



2020 Research Agenda

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Technological shifts always bring their share of opportunities and challenges, but the next decade will be unique as we see multiple emerging technologies from AI, robotics, quantum computing, blockchain, and high-performance computing coming to the forefront in different phases. Tractica addresses this multiphased shift using a bottom-up, use case, and vertical-based approach, building an in-depth and broad view of the impact these transformation technologies have across the software, hardware, and services value chain, and exploring what this means for the enterprise end customer.

2020 research themes

ARTIFICIAL INTELLIGENCE

- Enterprise AI market getting verticalized
- AI platform stacks maturing
- The value of AI beyond an operational efficiency and analytics tool
- The road for AI beyond deep learning and machine learning

ADVANCED COMPUTING

- AI acceleration goes wide and deep
- Multi-disciplinary approaches to compute will be the norm
- Open-source a key theme for future compute

ROBOTICS

- Robotics market expanding into non-traditional applications
- Chinese impact on both supply and demand dynamics for robotics
- Major gap between expectations and capabilities of robots
- Robot programmability getting better but not there yet despite cloud robotics and educational robots

Artificial Intelligence

The Market Challenge

The pace of growth for AI within the consumer, enterprise, government, and defense sectors continues unabated as use cases start to solidify and companies move from talking about AI to deploying and building solutions. The conversation has moved away from "How does one define AI?" to "What are the main challenges to deploying and scaling AI?" The global AI market is entering a new phase in 2019–20 where the narrative is shifting from hype to reality. While the market is still a few years away from an inflection point for real growth, it is critical for both end users and solutions providers to identify the technologies and use cases where they want to invest in AI.



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How Tractica helps you

Understand the taxonomy and breadth of AI use cases being applied today and their future trajectory.

Identify the core priorities of applying AI within one's own products, services, and overall strategy.

Explore business models and go-to-market strategies.

Tap into the pulse of companies deploying and scaling AI as the market moves beyond the hype phase.

Arm your strategy and product teams with granular data on the AI market as they plan and implement AI.

Stay ahead of the market as AI technologies and capabilities rapidly shift from academic settings into commercial deployments.

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What's new for 2020?

1. **Expansion of AI vertical market coverage** – As AI technology expands across different industry sectors the service aims to provide deeper research by vertical, while comparing and contrasting trends within each sector..

2. **AI developer and platform views** – With the growing maturity of AI platform stacks and a burgeoning AI developer ecosystem there will be a greater focus on the practical deployment issues surrounding AI.

New trackers and surveys – The AI market is now entering a phase where one can track vendor contracts and end user announcements, while surveying companies on their plans or existing deployments.

Key Deliverables

Comprehensive market reports that explore a key technology pillar or business topic covering the market drivers and barriers, technology issues, key players and forecasts.

Niche focused reports that dive into specific AI vertical markets, technology or business trends.

Vendor market radars providing product capability comparisons for AI solutions.

Enterprise surveys tapping into the pulse of AI adoption across industry verticals.

Market forecasts that size and segment the AI market across 300+ use cases, 30 verticals, six technologies and five regions, across software, hardware and services.

Quarterly contract and announcement trackers that comb the AI market landscape for the latest deals and news as the market shifts into the deployment phase.

Themes for 2020

Enterprise AI market verticalizes

AI is expected to impact almost every industry in the long run, but we are already starting to see its impact play out in certain select industry verticals more than others. AI is in the early stages of seeing a verticalized approach that offers specialized AI techniques, platforms, and best practices for specific verticals from automotive, retail, healthcare, telecoms, and manufacturing among others.

AI platform stacks maturing

The platform landscape for AI is highly fragmented today with cloud service providers, enterprise AI specialists, traditional IT vendors, and vertical specialists all competing in the market, bringing a varied set of expertise in driving AI for the enterprise. There is generally a sweet spot, both from a horizontal stack or vertical industry perspective where different players can add value. As platforms target different parts of enterprise AI ecosystem, the question is who is best placed to win?

