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CES 2020 - Tech that moves from human directed to anticipating and participating with humans

CES highlights 2020 [hashtag#ces2020](#)

CES 2020 was full of interesting technology across all sectors of industry and consumer applications. It continued the discussion from last year by showing viable use cases for technology. Everything from connected home, health care, sensor clothing and prosthetics to elegant bi-directional charging stations for home EVs were front and center. There was also an in-home water capture and creation system actively demonstrated.

Equally present were EVs, Drones, Robots showcasing how they could work above ground, in water and anywhere on any surface to do the job in commercial applications. These machines demonstrated applications such as hauling materials, automated farming and underwater imaging. There were also stationary robots to keep us company and feed us our meds as we age. We also saw more computer vision applications in enterprise and image recognition. Virtual reality was relegated to the gaming department while Augmented Reality shows promise for the enterprise in training and design. There were numerous safety applications for workers using IoT sensor technology and data as well. IBM along with a few start-ups lead that showcase. Sensors that detected unusual movement were also part of those safety applications.

If there was one theme that I could attach to this show, I would say that technology is moving from delegated tasks to now anticipating and participating with humans in everything we do. That idea is both ambitious, interesting and a bit scary! Cars that are sensing your mood and comfort will automatically adjust. Robotic prosthetics will move with your thoughts; AI will collaborate with you and will augment your knowledge and language skills or simply be there when you cannot. BCI – (Brain compute interface) in cars, machines, homes will read your thoughts and the machines will then adjust themselves to your needs.

Two breakthroughs in innovation were present at CES 2020; AI driven human Fakes and short-view content technology. Fakes like Neon want to replace the smart assistant and change your experience. New content players like Quibi are challenging the already established players like Netflix and HBO to create and deliver short-view mobile content.

Quibi laid down the gauntlet with their grand ambitions to dominate the mobile streaming content space with \$1.4B in funding. This could be the next big game. Meg Whitman, the CEO

for Quibi launched this new technology on center stage. The other groundbreaking innovation was Neon. They were given lots of airtime at CES to display how these realistic fakes are used in customer service applications and training. They presented realistic human presence driven by AI engines/machine learning to showcase how advanced AI is working in real time conversation and language translation.

Sustainability companies such as wallbox and Hydraloop showed up this year and demonstrated the transition from hype to a real business with paying customers. In a storm of consumer vision and applications that are more dreams than reality, the sustainability tech companies won the prize. They were set apart and honored with top awards for truly important and customer proven applications. Hydraloop demonstrated practical home and office water recycling use cases with 100 customers in Europe. They are now opening their business in the US. Hydraloop won CES product of the year for realizing their vision and demonstrating an important solution for water recycling.

Finally, wallbox demonstrated a sleek design for the industry's first bi-directional home charging station for EVs. They aim to simplify the whole consumer charging experience using mobile apps and voice interfaces such as Alexa and Google. Wallbox won an award for innovation and customer relevance.

Among the mass of the curved and spinning 8K TVs, 5G/AI, folding PCs, it was encouraging to see sustainability technology featured and rewarded at the show for its innovation and importance in the world.

Last year the message was clear that Voice is now the new interface for everything. Now, the new user interface is fake humans with multi-lingual capability. A future vision of the merger of human and machine will include mind and machine integration. Humans will think of something and the machine will move to act on its thoughts. This showed up clearly in the truly visionary session of Mercedes Chairman, Ola Kalleniug and film Director James Cameron as they presented the Mercedes vision AVTR car. Inspired by the Avatar movie, they describe the merger of human and machine where the machine senses everything and responds to the humans in the car.

This vision is very far away from today's reality. However, on the floor, there were working examples of how embedded sensors in cars would dynamically adjust temperature and air flow based upon how sensing human needs of each passenger in the car. Ola also made a statement that luxury cars would never go away because there would always be a need for comfort and personalized travel.

