

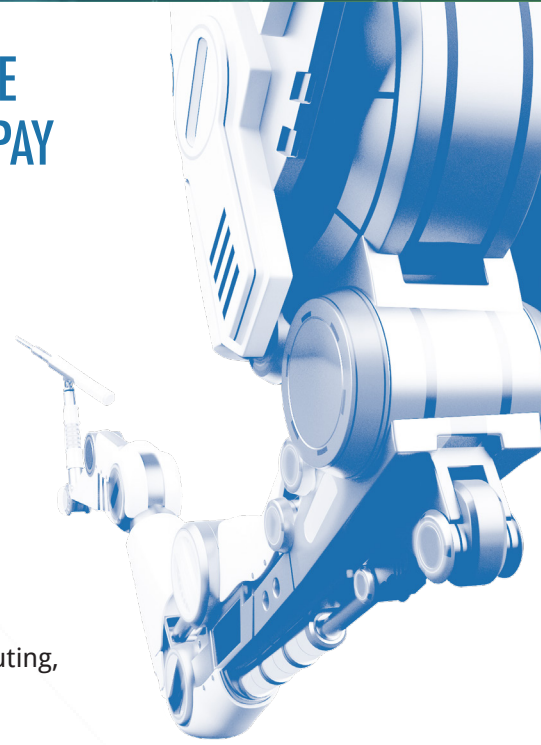
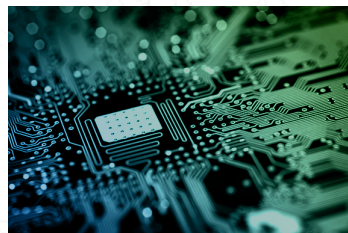
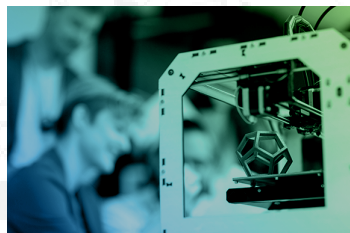
INVESTING IN THE ROBOTICS, AUTOMATION & AI REVOLUTION

ROBOTICS, AUTOMATION, AND ARTIFICIAL INTELLIGENCE IS DISRUPTING OUR WORLD. INVESTORS, IT'S TIME TO PAY ATTENTION.

The ROBO Global Robotics & Automation Index—the leading stock index created in 2013 to track the robotics, automation and AI revolution for investors—has significantly outperformed global equities in recent years, returning a total annualized 18.5% over three years to April 2019. The financial markets have made it clear that Robotics, Automation and AI (RAAI) may be one of the most important investment opportunities of our generation. Importantly, this technological revolution is still in its infancy, and the ingredients for a major breakthrough are in place:

- Costs are rapidly declining across key enabling technologies such as computing, sensing, and communication.
- Performance capabilities of RAAI are exploding, dramatically expanding its reach into nearly every industry.
- Data—the fuel of artificial intelligence—is growing by billions of gigabytes every day. In 2018, over 2.5 quintillion bytes of data were sent daily, according to cloud-based operating system DOMO.

Automation is nothing new. Humans have been automating our dull, dirty, and dangerous work for decades—from the earliest agricultural machinery to today's high-speed welding robots used in manufacturing. But with machine intelligence hitting an inflection point in recent years, we are on the cusp of a massive and exponential wave of change that will be even more transformative to our society than personal computers, the Internet, and mobile devices have been over the past twenty years.



THE REVOLUTION IS HAPPENING NOW

This revolution comes as no surprise. Robotics and AI are already an integral part of our lives. Last year, Amazon delivered over 5 billion items in two days or less to their Prime members—an accomplishment that would not have been possible without the advanced capabilities of robotics-driven factory automation and AI. Last year, more than 5,000 surgical robots in hospitals around the world helped perform nearly 1 million operations. Every day, Siri and Alexa help us transcribe voicemails to text, pick the perfect music playlist, discover the perfect dinner destination, and even help us to avoid traffic to get there right on time. Just as the Internet transformed how we work and communicate, robotics and AI are changing the fundamental structure of every sector of the economy, including how we grow and process our food, manufacture and move goods of every kind, shop and play, learn and utilize information, and even care for our health.



At ROBO Global, we are not alone in our belief that RAAI's economic impact will be measured in the trillions of dollars.

- Andrew Ng, then Chief Scientist of Baidu and Adjunct Professor at Stanford who led the development of its Massive Open Online Course platform, has called Artificial Intelligence “the new electricity.”
- Acclaimed futurist Ray Kurzweil has said that, “Artificial intelligence will reach human levels by around 2029,” and that by 2045, “we will have multiplied the intelligence, the human biological machine intelligence of our civilization a billion-fold.”

