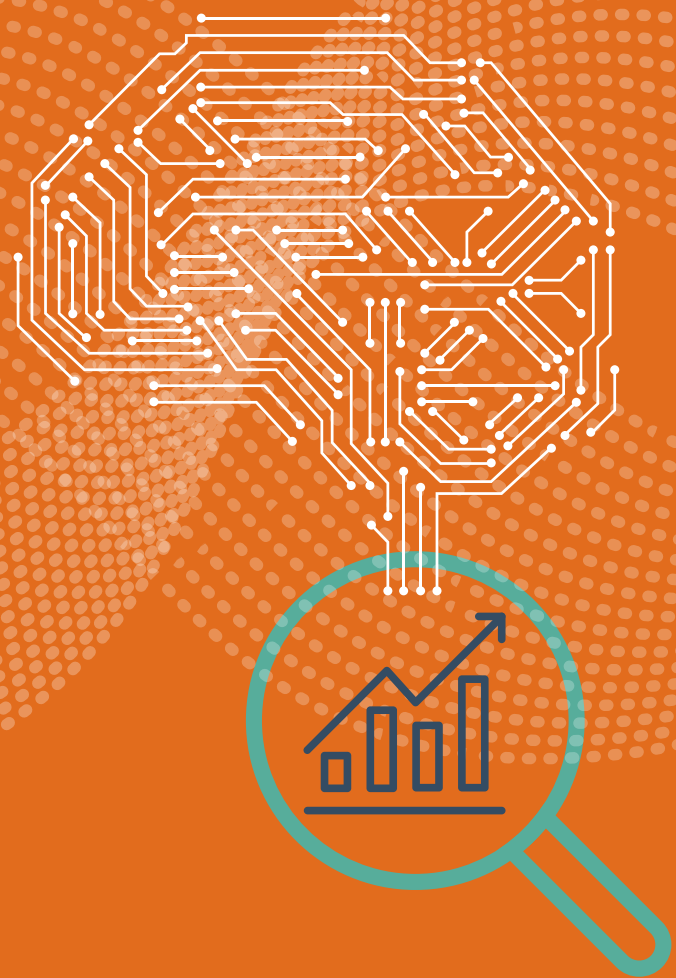
INTERSECT
Capital Management

Artificial Intelligence: A powerful tool in the investment process



AI + INVESTING PART 1: An educational series from Intersect Capital Management

EXECUTIVE SUMMARY

Artificial Intelligence has evolved rapidly, revolutionizing the investment landscape. From its introduction in science fiction in the 1940s and establishment as an academic field in the 1950s to its critical role in the 2020s pandemic, AI is a powerful tool fully utilized with the introduction of big data and cloud computing.

Catalyzed by the internet and the introduction of smart phones and tablets, massive amounts of data started being created and captured. Artificial Intelligence offers the tools to manage and find relevance in this wide ranging data. AI is able to do things such as recognize patterns, see hidden relationships, uncover market efficiencies, enhance risk management, and much more.

But AI needs to be partnered with the unique skills of humans such as subjective judgment and contextual understanding. In fact, in deep learning AI, neural networks which mimic how neurons in the brain signal one another—humans choose the data sets and assign weights and biases to the data. This gives the neural network a starting part to optimize its predictions and desired output—and keep learning.

Neural networks have had a profound effect on investment modeling through backtests. Traditional backtests are relatively more static and less dynamic than AI-engined versions. Neural networks allow for a "living backtest"—relevant data can be integrated into the model and analyzed daily so investment firms can make informed decisions based on continually refreshed data and information.

Artificial Intelligence offers a compelling new tool for investing. It leverages advanced algorithms and data-driven insights to enhance decision making and investment opportunities. But it needs to be integrated into fundamental, quantitative and qualitative analysis—and deployed by an experienced team with the judgment and perspective to leverage its power.


Complex
REVOLUTIONARY
Automated
Efficient
What is AI?
RISK MANAGEMENT
Powerful
Data-driven
Competitive Advantage
Predictive
Innovative
Evolving
Scalable
Real-time
TRANSFORMATIONAL

Artificial Intelligence (AI) as a powerful investment tool has undergone a journey of transformation and refinement over several decades. Since its inception in the 1970s, AI has experienced profound shifts with an emergence of diverse practices and terminology.

The multitude of AI terms like “scalability,” “automation,” and “predictive” can often bewilder investors. And when managers bring different philosophical approaches to building a portfolio using AI, further complexity is added.

In such a dynamic and rapidly evolving field, it is crucial to provide clarity and simplicity when integrating AI into the investment process. Our mission is to demystify the intricacies of investment strategies utilizing AI and equip investors with a comprehensive understanding of the opportunities and risks associated with using this tool—enabling them to harness the transformative potential of AI to shape their portfolios.

Artificial Intelligence Innovation Timeline

1940s
AI in Science Fiction

The exploration of AI concepts and ethical considerations first appeared through science fiction literature, imagining the potential of AI and its impact on society, laying the groundwork for future research and development.

