CES 2018
Tech Trends
Direct access to CES Unveiled Las Vegas

Seaside Ballroom
Slides and press release available at:

CTA.tech/salesandforecasts
CES 2018 Technology Trends In Three Parts

Ingredient Technologies
- 5G
- A.I.
- Robotics

In The Market
- Native Interfaces and Digital Senses
- Realism Redefined

Emerging Tech
- Smart Cities
- Sports Innovation
- Digital Therapeutics
5G Connectivity: Coming Soon

- **Higher speed** - **Greater Capacity** - **Lower Latency**
- Big stories for CES 2018: 5G New Radio (NR) and 5G roll-out

**Wireless VR**

**Smart Cities**

**Self-Driving Cars**
Solutions Enabled by 5G

**Telecommunications**
- Residential and Enhanced Mobile Broadband

**Industrial**
- Robust and secure network.

**Automotive**
- Extremely high data rate and very low latency

**Health Care**
- Real-time networks; streaming 8K video

**AR/VR**
- High data rates revolutionize customer experience
5G: How fast is it?

How long would it take to download the two-hour-long “Guardians of the Galaxy”?  

- **3G**: 384 Kbps (2001)  
  26 hours  
  Fly from New York to Sydney, including check-in times

- **4G**: 100 Mbps (2009)  
  6 minutes  
  Run a quick mile

- **5G**: 10 Gbps (2020)  
  3.6 seconds  
  Ask, “Is it downloaded yet?”

Network Type
5G Industry Roadmap

Technology Initiatives
- Carriers deploy LTE-Advanced/Pro Small /pico and metro cells

Standardization Initiatives
- Field trials

Market Initiatives
- 5G New Radio (NR) development

Regulatory Initiatives
- Finding spectrum

2016
- Short-term development

2018
- Longer-term development
- 5G / 4G LTE networks
- 5G stand-alone networks

2020
- Release 16 by 2020
- Enhanced Mobile Broadband New business models
- mmWave spectrum
Artificial Intelligence
Artificial Intelligence

*Systems that learn to do things we can’t program them to do*

- Deep / Machine Learning
  - Software learns from data (i.e., experience)

- Neural Networks
  - Processing devices from algorithms to hardware

- Narrow vs. General AIs

Use Cases: *Doing Things We …*

- Don’t Care to Do
- Can’t Do
- Need all the help we can get

Greater A.I. integration will generate societal impacts
LG IoT
Control LG Smart Products hands-free

Ok Google, Ask HOME-BOT to work

- TV
- Smart Lamp
- Door Locks
- Washing Machine
- Refrigerator
- Sound bar
- Thermostats
- Robot Vacuum (HOME-BOT)

Google Assistant
LG SmartThinQ
U.S. Smart Speaker Shipments

Units in 000s

<table>
<thead>
<tr>
<th>Year</th>
<th>Shipments (in 000s)</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>7,200</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>27,256</td>
<td>279%</td>
</tr>
<tr>
<td>2018</td>
<td>43,627</td>
<td>60%</td>
</tr>
<tr>
<td>2019</td>
<td>56,762</td>
<td>30%</td>
</tr>
<tr>
<td>2020</td>
<td>52,068</td>
<td>-8%</td>
</tr>
<tr>
<td>2021</td>
<td>47,177</td>
<td>-9%</td>
</tr>
</tbody>
</table>

Source: CTA
AI Applications in Auto:
Sensory Perception  |  Data Processing  |  Action

NVIDIA DRIVE PX2

NVIDIA PILOTNET

FORD | ALEXA
Detecting & deterring security intrusions
Resolving users’ technology problems
Reducing product management work by automating it
Gauging internal compliance
Anticipating future customer purchases
Financial trading
Using runbook automation
Improving media buying
Monitoring social media comments
Tailoring promotions
Automating call distribution

AI: Not Just For IT-Related Tasks

Top Areas Where Companies Are Using Artificial Intelligence

Legend:
- IT tasks
- Marketing tasks
- Finance & accounting tasks
- Customer service

44%
41%
34%
34%
19%
17%
16%
16%
16%
15%
15%
Retailers Experience The Tangible Benefits of AI

- Cost Savings: 49%
- Increased Productivity: 44%
- Increased Revenue: 43%
- More Informed Business Decision making: 40%
- Faster Resolution of Business Problems: 39%
- Automated Processes and Tasks: 38%
- Expansion of Employee Knowledge and Skills: 27%
- Faster Delivery of New Products & Services: 26%
- Predictive / Prescriptive Analytics: 24%
- Ability to Design and Test New Ideas with...: 24%
- Increase in Innovation: 22%
- Ability to Identify New Revenue Streams: 16%
- Attract New High Skill Employees: 11%
Inside A.I. at CES 2018

Intel’s Nervana NNP

NVIDIA Titan V GPU

Snapdragon 845 Mobile Platform
New Architectures for AI and Immersion
“One of the major groundbreakers is going to be our ability to truly converse with artificial intelligence embedded in the fabric around us—this will be far bigger than people realize right now.”

