



# THE INVESTOR'S GUIDE TO AI

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Demystifying Artificial Intelligence for the Future-Focused Investor



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**Listen to a podcast or turn on the TV today and you'll likely hear at least one ad for a tech-related product with the term AI tacked on in an attempt to appeal to consumers as the next big thing. We have Alexa and Roombas in our homes and talk to robots to reschedule a flight. AI's integration into society continues to push past basic human control to autonomous functions—understanding and doing what needs to be done automatically without intervention, saving our focus for other things.**

AI emulates human intelligence through the use of computer systems, with the ultimate goal of self-learning. AI was envisioned many decades ago, but recent advances in infrastructure and software engineering have allowed AI to go from theory to practice.

And while it's true that artificial intelligence is rapidly influencing the way we live, work, and play, having an understanding of the black box concept often falls to the experts. As long-time investors in disruptive technology, we believe that everyone could benefit from gaining a better understanding of AI, so you too can distinguish between the companies merely jumping on the buzzword bandwagon and the real deal.

In this report, we'll take a high-level approach to the world of artificial intelligence (AI), allowing investors to gain a stronger understanding of how AI works, where the technology is being applied, and ultimately, provide some ideas to invest in the tremendous growth opportunity being spurred by these innovations.

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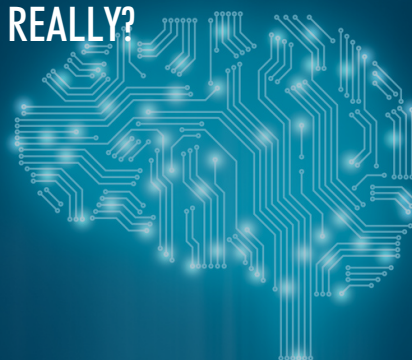
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## DEFINING ARTIFICIAL INTELLIGENCE: WHAT IS AI, REALLY?

Much like the introduction of electricity in the early twentieth century and the more recent advent of the internet and mobile technologies, AI offers broad technological capabilities that can be applied to all industries, profoundly transforming the world around us. We all know it exists around us, but when it comes to defining AI, many might remain silent.

Artificial Intelligence is defined as a branch of computer science that focuses on making machines imitate intelligent human behavior.



Sounds simple, right? Not exactly. It is important to remember the definition of AI tends to be a moving target as the technology continues to evolve. In the past few years, progress in the AI field has rapidly accelerated, with companies racing to develop and apply machine learning, neural networks, natural language processing, and a range of other subfields to drive innovation and monetize the power of AI.

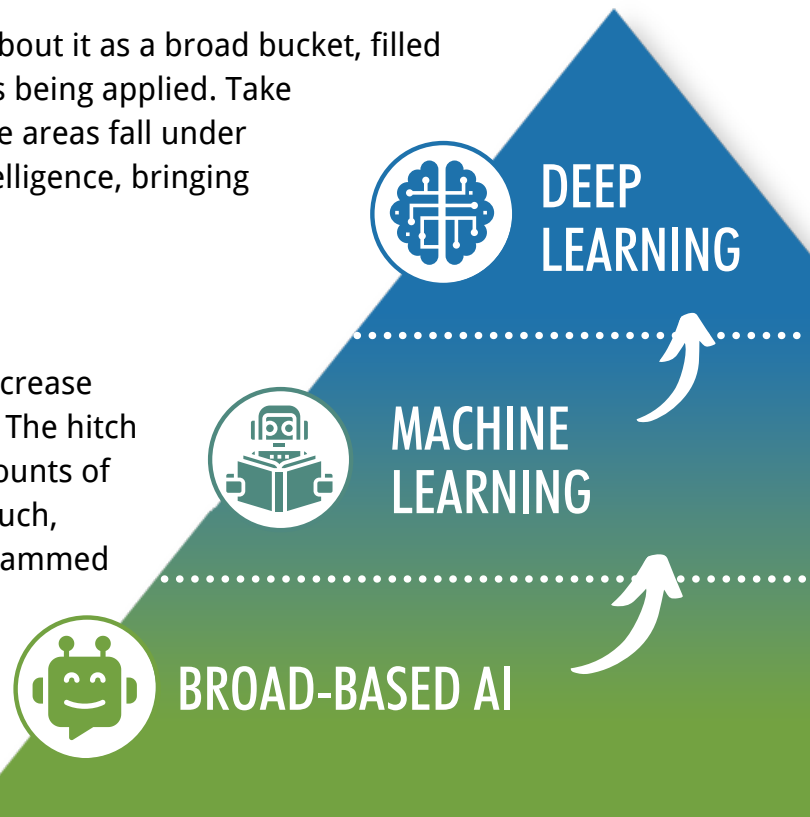
## THE HIERARCHY OF AI

When it comes to the landscape of AI, you can think about it as a broad bucket, filled with varying layers of complexities of the technologies being applied. Take machine learning or deep learning, for example. These areas fall under the AI umbrella, but progressively up the levels of intelligence, bringing the more futuristic concepts to life.