1942
The Three Laws of Robotics are introduced by Isaac Asimov, providing ethical guidelines for AI behavior.

1949
Norbert Wiener's "Cybernetics" influences future AI research by laying the groundwork for the field of cybernetics.

1950s
The Birth of AI as an Academic Discipline

The establishment of AI as an academic field opened up theoretical discussions on machine intelligence and the development of early AI programs.

1950
Alan Turing proposes the "Turing Test" as a measure of machine intelligence.

1956
The Dartmouth Conference marks the birth of artificial intelligence as an academic discipline.

1960s
Early AI Experimentation and Robotics

Early AI applications explored human-computer interaction, language processing, and physical embodiment through robotics.

1965
Joseph Weizenbaum creates ELIZA, an early natural language processing program.

1966
The Stanford Research Institute develops Shakey, one of the first autonomous robots.

1970s
The First AI Winter

Overhyped expectations and limited technological capabilities brought on the first AI winter—leading to addressing the challenges of early AI systems, refining algorithms, and learning from the limitations of the first wave of AI research.

1973
The first AI winter begins, characterized by decreased funding and interest in AI.

1979
Douglas Hofstadter's "Gödel, Escher, Bach" explores the concept of intelligence in AI systems.

1980s
AI Resurgence and Expert Systems

The development of expert systems in the next generation of AI created parallel computing, knowledge-based systems, and rule-based programming for specific domains.

1981
The Fifth Generation Computer Systems project in Japan aims to develop advanced AI and parallel computing technologies.

1986
The back propagation algorithm revolutionizes neural network training, setting the stage for deep learning.

1990s

From Game Playing to Practical Applications

AI applications expanded in practical areas such as robotics, natural language processing, and machine learning.

1997
IBM's Deep Blue defeats world chess champion Garry Kasparov, showcasing AI's prowess in strategic games.

1997
Rodney Brooks founds iRobot and introduces the successful Roomba consumer robot.

2000s

Big Data, Machine Learning, and Web-driven AI

Machine learning and web-driven AI harnessed large-scale data. Algorithms developed to improve search engines, recommendation systems, and data-driven decision making.

2000
Big data explodes with the development of cloud storage, widespread access to the internet and mass adoption of smart phones and social media

2006
Amazon Mechanical Turk leverages human intelligence for AI tasks—some parts of a computer program are carried out much faster by people.

2009
Google introduces a self-learning algorithm to improve its search engine.

2010s

Breakthroughs in Deep Learning and AI Applications

Significant progress made in deep learning, neural networks, and natural language processing. Predictive AI applications explored in healthcare, finance, and more.

2011
IBM's Watson defeats human champions in Jeopardy!, demonstrating AI's ability in natural language processing.

2014
DeepMind's AlphaGo defeats world Go champion Lee Sedol, a significant breakthrough in game AI.

2017
Transformer model created by Google researchers

2018-19
OpenAI introduces GPT and GPT-2, a language model capable of generating coherent text.

2020s

AI in the Age of Pandemic

Advanced LLMs, and Generative AI

Generative AI enabled by more complex LLMs utilizing the transformer model

2020
AI applications aid in combating the COVID-19 pandemic, supporting diagnosis, drug discovery, and contact tracing.

2022-23
OpenAI launches ChatGPT, a conversational AI model. ChatGPT ignites a surge in funding. Advances in LLMs such as Dall-E, GPT 3.5, GPT 4, Llama 2, MidJourney, PaLM 2, and Stable Diffusion

2023
Generative AI advancing rapidly—transforming productivity and the labor market

The Explosion of Big Data

While the internet was the catalyst behind big data, the introduction of smartphones and tablets caused it to explode. Social media, music, documents, websites, books, movies, text messages, photographs, videos, Internet of Things and more—exponentially created data and access to that data.

Smartphone subscribers

21M (2008)[1]

6.7B (2023)[2]

