

Accessing Artificial Intelligence & Robotics:

Nasdaq CTA Artificial Intelligence & Robotics Index (NQROBO) – Spring 2020

Introduction

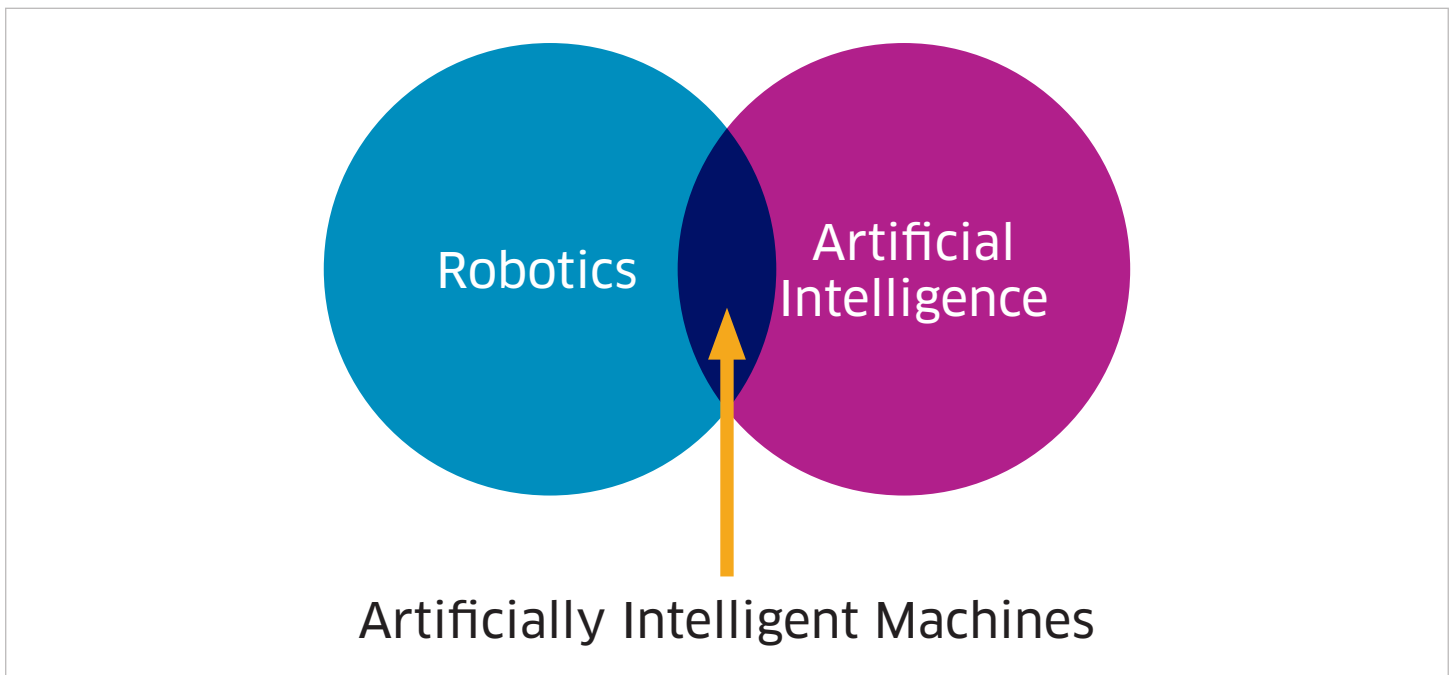
The future is here. Artificial intelligence (AI) and robotics, together, is the augmentation and imitation of human activity and behavior to increase output or efficiency. Driven in large by technological advancements and an increase in implementation and demand, these burgeoning fields have both gained a lot of attention in the last few years and are now playing an ever increasing role in our daily lives, helping to solve some of the problems that our world faces, and to make the future a better place.

Take the recent COVID-19 pandemic, for example. Currently there is a shortage of ventilators across many hospitals in the United States and the world. To help address this problem, the University of Minnesota and a group of healthcare and technology companies have invented a new “light” ventilator that uses robotics, through the use of an electrically powered robotic arm to “mechanically squeeze an off-the-shelf adult resuscitation bag, the sort paramedics often use to help a patient breathe.”¹ AI is also being used to tackle COVID-19, as well. According to a recent Harvard Business Review article, AI-based solutions are being used in a screening and triage tool; to power sensors to identify contagious individuals in crowds and groups; and to monitor patients with symptoms.²

As we highlighted in the 2018 research note, “Artificial Intelligence & Robotics: Industry Report & Investment Case,” what is most interesting today is the intersection of AI and robotics, where advancements in both fields feed on each other, creating a multiplier effect on this intersection. The fusion and harmonization of fields allows them to grow more rapidly, and AI and robotics are an essential part of this breakthrough.³ This is one of the reasons why AI and robotics, together, are geared for exceptional growth.