In several sessions on IoT and 5G there was a lot of recognition that 5G and more readily WiFi6 would live first on the enterprise floor and gradually make it out to consumers in the next 2-3 years. The upgrade cycle for SPs will be a long one so enterprises will lead the charge on fast mobility to fuel IoT. This is something that I had spoken about in last year's report. The movement to 5G will be gradual for more than just economic reasons. 5G Mini towers are not

as clumsy and claim to be less of a health issue than full cellular towers but there needs to be more than 800K for them (virtually everywhere) to cover the nation's hot spots. That migration across all of America will be slow and expensive. The need for approval from communities is minimal but the number of towers required to make it real will take time. Consumers are also fighting to ban these towers in their neighborhoods because of concerns for their health. Outside of today's gaming applications or autonomous vehicles (still several years away), there is not a realistic need for 5G in consumer applications. 4G plus is good enough for now but perhaps Quibi will provide that killer app!

In the enterprise, it is a completely different story. Leading companies are driving quickly forward on Wi-Fi6 because of increasing IoT applications being deployed. Applications driven by sensors for connected products, services and factories/logistics/energy/water/fleets as well as health care/remote diagnostics are growing and so are their use cases. Sensor based applications embedded in the overall automation scheme of AI and Robotics were everywhere on the floor but were treated like last year's news. CES 2020 showed new safety applications that integrate face recognition/expression to sense when a worker gets tired. They showed how this technology can sense these conditions and shut machines down to keep accidents from happening. Of course, no one was discussing how Amazon robots were running into workers in their warehouse because that would spoil the fun!

John Deere demonstrated an automatically propelled sprayer with a 120-foot carbon fiber boom, featuring imaging and recognition technology to spot weeds. The equipment moves through the field with a mounted camera constantly taking pictures. There's a computer on board that is in real time using a machine-learning algorithm that has been trained to categorize, 'is what I'm looking at a plant or a weed?'

We are beyond hype with IoT as companies invest in this space to solve logistics, fleets, XaaS, M-M communications and data (Humans/AI and Robotics) to further the cause of automation, speed, safety and cost reduction. Retailers, in their attempt to survive Amazon, are investing into multi-channel strategies where automation for checkout, inventory mgt and automated ordering are now standard in leading franchises. These will be the leading killer apps for these faster, lower latency wireless technologies like 5G and Wi-Fi6.

Like last year there were plenty of vehicles to check out that are road ready in the EV category. It turns out that trucks (shipping, dump trucks, food vending trucks) will probably be heading toward Autonomy faster than cars because they must! Available and qualified drivers for commercial trucks are decreasing rapidly and slowing down American distribution. At CES, you could get an autonomous ride from the airport to your hotel if you wanted to wait but of course you can do that in the Silicon Valley if you live near Google. I have a few pictures below showing these new vehicles inclusive of John Deere. Who doesn't want their own personal tractor and utility vehicle that can tow the statue of liberty (the XUV855)? If that does not suit you how about an automated weed killer? There was the next gen Bell Nexus copter and

MAKING THE NEXT VERSION OF THE NEIGHBORHOOD FARM ACCESSIBLE TO CAMPUSES OR NEIGHBORHOODS BY DISPENSING FRESH FOOD IN AN AUTONOMOUS FOOD TRUCK IS A PRACTICAL WAY TO FEED A GROWING URBAN POPULATION

flying Taxi's with Uber, vision cars that merge man with machine and read your thoughts, climbing robots and vehicles that can move straight up a vertical wall and carry your load.

China's presence was once again down this year because of the trade war but ASIA based companies were there in force. Many of the robotics companies at CES were from Asia.

It was a good week overall – As technology starts to work in collaboration with humans and needs less and less instruction, there is no telling how far humanity or rather humanoids will go.





ZERO MASS DEMONSTRATES WATER FROM THE SUN AND THE AIR THAT IS DRINKABLE AFTER FILTERING IT FROM THE SOURCE



WATER RECLYING FOR HOME OR THE OFFICE

Zero demonstrated how they capture water from air and produce clean drinkable water

They Capture water particles from panels that look like solar panels

This then gets purified and ported to drinkable water



A Dutch based company, [Hydraloop is the best of CES award winner](#) and is an in-home water recycling system. The product is about the size of a refrigerator and hooks into your home's existing water system. Once installed, it'll take in outgoing wastewater and process it in multiple ways: In its self-enclosed for factor, it does its magic to clean the water for reuse.