The value of AI beyond an operational efficiency and analytics tool

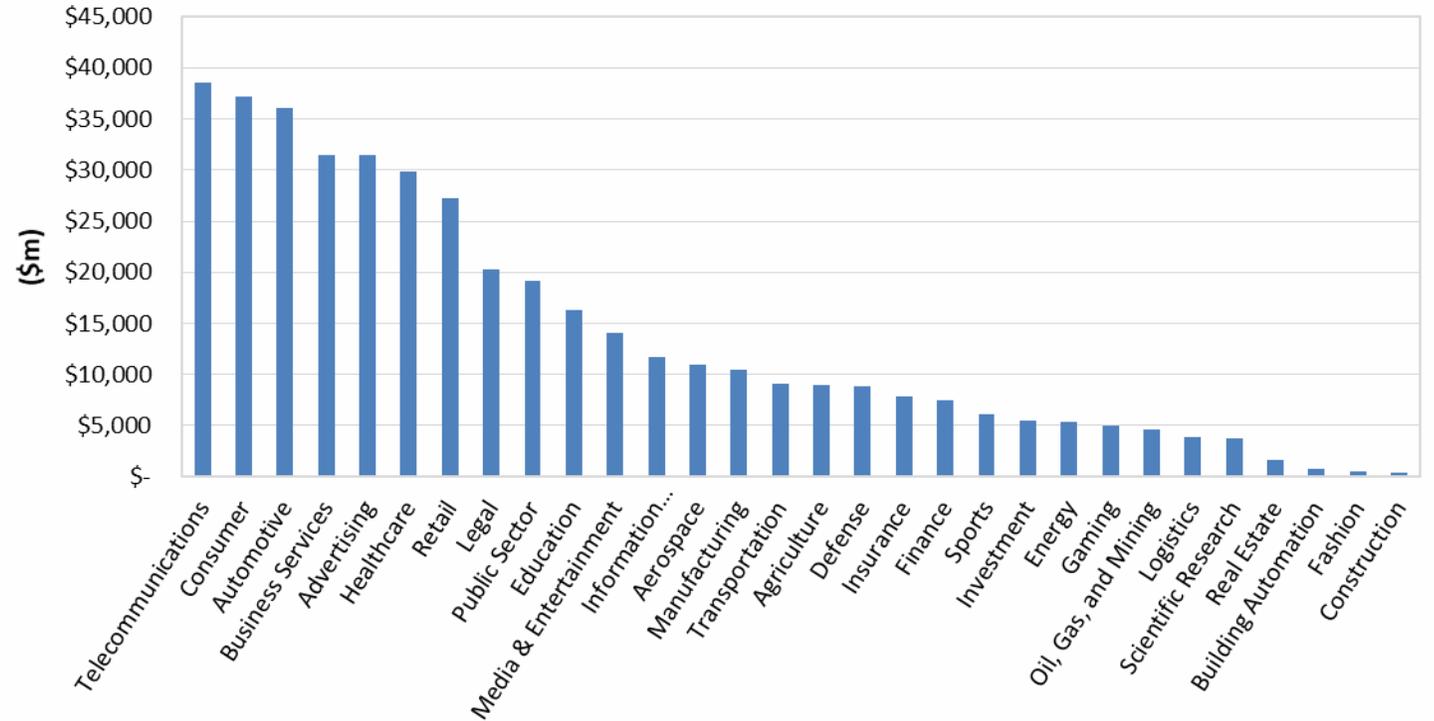
The general consensus view on AI is that it is a great tool for extracting operational and cost efficiencies across process and systems, and can offer predictive capabilities across a variety of data streams. However, the value of AI goes beyond being an operational and analytical engine, essentially becoming a tool for generating new business models and revenue streams across new lines of business, but also using its perception recognition abilities to add extra dimensions to how enterprises think about technology.

The road for AI beyond deep learning and machine learning

There is a debate in the AI community whether AI has reached its limit, and whether its trajectory is expected to continue progressing or whether we are close to entering another AI winter. Until now, the progress of AI has been heavily dependent on the progress in deep learning and machine learning techniques, but there are questions if these techniques are enough to take AI to the next phase building truly robust generalized AI.

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Navigating the complex AI landscape is as much about identifying the gaps in the delivery mechanisms and business models across the vertical and horizontal stacks, as it is in figuring out the use cases that make up the AI opportunity.