Google searches

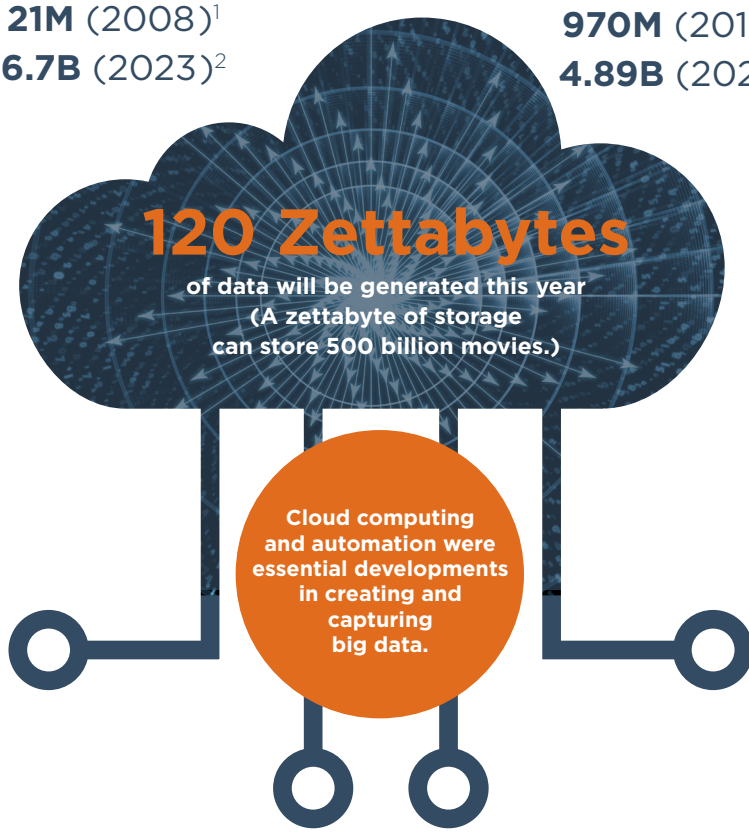
141B (2005)[3]

1.2T (2023)[4]

Social media users

970M (2010)[5]

4.89B (2023)[6]



[1] https://www.internetlivestats.com/google-search-statistics/

[2] https://firstsiteguide.com/google-search-stats/#:~:text=3.,1.2%20trillion%20searches%20every%20year.

[3] https://www.nielsen.com/wp-content/uploads/sites/2/2019/04/smartphone-2.png

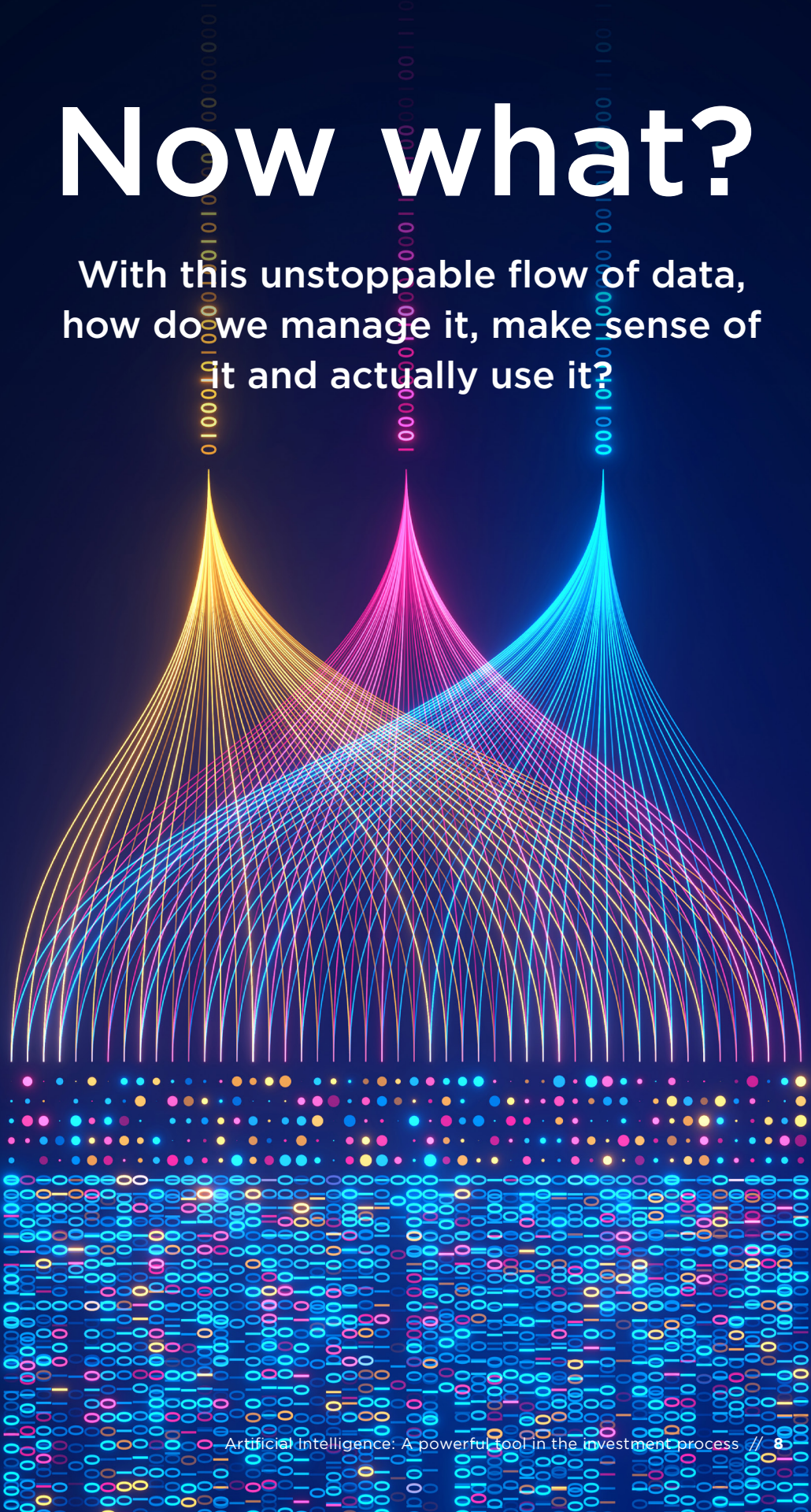
[4] www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