- Amazon CEO Jeff Bezos has said, “We are now solving problems with machine learning and artificial intelligence that were in the realm of science fiction for the last several decades. And natural language understanding, machine vision problems—it really is an amazing renaissance.”

That's quite a revolution.

Corporate giants around the world already understand this vision of the future and are aggressively deploying capital to develop and acquire the RAAI technologies needed to take their businesses to the next level. The choice is simple: to be a disrupter or to be disrupted. As companies rush to leverage and build on all that RAAI has to offer, the pace of RAAI acquisitions has continued to accelerate.

The exponential growth trends across robotics and AI are undeniable:

- The computing & AI market is projected to generate \$105.8 Billion in revenue by 2025, up from \$5.4 billion in 2017—a CAGR of 45% (Tractica)
- The industrial automation market value will reach an estimated \$352 billion by 2024 (Transparency Market Research)
- The computer vision market's estimated worth will be \$19 billion by 2025 (Market Insights)
- The healthcare AI market is projected to be valued at \$7 billion by 2021 (Accenture)
- VC funding into US artificial intelligence startups grew 72% year-over-year, hitting over \$9.3B in 2018 (CB Insights)

The impact of that growth is evident. According to The Robot Report, over \$12 billion in investments flowed into robotics companies. In January 2019 alone, 25 different robotics startups were funded, cumulatively raising \$644 million.

FUTURE-PROOF YOUR PORTFOLIO WITH RAAI

For investors, the name of the game is to future-proof their portfolios. And while venture capitalists have clearly shifted their focus towards RAAI, it looks like public equity investors may need to play catch-up, especially in the US, where investors have only just begun to approach RAAI as an investable theme. Since the ROBO Global Robotics & Automation Index was established in 2013, a dozen competing strategies have come to market around the world, totaling, by our estimates, approximately \$30 billion in assets under management. This is just a tiny drop in the bucket of the global equity markets, which total more than \$70 trillion. It also looks small in the context of the market value of Internet companies, which account for around 10% of the S&P 500, or to Softbank's \$100 billion Vision Fund—the largest tech fund in history.

Not all funds are created equally. That is precisely why investors who choose to take advantage of the RAAI opportunity would be wise to choose their investment vehicle carefully. While each may offer the opportunity to direct funds toward robotics and AI, it's important to recognize that these funds pursue vastly different investment strategies, and some are significantly riskier than others. Certain funds invest in just a handful of large-cap stocks in the sector in the hopes that these will be tomorrow's winners. And yet it's very possible—if not highly likely—that in today's dynamic environment, the largest players will change nearly as quickly as the technologies themselves. For that reason, a strategy that includes broad exposure to the global value chain may be a more prudent approach. This broad exposure may include not only large-cap participants, but also providers of key enabling technologies (sensing, computing, machine learning, actuation, etc.), as well as providers of applications that deliver capabilities in every industry (factory automation, surgical robotics, food and agriculture, 3D printing, logistics automation, and more).

FOR INVESTORS IN RAAI, THE FUTURE IS HERE

In the words of Danish physicist Niels Bohr, "It is difficult to predict—especially the future." This is especially true in the world of robotics, automation, and artificial intelligence. Never before have we seen such an explosive mix of exponential technological change, an abundance of disruption, and high levels of mergers and acquisitions that are driving massive moves in share prices. Who could have forecast that the 3D printing sector would appreciate a stunning 8-fold growth from 2012 to 2013—or foresee its 80% collapse in the following two years? Yet shifts of this magnitude are inevitable as RAAI technologies continue to evolve at an unprecedented pace.

Investors who grasp this reality will choose to seek superior risk-adjusted returns by building a portfolio of industry leaders that is diversified across geographies, small and large companies, and technologies and applications. Additionally, they will rely on the guidance of industry experts, academics, and entrepreneurs to select tomorrow's growth leaders and provide the knowledge and insight to more accurately foresee emerging trends, identify the most promising new technologies, and understand the intricate interaction between technologies and their specific applications.

Today, it seems there's an index available to tackle nearly every theme and style an investor can dream up, giving investors more options to choose from than ever. But understanding precisely what those options actually offer can be a challenge—even for experienced investors and portfolio managers. To decipher this complexity, it is important to investigate how an index is constructed and how often it is rebalanced, as well as the index turnover rate, performance history, and track record. For investors seeking a way to future-proof their portfolio with robotics and AI, these are the details that matter. The time to invest in all that RAAI has to offer is now.