

## The AI Revolution: Framing Risks and Opportunities

Total reading time = 4 minutes

**Over the past several months, Artificial Intelligence (AI) has leaped from the realm of science fiction into reality right before our eyes. The evolution has taken decades, but the impressive growth in power and user access has accelerated very recently with ChatGPT. This process continues to evolve extremely rapidly, in raw technology, application, regulation, and politics.**

**This is the first piece in a new JAG Insights series where we will examine the opportunities and threats that AI presents. Two caveats are important to note. First, the pace of change is so rapid that some of the data and observations in this piece may quickly become moot. Second, we are not trying to explain the totality of our thinking or to opine on social, moral, and ethical guidelines for AI. Rather this is an attempt to synthesize for our clients the most relevant points from an investment perspective.**

ChatGPT (Chat), which was released publicly on 11/30/22, is the best-known web-based AI tool. Chat was built by OpenAI, a private company founded in 2016 by Sam Altman, Elon Musk, and Peter Thiel (among others), with additional investment and backing from Microsoft. Technically, Chat is a conversational Large Language Model (LLM) that can discuss or explain almost any topic. It generates human-like responses to user queries incredibly quickly, often in just a few seconds. It also seems to be subject to biases like AI “hallucinations,” where it confidently presents responses that seem to be accurate to the underinformed reader, but are not actually accurate.

According to Reuters, Chat’s global user base exceeded 100 million users in January 2023 (about 15% of these users are American), only two months after its launch. By comparison, it took 2.5 years for Instagram, 3.5 years for Apple’s iPhone, and 4.5 years for Facebook to reach the same milestone. The World Wide Web itself only surpassed 100 million users in 1998 after a decade in existence. We share these examples to illustrate that we are very likely witnessing the fastest ramp-up of a consumer-based technology tool in history. Moreover, this lightning-fast growth is arguably just the beginning. Hundreds of companies have signaled that they will be using this more advanced version of AI-based tools to improve their efficiency and enhance their customer propositions. Many companies had already been using a previous version of AI for years, prior to the integration of these recent language models.

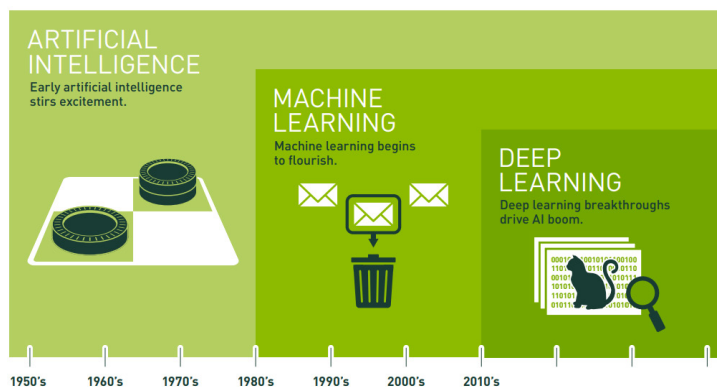
However, it should be noted that even new version improvements in the past several months for Chat represent massive leaps in technology.

From our experience over the past several decades, skepticism is warranted when evaluating the potential impact of new inventions and technologies. For recent examples of over-hyped fads that have thus far failed to pan out, one need look no further than cryptocurrencies and non-fungible tokens (NFTs). Although their proponents claimed loudly that they would change the world of finance forever, they have instead resulted in hundreds of billions of dollars of losses, high-profile scams and bankruptcies, and misery to many of their adherents.

Occasionally, however, as evidenced by the rise of the Internet in the 1990s, the risks of failing to appreciate the significance of a new technology can outweigh the risks of overstating the significance of a lasting sea change in the landscape. Although we cannot be sure, we believe the rise of AI is a seminal event for businesses, investors, and global society. At the very least, we believe that AI is the most revolutionary and disruptive development since the dawn of the Internet itself.

Here is what Chat has to say about AI when asked for a definition: “AI refers to the ability of computer systems to perform tasks that typically require human intelligence, such as learning, reasoning, perception, problem-solving, and decision-making.” Chat claims to have sourced this definition from a vast corpus of text data, including books, articles, and academic papers.