Defining Artificial Intelligence & Robotics

So what exactly is artificial intelligence? What is the future of robotics? Separately, AI and robotics are fundamentally different and can be used for a variety of purposes. Robots are programmable machines that can carry out routine tasks semi-or-fully autonomously. Artificial intelligence, on the other hand, is the development of computer models to complete tasks that would otherwise require human intelligence. In other words, artificial intelligence algorithms are generally self-trained to carry out tasks with some level of human behavior (e.g. language understanding capabilities). This shows that the two branches are fundamentally different, in that robots carry out pre-defined and routine tasks while artificial intelligence attempts to mimic “intelligence”. There is, however, an intersection of these two branches, which is artificially intelligent machines.⁴ Artificially intelligent robots or machines are the bridge between artificial intelligence and robotics. They are machines which are controlled by artificial intelligence programs. This allows robots to not only complete routine tasks, but also more complex tasks requiring more “intelligence”. These two branches can be summarized with the Venn diagram below.



Artificially intelligent machines go beyond humanoid robots; each intelligent robot can take many different forms and can be designed to satisfy a variety of needs. Some examples of AI-enabled robots are disk-shaped robots that vacuum floors, computers that combine eye-tracking and speech recognition to replace the keyboard and mouse, unmanned aircrafts, software for analyzing and optimizing designs, and genomics research products

What is the Industry Outlook for Artificial Intelligence & Robotics?

In 2019, the global robotics market was valued at around “\$34 billion and is expected to register double digit CAGR over the forecast period of 2020-2025”, according to Business Wire.⁵ Additionally, the sector is expected to grow “exponentially” over the next five years, as a result of “cost reduction, improved quality, increased production, and improved workplace health and safety.” The competitive landscape in this field is currently dominated by large international companies who are able to design, produce or enhance robots and/or artificial intelligence at a low cost and are able to generate revenue both from direct and indirect sales (examples: Samsung, Apple, Tencent, Alphabet and Facebook). However, there are number of smaller companies that continue to break into this space, such as business software company Cloudera and unmanned aircraft company AeroVironment, by providing highly specialized AI and/or robotics.

Some of the primary markets that AI and robotics companies are targeting are:

- Autonomous Systems
- Software
- Electronic Equipment
- Industrial Machinery
- Medical
- Manufacturing
- Biotechnology
- Defense
- Automotive

Nasdaq CTA Artificial Intelligence & Robotics Index Methodology – A Summary

The Nasdaq CTA Artificial Intelligence & Robotics Index is designed to track the performance of companies engaged in the artificial intelligence and robotics segment of the technology, industrial, medical and other economic sectors. The important difference about NQROBO when compared to other AI and robotics indexes is that its tiered methodology is designed to track the three levels of the AI and robotics industry involvement by classifying companies in the space into one of three categories: enabler, engager and enhancer.

- **ENABLERS** are companies that develop the building block components for robotics or artificial intelligence, such as advanced machinery, autonomous systems/self-driving vehicles, semiconductors, databases used for machine learning.
- **ENGAGERS** are companies that design, create, integrate, or deliver robotics and/or artificial intelligence in the form of products, software, or systems.
- **ENHANCERS** are companies that provide their own value-added services within the Artificial Intelligence and Robotics ecosystem, but which are not core to their product or service offering.

Eligibility Criteria:

- Minimum market cap of \$250M;
- Minimum three-month average daily dollar volume of \$3M;
- Minimum free float of 20%;
- Classified as an Artificial Intelligence or Robotics company as an enabler, engager or enhancer as determined by the Consumer Technology Association (CTA).

The top 30 securities (or more inclusive of ties) within each of the three categories – Enablers, Engagers and Enhancers - are selected for a total of 90 (or more inclusive of ties) securities in the Index at the time of the semi-annual evaluations utilizing CTA's AI/Robotics Intensity Rating. This rating is designed to capture the perceived degree of a company's AI/Robotics sector involvement within each respective Engager, Enabler and Enhancer category.