### What is Machine Learning?

Machine Learning (ML) uses data and algorithms to increase accuracy in a similar way to that of a human learning. The hitch is that machines can theoretically process infinite amounts of information whereas humans are restricted in how much, and how fast, we can absorb at one time. These programmed algorithms allow the computer to create simple predictions based on the data set analyzed.

Think: how our streaming services can provide us with custom-tailored recommendations based on the content we consume.



## What is Deep Learning?

Deep Learning (DL) takes machine learning to the next level, modeled after the concept of neural networks in the human brain. Hello, neural networks. Deep learning is the process of teaching a computer how to learn by example, and eventually learning and leading itself. It goes beyond machine learning to understand further complex, unstructured data such as analysis of images and videos. It is able to implement learnings faster but requires more resources and data to train.

Some examples of these behaviors are knowing the difference between a human and a lamp post on the roads, learning how to recognize cancer cells versus healthy cells, or detecting the presence of a person while operating and slowing down for safety purposes.

### Machine Learning & Deep Learning Capabilities



Natural  
Language  
Processing &  
Translation



Visual  
Perception  
& Pattern  
Recognition

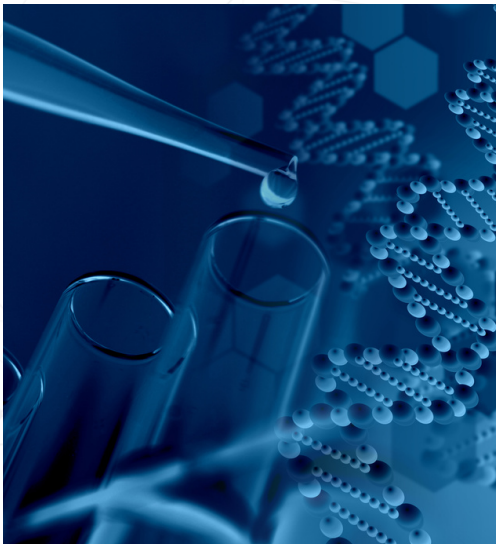


Real-time  
Decision  
Making in  
Closed vs Open  
Environments

## What Makes Deep Learning So Transformative?

The de-centralization of information has led to a massive increase in the amount of digital data. This is enabled by massive data centers and more avenues for valuable data collection through sensors and other inputs. In fact, this has advanced so far that training can occur entirely within virtual environments with synthetic data, allowing for incredibly nimble and agile training. When it comes to deep learning, the more data, the better. As the data set increases, so does the intelligence being applied to the objective.

Deep learning is a technology that we've only recently been able to fully capitalize on thanks to today's availability of massive amounts of data and ever-growing speed, power and lower energy costs of computing. Without deep learning, something like the safe operation of self-driving cars could never be possible.





## WEAK AI VS. STRONG AI

Now that we've discussed the hierarchy of AI, let's dive into the sliding scale of simple versus complex artificial intelligence—also known as weak versus strong AI. According to IBM, "strong AI aims to create intelligent machines that are indistinguishable from the human mind. But just like a child, the AI machine would have to learn through input and experiences, constantly progressing and advancing its abilities over time."

