

PART 1: A REALISTIC FRAMING OF THE PROGRESS IN ARTIFICIAL INTELLIGENCE

Christopher Gannatti — Global Head of Research

06/24/2022

Let's face it—we love exciting announcements. Why talk about the small technical improvements of a given [artificial intelligence \(AI\)](#) system when you can prognosticate about the coming advent of [artificial general intelligence \(AGI\)](#)? However, focusing too much on AGI risks missing many incremental improvements in the space along the way. This is very much like how focusing solely on when cars can literally drive themselves risks missing all the incremental assisted driving features being added to cars all the time.

DeepMind at the Forefront...AGAIN

The coverage of [AlphaGo](#), [DeepMind](#)'s¹ system that was able to best the performance of professional Go player Lee Sedol, was a game changer. Now there is [AlphaZero](#), [AlphaFold](#) and more. DeepMind has made incredible progress in showing how AI can be applied to real problems. AlphaFold, for example, predicts how given proteins will fold, and, in accurately knowing the shape of given proteins with accuracy, unlocks enormous potential in how we think about all sorts of medical treatments.

*The Covid-19 vaccine using mRNA was based largely on targeting the shape of the specific 'spike-protein.' The overall protein-folding problem was something humans were focusing on for more than 50 years.*²

However, DeepMind recently presented a new 'generalist' AI model called Gato. Think of it this way—AlphaGo specifically focuses on the game of Go, and AlphaFold specifically focuses on protein folding—they are not generalist AI applications. In contrast, Gato can³:

- Play Atari video games
- Caption images
- Chat
- Stack blocks with a real robot arm

In total, Gato can do 604 tasks. This is very different from the more specialized AI applications that are trained with specific data to optimize one task.

So, AGI Is Now on the Horizon?

To be clear, full AGI is a significant jump over and above anything achieved to date. It's possible that with an increase in scale, the path used by Gato could lead to something closer to AGI than anything done to date. Similarly, it's possible that increasing scale alone goes nowhere. AGI may require breakthroughs that are yet not determined.

People love to get hyped on AI and its potential. In recent years, the development of [GPT-3](#) by [OpenAI](#)⁴ was big, as was the image generator [DALL-E](#). These were both huge achievements, but neither has led to technology exhibiting human-level understanding, and it is unknown if the approaches used in either will naturally lead to AGI in the future.

If We Cannot Say When AGI Will Come, What Can We Say?

While the massive breakthroughs like AGI may be difficult, if not impossible, to predict with certainty, the focus on AI broadly has been undergoing an incredible upswing. The recently published Stanford AI Index report is extremely useful, in that one can see:

1. The magnitude of the investment pouring into the space. Investment, in a sense, partly measures confidence, in that there has to be a reasonable belief that productive activity will result from the efforts being funded.
2. The breadth of AI activities and how the activities are universally showing improving metrics.