[5] https://www.researchgate.net/figure/Figure-41-Number-of-social-media-users-from-2010-to-2020-in-billions_fig10_317525261

[6] https://www.oberlo.com/statistics/how-many-people-use-social-media#:~:text=The%20latest%20figures%20show%20that,jump%20in%20just%20five%20years.

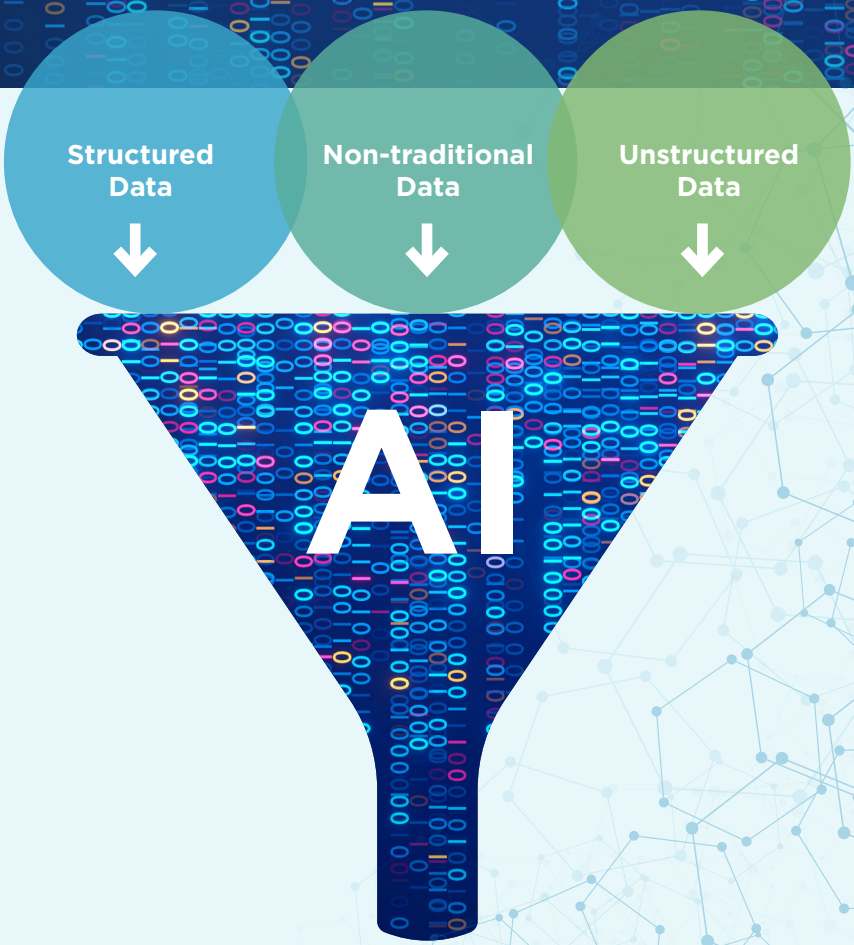
Now what?

With this unstoppable flow of data, how do we manage it, make sense of it and actually use it?