This includes [sedimentation](#), [flotation](#), [dissolved air flotation](#) and [foam fractionation](#). That treated water is then processed by an aerobic bioreactor, and finally disinfected with UV light similar to larger scale water utilities. And after the treatments are complete, the resulting clean water springs forth from the Hydraloop to be reused in toilets, washing machines, pools and even in the garden. This multi-step process is Hydraloop's innovation vs using standard in chemicals to sterilize it. The home cost is \$4,000 and it saves about 20,000 gallons of water per year. They have over 100 installations in Europe and Asia and are now coming to the US and looking for distribution partnerships.



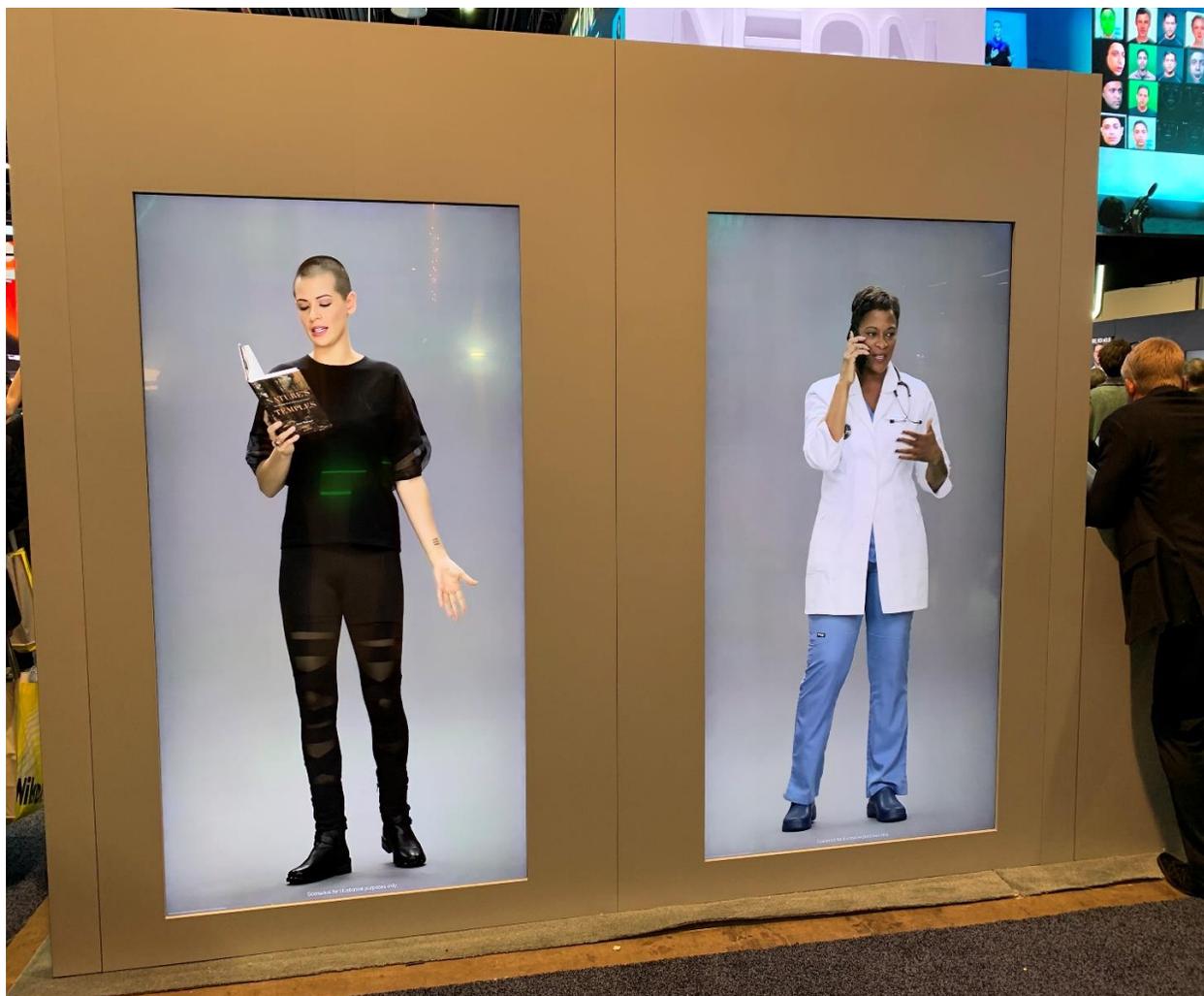
Commercial EV trucks of all types that were autonomous with various features on sensing road, weather, human conditions were on display aiming to make the roads cleaner, safer and filling the gap of resources required to drive and run the services for these trucks. They are also touting more maneuverability than traditional vehicles