Each of the three classifications has its own tiered weighting that is updated at each rebalance. The index employs a modified equal weighting methodology where each category receives the following weights (for more information on the index methodology, [click here](#)):

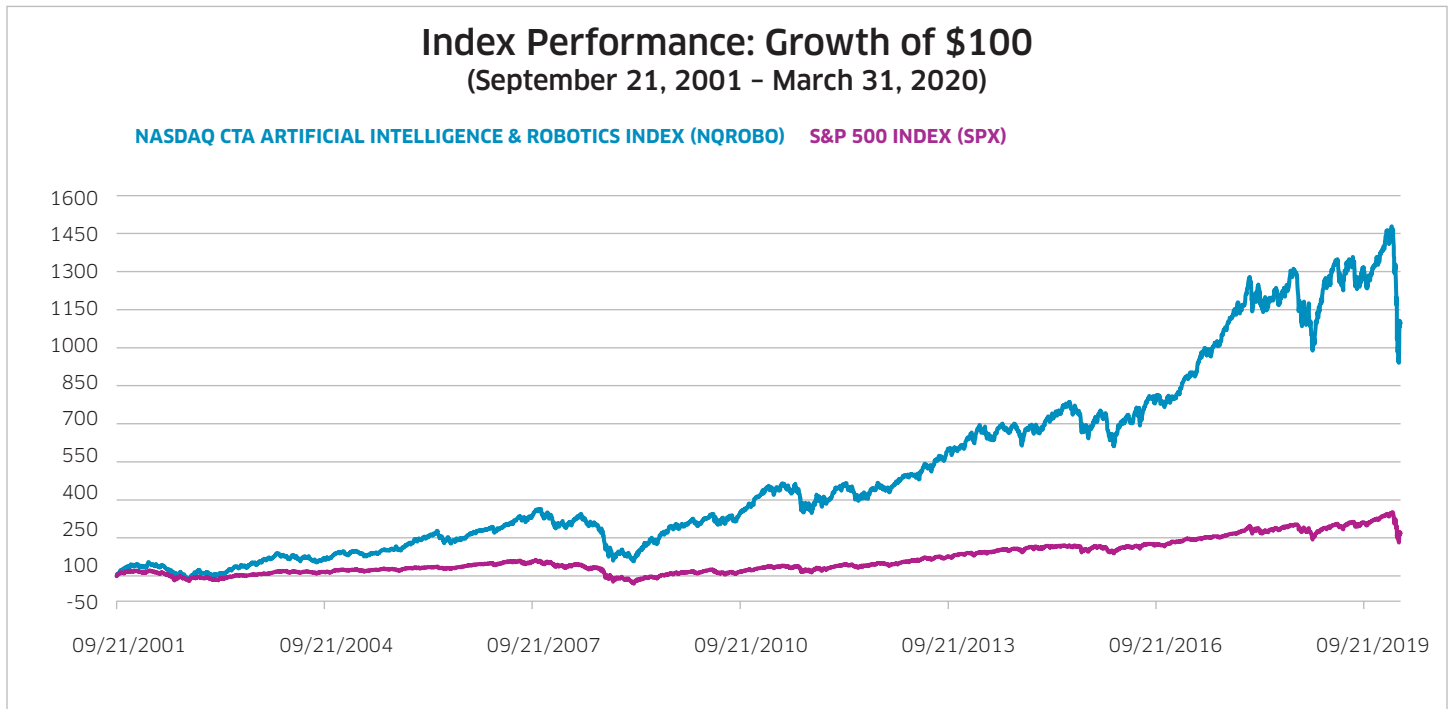
- **ENABLERS: 25%**
- **ENGAGERS: 60%**
- **ENHANCERS: 15%**

The reasoning behind why a significantly larger weight is assigned to the Engagers category is that AI and robotics products developed, integrated or delivered by companies in this category account for a large portion of the company's revenue. Following a similar logic, companies in the Enablers category receive a significant yet more indirect impact in terms of revenue from AI/robotics products. Last, it is important to capture companies that overlay their own value-added services to devices in the industry, but since these are not the core revenue generating services of the companies in question, the Enhancers category is capped at a lower weight.