Arvind Krishna, Senior Vice President of Hybrid Cloud and Director of IBM Research
Source: IBM
What’s Next for A.I.?

Building Trust and Reducing Bias

“We will get to a point, likely within the next five years, when an AI system can better explain why it's telling you to do what it's recommending.”

Rachel Bellamy, IBM Research Manager for human-agent collaboration. Source: IBM
From Conversations to Relationships?

From Amazon’s Alexa ...

“Alexa turn on Movie Night”

“Alexa, turn on Kids’ Bedtime.”

To Toshiba’s Aiko...

“Alexa, turn on My Morning Motivation Routine.”

“I’m outta here. Alexa, turn on the Leave Home Routine.”
Roboticstics

Blue Frog Robotics’ BUDDY
Robotics in the Consumer Market

Mayfield Robotics
  Kuri

Leka

Ubtech Lynx

Black and Decker
Smartech Robot Vac

LG Robots at CES
Hub Robot

Lawn Mowing Robot

Airbot

Kuri Leka LG Robots at CES
Life with Kuri ...

Family friend

Capturing life’s moments automatically using face recognition

Life of the party

Home video connection
Somnox sleep robot
Honda Robots – way beyond Asimo

3E Philosophy: Empower, Experience, Empathy
Digital Senses and Native Interfaces

Addressing the need for better authentication and greater security

Voice becomes the preferred UI

New business opportunities and implications for marketers
Voice: The Fourth Sales Channel

The smart way to stock your home this holiday

Learn more

“Alexa, order...”
Fingerprint Technology

Benjilock
Thumbprint Padlock

NXT-ID
Smart Wallet

Synaptics
Natural ID Capacitive Sensor
Facial Recognition on the Go

Continental AG

IPhone X Face ID
Samsung Galaxy S8 Iris Scanning
Comfort with Native Interfaces

U.S. Consumers

Use Cases: Net Comfort Levels with Biometric Technology

Net Comfort Level = Very Comfortable + Comfortable

Source: CTA, 2017 Biometrics Study
Realism Redefined

“Presence. Where if you create the right type of experience, you can make someone forget where their real body is for a moment, a minute or two, and make them truly feel like you've taken them somewhere else.”

Hollywood Executive

VR’s Market Journey

B2C

B2B
AR’s Market Journey

B2B

B2C
VR Ecosystem Expanding

- HTC Audio Strap
- Audeze and JBL Headphone Solutions Specifically Developed for VR
- Nyko VR charging docks
- Taclim VR Boots
- HTC Vive tracker
- Content Subscription Plans
- Insta360 Pro 8K 360-Degree VR Camera
- Dynamic Tactile Wave
- Intel’s Project Alloy
Lenovo Mirage Solo
Have You Got Friends in VR Spaces?
VR Use Cases: Favorability

U.S. online adults aware of VR

**Level of favorability**
(Very favorable + favorable)

**Training and Medical Support**
- Teach school children: 58%
- Train surgeons: 56%
- Engage patients in VR games to distract: 54%

Average: 56%

**Indoor Entertainment**
- View live performance at home: 51%
- In video games: 51%
- View 360 videos online: 51%
- Share VR content in social media: 41%

Average: 48%

**Outdoor Entertainment**
- Movies in theatre: 56%
- View sporting events at the venue: 48%
- At theme parks: 44%

Average: 50%

**Commercial**
- Explore holiday destinations to make a decision: 63%
- Commercial promotions to virtually experience product or service: 45%
- Shop online: 42%

Average: 50%

Source: CTA, 2017 AR/VR Tracker Study
AR Gets Real

2 Hours of Doctor time saved per day

15% Gain in operational efficiency

25% Reduction in manufacturing time

Source: Google X
AR All Around CES

Lenovo Mirage AR Headset

Vuzix Alexa-enabled AR Glasses
AR/VR and Sports

Next VR Camera

CES Sports Zone
AR for All
Smart Cities
The Case for Smart Cities

• Urban centers increasingly difficult to monitor/manage
• Better, more-timely information = better choices
• Optimization of public safety and services
• Reducing traffic congestion
• Less pollution
• Competitive economic advantages
• Self-Driving Pizza Delivery >>>>>>>>>>

Big challenges exist: Market-based, Organizational, Political leadership

Visit Smart Cities at CES at Westgate
In December 2015, the U.S. Department of Transportation launched its Smart City Challenge—a public-private partnership between the U.S. DOT and investment vehicle Vulcan.

