high VR bar.

Augmenting the physical world with interesting and shareable content has been the focus of AR in experiential marketing. Remy Martin and Macallan both used holographic visuals for their Microsoft Hololens-specific "Rooted in Excellence" experience and The Macallan gallery experience, respectively. Given Hololens' hefty price tag ($3,000 for the base Development Edition), most other brands have stuck with mobile AR – such as Coca Cola's Christmas magic campaign that gave users the ability to see virtual Santa and hidden scenes across branded bus stops in NYC or Patron's AR-enabled tasting experience with a mini bartender. Brick-and-mortar locations are also toying with fun AR elements, with London's City Social debuting cocktail coasters outfitted with augmented visuals and India-based chain Beer Café using AR to educate drinkers on the origins, ABV, category and taste of each beer available.

If the last few years are any indication, even more futuristic applications of AR/VR are soon to come. Visual enjoyment is a major part of any eating and drinking experience and brands have come to embrace virtual overlays – whether immersed in VR or augmented in AR – as a way to educate, inspire, and prompt consumers to action. In one extreme scenario, like the world Project Nourish paints, we

could all be eating and sensing two entirely different things!

Adding Interactivity to Products

Since Bill Gates' famous 1996 essay, the adage "content is king" has been echoed and taken to heart by companies large and small. In recent years, the rise of platforms such and Instagram and Pinterest – and the social influencers and blogger celebrities it has created – have shown even more clearly that engaging with consumers digitally result in real action. Products and retail locations may still be static, but its content must extend beyond physical space to attract the attention of potential and returning buyers.

Augmented reality can bridge this gap between consumer, product and product content. The ability to overlay additional information, visual stimulus and interaction on top of specific items give product companies the chance to combine the digital world with the physical one in a targeted and seamless way. Food and beverage companies have begun to utilize AR in innovative new ways: Treasury Wine Estates' line 19 Crimes brings each label's pictured convict to life in AR; Nestle used a character from the movie "Rio" for an AR game available on 26 million boxes; Walmart and Kraft teamed up for an AR-backed summer sweepstakes to sell more Kraft products. One recent, poignant example was when chef & restauranteur David Chang released his limited-edition Momofuku x Nike sneaker via Nike's AR app SNKRS, which would only allow fans buying access to the shoe when physically located at Fuku's East Village location.

The potent ability of AR to enrich the knowledge and visuals of physical content goes beyond marketing purposes. Companies can use the technology to educate consumers on nutritional information and product composition or even make healthy but bland-looking foods appear more appealing. AR also allows physical content, like cookbooks, to merge with digital content for a simultaneous cross-medium experience as HoloYummy showcased with 3D dish renderings of Chef Dominique Crenn's book Metamorphosis of Taste.

As consumers become more comfortable with AR, its presence will become a more continuous expectation. Instagram's rise to prominence resulted in an entire industry of specialists across the world, allowing for mass adoption for even small businesses. AR is at the base of the same mountain; big brands are already repeatedly using AR outreach, but it still needs momentum from creators, developers and marketers to make it accessible for anyone and everyone.

Source: https://techcrunch.com/2017/12/25/ how-augmented-and-virtual-reality-will-reshape-the-food-industry/

For More Information: