



What is the Potential ROI from AI in 5G Wireless Networks?

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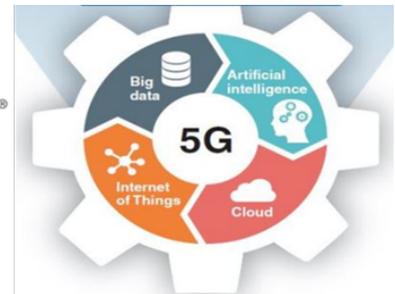
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EXECUTIVE SUMMARY

There has been a lot of hype lately regarding the dramatic breakthroughs that will result from the synergy between Artificial Intelligence (AI) and 5G. Enterprises are especially interested in how the business case for their investments in Big Data, Cloud and IoT applications will be enhanced by AI and 5G networks. I attended the AI World Conference and Expo in Boston last month to learn more about how the wireless industry can harness AI and intelligent technologies in the climb to 5G networks. I met with many of the software and hardware companies leading the AI revolution, including Oracle, Accenture, Dell EMC, Nuance and IBM. I also met many new entrants into the AI area in the Startup Pavilion and Technology Solutions Theater. I learned that a wide range of companies are investing in enterprise AI and enhancing big data with AI to drive real-time IoT, implement robust cybersecurity, and automate customer service with intelligent assistants & chatbots.



AI in 5G Wireless Networks

In this report, Wireless 20/20 examines the potential ROI from AI in 5G Wireless Networks. I am now investigating the plans of the major US-based mobile operators and major wireless equipment vendors, to better understand the potential ROI from AI in 5G Wireless Networks. Network operators like Verizon, AT&T and T-Mobile, all claim that AI and machine learning will help them with 5G network planning, optimizing their 5G network investments, managing costs, and improving O&M efficiency. Wireless 20/20 believes that to effectively deploy AI in 5G networks, carriers need to consider their business growth strategies, technology roadmap and the need to manage cost. AI can greatly help with precision capacity forecasts, coverage auto-optimization, smart MIMO, dynamic cloud network resource scheduling and 5G smart network slicing. Ultimately, 5G and AI can also transform IoT, the factory floor, autonomous cars and the health care industry.

One of the driving forces behind AT&T's overall network transformation is [Network AI](#), a framework using software-defined networking, artificial intelligence, and edge computing to create an autonomous network based on open source efforts. AT&T Labs is spearheading this intelligent, software-defined framework initiative focused on identifying areas where a combination of software, open source and AT&T resources can drive innovation for the wireless industry. AT&T and Tech Mahindra have co-created [Acumos AI](#), an industry-first platform, open source framework and marketplace that makes it easy to chain multiple micro-services together in a simple drag-and-drop interface. The Acumos AI White Paper highlights AT&T's direction and efforts in supporting this open source AI and machine learning community.

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all claim that AI and machine learning will help them with 5G network planning, optimizing their 5G network investments, managing costs, and improving O&M efficiency.



[Verizon](#) currently uses AI and machine learning to improve the performance of its FIOS fiber optic broadband networks. Verizon has made a large investment in AI and machine learning technologies and uses advanced predictive analytics algorithms to monitor 3GB of data every second, streaming from millions of network interfaces. Verizon’s AI and Big Data infrastructure sits on Hadoop and is built largely from open source components including Python and Java. The Verizon AI team relies heavily on Spark and Kafka due to their ability to handle very fast streaming network data in real-time. During his keynote at CES 2019, [Verizon CEO Hans Vestberg](#) referenced AI as a key enabler to unleash the power of 5G technologies beginning with the commercial 5G fixed-home internet services launched in certain neighborhoods of four cities during October 2018. Verizon Wireless also believes that its 5G wireless networks could revolutionize AI, since latency is reduced from the current 15 to 60 milliseconds, to just 1 millisecond or less, while achieving download speeds that were 30 to 50 times faster than with 4G.

T-Mobile is leveraging AI and machine learning to completely overhaul and accelerate the automation of its customer service operations. T-Mobile has already deployed the [Tupl](#) Automated Customer Care Resolution (ACCR) platform, which uses AI to speed response-time and resolve technically complex and time-consuming customer care issues. T-Mobile is obsessed with wireless customer experience and satisfaction, and the TuplOS and ACCR AI and machine learning tools provide T-Mobile’s Customer Care reps with detailed and easy-to-understand cause reports and technical resolutions, so they can serve more customers, 100 times faster and up to 4 times more accurately, than legacy resolution methodologies providing automation levels around 90%. The “Un-carrier” also recently launched [Team of Experts](#), a new approach to customer service that will give customers in different regions of the US their own dedicated “team” of customer care representatives who offer quick, efficient assistance. T-Mobile’s Team of Experts eliminates robot voices and a no-confusing tree of push-button menus for all business and consumer postpaid customers. These AI-driven customer care initiatives will be critical as [T-Mobile](#) prepares to deliver nationwide 5G using a mix of wireless spectrum.