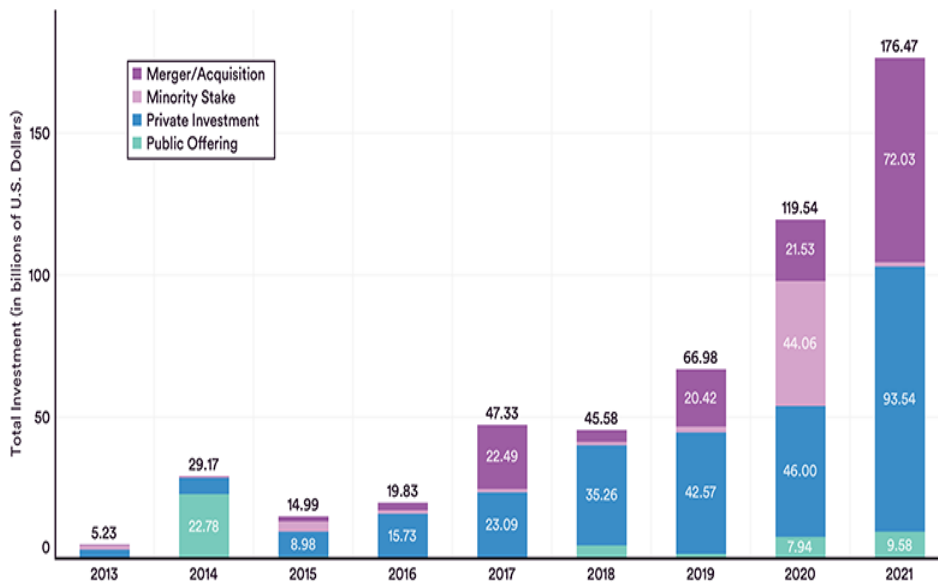
The Growth of AI Investment

Looking at figure 1, the progression of investment growth has been staggering. We recognize that this is partly driven by the excitement and potential of AI itself, and also by the general environment. The fact that 2020 and 2021 showcased such large figures has to be influenced by the fact that the [cost of capital](#) was minimal and money was chasing exciting stories with potential [profits](#) way out in the future. Based on what we know today, it would be difficult to predict that the 2022 figure outpaces 2021, but it could still be a strong absolute amount of money.

It's also interesting to consider the evolution of the components of investment:

- 2014 was defined by [public offering](#), which in other years was generally on the smaller end of the spectrum relative to the totals.
- The primary driver of consistent growth in investment was on the private side, so it appears clear that figure 1 depicts the cyclical upswing in private investment, which we recognize may not necessarily continue a straight-line upward trend throughout the 2020s.

Figure 1: Global Corporate Investment in AI by INVESTMENT ACTIVITY, 2013–21



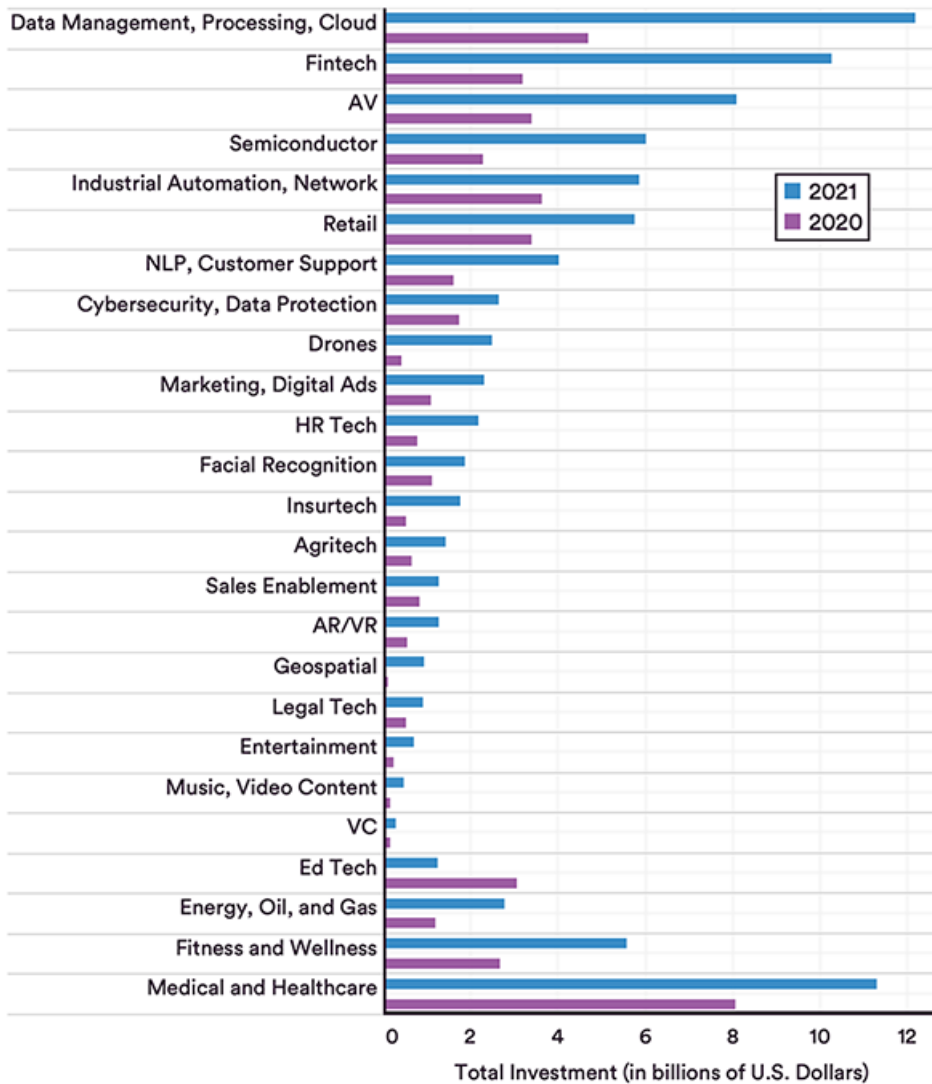
Source: Daniel Zhang et al., "The AI Index 2022 Annual Report," AI Index Steering Committee, Stanford Institute for Human-Centered AI, Stanford University, March 2022.