### STRONG AI

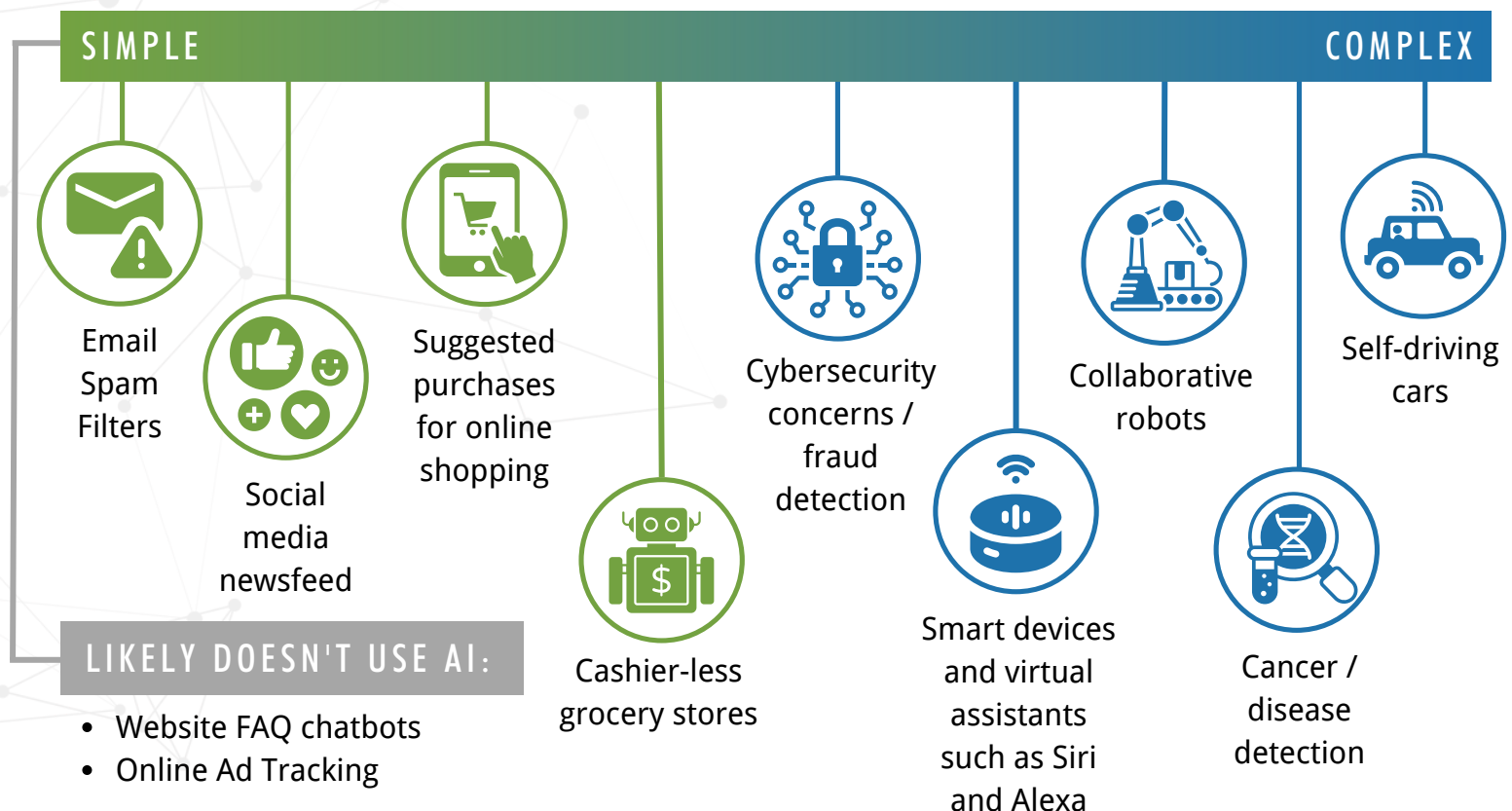
Much like the subfield of deep learning, strong AI works to perform many functions, with the ultimate goal of learning how to solve future problems autonomously (that is, without the help of a human) in complex environments.

### WEAK AI

Focuses on a simple or specific task, with perimeters designated and defined by a human. However, this isn't necessarily to say that these are easy problems to solve or automate; rather, that our existing technology has already been able to tackle parts of these areas.

Clearly, we have a journey ahead of us in terms of taking strong AI mainstream and yet, we're still inundated with marketing messages about questionable company uses of advanced AI. This begs the question of how often products and services are truly utilizing computer intelligence versus sophisticated algorithms. Let's explore some of the varying levels of AI when it comes to real-world concepts.

