



Deep Learning Delivers Advanced Analytics for Financial Services Firms

Intel® Nervana™ platform for deep learning helps companies large and small prevent fraud, improve customer service, enhance predictive capabilities, and manage knowledge

This solution brief describes how to solve business challenges through investment in innovative technologies.

If you are responsible for...

- **Business strategy:**
You will better understand how an advanced analytics solution will enable you to successfully meet your business outcomes.
- **Technology decisions:**
You will learn how an advanced analytics solution will work to deliver IT and business value.

Executive Summary

IDC recently named deep learning as one of the most important drivers of growth in the high-performance computing space.¹ The reason: Deep learning extracts insights from massive, unconnected data sets to unravel exactly the sort of complicated challenges facing financial institutions—preventing fraud, improving customer service, enhancing predictive capabilities, and accelerating knowledge management.

Until recently, this branch of artificial intelligence (AI) had been too resource-intensive for all but the largest firms to deploy, as it required specialized infrastructure and the expertise of teams of data scientists. Smaller companies simply didn't have the budget or capacity to realize benefits from this category of machine learning (ML). Now, however, Intel is set to democratize deep learning through the recent purchase of Nervana* technology.

The Intel® Nervana™ platform for deep learning enables businesses to quickly and efficiently develop and deploy custom, highly accurate, enterprise-grade AI solutions. The Intel Nervana platform for deep learning is available in two deployment options—the hosted Nervana Cloud* or an on-premise solution.

The Intel Nervana platform for deep learning places the power of advanced analytics into the hands of every business, large or small.



Deep learning can help financial services firms gain insights from their big data, leading to fraud prevention, improved customer service, enhanced predictive ability, and superior knowledge management.

Business Challenge: Deep Learning Seen as Too Resource-intensive

Financial institutions such as banks and insurance companies are awash with data. Customer data, financial data, external data such as articles and social media conversations, call center data, images, and so on hold the tantalizing promise of business insights. Linear regression techniques, with which most firms are familiar, work well for small data sets. But the performance of linear regression analysis tends to deteriorate as data sets become very large. In contrast, deep learning—an artificial intelligence (AI) discipline that uses deep neural networks—is perfect for making sense out of big data. Deep learning algorithms quickly make connections between seemingly disparate sources of data, identifying new insights that can be used to monitor markets, make predictions, manage risk, and more.

But for many in the industry, extracting those insights from a massive data store that comprises both structured and unstructured data has been a prohibitively daunting task. Historically, barriers to the large-scale use of deep learning have included isolated data stores, complex tools, limited engineering resources, a small talent pool of data scientists, and the need for specialized computing infrastructure that can handle computationally intensive workloads.

The Intel Nervana solution brings deep learning to financial service organizations of every size, unlocking the business insights needed to boost companies' fraud prevention efforts, customer service levels, predictive capabilities, and knowledge management.

Deep Learning Is Solving Financial Services Challenges

The Intel Nervana platform for deep learning is easy to use, flexible, and powerful enough to help solve many of the pressing challenges facing banks, trading companies, insurance carriers, and other firms in the financial services industry. Here are a few examples of how these companies can put deep learning to work:

- **Detect anomalous data.** Deep learning models use a high degree of representational power to capture the complex statistical structure of financial data, often far better than other ML methods. These powerful tools can be used to detect anomalies in a wide range of settings, including flagging fraudulent credit card transactions, identifying unusual activity in an exchange limit-order book, or predicting sudden regime changes in securities markets.
- **Integrate more data sources.** Deep learning models have the ability to integrate data from disparate sources, such as asset price-time series, Twitter* volume and sentiment, U.S. Securities and Exchange Commission filings, analyst reports, and satellite imagery, as well as text, audio, and video news feeds. Deep learning reveals relationships and causal effects across these disparate sources that humans or traditional ML techniques may miss, making it easier to build neural network models for data analysis. The Intel Nervana solution can greatly augment business decisions by using new, non-traditional sources of data. For example, banks can improve customer service by monitoring social media discussions, and trading companies can use headlines and news articles to better predict fluctuations in stock and bond prices.
- **Integrate and optimize to reduce cost and complexity.** Financial institutions have sprawling IT infrastructures. Processes are often handled by a large collection of disconnected systems. Deep learning provides a powerful generic paradigm for understanding data across these systems. The Intel Nervana platform for deep learning acts as a central resource for deploying deep reinforcement learning models that can automate complex processes ranging from transaction and settlement to optimal trade execution and automated market making.