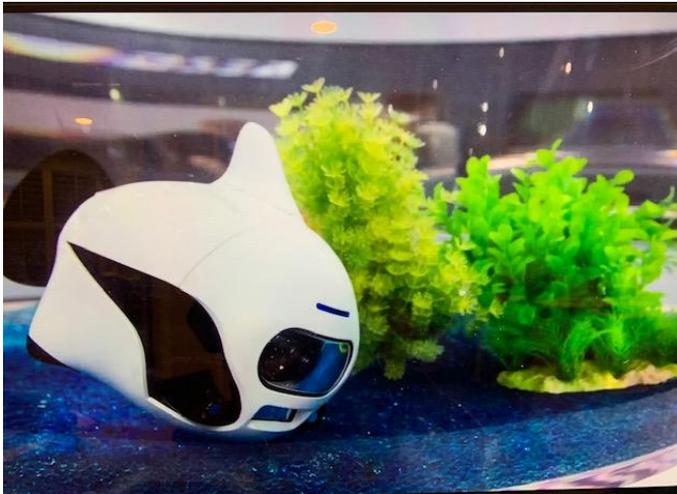


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*Neon (A Samsung subsidiary) Showed up large with life sized Fakes generated from machine learning and AI. These are positioned to replace smart assistants. They attracted a lot of show activity because of the amazing realness of the fake's movement, speech and overall experience. If they can pull this off in a scalable way for customer service applications and education on websites, it could be the next big unicorn. Enterprises are always looking for a better way to connect with their customers and chatbots are ok but not like real human interaction. These appear to be much more responsive and realistic. They can be preprogrammed to present information on websites and educate people on topics and respond to questions in milliseconds. A far better experience than chatbots.*

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## Showcasing Human and machine integration

Several companies were showcasing human and machine integration. e-shock promises to run shuttles in designated locations and communicate through active screens with humans on its status. It tells you when it is stopping and show humans when they can anticipate arrivals

Water Robots that are programmable can become human eyes. They sample and test water and produce data for laboratory analysis on water conditions. They also can observe and generate data for reports on the health of oceanic species.

They can also be used for pure underwater cinematography



## FPT POWERTRAIN

NEXT GEN  
POWERTRAINS THAT  
CAN USE VARIOUS  
FUELS AND BE USED  
IN A VARIETY OF  
APPLICATIONS FOR  
INDUSTRY



ZEROZERO ROBOTICS  
CONTINUE TO  
MINIATURIZE DRONES  
AND CAN LAST MORE  
THAN ONE HOUR IN  
THE AIR AND FLY AT  
NEW SPEEDS  
INCREASING THEIR  
USE FOR  
COMMERCIAL AND  
CONSUMER  
APPLICATIONS



WATER OR CLIMBING

COMPUTER AIDED  
VISION UNDERWATER  
FOR BOTH  
RECREATION AND  
SCIENTIFIC OCEANIC  
WORK



...AND ROBOTS THAT  
CAN CLIMB ANYTHING



This is the IBM Quantum computer in its early stage. While there are no real applications today that can really take advantage of the technology, that will change soon. This machine needs to live in Zero-degree temperatures to keep accuracy in calculations.

Today IBM enables R&D houses to collaborate with them as part of Q Experience to drive the future of real-world applications in quantum computing.

Google claims to have made a further breakthrough in its Quantum efforts with the quantum computer they share with NASA. This is still far from general enterprise applications...at least for now.