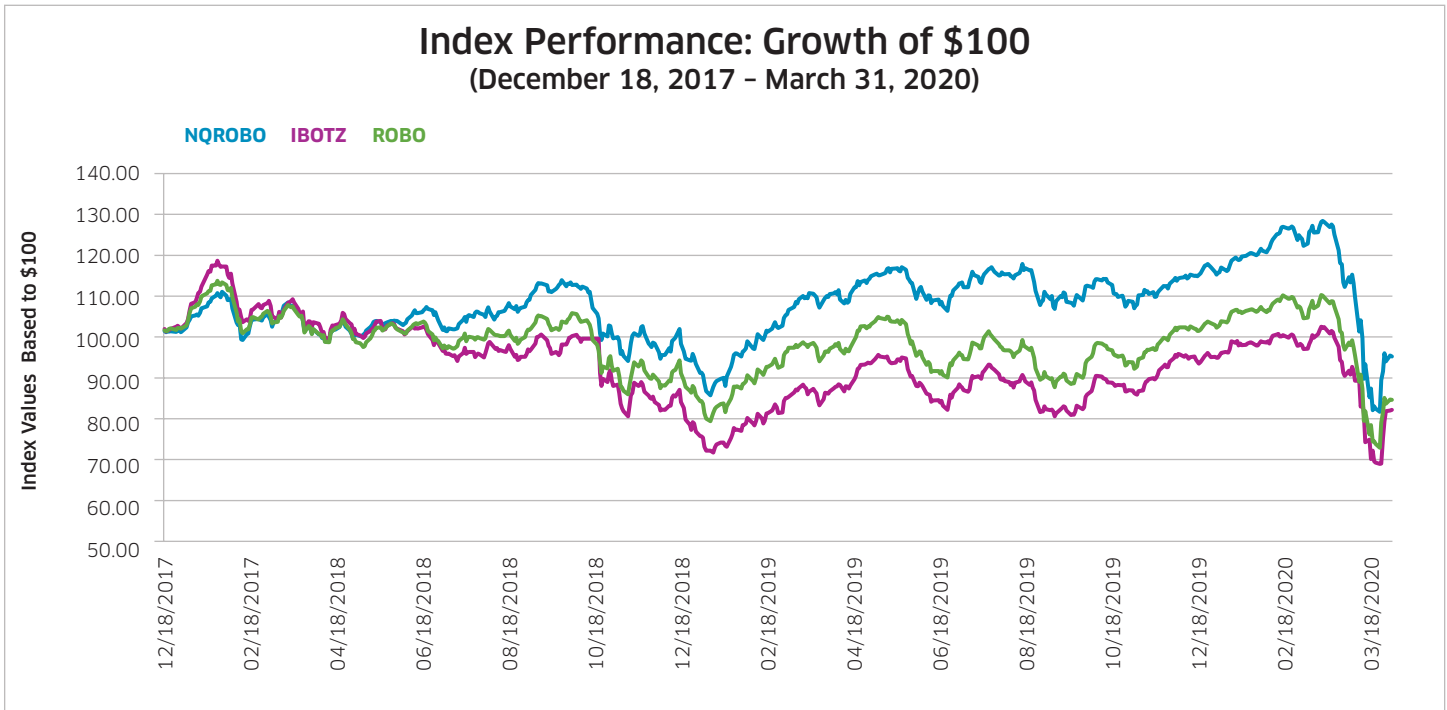
The index is evaluated semi-annually in March and September using data through the end of January and July. The results of the semi-annual evaluations go effective after the close of trading the third Friday in March and September. The other two quarters, June and December, have index rebalances, where weights are adjusted to be brought back in-line to the stated weighting methodology of the index, but no other review is enacted at those times. Note that these weights are assigned as of the end of February, May, August and November that go effective after the close of trading the third Friday the following month (March, June, September, December). The index's inception date is December 18, 2017.

Performance

The growth of the companies in the Nasdaq CTA Artificial Intelligence & Robotics Index (NQROBO) from a price return standpoint is worth highlighting as it is quite pronounced. Though the live Index officially launched on December 18, 2017, NQROBO has gained 997.21%, compared to 167.61% by the S&P 500 Index since its first day of back-tested history in September 2001 through the end of March 2020.