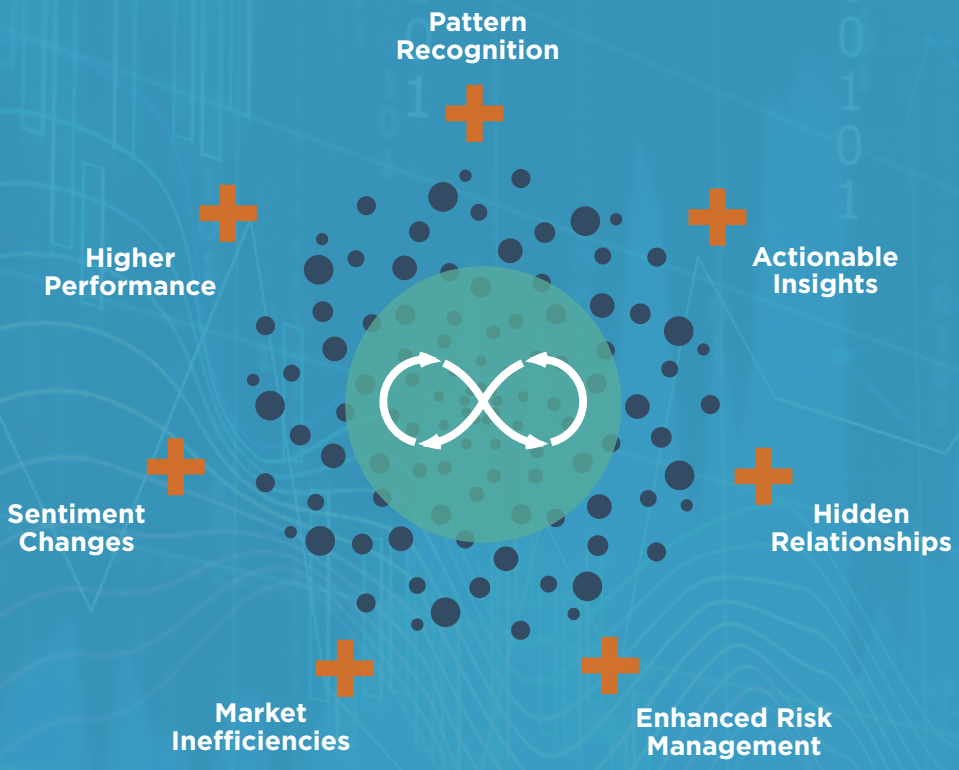
WITH THE DATA PROCESSING POWER OF AI

Mastering data is insurmountable without Artificial Intelligence and AI is useless without data.



And mastering data through AI means illuminating relevant, applicable knowledge

What does AI actually do with all that processing power?



AI and Labeled Data: Weights + Biases

Deep learning algorithms in AI require training data to improve their accuracy. This is achieved by associating input data with weights and biases to optimize predictions as it iterates on data sets.

But wait, is AI going to replace analysts?

NO.

People and computers have different strengths.

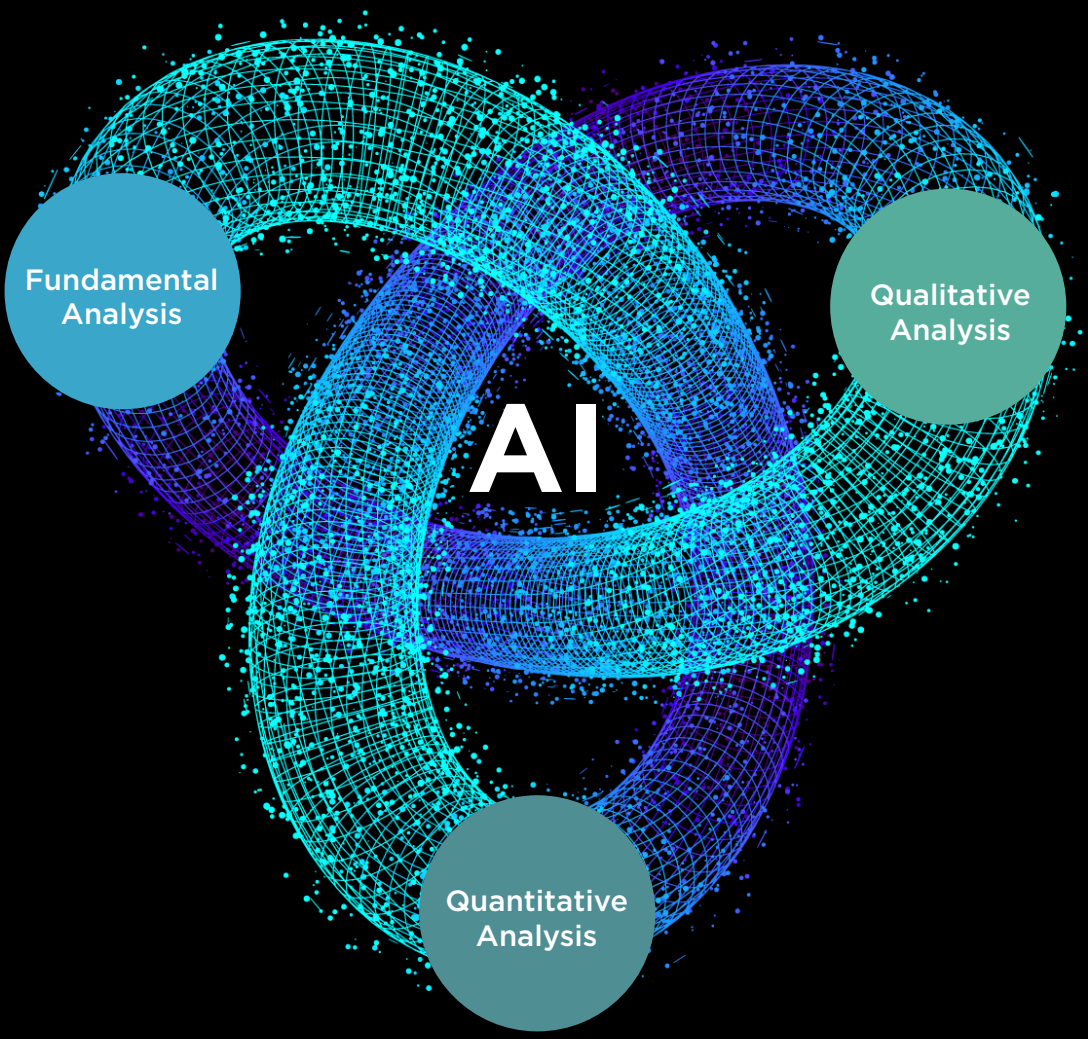
AI can perform computations and analyze data at incredible speeds, often processing even billions of data points per second—and making decisions on large-scale datasets without emotion or bias.