Cumulative AI software revenue by industry, world markets, 2018–25



Source: Tractica

Advanced Computing

The Market Challenge

As the pace of technology accelerates, the compute stack is becoming increasingly important to understand, whether it is around AI hardware, high-performance computing, quantum computing, neuromorphic computing, blockchain, or optical computing. We are entering a phase where many of these technologies will overlap and feed into each other, driving capabilities multiple orders of magnitude. One can no longer rely on a homogeneous, Von-Neumann compute framework, but consider heterogeneous architectures that combine best of centralized and decentralized approaches. Unlike the 1970s when the PC compute stack was emerging, we are now entering a multimodal future where multiple compute techniques will emerge simultaneously. Understanding them in context and in relation to each other is key to identifying winning strategies.



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How Tractica helps you

Understand the underlying technologies that are driving the future of computing.

Think outside the box to build strategies that align with the upcoming shift in compute architectures.

Identify partners and innovators that are building the foundational stacks for advanced computing.

Navigate the landscape of ecosystems that are likely to emerge and determine your role.

Deliver on a roadmap of products and solutions that take advantage of new compute paradigms.

What's new for 2020?

- 1.** **Broadening the scope of technologies** – including coverage on exciting new areas like neuromorphic computing, optical computing, and DNA data storage.
- 2.** **Diving deeper into hardware** – with hardware being the foundation of advanced computing, the service will include coverage on machine learning and data science hardware, future storage technologies like DNA storage, optical chipsets being used in AI, and new chip architectures based on neuromorphic techniques.

Key Deliverables

Niche focused reports that dive into new and emerging areas of advanced computing.

Deep-dive sector reports on the broader technology areas that can be identified as the building blocks for future compute.

Market forecasts that size and segment the opportunity across the key building blocks and emerging technology areas.

Themes for 2020

AI acceleration goes wide and deep

As AI techniques are infused across a broader range of applications and domains, the need for acceleration of compute workflows will increase, using a heterogeneous set of processor types depending on the workload and, at the same time, allowing for processing capabilities deeper into the edge of the network. Whether it is a machine learning or deep learning workload, the need for accelerated compute will become the norm. As a result, new hardware and software compute stacks will emerge that enable AI accelerators to offer both decentralized and heterogeneous capabilities.

Multidisciplinary approaches to compute will be the norm

Technologies no longer live in isolation, and the companies that can use a multidisciplinary approach – cutting across a wide range of fields from blockchain, quantum computing, AI, optical neuromorphic computing, and DNA storage, for example – will reap the benefits. Rather than a trivial combination of the technologies, it's a careful assessment of how each technology infuses the other, from blockchain's decentralized trust and secure mechanisms, to quantum and neuromorphic computing's ability to accelerate compute by orders of magnitude, AI's ability to learn from data, and DNA storage's ability to supercharge information safekeeping.