What Activities Is the Money Funding?

Aggregate investment amounts are one thing, but it's more concrete to consider specific areas of activity. Figure 2 is helpful in that regard, providing a sense of the change in 2021 relative to 2020.

- In 2021, 'Data Management, Processing, Cloud,' 'Fintech' and 'Medical and Healthcare' led the way, each breaking \$10 billion.
- It's notable that in the 2020 (purple) data, 'Medical and Healthcare' led with around \$8 billion. It puts the relative year-over-year increase for 'Data Management, Processing, Cloud' and 'Fintech' in more stark relief.

Figure 2: Private Investment in AI by Focus Area, 2020 vs. 2021



Source: Daniel Zhang et al., "The AI Index 2022 Annual Report," AI Index Steering Committee, Stanford Institute for Human-Centered AI, Stanford University, March 2022.

Is AI Technically Improving?

This is a fascinating question, the answer to which may have nearly infinite depth and may be covered in a limitless array of academic papers to come. What we can note here is the fact that it involves two distinct efforts:

1. Designing, programming or otherwise creating the specific AI implementation.
2. Figuring out the best ways to test if it is actually doing what it's supposed to or improving over time.

I find 'semantic segmentation' particularly interesting. It sounds like something only an academic would ever say, but it refers to the concept of seeing a person riding a bike in a picture. You want the AI to be able to know which pixels are the person and which pixels are the bike.

If you are thinking—who cares if sophisticated AI can discern the person from the bike in such an image?—I grant you it may not have the highest application value. However, picture an internal organ shown on a medical imaging device—now think about the value of distinguishing healthy tissue from a tumor or lesion. Can you see the value that could bring?

The Stanford AI Index report actually breaks down specific tests designed to measure how AI models are progressing in such areas as:

- Computer vision
- Language
- Speech
- Recommendations
- Reinforcement learning
- Hardware training times
- Robotics

Many of these areas are approaching what could be defined as the 'human standard,' but it's also important to note that most of them are only specializing in the one specific task for which they were designed.

Conclusion: It's Still Early for AI

With certain megatrends, it's important to have the humility to recognize we don't know with certainty what will happen next. Within AI, we can predict certain innovations, be it in vision, autonomous vehicles or drones, but we must recognize that the biggest returns may come from activities we aren't yet tracking. For those interested in an investment vehicle designed to gain exposure to AI, consider the [WisdomTree Artificial Intelligence and Innovation Fund \(WTAI\)](#).

Stay tuned for Part 2, where we discuss recent results of certain companies operating in the space.

¹ DeepMind is a subsidiary of Alphabet. As of 23 June 2022, Alphabet was a 1.46% weight in WTAI.

² Source: Heaven, Will Douglass. "DeepMind's protein-folding AI has solved a 50-year-old grand challenge of biology," MIT Technology Review, 11/30/20.

³ Source: Melissa Heikkila, "The Hype around DeepMind's New AI Models Misses What's Actually Cool About It," MIT Technology Review, 5/23/22.

⁴ OpenAI has 0% holding in the WisdomTree Artificial Intelligence and Innovation Fund (WTAI).

Important Risks Related to this Article

Christopher Gannatti is an employee of WisdomTree UK Limited, a European subsidiary of WisdomTree Asset Management Inc.'s parent company, WisdomTree Investments, Inc.

There are risks associated with investing, including the possible loss of principal. The Fund invests in companies primarily involved in the investment theme of artificial intelligence (AI) and innovation. Companies engaged in AI typically face intense competition and potentially rapid product obsolescence. These companies are also heavily dependent on intellectual property rights and may be adversely affected by loss or impairment of those rights. Additionally, AI companies typically invest significant amounts of spending on research and development, and there is no guarantee that the products or services produced by these companies will be successful. Companies that are capitalizing on innovation and developing technologies to displace older technologies or create new markets may not be successful. The Fund invests in the securities included in, or representative of, its Index regardless of their investment merit and the Fund does not attempt to outperform its Index or take defensive positions in declining markets. The composition of the Index is governed by an Index Committee and the Index may not perform as intended. Please read the Fund's prospectus for specific details regarding the Fund's risk profile.

