

11 technologies developers should explore now

Heltzel, Paul . InfoWorld.com ; San Mateo (Apr 24, 2017).

[ProQuest document link](#)

ABSTRACT (ENGLISH)

Future opportunities for developers are emerging from a confluence of cutting-edge technologies, such as AI, VR, augmented reality, IoT, and cloud technology ... and, of course, dealing with the security issues that are evolving from these convergences. A recent report from research firm Gartner recommends developers and security teams work together early in the design process to make sure new threats can be addressed as they come up-for example, by providing the ability for IoT devices to download security updates. Morini-Bianzino sees demand for "software engineers, technologists, and research scientists with language translation, speech recognition, computer vision, robotics, natural language processing, knowledge representation, and reasoning expertise. [...]subject-matter experts will remain a valuable commodity until academia and industry can rebalance the equation." Machine learning A form of artificial intelligence, machine learning can take massive amounts of data to very quickly find patterns-like facial recognition-and solve problems, like recommending a movie to stream, without being explicitly programmed to do so. Prepare to fail Software models tied to physical and virtual sensors can help predict product or service failures so that organizations are able to plan and assign resources to make repairs before the failure occurs. Advances in machine learning and the adoption of IoT technology are helping to bring down costs for this sort of predictive "digital twin" modeling, which boosts efficiency and can bring down operating costs over the life of, say, a jet engine or a power plant.

FULL TEXT

New and evolving technologies are rapidly reshaping how we work-offering creative opportunities for developers who are willing to pivot and adopt new skills. We took a look at 11 tech trends experts say are likely to disrupt current IT approaches and create demand for engineers with an eye on the future.

It isn't all about The Next Big Thing. Future opportunities for developers are emerging from a confluence of cutting-edge technologies, such as AI, VR, augmented reality, IoT, and cloud technology ... and, of course, dealing with the security issues that are evolving from these convergences.

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If you're interested in expanding your developer's toolkit, check out these trending domains-and our tips on how to get ahead by getting started with them.

Internet of things security

After tens of millions of connected devices were hijacked last year, even casual observers could see that unprotected IoT devices create nightmarish security problems.

A recent report from research firm Gartner recommends developers and security teams work together early in the

design process to make sure new threats can be addressed as they come up—for example, by providing the ability for IoT devices to download security updates.

Demand is high for engineers with IoT security skills, especially those who understand the vulnerabilities of the hardware and software used by net-connected devices.

“The attack vectors in IoT are largely identical to those of any other distributed network, like computers or cellphones, so the same security knowledge is relevant and critical,” says Richard Whitney, vice president of product at IoT startup Particle. “Study the foundations of crypto and authentication, and you’ll be well on your way.”

Tom Gonser, founder of DocuSign and a partner at Seven Peaks Ventures, says firms need skills in low-level programming for microprocessors. “They’ll also want RF experience with Bluetooth, [Windows Identity Foundation], and spread spectrum components. Leading-edge Linux security options, especially optimized for tiny kernels like Qubes OS, is also valuable.”

Matt Abrams, a partner at Seven Peaks Ventures with Gonser, suggests focusing on “understanding workflows and how to disrupt them. Postquantum computing cryptography is also coming faster than one might expect. They should also understand differential privacy and adversarial networks.”

Artificial intelligence

As we prepare for the next wave of autonomous vehicles, robots, and smart electronics, the demand for AI-savvy engineers is exploding.

“We’re now at a tipping point in large part due to advances in ubiquitous computing, low-cost cloud services, and near unlimited storage,” says Nicola Morini-Bianzino, senior managing director and artificial intelligence lead at Accenture. “AI is being built into everything.”

Morini-Bianzino sees demand for “software engineers, technologists, and research scientists with language translation, speech recognition, computer vision, robotics, natural language processing, knowledge representation, and reasoning expertise. AI ... feeds off data, so content and data curators, data scientists, and analytics experts are also crucial.”

Treasure Data’s VP of marketing Kiyoto Tamura envisions AI moving from very specific, mundane operations to much broader—and more exciting—applications.