## The Scale of Intelligence

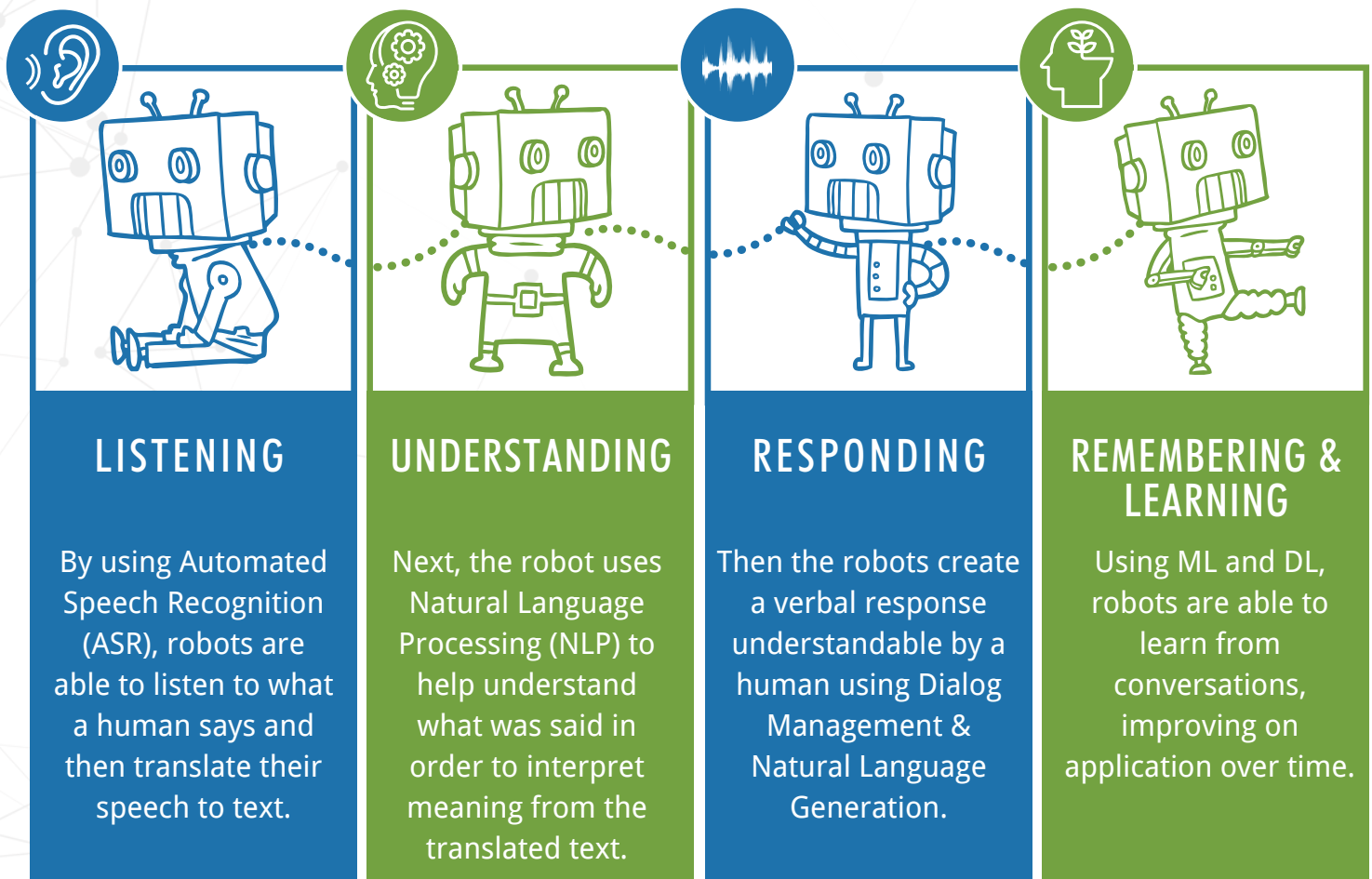


## TALKING TO A BOT: THE NUANCES OF CONVERSATIONAL AI

One of the most critical obstacles to introducing effective and useful AI into our daily lives has been something that comes so naturally to humans: clear communication. For decades, researchers have worked to teach the technology the quirks and nuances of human interaction. Luckily, the days of disjointed interactions with chatbots and virtual assistants should soon be over, thanks to advancements in the underlying technologies tied to conversational AI.

Recently, the capabilities of speech recognition, conversational AI, and natural language processing (NLP) have accelerated. Whether it's an initial phone screen that can verify your identity, a doctor's device that transcribes patient notes through verbal descriptions, or simply asking questions that can be understood and actioned by a responsive chatbot for an online retailer, conversational AI has come a long way.

For a human and robot to communicate, a lot of moving parts must come together behind the machines. Think about this process as being like that of a normal human conversation: listening, understanding, and responding.