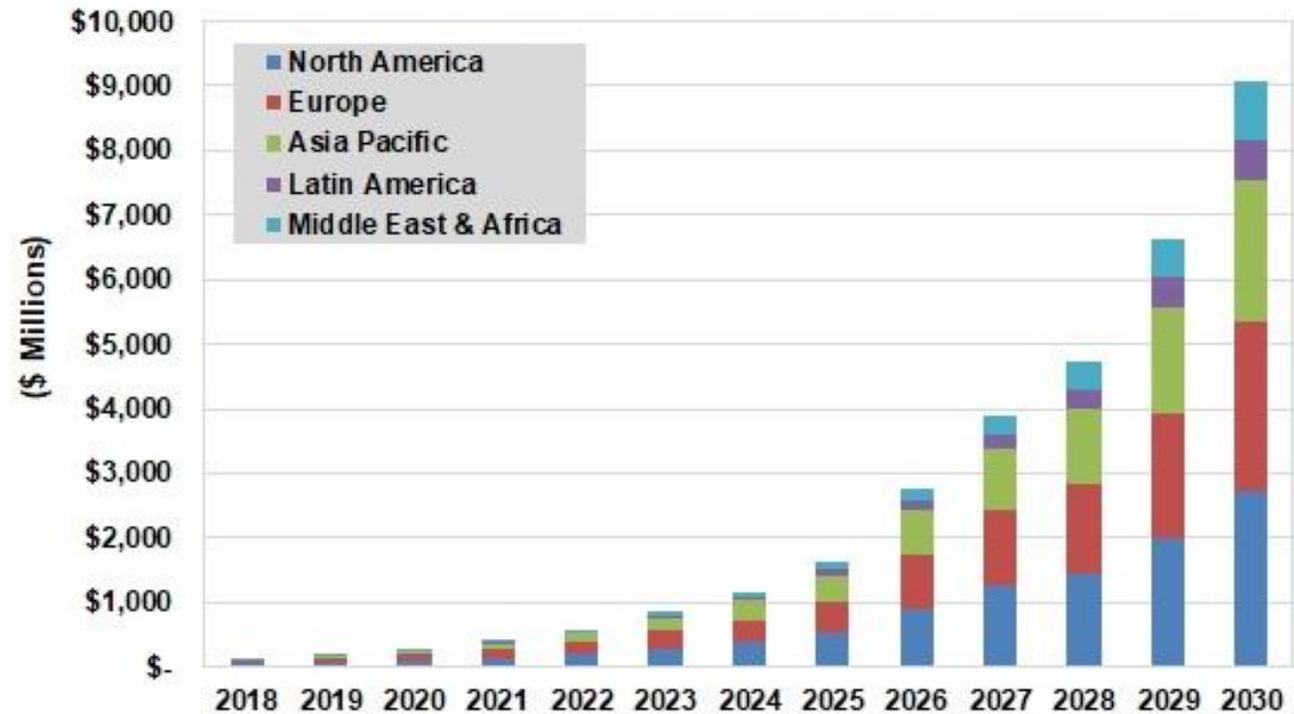
Open source a key theme for future compute

Although the open source technology movement has given us many of the key building blocks of computing, from Linux to LLVM compilers, there is a revival of open source to touch even more layers of the compute stack. Most of AI software platforms are built on open source technology such as Tensorflow, blockchain is being driven by open source movements such as Ethereum, and within the hardware area, RISC-V is gaining momentum as an open source alternative. As technologies overlap to create new compute architectures, their open source nature lends itself to better collaboration and exploration, attracting a wider array of practitioners and developers to build and experiment with techniques.



Significantly scaling the processing power, improving error correction abilities, and writing and refining quantum algorithms will be required before enterprises adopt quantum computing en masse

Total Enterprise Quantum Computing Revenue by Region, World Markets: 2018-2030



Source: Tractica

Robotics

The Market Challenge

The global robotics market is in the early stages of a shift from industrial robots toward non-industrial robots. It is seeing some growing pains, as expected when moving from a mature domain of robotics to new application areas. Many of the non-industrial robot categories are starting to feel the strain, including consumer robots, consumer unmanned aerial vehicles (UAVs), consumer autonomous vehicles (AVs), and customer service robots. Despite some areas seeing slower than expected demand, areas such as warehouse and logistics robots, agricultural robots, and surgical robots are seeing high-growth driven by specific market drivers in niche application areas. Overall, robotics platforms are also seeing a resurgence due to advancements in AI techniques especially in vision, navigation, and language skills.



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How Tractica helps you

Learn about the new and upcoming areas of robotics that extend beyond traditional industrial robots.

Expand your view on the impact robotics will have across various industry domains from enterprise, automotive, drones, healthcare, and defense.

Understand the capabilities of robotics companies across the value chain from components to platforms.

Map out the robotics market landscape across vertical markets and horizontal stacks.

Explore new business models being offered across different robotic sectors, and modalities like cloud and device.

What's new for 2020?

1. **New application markets** – expand coverage into new and emerging markets for robotics where companies and technologies are breaking new ground.

2. **Robotics business models** – focus on business models across robotics which are evolving from leasing and bundling cloud capabilities with hardware.

Robotics components coverage – expansion of research covering the components stack including cameras, sensors and chipsets.

Vendor capability comparisons – in well-established and mature markets providing detailed overviews of vendor product capabilities and strategies.

Key Deliverables

Comprehensive market reports that explore a key robotics theme covering the market drivers and barriers, technology issues, key players, and forecasts.