The unique cognitive abilities of the human brain make it valuable in areas where subjective judgment, intuition, and contextual understanding play crucial roles.

Edge Cases: AI needs people

When an AI model makes inexact or incorrect assumptions based on the information it's ingested—especially when that information is contradictory as it so often is on the web—AI can get stuck. This is called an edge case. People bring the contextual understanding to not only guide AI with new parameters but study these cases to strengthen the overall accuracy of the model moving forward.

The benefits of integrating AI in the investment process?



Actionable Insights

Hidden Relationships

Emerging Trends

Market Inefficiencies

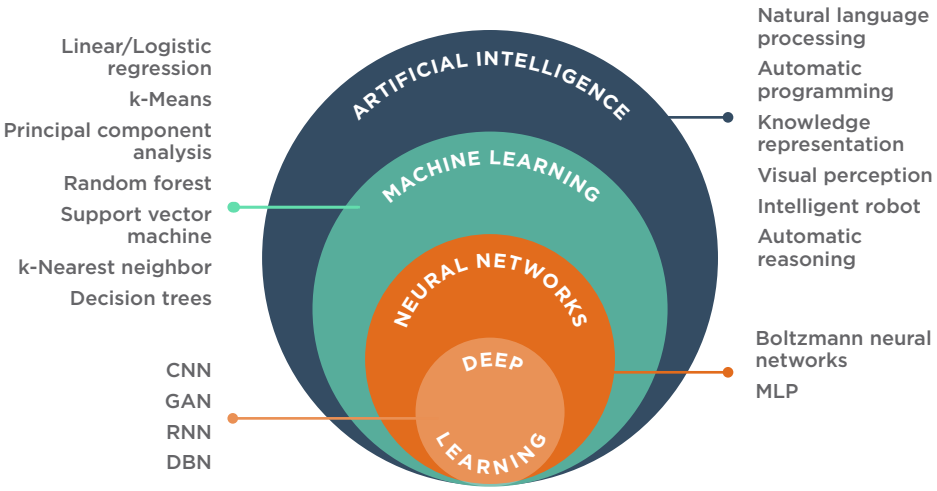
Enhanced Risk Management Capabilities

Higher Performance

> **The greatest potential for AI we have found is to create value in use cases in which more established analytical techniques such as regression and classification techniques can already be used, but where neural network techniques could provide higher performance or generate additional insights and applications. This is true for 69 percent of the AI use cases identified in our study."**
>
> McKinsey & Company

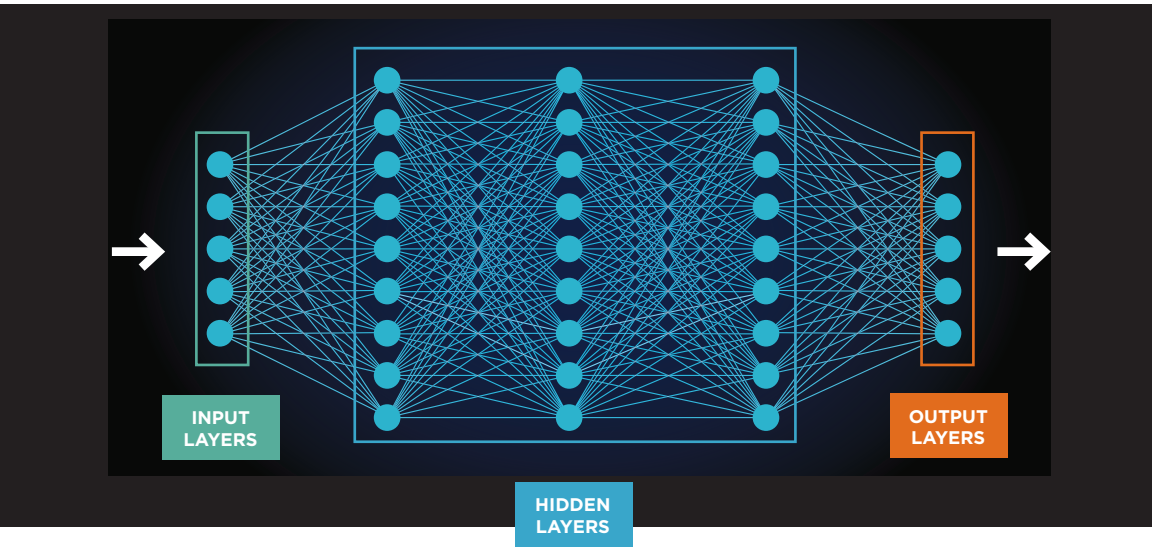
Neural networks and their ability to learn

Artificial Intelligence systems are nested from largest to smallest, each encompassing the next. Investments strategies rely on the whole AI system but especially on neural networks and deep learning because they can be trained with selected input data to forecast targeted investment outcomes.