“In the past, it was more like, ‘Find the optimal route for package delivery ... or the most relevant websites for a search query.’ Now, we are starting to see, ‘Play a game of Go really well; drive a car safely,’ etc. All of this is cool, but humans still need to feed objective functions to the computer, and at least for now, this is going to be the case.”

Data scientists, machine learning researchers, and computational linguists are increasingly sought out, says MindMeld CEO Tim Tuttle. He cites a VentureScanner study that counted 910 AI companies emerging from March to October 2016, more than half of which focus on deep learning/machine learning and natural language processing.

"Not only do these categories win in numbers, but they've also received the most funding, to the tune of \$4.5 billion," Tuttle says. "With the recent explosion of interest in conversational applications, there has been a mismatch between supply and demand. As a result, subject-matter experts will remain a valuable commodity until academia and industry can rebalance the equation."

Machine learning

A form of artificial intelligence, machine learning can take massive amounts of data to very quickly find patterns-like facial recognition-and solve problems, like recommending a movie to stream, without being explicitly programmed to do so.

"Cognitive technologies, aided by bots and machine learning, will start to add value as organizations strive to find the 'signals in the noise,'" says Patrick Spedding, senior director of BI R&D for Rocket Software. "Machine learning is, after all, based on mature analytics capabilities-formerly known as 'data mining'-which really have been waiting for a suitable platform to become more 'consumable.'"

How should developers who want to expand into machine learning develop skills in this area?

Abrams, of Seven Peaks Ventures, points to a highly regarded online class: "Andrew Ng's seminal course on machine learning on Coursera is a great example. Students who took his course via Coursera actually did better in Kaggle competitions than some longtime practitioners."

Not every developer working in machine learning comes from a computer science background, though it's helpful, says Solvvy CTO and co-founder Mehdi Samadi, who sees some Ph.D.s without CS degrees being recruited and trained to become machine learning engineers.

"Core contributions in the field of machine learning require running a lot of experiments using the real data, observing from the result of the model, and improving the model," he says. "Having a CS degree or core engineering background usually would benefit the engineers to be more successful in their job in order to be able to continuously run experiments and improve machine learning models."

Data science

Data science is another hot area, requiring multidisciplinary skills that vary by industry. Requirements can include experience with machine learning and AI to take large amounts of data and shape it in a form that can be used to make business decisions.

"Skilled data scientists are in short supply, period," says Spedding. "Specifically, I see areas where technology can be designed to 'assist' decisions, such as cognitive bots and guided analytics, to be high value-add opportunity areas."

A thorough understanding of probability and statistics is key for those who want to work in this area, says Gary Kazantsev, who heads up the machine learning group at Bloomberg. "Add in some engineering skills, as the need to be capable to write some code to build a system will never go away, though with the emergence of tools like TensorFlow or Jupyter notebooks, this too is getting a whole lot easier. They also need good research skills-that is, the ability to form a hypothesis and test it, read the current literature, and stay up to date."

Gunter Ollmann, chief security officer at Vectra, says he currently sees firms treat data scientists separately from engineering and research and development teams. But he doesn't think that approach will last.

"As the deep learning and machine learning tools improve, and boot camp training courses become more adept at bringing senior engineers up to speed in data science, the division between data science and engineering will disappear. All engineers need to be good at math. Now they need to also master the math of data science. The fusion of skill sets and ability to wield both hammers will be mandatory going forward."

Blockchain

This means of creating a distributed ledger for transactions offers benefits in transparency and security, though a lack of standardization may slow its adoption across wide industries.

Peter Loop, associate vice president and principal technology architect at Infosys, is bullish on the technology: "Despite misconceptions that blockchain is years away, we'll see full deployments in financial services, insurance, and health care industries next year. This will completely disrupt our payment systems on an international scale."

Other emerging tech has a steeper learning curve, says Robert Bardunias, co-founder and chief revenue officer of IRIS.TV, who is excited by the inherent entrepreneurial focus of blockchain.

