

THE INTERNET OF THINGS

How Our Lives Are Being Impacted By
All Of These “Connected Devices”

*By Bob Primak, for the Lexington Technology
Users Group, June 6, 2018*

IoT Articles: Recommended Reading/Listening/ Viewing --

10 Real Life Examples of Internet of Things

<https://circuitdigest.com/ten-examples-of-internet-of-things-iot>

The Best Smart Home Devices of 2018

[https://www.pcmag.com/
article2/0,2817,2410889,00.asp](https://www.pcmag.com/article2/0,2817,2410889,00.asp)

Google Assistant Will Soon Support a Lot More of Your Household Gadgets

[https://www.reviewgeek.com/3646/google-
assistant-will-soon-support-a-lot-more-of-your-
household-gadgets/](https://www.reviewgeek.com/3646/google-assistant-will-soon-support-a-lot-more-of-your-household-gadgets/)

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**Nest Hello review: A premium doorbell for the
paranoid homeowner**

You'll pay dearly for it, though.

<https://www.engadget.com/2018/04/27/nest-hello-review/>

Best Smart Locks of 2018

<https://www.tomsguide.com/us/best-smart-locks,review-3352.html>

**The Best Products That Work With Amazon
Alexa**

<https://www.tomsguide.com/us/pictures-story/880-best-alexa-compatible-devices.html#s27>

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Amazon will install a full smart home security system for you

You'll only have to pay once, and packages include the installation fee.

<https://www.engadget.com/2018/04/27/amazon-full-home-security-system-install/>

You know tech has arrived when you need an installer to set it all up for you. This story indicates just how pervasive IoT devices and connections are becoming.

Google Assistant Will Soon Support a Lot More of Your Household Gadgets

<https://www.reviewgeek.com/3646/google-assistant-will-soon-support-a-lot-more-of-your-household-gadgets/>

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Important Concepts:

What is cloud computing?

A beginner's guide

<https://azure.microsoft.com/en-us/overview/what-is-cloud-computing/>

(Told from the perspective of Microsoft's Azure Cloud Platform, which is an example of a Public cloud.)

Illustration: Cloud Computing

<https://circuitdigest.com/sites/default/files/field/image/Internet-of-Things-examples.gif>

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"There are three different ways to deploy cloud computing resources: public cloud, private cloud, and hybrid cloud."

"How cloud computing works"

"Cloud computing services all work a little differently, depending on the provider. But many provide a friendly, browser-based dashboard that makes it easier for IT professionals and developers to order resources and manage their accounts. Some cloud computing services are also designed to work with REST APIs and a command-line interface (CLI), giving developers multiple options."

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Real-Time Processing -- What Is Edge Computing?

Not Ready for Cloud Computing Yet? Buckle Up for Edge Computing

<https://www.maketecheasier.com/buckle-up-for-edge-computing/>

Illustration: Edge Computing

<https://www.windowscentral.com/sites/wpcentral.com/files/styles/xlarge/public/field/image/2018/05/intelligent-edge-microsoft-press.jpg?itok=Lat6fF6>

Microsoft's strategy for the future

At Build 2018, Microsoft will continue to form the foundation for ubiquitous computing's future

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If you blink, you may just miss how the world of computing is changing right now.

<https://www.windowscentral.com/microsofts-future-building-backbone-ubiquitous-computing>

<https://www.windowscentral.com/sites/wpcentral.com/files/styles/xlarge/public/field/image/2018/05/graph-microsoft-press.jpg?itok=NZbY9uyb>

Navigating that new world as a consumer-orientated site and reporter is challenging. While covering the latest updates to Office or various new messenger strategies was never thrilling, artificial intelligence (A.I.), the "cloud," "intelligent edge,"

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and seemingly abstract concepts like quantum computing feel like science fiction at times.

The next evolution of computing is not desktop PCs, laptops, or even smartphones. It's ubiquitous and ambient computing. It's Internet of Things (IoT), where your thermostat is not only connected to the internet but has a smart assistant letting it talk and answer questions.

Whether it's intelligent speakers that act on your vocal commands, smart ovens that ensure you don't burn a casserole, or doorbells with full HD cameras in them, we're heading into some strange times.

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Computing is now going to be distributed, parallel, cloud-based, ambient, and ubiquitous. The reason for such systems is to improve efficiency, speed, and the simple fact that local, centralized computing networks – or even cloud-based ones – simply cannot keep up with having these many devices constantly connected to them, each vying for precious resources and algorithmic processing. It'll also be inclusive because everyone should be able to participate.