For the top 10 holdings of WTAI please visit the Fund's fund detail page at <https://www.wisdomtree.com/investments/etf/s/megatrends/wtai>

For standardized performance and the most recent month-end performance click [here](#) NOTE, this material is intended for electronic use only. Individuals who intend to print and physically deliver to an investor must print the monthly performance report to accompany this blog.

Related Funds

+ [WisdomTree Artificial Intelligence and Innovation Fund](#)

View the online version of this article [here](#).

IMPORTANT INFORMATION

U.S. investors only: Click [here](#) to obtain a WisdomTree ETF prospectus which contains investment objectives, risks, charges, expenses, and other information; read and consider carefully before investing.

There are risks involved with investing, including possible loss of principal. Foreign investing involves currency, political and economic risk. Funds focusing on a single country, sector and/or funds that emphasize investments in smaller companies may experience greater price volatility. Investments in emerging markets, currency, fixed income and alternative investments include additional risks. Please see prospectus for discussion of risks.

Past performance is not indicative of future results. This material contains the opinions of the author, which are subject to change, and should not to be considered or interpreted as a recommendation to participate in any particular trading strategy, or deemed to be an offer or sale of any investment product and it should not be relied on as such. There is no guarantee that any strategies discussed will work under all market conditions. This material represents an assessment of the market environment at a specific time and is not intended to be a forecast of future events or a guarantee of future results. This material should not be relied upon as research or investment advice regarding any security in particular. The user of this information assumes the entire risk of any use made of the information provided herein. Neither WisdomTree nor its affiliates, nor Foreside Fund Services, LLC, or its affiliates provide tax or legal advice. Investors seeking tax or legal advice should consult their tax or legal advisor. Unless expressly stated otherwise the opinions, interpretations or findings expressed herein do not necessarily represent the views of WisdomTree or any of its affiliates.

The MSCI information may only be used for your internal use, may not be reproduced or re-disseminated in any form and may not be used as a basis for or component of any financial instruments or products or indexes. None of the MSCI information is intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. Historical data and analysis should not be taken as an indication or guarantee of any future performance analysis, forecast or prediction. The MSCI information is provided on an "as is" basis and the user of this information assumes the entire risk of any use made of this information. MSCI, each of its affiliates and each entity involved in compiling, computing or creating any MSCI information (collectively, the "MSCI Parties") expressly disclaims all warranties. With respect to this information, in no event shall any MSCI Party have any liability for any direct, indirect, special, incidental, punitive, consequential (including loss profits) or any other damages (www.msci.com)

Jonathan Steinberg, Jeremy Schwartz, Rick Harper, Christopher Gannatti, Bradley Krom, Tripp Zimmerman, Michael Barrer, Anita Rausch, Kevin Flanagan, Brendan Loftus, Joseph Tenaglia, Jeff Weniger, Matt Wagner, Alejandro Saltiel, Ryan Krystopowicz, Kara Marciscano, Jianing Wu, Brian Manby and Scott Welch are registered representatives of Foreside Fund Services, LLC.

WisdomTree Funds are distributed by Foreside Fund Services, LLC, in the U.S. only.

You cannot invest directly in an index.

DEFINITIONS

Artificial intelligence : machine analysis and decision-making.

Artificial general intelligence : The ability of an intelligent agent to understand or learn any intellectual task that a human being can.

AlphaGo : A computer program that plays the board game Go. It was developed by DeepMind Technologies a subsidiary of Google (now Alphabet Inc.).

Deep Mind : A British artificial intelligence subsidiary of Alphabet Inc. and research laboratory founded in September 2010.

AlphaZero : A computer program developed by artificial intelligence research company DeepMind to master the games of chess, shogi and go.

AlphaFold : An artificial intelligence (AI) program developed by Alphabet's/Google's DeepMind which performs predictions of protein structure.

GPT-3 : Generative Pre-trained Transformer 3 (GPT-3) is an autoregressive language model that uses deep learning to produce human-like text.

OpenAI : An artificial intelligence (AI) research laboratory consisting of the for-profit corporation OpenAI LP and its parent company, the non-profit OpenAI Inc.

DALL-E : An artificial intelligence program developed by OpenAI that creates images from textual descriptions.

Cost Of Capital : A company's calculation of the minimum return that would be necessary in order to justify undertaking a capital budgeting project, such as building a new factory.

Profits : Income that a company receives from revenue after costs and expenses are deducted.

Public offering : The sale of equity shares or other financial instruments such as bonds to the public in order to raise capital.