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*Autonomous EVs of all types -fleets, shuttles, personal vehicles all built with sensors for every kind of human to machine insight that you can imagine*

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## Wallbox – Leader in Europe of Home EV charging

Quasar - The first home EV wall chargers that are bi-directional. You can discharge to the home or the Grid. The grid will need to support bi-directional power in the future for this to be effective.

9.6 Kilowatts charging stations also offer apple, Alexa or Google interface for voice instructions. Works with all EVs.

Wallbox offers sleek new designs for consumers. Their motto is to innovate to make charging simple.





ABOVE A WATERPROOF DRONE ABLE TO TACKLE ASSIGNMENTS IN THE POURING RAIN. BELOW THE MERCEDES VISION CAR WITH TIRES THAT TURN 360 DEGREES AND A ROOF THAT BREATHES AND MERGES WITH NATURE. IT IS COMPLETELY CONTROLLED WITH A STAR WARS LIKE CENTER PALM CONTROL THAT SENSES COMMANDS AND READS MINDS. INSPIRED BY AVATAR AND JAMES CAMERON.





## MERCEDES VISION CAR AVRT

On the prior page, Mercedes had the greatest vision concept showing how the Avatar movie concepts came to life with their vision car. James Cameron producer of Avatar the movie and Ola Kalleniug Chair of Mercedes showed how the car and humans will merge in their new machine with only one hand control as a sensor. The car can drive sideways with its full 360 degree turn wheel radius. The car's roof breathes and creates a blend of car and nature with its outdoor views.

This page shows the Mercedes of today – EV and semi-autonomous

## NEXT GENERATION OF EV MORORCYCLES AND AN AUTONOMOUS SELF-SERVING ICE CREAM TRUCK



Above is the John Deere Autonomous spraying tractor using Computer visioning. Below are tiny programmable robots for consumer hobbyist's or for beginners to learn AI and programming for Robotics.



The Hyundai Air Taxi



## Summary of this years Investment Statistics on Tech and other

- VC investment declined 16% YoY in 2019 yet remained robust, with \$7.5 billion in capital invested\*
- Most PE firms are diversifying and growing. They are picking up the slack for VCs and growing their funds aggressively.
- VC-backed companies managed to set a record on exit value because of top unicorn IPOs (Uber, Zoom, Lyft, Impossible meats)
- While many PE firms diversify funds, some players like Thoma Bravo are focusing exclusively on software which is increasing his returns. And the firm has been doing it awfully well, based on its fund performance metrics.
- After several billion-dollar deals and a firm-record fund in 2019, Thoma Bravo is climbing the ladder of the top players in PE this year
- According to Pitchbook\*, the top PE firms today in funding are listed below. Thoma Bravo has helped lead the surge, ranking among the **most active PE firms** in the sector in 2019, according to PitchBook data:

1. **TA Associates (40)\***
2. **Vista Equity Partners (37)\***
3. **Insight Partners (33)\***
4. **Thoma Bravo (28)\***
5. **Providence Equity Partners (25)\***

The funding paradigm for tech has changed considerably in the last 10 years. Early seed stage is now delegated for individual friends and family investments or small group funds unless the last start-up you did was a unicorn.

VCs come in the game much later (larger series A-B) with larger funding rounds (\$5-100M) after a technology is proven but they stay invested much longer. The average IPO is 10 years out when the technology is proven and there are many customers. Profitability is often after market dominance. If start-ups have promise but struggle to scale – acquisitions or PE becomes the answer.

PE firms that focus on tech take the IPOs private or buy private VC or corporate spin offs that may no longer fit the company strategy but have good product to salvage. They then combine with other like products to create a company of scale. Toma Bravo has bought many cyber companies under these conditions.

Tech is continuing to get the attention of Enterprises who want to invest and acquire. Most large tech, and industries moving to be tech companies are growing through acquisition. It is inevitable that when industries mature, they consolidate. The move from public to private is also on the rise with PE fund raising being a big factor in this trend. There are fewer public companies now than there were 10 years ago. This trend is being driven by increasing regulatory requirements, the rise of PE mega funding and the elongated tail of IPOs. That being said, tech is and will continue to be a growing part of every company. Just like my theme of CES, the best companies will anticipate change and participate in technology to solve some of the world's greatest problems.

\*Pitchbook data