The computer in your bag or phone in your pocket will continue to evolve, but now it's time to make the rest of world "smart" and connected. Instead of configuring computers to our liking, the computers will learn about us, suggesting ideas, things to buy,

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reminders, and more (much of this is already active if you use Amazon).

...

Microsoft's technologies, in theory, are what will help self-driving cars, drones, sensors, smart-home devices, and more. Google, Amazon, and to a much lesser extent, Apple, are all attempting similar programs.

We are seeing some of this now. Microsoft's new feature for the April 2018 update is part of this "intelligent edge". The idea that your PC history follows you in the cloud from device to device (and

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beyond PCs) is the start of this idea of always-connected, ubiquitous computing.

...

Like the pre-Internet days in the 1990s, it was difficult to imagine 4K video conference calls, 1Gbps internet to your home, or using your phone as an independent navigation tool. But that's all possible now. The intelligent edge, cloud, AI, IoT, and ambient computing are all coming slowly but surely to fruition.

Your technological world is changing right before your eyes, but if you don't pay attention, you'll miss it.

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Why 5G is bringing edge computing and automation front and center

[https://www.networkworld.com/article/3255426/
lan-wan/why-5g-is-bringing-edge-computing-and-
automation-front-and-center.html](https://www.networkworld.com/article/3255426/lan-wan/why-5g-is-bringing-edge-computing-and-automation-front-and-center.html)

“The rise of 5G coincides with the explosion of connected devices and systems associated with the Internet of Things (IoT). Smart heating systems, wearables and [TV or video streaming in moving] vehicles all bring with them large amounts of data. In addition to more processing power, 5G promises speeds (at least) 10 times faster than those of 4G...”

“Processing these high volumes of data, at a faster speed, will require new antennas, new devices, and new applications for wireless data. No matter what the setup looks like, the influx of additional data -

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which will need to be processed in real-time - will drive the need for edge computing.”

Real-time processing also needs to be done at a location close to where the data will come from and be used.

The Key Definitions Of Artificial Intelligence (AI) That Explain Its Importance

<https://www.forbes.com/sites/bernardmarr/2018/02/14/the-key-definitions-of-artificial-intelligence-ai-that-explain-its-importance/#7fab1ce24f5d>

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For our purposes, we can think of AI as:

“The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.”

with emphasis on task-centered AI (reinforcement machine learning):

"Generally, people invest in AI development for one of these three objectives:

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1. Build systems that think exactly like humans do (“strong AI”) (or, general AI)
2. Just get systems to work without figuring out how human reasoning works (“weak AI”) (or Deep Learning AI)
3. Use human reasoning as a model but not necessarily the end goal (Typically, applications like in the home or on the phone personal assistants -- e.g., Google Home or Alexa or Cortana and their associated devices. Also smart TVs, smart cars and other consumer-level IoT applications.)

"Turns out that the bulk of the AI development happening today by industry leaders falls under the third objective and uses human reasoning as a guide to provide better services or create better products rather trying to achieve a perfect replica of the human mind."

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What is Machine Learning? A definition

<http://www.expertsystem.com/machine-learning-definition/>

"Reinforcement machine learning algorithms is a learning method that interacts with its environment by producing actions and discovers errors or rewards. Trial and error search and delayed reward are the most relevant characteristics of reinforcement learning. This method allows machines and software agents to automatically determine the ideal behavior within a specific context in order to maximize its performance. Simple reward feedback is required for the agent to learn which action is best; this is known as the reinforcement signal."

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Most of the AI we will encounter in our automated homes and cars will be of the reinforcement machine learning variety. Some will be preprogrammed, as in supervised machine learning:

"Supervised machine learning algorithms can apply what has been learned in the past to new data using labeled examples to predict future events..."

Examples of AI Expert Systems:

AI in Medicine? It's back to the future, Dr Watson

Why IBM's cancer projects sounds like
Expert Systems Mk.2

[https://www.theregister.co.uk/2017/09/25/
ai_in_medicine](https://www.theregister.co.uk/2017/09/25/ai_in_medicine)

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A Reality Check for IBM’s AI Ambitions

[https://www.technologyreview.com/s/607965/
a-reality-check-for-ibms-ai-ambitions/](https://www.technologyreview.com/s/607965/a-reality-check-for-ibms-ai-ambitions/)

Brit neural net pioneer just revolutionised speech recognition all over again

Deep learning with Dr Tony Robinson

[https://www.theregister.co.uk/2017/07/17/
tony_robinson_speechmatics/](https://www.theregister.co.uk/2017/07/17/tony_robinson_speechmatics/)

Probabilistic Machine Learning [Discussion]

[https://stats.stackexchange.com/questions/260391/
probabilistic-vs-other-approaches-to-machine-
learning](https://stats.stackexchange.com/questions/260391/probabilistic-vs-other-approaches-to-machine-learning)