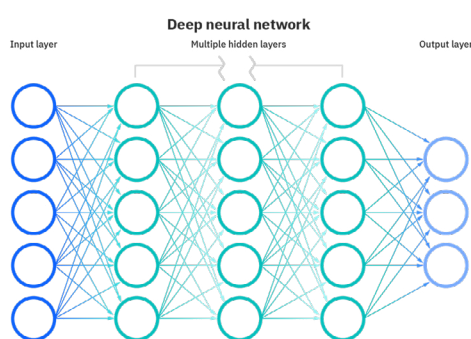
**Figure 1: Timeline of AI to Deep Learning**



Source: Nvidia

Machine Learning (a sub-field of AI that enables computers to learn without being explicitly programmed) and particularly deep learning algorithms have gained popularity in recent years given their flexibility and an availability of more processing power tied to the development of powerful graphics processing units (GPUs) and data center/cloud computing. Chat is a large language model that is trained on huge data sets (as of a certain date, which can be a critical limitation) using a “deep neural network.” The important thing to note is that Chat uses a neural network type (transformer architecture) that allows for inputs to be processed in parallel, significantly improving the network’s efficiency. Additionally, transformers have a “self-attention” mechanism that helps the model better understand the relationship between words.

**Figure 2: Deep Neural Network**



Source: IBM

We invest in several companies across different strategies that should be direct beneficiaries of the AI evolution. Machine learning requires significant processing power and high-end hardware. GPUs are particularly essential in deep learning applications. Relative to central processing units (CPUs), GPUs have larger memory bandwidth and are good at doing many simple calculations in parallel. As the world’s leading GPU producer, Nvidia should benefit from rising GPU demand in AI applications. According to UBS Analyst, Timothy Arcuri, Chat used as many as 10,000 Nvidia GPUs to train its model.

While likely to a lesser degree, AMD (Advanced Micro Devices) should benefit from higher GPU demand as it’s the only other company producing discrete GPUs, and it also offers other accelerated computing solutions. AVGO (Broadcom) is another beneficiary. This company is a market leader in application-specific integrated circuits and switching products used in computing/data center applications. Outside of the computing/processing side, META (Facebook) has its own language models and has been successfully integrating AI technology into applications such as Reels. Microsoft and Google maintain technological leadership in AI and should benefit from the growing demand for AI applications.

Just like any other new technology tool, AI faces challenges as it becomes more mainstream. The cost of search using generative AI such as Chat is much higher — with analysts estimating it could be up to 10 times higher versus web-based search. This will present cost headwinds for companies like Google unless search results are considerably better, and the customers are willing to pay more for it. Over relying on Chat could present serious challenges as it generates many incorrect or biased answers that on the surface sound very convincing (“AI hallucinations”). Machine learning algorithms generally work poorly when there is relatively little data available or when the program is asked to perform on new data types that it has not been trained on. Finally, AI systems are vulnerable to adversarial attacks — attempts to fool AI.

While this Insights piece concentrates on the technology behind Chat, many industries already use sophisticated AI tools. For example, agriculture equipment manufacturers use AI for precision farming, health care companies use AI for image analysis and banks use AI for fraud detection. In fact, we believe that integrating AI could ultimately become “table stakes” for companies operating in almost every industry and sector of the economy.

**Our research team is dedicated to uncovering opportunities to capitalize on durable sector and industry-specific trends. We welcome your comments and questions any time!**

**Norm Conley, CEO & Chief Investment Officer**

**Mike Kimbarovsky, Managing Director & Portfolio Manager**

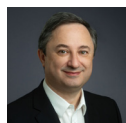
**George Margvelashvili, CFA®, Equity Research Analyst**

**JAG Investment Team**

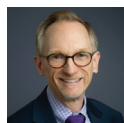
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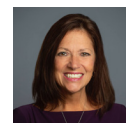
**Norm Conley**  
CEO & Chief Investment Officer



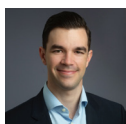
**Mike Kimbarovsky**  
Managing Director &  
Portfolio Manager



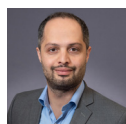
**Mike Buck, CFA®**  
AVP, Quantitative Analyst



**Roberta Maue**  
SVP, Director of Equity Trading &  
Portfolio Operations



**Nico Falkinhoff**  
Associate Portfolio Manager &  
Equity Research Analyst



**George Margvelashvili, CFA®**  
Equity Research Analyst



**Tucker O'Neil**  
Equity Research Analyst



**John Krueger**  
Junior Equity Research Analyst

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**Ownership:** Fifty-one percent ownership by a Veteran or Veterans. The applicant must share in all risk and profits commensurate with their ownership interest.

**Control and Management:** Proof of active management of the business. Veteran must possess the power to direct or cause to direct the management and policies of the business.

**Contribution of Expertise and Capital:** Contribution of capital and/or expertise by Veteran owner(s) to acquire their ownership interest shall be real and substantial and be in proportion of the interest acquired.

**Independence:** The Veteran owner(s) shall have the ability to perform in their area of specialty/expertise without substantial reliance on non-Veteran-owned businesses.

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9841 Clayton Rd  
St. Louis, MO 63124

The Wrigley Building  
400 North Michigan Ave

Suite 1680  
Chicago, IL 60611