Vendors Drive AI in 5G Wireless Networks

The major wireless equipment vendors like Ericsson, Nokia and Samsung are also

investing to fully capitalize on the potential evolution of AI and machine learning in a 5G network. [Nokia](#) is using artificial intelligence and machine learning to boost network performance and cut costs in deploying new 5G networks. Nokia and China Mobile Research Institute (CMRI) recently signed an [MoU](#) that will result in a joint AI*5G laboratory in Hangzhou, China to study the intersection of AI and 5G technology. The goal of this initiative is to leverage AI and machine learning to optimize 5G networks, enable the delivery of new Edge-to-Cloud and 5G services, and foster an open RAN ecosystem.

[Samsung Electronics](#) recently announced plans to invest \$22 billion in 5G networking and AI at the "[Samsung AI Forum 2018](#)". They also recently announced their acquisition of [Zhilabs](#), known for its AI-based network and service analytics, to further enhance its 5G capabilities. The acquisition lays the foundation for Samsung to strengthen its 5G solutions with automation functions that will finely tune customer experiences in the 5G era. Samsung Networks has announced a goal to secure a "minimum" of 20% market share in network equipment by 2020.

[Ericsson](#) is convinced that AI offers the best opportunity to achieve the high levels of automation necessary to optimize and manage the complexity of 5G system performance, allowing them a shift from managing networks to managing services. I attended Ericsson Industry Analyst Day in Boston last month, in part, to learning more about AI and networked automation with managed services. Ericsson believes that network automation, machine learning and AI are crucial to the evolution of 5G, IoT and industrial digitalization. Vodafone is one Ericsson customer that is leading the industry in using AI in radio networks, because of the pioneering work between Ericsson and the operator's Networks Centre of Excellence. As 5G-enabled technologies develop, operators will need AI to augment the human capabilities to improve efficiency and manage their OPEX. Ericsson has introduced engineering solutions that combine machine learning and human ingenuity to enable networks to self-learn, self-optimize and deliver optimal user experience, allowing operator customers to capitalize on the opportunities of 5G.

Qualcomm Ventures recently announced plans to invest \$100 million to fund AI startups, in part driven by opportunities in autonomous cars, robotics, machine learning and other applications where the processing is done on smartphones and other devices that contain mobile processors. Qualcomm has also focused funding on AI applications and mobile edge computing where a significant amount of the processing can be done on smartphones, at cell towers or on other devices outside of data centers. Qualcomm Ventures expects to invest in about 15 companies through its AI fund.



Intel Capital is also investing in AI-focused chip startups, targeting the use of AI in autonomous vehicles, data centers, the cloud, 5G, next-generation computing, and a wide range of other technologies. Intel Capital recently led investors in a \$75 million series B funding round for Israeli-startup Habana Labs, a fabless semiconductor manufacturer of AI processors. Habana Labs AI processors provide an order-of-magnitude improvements in processing performance, costs and power consumption. These new processors are optimized for the specific needs of training deep neural networks and for inference deployment in production environments.

Wireless 20/20 believes that AI applications in areas like enterprise IoT, robotics, AR/VR and autonomous driving will be the key to driving ROI in 5G Wireless Networks.

AI Applications will Drive ROI in 5G Wireless Networks

According to a recent article in [Forbes](#), "...a fully autonomous self-driving vehicle will be the epitome of AI and 5G technology." The assessment focuses on the trade-offs between an intelligent Cloud and intelligent Edge devices, and what would be the best approach for deploying AI in 5G self-driving vehicle networks. Traditionally, most AI applications have resided in the cloud. Even though low latency is a key attribute of 5G wireless technology, centralized AI processing in the cloud would significantly increase the reaction-time for autonomous cars when decisions must be made in split seconds. The conclusion made in the Forbes article is that an effective AI system for 5G networks must integrate intelligence in the centralized cloud with AI at the edge devices of a distributed architecture. Wireless 20/20 believes that AI applications in areas like enterprise IoT, robotics, AR/VR and autonomous driving will be the key to driving ROI in 5G Wireless Networks.