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How Bayesian Inference Works

[https://brohrer.github.io/
how_bayesian_inference_works.html](https://brohrer.github.io/how_bayesian_inference_works.html)

Probabilistic Machine Learning [PDF]

[https://www.springer.com/cda/content/document/
cda_downloadaddocument/9783642553363-c2.pdf?
SGWID=0-0-45-1461618-p176729843](https://www.springer.com/cda/content/document/cda_downloadaddocument/9783642553363-c2.pdf?SGWID=0-0-45-1461618-p176729843)

Fuzzy Logic

[https://searchenterpriseai.techtarget.com/definition/
fuzzy-logic](https://searchenterpriseai.techtarget.com/definition/fuzzy-logic)

Artificial Intelligence - Fuzzy Logic Systems

[http://www.tutorialspoint.com/artificial_intelligence/
artificial_intelligence_fuzzy_logic_systems.htm](http://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_fuzzy_logic_systems.htm)

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Using Artificial Intelligence for Mental Health

Your Virtual Counselor Will See You Now

Eliza to Ellie to Ginger and Beyond

<https://www.verywellmind.com/using-artificial-intelligence-for-mental-health-4144239>

(See also the *Verge* article under Future of IoT about The “*Selfish Ledger*” video circulated inside of Google in 2016.) (later in this document)

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And of course we will need improved WiFi standards for the mesh networks (non-intelligent neural-style networks) to control and coordinate all these Things:

Wi-Fi Alliance’s Wi-Fi EasyMesh certification aims to standardize mesh networks

<https://www.pcworld.com/article/3272469/wi-fi/wi-fi-alliances-wi-fi-easymesh-certification-aims-to-standardize-mesh-networks.html>

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A Little bit About Security and the IoT:

How to Secure Your (Easily Hackable) Smart Home

<https://www.tomsguide.com/us/secure-smart-home-how-to,news-19380.html>

- Create two different Wi-Fi networks
- Firewall the network
- Install a unified threat management appliance (UTM)
- Install security software wherever possible
- Check manufacturers' websites for firmware updates (signed firmware updates vs. unsigned)

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**There's the hard way (manually or using a
security router)**

**[Other] How to secure IoT devices in home
network for a newb[ie]**

[https://www.dslreports.com/forum/r31652367-
Other-How-to-secure-IoT-devices-in-home-
network-for-a-newb](https://www.dslreports.com/forum/r31652367-Other-How-to-secure-IoT-devices-in-home-network-for-a-newb)

**and there's an easier way (buy a security
appliance):**

**Example of a device to protect IoT Things
(Review):**

Bitdefender Box 2

[https://www.pcmag.com/review/357433/
bitdefender-box-2](https://www.pcmag.com/review/357433/bitdefender-box-2)

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"The battle for the Internet of Things has just begun," [John] Maddison [of Fortinet] said.

"The ultimate winners of the IoT connected home will come down to those vendors who can provide a balance of security and privacy vis-à-vis price and functionality."

More IoT security tips:

8 tips to secure those IoT devices

Make sure the Internet of Things isn't a route for hackers to get into your home or workplace

<https://www.csoonline.com/article/3085607/internet-of-things/8-tips-to-secure-those-iot-devices.html>

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Privacy and Home Assistants:

How to Make Sure Alexa, Google Home Don't Hear Too Much

<https://www.tomsguide.com/us/alexa-google-home-privacy,news-27038.html>

There is a Mute Button. Use it when you aren't asking for assistance or doing something else with your devices.

So, in the future:

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Nova Wonders: Can We Build a Brain?

<http://www.pbs.org/video/nova-wonders-can-we-build-a-brain-j53aqq/>

(Especially from Minute 35 onward.)

How AI and ML (artificial intelligence and machine learning), and neural networks (deep learning) apply to IoT and other areas of our lives. Why General Artificial Intelligence is much farther away than task-specific Deep Learning. (Both are aspects of Machine Learning.)

Google Duplex:

**HOW GOOGLE'S EERIE ROBOT PHONE
CALLS HINT AT AI'S FUTURE**

<https://www.wired.com/story/google-duplex-phone-calls-ai-future/>

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GOOGLE’S SELFISH LEDGER IS AN UNSETTLING VISION OF SILICON VALLEY SOCIAL ENGINEERING

[https://www.theverge.com/2018/5/17/17344250/
google-x-selfish-ledger-video-data-privacy](https://www.theverge.com/2018/5/17/17344250/google-x-selfish-ledger-video-data-privacy)

Questions? Ideas?

Discussion Time

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(Amended for posting at the LTUG Yahoo Group)