"These technologies are growing with real operational business applications in mind from day zero, so there's no need on the development side to try to imagine case use-they are happening and growing in real time," Bardunias says. "The real overwhelming challenge for those looking to develop skills in these areas will be how to keep up with new developments and evolutions. I remember when I was learning secondary development skills, reading industry trade websites-and magazines, it was a long time ago-were the last thing I wanted to do, but it's a real part of today's learning mix as a developer looking to build and maintain a competitive edge in the global market."

Mesh app and service architecture (MASA)

Demand for apps that seamlessly stay connected as we move through our home, commute, and work are increasingly in demand.

"The purpose of a mesh network or app is that will it be high availability-everything connected to everything," says Joseph Carson of Thycotic. "If the path is unavailable, it will find another device to establish the connection. We have seen this being used for example with the Tile tracker devices, which has created a community of tracking devices, and with bitcoin being a distributed ledger."

But some see a lack of device compatibility as a potential bottleneck.

"Each vendor has their own way of trying to drive trust into this system, so they are all walled gardens, if they even exist at all," says Derek Collison, formerly of Cloud Foundry and CEO of Apcera.

This technology promises a previously unthinkable level of connectedness-if a lack of standards doesn't get in the way.

"My larger thought here is that AI will generally be trained in the cloud with massive amounts of data from all users," says Collison. "These algorithms will then continuously update their execution model, which will be shipped

to the edge over the air and update firmware on edge devices like our phones, cars, and home. The processing will happen at the edges in hardware; the training will happen in the cloud in software.”

Digital twins: Prepare to fail

Software models tied to physical and virtual sensors can help predict product or service failures so that organizations are able to plan and assign resources to make repairs before the failure occurs. Advances in machine learning and the adoption of IoT technology are helping to bring down costs for this sort of predictive “digital twin” modeling, which boosts efficiency and can bring down operating costs over the life of, say, a jet engine or a power plant.

Matias Woloski, CTO and co-founder of Auth0, says companies can also use digital twins in the concept and design stage, testing new products in simulations, then making changes until the engineers have the product they want. Findings from the digital twin are then used to build the product.

“A few organizations have already launched digital-twin initiatives, although the primary projects leveraging this technology are the ones with large upfront development expense where the cost of failure is too high,” Woloski says.

SpaceTime Insight’s CTO Paul Hofmann says digital twins benefit from machine learning, making them more effective than condition-based models at predicting failures.

“IoT and machine learning systems allow organizations to ensure that its assets aren’t randomly failing, and if they do fail, then organizations can optimize real-time decision making for the best long-term solution.”

Autonomous vehicles, robots, and appliances

New opportunities are seen developing as AI and machine learning smarten up home devices, industrial equipment, cars, and drones. Research firm Gartner estimates that by 2020, automakers will send 61 million data-connected cars off production lines.

“There are entire economies already cropping up in these areas,” says Vince Jeffs, director of strategy and product marketing at Pegasystems. “For example, there are AI startups-and more mature companies-already well-established in the autonomous vehicle space. For example, MobileEye is a company with about \$500 million in VC backing that specializes in the little cameras all over the vehicle. Similarly, there are stores for physical robots-for example, SoftBank Robotics specializes in robots used in hotels for concierge. They have about \$250 million in VC backing.”

Credit: By Paul Heltzel

DETAILS

Subject:	Research; Industrial equipment; Scientists; Spread spectrum; Artificial intelligence; Studies; Autonomous vehicles; Twins; Robots; Internet of Things; Software upgrading; Natural language processing; Robotics
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Company / organization:	Name: Seven Peaks Ventures LLP; NAICS: 523910
Publication title:	InfoWorld.com; San Mateo
Publication year:	2017
Publication date:	Apr 24, 2017
Publisher:	Infoworld Media Group
Place of publication:	San Mateo
Country of publication:	United States
Publication subject:	Computers--Microcomputers, Computers--Computer Industry
Source type:	Trade Journals
Language of publication:	English
Document type:	News
ProQuest document ID:	1891402045
Document URL:	https://libweb.uwlax.edu/login?url=https://search.proquest.com/docview/1891402045?accountid=9435
Copyright:	Copyright Infoworld Media Group Apr 24, 2017
Last updated:	2017-04-25
Database:	Business Premium Collection

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