77 cities entered the contest. **Bold** cities were the finalists.
Smart Cities Across the EU

**Number of Smart Cities**

- 31+
- 11-30
- 4-10
- 1-3
- 0

**Proportion of Smart Cities**

- 76%-100%
- 51%-75%
- 26%-50%
- 1-25%
- 0%

Source: 2014 EU research project
Among the 264 EU Smart Cities in 2014, how many present these characteristics?

- **Smart Environment**: 83%
- **Smart Mobility**: 52%
- **Smart Governance**: 35%
- **Smart Living**: 30%
- **Smart Economy**: 28%
- **Smart People**: 22%

Source: 2014 EU research project
## Smarter Transportation With Mobile Apps

The future for smart city app development may be these data collection apps like these:

<table>
<thead>
<tr>
<th>City</th>
<th>App Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paris</td>
<td>SoundCity by Inria</td>
<td>Measures users’ personal exposure to noise pollution and allows app creators to build a map of noise pollution for Paris.</td>
</tr>
<tr>
<td></td>
<td>DansMaRue by Paris Numirique</td>
<td>Allows users to identify and report damaged infrastructure or cleanliness issues so that service teams can be easily deployed.</td>
</tr>
<tr>
<td>London</td>
<td>Appyparking</td>
<td>Allows users to easily locate available parking spots in real-time and on-the-go.</td>
</tr>
<tr>
<td></td>
<td>FixMyStreet</td>
<td>Is a platform connecting citizens with their council to report damaged or dirty streets.</td>
</tr>
<tr>
<td>Amsterdam</td>
<td>Tranzer</td>
<td>Allows users to pay for public transport on the go, making their trips more convenient.</td>
</tr>
<tr>
<td>Helsinki</td>
<td>MAAS Global</td>
<td>Identifies the optimal path for its users across a combination of public (trains, busses, bike shares) and private (taxis) transport options.</td>
</tr>
</tbody>
</table>
Sports Innovation

Quantified Athlete: From next-generation activity tracking sensors to personalized nutrition, tech is shaping the way we eat, sleep, and exercise.

Smart Venues: Smart city technology will be pressure-tested in crowded stadiums hardening IoT systems and software.

Next-Gen Sponsorship: Tech companies create new sponsorship categories and increase demands on measurement tools. Experience valuations will dominate impression counts.

Immersive Media: Streaming platforms shake up media business models and increase fan choice. Personalized augmented and virtual reality viewing experiences are here.

Esports: Competitive video gaming provides a laboratory for experimentation on the future of sport content creation and consumption.
Digital Therapeutics
Digital Therapeutics

Digital therapeutics harness the power of technology to impact health by:
• **Enhancing traditional medical practices**
• **Encouraging behavior change**, and in some instances,
• **Serving as a direct stand-alone therapy** for a health condition.

Digital therapeutics are **validated by clinical evidence** to demonstrate an effect on **health outcomes** for specific treatment pathways as well as primary and secondary disease prevention.

**Chronic diseases are believed to present the greatest opportunities for Digital Therapeutics adoption**

- Sleep apnoea
- Oncology
- COPD
- Mental health
- Diabetes
- Hyper-tension
- Heart disease / cardiology
- Ortho-paedic surgery
- Pain management
- Insomnia

**Chronic diseases**

- Sleep related disorders
- Other
Digital Therapeutics Will Be Defined Using Both Clinical and Non-Clinical Components:

- Standalone treatment
- Supportive apps
- Connected solutions
- Compliance
- Safety
- Efficiency

“Another tool in our tool box”
U.S. Consumer Tech Connected Devices

Retail Sales – Volumes in Millions

<table>
<thead>
<tr>
<th>Year</th>
<th>Volumes (in Millions)</th>
<th>Growth</th>
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<tbody>
<tr>
<td>2016</td>
<td>621</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>671</td>
<td>8.1%</td>
</tr>
<tr>
<td>2018</td>
<td>715</td>
<td>6.6%</td>
</tr>
<tr>
<td>2019</td>
<td>753</td>
<td>5.3%</td>
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<tr>
<td>2020</td>
<td>776</td>
<td>3.0%</td>
</tr>
<tr>
<td>2021</td>
<td>791</td>
<td>2.0%</td>
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Source: CTA
<table>
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<tr>
<th>Year</th>
<th>Revenue (USD in Billions)</th>
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<tr>
<td>2013</td>
<td>$295</td>
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<tr>
<td>2014</td>
<td>$308</td>
<td>4.7%</td>
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<tr>
<td>2015</td>
<td>$315</td>
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<tr>
<td>2016</td>
<td>$318</td>
<td>1.4%</td>
</tr>
<tr>
<td>2017</td>
<td>$339</td>
<td>6.7%</td>
</tr>
<tr>
<td>2018</td>
<td>$351</td>
<td>3.9%</td>
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Source: CTA
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