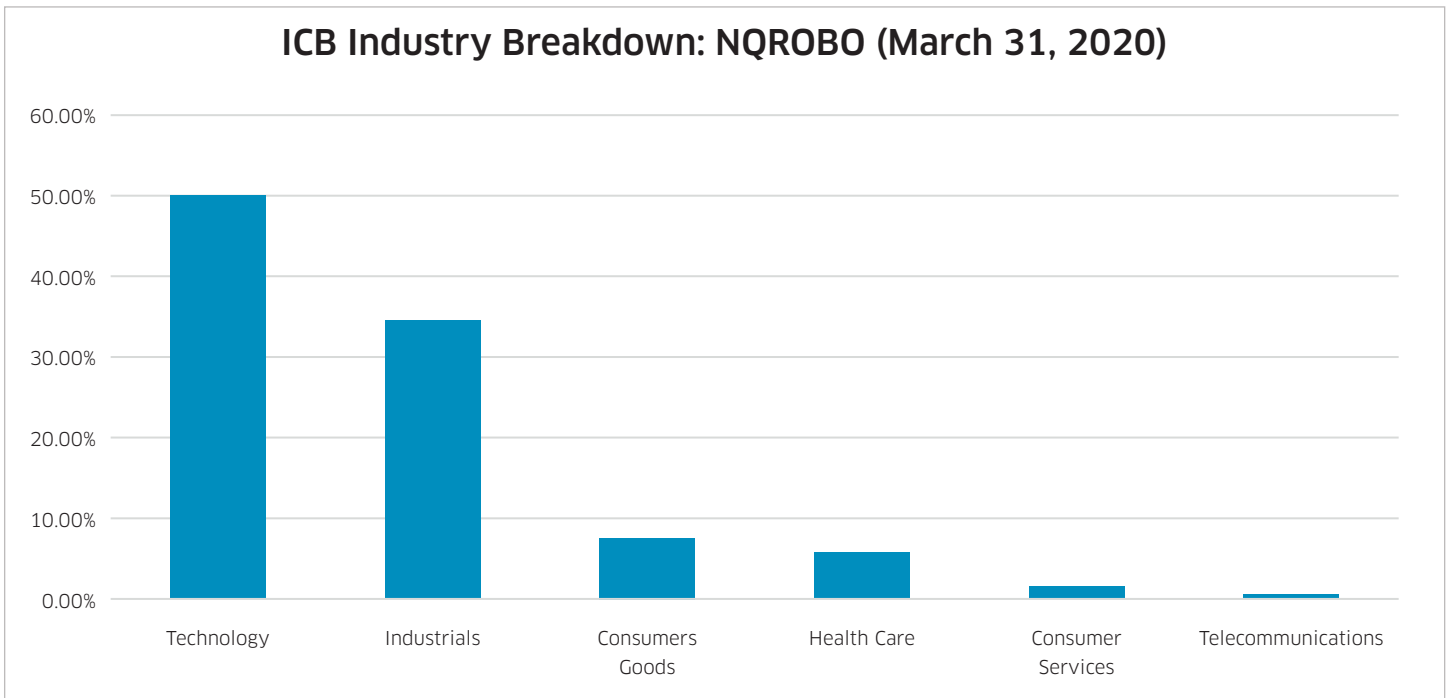


In addition, since inception the Nasdaq CTA Artificial Intelligence & Robotics Index (NQROBO) has outperformed both of its peer benchmarks - Indxx Global Robotics & Artificial Intelligence Thematic Index (IBOTZ) and the ROBO Global Robotics and Automation Index (ROBO). From inception through the end of the first quarter of 2020, NQROBO is only down -6.14%, compared to -19.36% for IBOTZ and -16.68% for ROBO. Even though the NQROBO is still outperforming its peers on a cumulative basis, it has experienced recent underperformance during the global equity correction due to the COVID-19 pandemic. But overall, NQROBO continues to lead its benchmarks since inception.