## UNLOCKING THE AI INVESTMENT UNIVERSE

At ROBO Global, we recognized the robotics, automation, and AI revolution was coming early on, becoming the first investment product (ticker: ROBO) to market in 2013 to capitalize on this growth. With ROBO came the construction of the first industry classification system of its kind. ROBO is inclusive of the technologies behind the machines and the areas in which those technologies are implemented. We believe that a diversified approach to investing in disruptive technologies is the best way to play such rapidly evolving spaces.

In monitoring the publicly traded universe of the enablers of artificial intelligence, we saw the massive shift that was occurring. It was time to create a portfolio to capture this targeted investment opportunity.

We launched the ROBO Global Artificial Intelligence Index (ticker: THNQ) in 2018, exclusively focused on providing exposure to the companies powering the AI revolution. Taking the same research-driven approach to THNQ, we defined 11 subsectors that best encapsulate the theme. Each of these subsectors falls into either the 'Infrastructure' bucket or the 'Applications & Services' bucket.

- **'Infrastructure'** refers to companies that provide the enabling technologies that make AI possible, from the data collection and preparation to the computing, processing, and storage as well as networking and security—which allow trusted platforms to develop and grow.
- **'Applications & Services'** refers to companies that are deploying AI in business cases across a variety of vertical industries.

One key takeaway from the THNQ classification is that it aims to cover the entire AI value chain, with the companies in the infrastructure subsectors laying the foundation for the existence of the applications and services.

### Infrastructure Subsectors



#### Big Data / Analytics

Predictive analytics and maintenance, along with data aggregation and analysis, are among the AI technologies that give companies the power to analyze and predict outcomes. The result: actionable, predictive insights that help companies improve customer experiences, deliver more targeted offerings, and solve complex business challenges.



#### Cloud Providers

Public and private cloud platforms are the key to storing and sharing the massive amounts of data required to feed AI processes, and to delivering the standardization required for AI automation. Cloud providers help companies accelerate the delivery lifecycle and rapidly evolve and improve products and services.



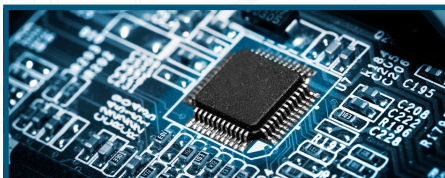
#### Cognitive Computing

Computer-based neural networks give computers the ability to think, reason, and remember—all without human intervention. Solutions that offer these advanced deep-learning algorithms are driving unprecedented developments in medicine, education, agriculture, and more.



## Network & Security

AI-driven behavioral analytics use the power of machine learning to model network behavior and improve threat detection. AI's storage capacity, processing power, and advanced analytics give companies the ability to sort through vast quantities of vulnerabilities, configuration errors, and isolate high-risk situations—all in near-real time.



## Semiconductor

The exploding use of AI is ushering in a new era of semiconductor architectures and computing platforms that can handle the accelerated processing requirements of an AI-driven world. Semiconductor companies are creating advanced AI chip engines using a whole new range of materials, equipment, and design methodologies.

## Applications & Services Subsectors



BUSINESS  
PROCESS



CONSUMER



CONSULTING  
SERVICES



ECOMMERCE



FACTORY  
AUTOMATION



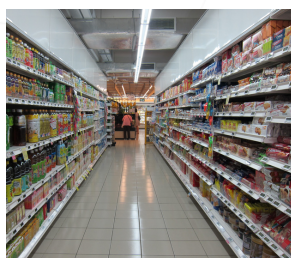
HEALTHCARE

## HOW COMPANIES ARE MOST COMMONLY USING AI TODAY

For businesses, AI has become an absolute imperative for creating and maintaining a competitive edge. In McKinsey's ['State of AI in 2021'](#) report, the most common use-cases of AI reported by the companies surveyed fell predominantly into the service operations and product and/or service development buckets.



Service-  
operations  
optimization



New AI-based  
enhancements  
of products



Contact-  
center  
automation



Product-  
feature  
optimization



Predictive  
service and  
intervention

Notably, nearly two-thirds of the companies surveyed said that their investments in AI will increase over the next three years.



While many AI stocks provide investors with exposure to the technology, single stock investment is a riskier move when it comes to disruptive technology. Picking the winners and losers in AI today is nearly impossible. That's why we believe that a diversified investment portfolio is the best way to gain exposure to this ever-changing space.



Interested in investing or learning more? Get in touch at [info@roboglobal.com](mailto:info@roboglobal.com)



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