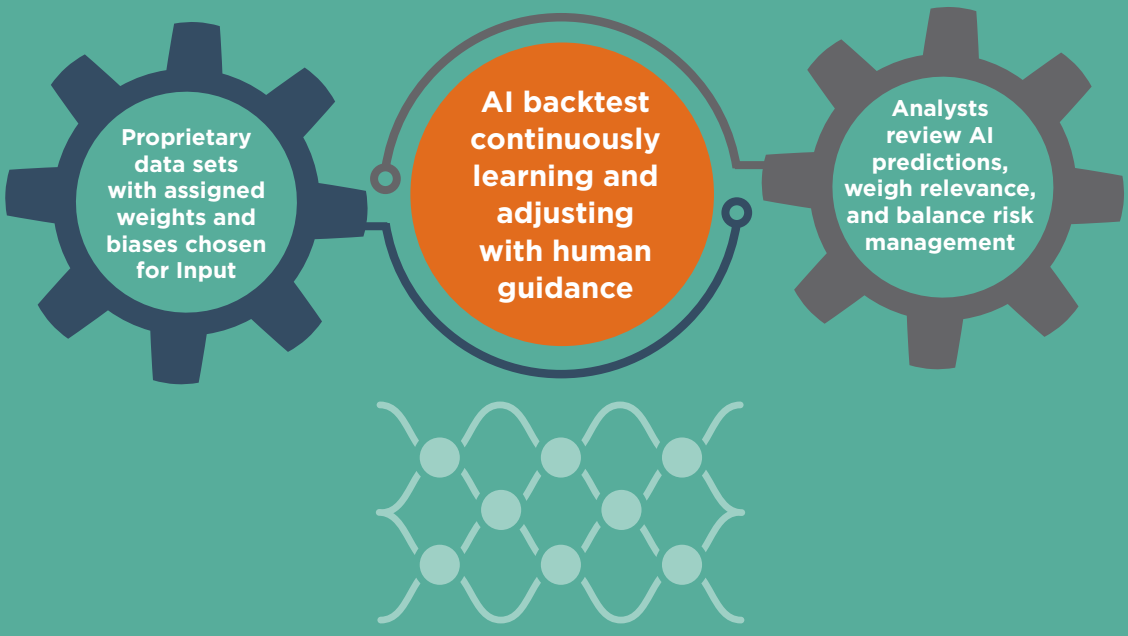
Neural networks mimic how neurons in the brain signal one another. Information flows through a neural network with forward propagation—from the input layer, to the hidden layers to the output layer, resulting in the prediction or output of the model.

Any labels and targeted outcomes which correlate to data can be used to train a neural network. People choose the input data and associate it with **weights** and **biases** which **helps the neural network learn** to optimize its predictions and minimize the discrepancy between its output and the desired output. And a neural network is continuously learning!



Neural Networks and Backtests: a profound shift in investment modeling

Traditional backtests may struggle to capture evolving patterns and relationships in financial data. They are more static and less dynamic than AI-engined versions. Neural networks allow for a "living backtest" — relevant data can be integrated into the model and analyzed daily. Algorithms continuously learn from new data, adjusting and refining the underlying model as market conditions shift. This adaptive nature of machine learning helps investment firms stay up-to-date and make informed decisions based on current data and information.



A generative AI image created from text input.