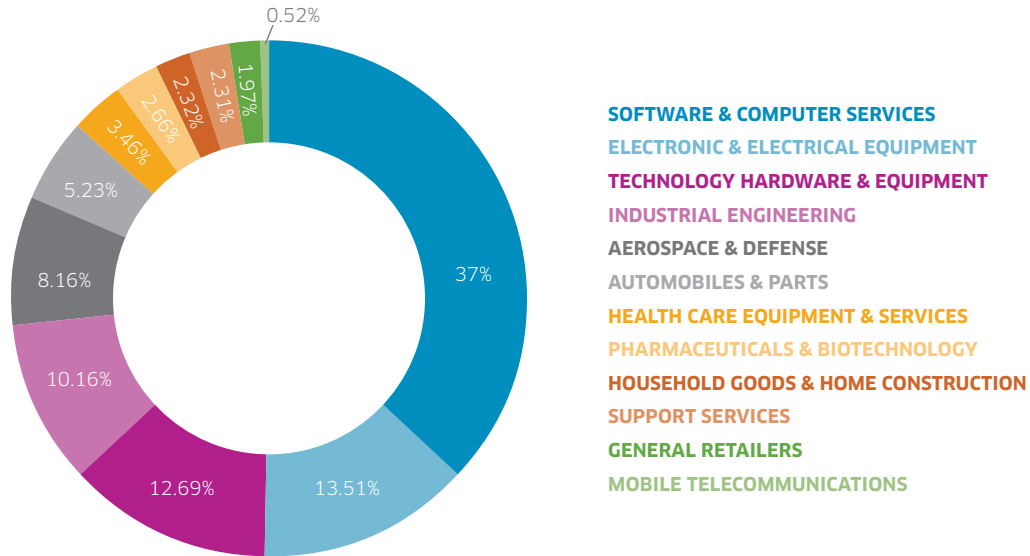


Sector Exposure

From an ICB Industry perspective, it is not surprising to see more than half of the companies fall in the technology industry. But it is important to consider that the index also has exposure to industrials, consumer goods, and even healthcare securities. When one drills down further into the ICB Sectors, the majority of the technology exposure is in software & computer services, electronic & electrical equipment, and technology hardware & equipment.



ICB Sector Breakdown: NQROBO (March 31, 2020)



Top Ten Holdings

While it is helpful to see the way in which securities are classified within a classification framework such as ICB, it is important to note that the diversification element within this Index is truly driven by the different types of AI and Robotics companies: Engagers, Enablers, and Enhancers. As such, that is why the Index has the cap at 30 securities within each category. Here are the top ten holdings as of March 31, 2020.

COMPANY NAME	SYMBOL	COUNTRY DOMICILE	INDEX WEIGHT (%)
SERVICENOW, INC.	NOW	US	2.50
AEROVIRONMENT, INC.	AVAV	US	2.46
OBIC CO., LTD	4684	Japan	2.45
BLUE PRISM GROUP PLC	PRSM	UK	2.36
NICE LTD.	NICE	Israel	2.34
CADENCE DESIGN SYSTEMS, INC.	CDNS	US	2.33
DASSAULT SYSTEMES SE	DSY	France	2.32
IROBOT CORPORATION	IRBT	US	2.32
NUANCE COMMUNICATIONS, INC.	NUAN	US	2.32
APPIAN CORPORATION	APPN	US	2.31

(As of March 31, 2020)

Conclusion

The Nasdaq CTA Artificial Intelligence & Robotics Index (NQROBO) offers investors a robust exposure to the global AI and Robotics market while ensuring investability, sufficient liquidity and size. Though there are other indexes that provide exposure to the global AI, Robotics and Automation fields, there is a distinct disparity in the underlying basket of stocks. NQROBO's methodology, which includes enablers, engagers and enhancers, captures companies in all three stages of the AI and Robotics space. Investors looking to get exposure to the artificial intelligence and robotics industries can invest in the products tied to NQROBO: the First Trust Nasdaq Artificial Intelligence and Robotics ETF in the U.S. (XNAS: ROBT), the Cathay Nasdaq AI & Robotics ETF in Taiwan (TWSE: 00737) and the Ping An Nasdaq AI & Robotics ETF in Hong Kong (HKEX: 3023).

Sources: FactSet, Bloomberg, Nasdaq Global Indexes.

1. "Light Ventilator Uses Robotic Arm and Resuscitation Bag to Help with Coronavirus," Marketwatch, April 23, 2020, <https://www.marketwatch.com/story/light-ventilator-uses-robotic-arm-and-resuscitation-bag-to-help-with-coronavirus-2020-04-23?mod=home-page>
2. "How Hospitals are using AI to battle Covid 19", Harvard Business Review, April 2020 <https://hbr.org/2020/04/how-hospitals-are-using-ai-to-battle-covid-19>
3. Artificial Intelligence & Robotics: Industry Report & Investment Case, 2018, <https://indexes.nasdaqomx.com/docs/NQROBO%20Research.pdf>
4. Difference Between Robotics and Artificial Intelligence, RobotIQ, July 2017, <https://blog.robotiq.com/whats-the-difference-between-robotics-and-artificial-intelligence>
5. Global Robotics Market Valued 34 Billion 2019, Business Wire, February 2020, <https://www.businesswire.com/news/home/20200127005283/en/Global-Robotics-Market-Valued-34-Billion-2019>

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