Niche focused reports that dive into specific upcoming robotic application areas and technology or business-related issues.

Market radars providing product capability comparisons for specific robot markets.

Market forecasts that size and segment the robotics market across 23 application areas across five regions.

Themes for 2020

Robotics market expanding into non-traditional applications

Robotics until now has been largely the domain of large industrial automation companies, but is now well beyond the traditional applications across manufacturing shop floors to expand into drones, autonomous cars, vacuum robots, surgical robots, construction robots, and many more. Identifying and building upon new and emerging applications for robots is key to winning, and pushing the boundaries of what robots can do.

Chinese impact on both supply and demand dynamics for robotics

China has had a major impact on the global industrial robot market, making up almost half of global demand, which has led to huge influx of Chinese industrial robot companies. However, Chinese influence on robotics extends into consumer and enterprise robots, particularly drones and vacuum robots where both supply and demand dynamics are shaping the industry.

Major gap between expectations and capabilities of robots

Robotic capabilities in terms of navigation, planning, perception, manipulation, and language have a lot of room for improvement, and lag behind what is expected of robots across most aspects. While there have been advancements in perception capabilities thanks to AI, there is still a long way to go before robots can truly become human companions, or replacements, both physically or emotionally. Any leaps in capabilities across the domains could become commercial game changers.

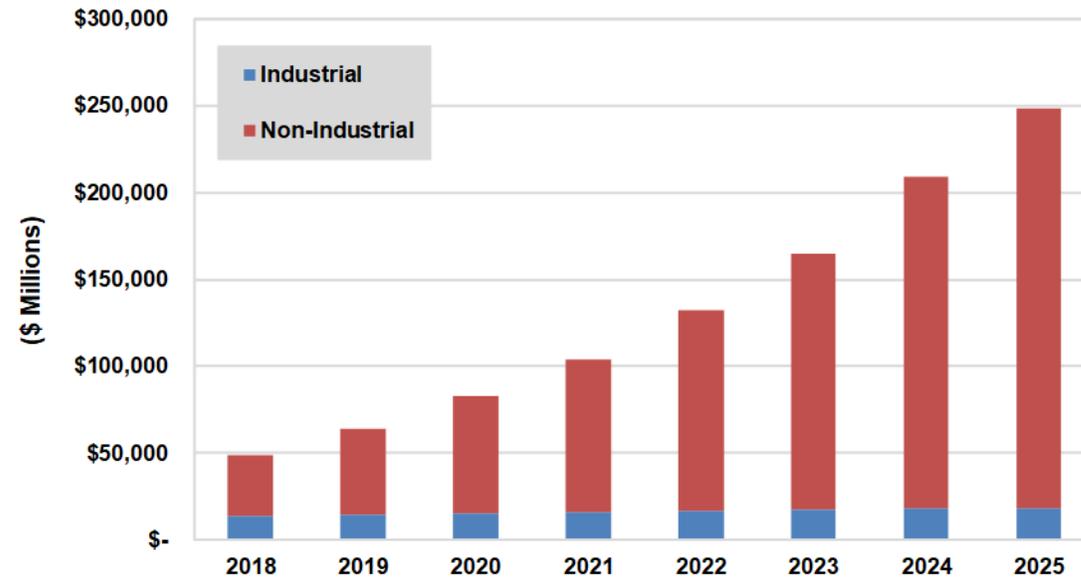
Robot programmability getting better but not there yet despite cloud robotics and educational robots

Although robots have moved beyond the industrial shop floor, the programmability of robots still remains constrained and limited to traditional software like ROS, now seeing improvements in its second avatar of ROS 2. At the same time, educational robots have made robotic programmability much more intuitive and easy to use, this has not translated into enterprise robot applications. The rise of cloud robotics and web programmability is aimed at tackling the problem of enterprise robot scalability and deployment, but we are still in the early stages of this revolution.



Despite recent setbacks in a few sectors, the future of robots is squarely in the non-industrial domain with 10x–12x larger market opportunity than industrial robots.

Total Industrial and Non-Industrial Robotics Revenue, World Markets: 2018-2025



Source: Tractica