For example, one large financial institution with more than 30,000 employees is using the Intel Nervana platform for deep learning to save portfolio managers time in their daily routines by distilling information from up to 30,000 documents per day—e-mails, internal files, online information, and financial news. With access to richer analysis, these managers can make more accurate investment decisions in less time.

DEEP LEARNING ALGORITHMS MAKE CONNECTIONS



Deep learning algorithms identify new insights that can be used to monitor markets, make predictions, manage risk, and more.

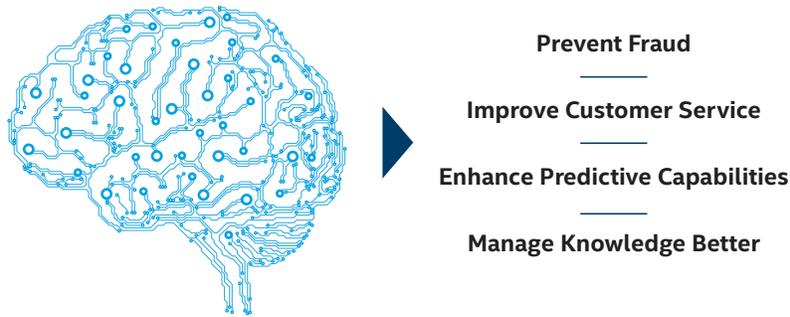


Figure 1. Industry-leading Intel® Nervana™ platform for deep learning, along with Intel®-based hardware, makes the benefits of deep learning available to all businesses, regardless of size or budget.

Solution Value: Taking the Complexity Out of Deep Learning

Deep learning solves many financial industry data problems. The Intel Nervana platform provides a complete solution for deploying deep learning as a core technology, acting as a central hub where state-of-the-art algorithms can be applied across numerous business areas.

By deploying Neon* deep learning framework and Nervana Cloud, customers can quickly design, develop, and deploy state-of-the-art deep learning models—thereby removing the cost and complexities associated with developing their own deep learning capabilities. Specific benefits include:

- **Fast results.** Neon is among the fastest deep learning frameworks available today, enabling data scientists to train a model in hours, not days.
- **Ease of use.** The Intel Nervana platform for deep learning enables businesses to focus on the science instead of the setup. For example, Nervana Cloud has an easy-to-use interface that dramatically simplifies the ML process. All functionality is also available through a command-line interface.
- **Affordability.** Because it is a hosted solution, Nervana Cloud enables businesses to access deep learning models without investing in expensive onsite infrastructure.
- **Flexibility.** Nervana Cloud supports loading and training on video, images, audio, time-series data, and any other data type imaginable.
- **Security.** The solution is tightly integrated with cloud storage providers to help transfer and store data more securely. At the software level, the solution uses a secure OS and containerization to enhance security. At the hardware level, the solution uses Trusted Platform Module (TPM) and encryption to protect data at rest, in motion, and in use
- **Scalability.** As a hosted solution, Nervana Cloud scales up and out as required by customer workloads. Intel® hardware accelerators can be added for additional processing power, aided by Intel's analytics libraries.

Intel® Nervana™ AI Academy

Intel is committed to democratizing artificial intelligence (AI) innovation, leading the charge for open data exchanges and initiatives. The Intel® Nervana™ AI Academy was created to increase accessibility to data, tools, training, and intelligent machines for a broad community of developers, academics, and start-ups. The goal is to meet these diverse needs and help ensure the practicality of AI. By taking advantage of the Intel Nervana AI Academy, financial services companies can put AI to use quickly, efficiently, and cost-effectively on Intel® architecture. Visit intel.com/AI to learn more.