Looking Ahead: AI Continues to Evolve

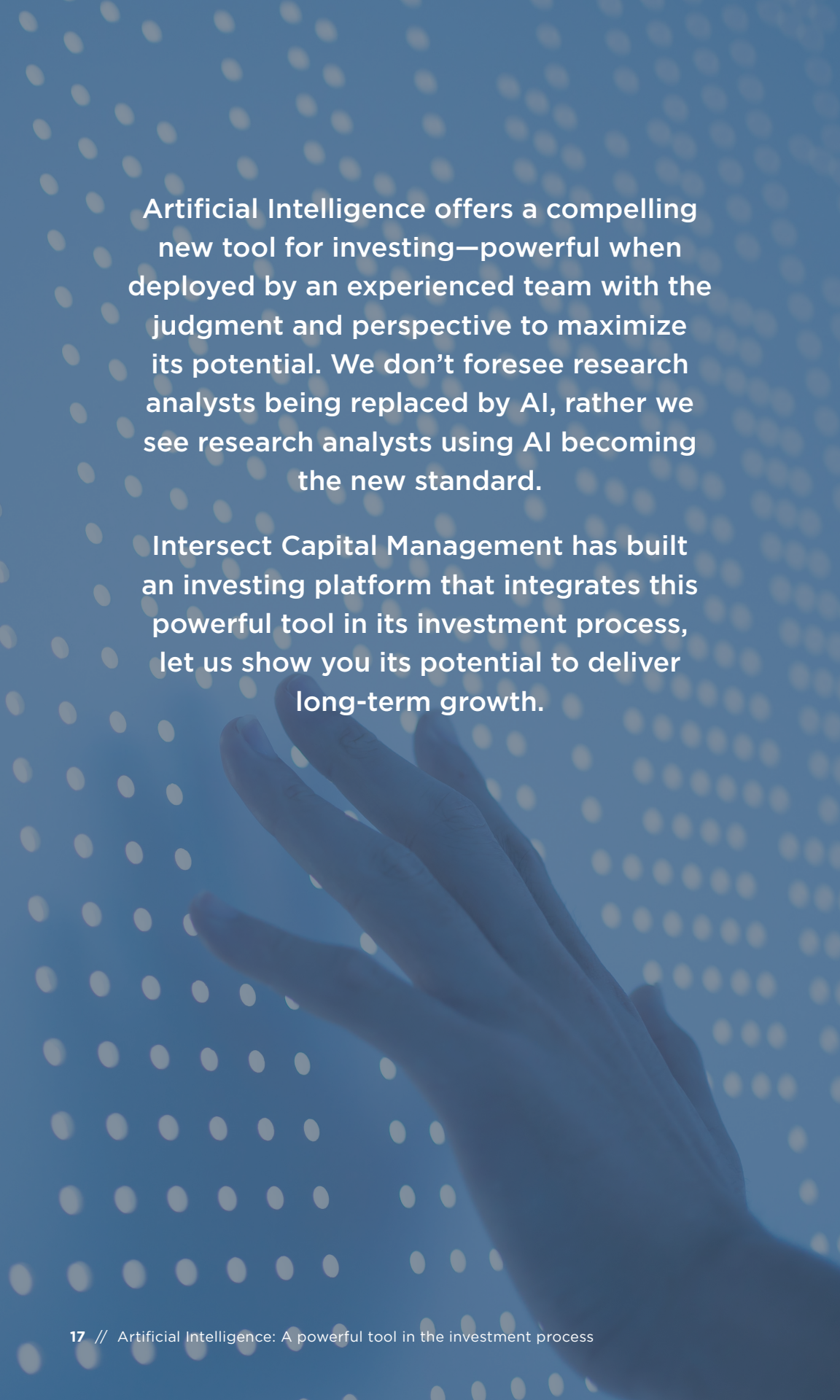
The transformer model, created by Google researchers in 2017, radically accelerated and augmented how computers understand language. It allowed software to capture context and patterns better, and translate—or generate—text more accurately. This in turn laid the groundwork for more complex and powerful Large Language Models (LLMs) which are faster to train.

The rapid advances enabled by the transformer model have improved efficiency and scalability, and sparked an evolution of AI from predictive AI to generative AI. While predictive AI is used to observe data and make predictions about what it learned, generative AI creates new data based on observing existing data—drawing on enormous amounts of diverse unstructured mixed-modality data sets such as text, video, code, etc.

Generative AI built on the underlying LLM is able to create plausible and sophisticated text, images and computer code at a level that mimics human ability. It is impacting broad industries in innovative ways. Here are some real-life examples of how it is being used:

- Simulated surgery using digital twins of organs
- Original plays and movie scripts
- Music scores and composition
- Training videos with virtual trainers and voice synthesis
- Drug development based on AI-identified disease pathways

Generative AI applications are expanding in part due to a surge in AI research funding sparked by the creation of ChatGPT. Further AI advancements are expected to radically transform productivity and the labor market in the coming years.



Artificial Intelligence offers a compelling new tool for investing—powerful when deployed by an experienced team with the judgment and perspective to maximize its potential. We don't foresee research analysts being replaced by AI, rather we see research analysts using AI becoming the new standard.

Intersect Capital Management has built an investing platform that integrates this powerful tool in its investment process, let us show you its potential to deliver long-term growth.

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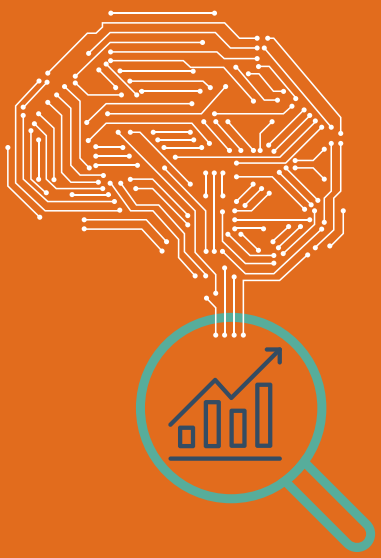

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