Solution Architecture: Full-stack Platform with Two Deployment Options: Hosted and On-premise

The Intel Nervana platform for deep learning includes a complete technology stack, enabling the development and deployment of a custom deep learning solution in record time (Figure 2). It is available in both hosted and on-premises options.

Software tools enable data scientists to quickly and easily import and process training data of all types, including time series, tabular data, voice, images, video, text, and more. Data scientists begin development with a state-of-the-art deep learning model from the platform's model library, which is updated regularly according to the latest research and real-world customer experiences. The model can be customized using the platform's "interactive mode" interface. The platform offers high-speed training using the Neon framework and hardware optimized for deep learning. When the model is acceptably accurate, it can be deployed for inference with a single click.

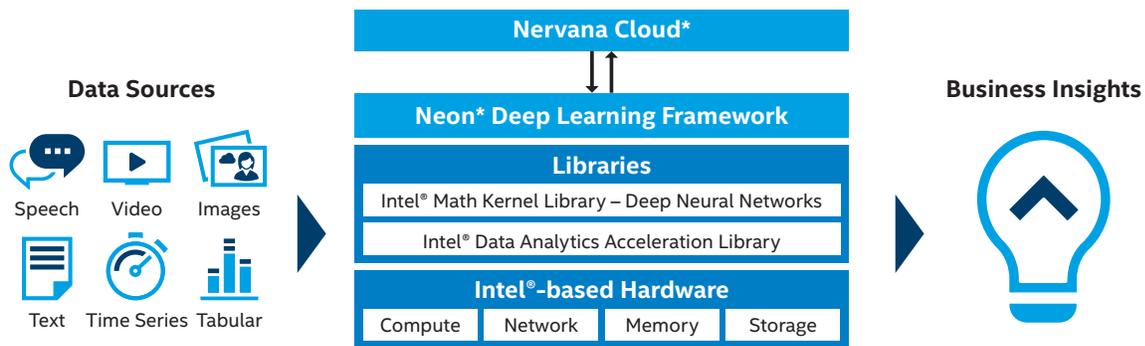


Figure 2. The Intel® Nervana™ platform for deep learning spans silicon, software, and cloud, resulting in a full-stack solution that affordably solves artificial intelligence problems at scale.

Hosted Solution Reduces Cost and Complexity

Nervana Cloud provides deep learning on demand, enabling financial services firms to develop and deploy high-accuracy deep learning solutions at a fraction of the cost of building their own infrastructure and data science team.

An On-premise Option

For companies that must (or prefer) to keep their data onsite, the Intel Nervana solution is available in an on-premise option as an alternative to Nervana Cloud. The on-premise option provides the same deep learning capabilities as Nervana Cloud, using a physical server that can be integrated directly into a customer's IT stack.

Conclusion

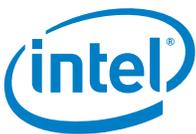
Deep learning and AI are at the heart of today's technological innovations. Deep learning can help financial services firms gain insights from their big data, leading to fraud prevention, improved customer service, enhanced predictive ability, and superior knowledge management. The Intel Nervana platform for deep learning, available in both hosted and on-premise options, enables businesses of all sizes to quickly and efficiently develop and scale applications for AI—and gain insights more effectively—without investing in expensive new infrastructure.

Find the solution that is right for your organization. Contact your Intel representative or visit intel.com/ai.

Learn More

You may also find the following resources useful:

- [Nervana Systems Website](#)
- [Intel: Artificial Intelligence](#)
- [Data Science Central Blog: AI vs Deep Learning vs Machine Learning](#)



¹ aibusiness.org/nvidias-jack-watts-our-gpus-break-down-barriers-to-deep-learning-in-business/#sthash.sRVfEsdT.dpuf.

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