White Paper

Data Science - AI

Improve business outcomes with NousPratIT Data Science and AI Solutions

The insights to transform your business into the data driven reality, meliorate your products and services and gain a competitive advantage.

NousPratIT

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The advantages to be gained from Big Data and Data Science

Every business organization, small or big, needs valuable data and insights. Big data plays a very important role when it comes to understanding your target audience and customer's preferences. It even helps you anticipate their needs. The right data needs to be effectively presented and properly analyzed. It is the key for a business organization to achieve various goals.

Big Data is a combination of all the processes and tools related to utilizing and managing large data sets, which are characterized by their big volume, variety, and velocity of information. The Big Data concept was born out of the need to understand trends, preferences, and patterns in the huge database generated when people interact with different systems and each other. With Big Data, business organizations can use analytics, and figure out the most valuable customers. It can also help businesses create new experiences, services, and products. However, this overabundance of information can also be an important asset to those organizations that choose to capitalize on it.

Powerful big data and analytics solutions are now being used to analyze this explosion of information and fundamentally change the way that organizations manage their daily operations. The advantages to be gained from big data and analytics are substantial. In many industries, new entrants and established competitors use data-driven strategies to compete, capture and innovate. In fact, you can find examples of Big Data usage in almost every sector, from IT to healthcare. Meanwhile, many companies that neglect to implement big data and analytics are struggling to maintain market share.

Outperform in your industry

Insights gained from big data and analytics enable companies to know their most profitable customers and continuously serve them better. Companies with big data and science implementations are outperforming their competitors by finding new revenue opportunities, driving product innovation, and identifying patterns to reduce fraud. Big Data is one of the best ways to collect and use feedback. It helps you understand how customers perceive your services and products. The speed of analytics can also differentiate companies from their competitors Because businesses are no longer limited to small sample sizes and narrow data sets, they can analyze all relevant data to discover previously hidden correlations.

Big Data allows you to test numerous variations of high-end computer-aided designs within seconds. For instance, you can gather information about lead times, material affect costs, performance and more. It allows you to raise the productivity and efficiency of various production processes. Equipped with these new insights, companies can reduce latency in decision-making and business processes. Companies are also creating new products and services from their data resources. Above all else, big data and analytics are continually generating a wealth of insight.

With that insight, companies are building the confidence to act with speed and conviction, enabling them to be more right, more often.

Acquire, grow, and retain customers

Big data and analytics in general, can help companies communicate with their customers on a more personalized, individual level. The customer is the most important asset any business depends on. There is no single business that can claim success without first having to establish a solid customer base. However, even with a customer base, a business cannot afford to disregard the high competition it faces. If a business is slow to learn what customers are looking for, then it is very easy to begin offering poor quality products. In the end, loss of clientele will result, and this creates an adverse overall effect on business success.

Big data and analytics can help an enterprise identify and deliver exactly what an individual customer needs. By uncovering significant trends that are hidden in the enormous cache of incoming data and merging that information with the vast amount of existing customer data, big data and analytics can help promptly address customer needs in real time. Big Data allows a business organization to profile such customers in a far-reaching manner. This allows a business to engage in a real-time, one-on-one conversation with consumers. All that is necessary is having a big data analytics strategy to maximize the data at your disposal. With a proper customer data analytics mechanism in place, a business will have the capability to derive critical behavioral insights that it needs to act on so as to retain the customer base.

This high level of personalization and consistency is what enables organizations to acquire new customers, grow their customer base, and retain their current customers.

Predictive Maintenance and Quality for products and services

Your data is valuable

In this highly competitive economy, companies are urged to take full advantage of all available information resources by analyzing data and applying insights to critical business and manufacturing processes.

Appropriate modifications can be made to the production line or to eliminate substandard components from the manufacturing process just by detecting problems earlier. As a result, companies can minimize disruption, waste and reputational damage.

Smarter, just-in-time maintenance strategies based on predictive analysis can save money and boost operational efficiencies.

Machine learning: What it is and Why it matters

Machine learning is a method of data analysis that automates analytical model building. It is a subfield of artificial intelligence (AI) and is mostly associated with big data analysis. Machine learning provides algorithms and software tools for extracting insights from large sets of data. There is also a lot of machine learning experimentation with randomised or semi-randomised data, where the machine learns by trial and error. Machine learning is enabling a machine to learn from data without explicitly programming it with rules, because it can learn from the data it's given. Generally, as machine learning we can refer to the practice of using computer algorithms to emulate or simulate a human brain in order to improve the way computers understand, process, interpret and make predictions. Computers or other systems learn and make predictions by applying specialized algorithms to data. These algorithms are designed to teach themselves how to make different decisions by weighing different factors, rather than pre-programming such decisions. Instead of programming all the rules, you feed the algorithm data and let the algorithm adjust itself to improve the accuracy of the algorithm.

Traditional science algorithms mainly process, whereas machine learning is about applying an algorithm to fit a model to the data. Examples of machine-learning algorithms that are used a lot and that you might be familiar with are decision trees, random forest, Bayesian networks, K-mean clustering, neural networks, regression, artificial neural networks, deep learning and reinforcement learning. Artificial neural networks and deep learning have recently become more common machine learning algorithms.

The benefit of a machine learning method is that it allows computers to learn how to perform tasks that are very difficult or even impossible for humans to carry out. Implementation examples would be predicting stock market prices or predicting whether a customer will churn from your company.

Evolution of machine learning

A variety of machine learning algorithms have been around for a long time. Machine learning was born from pattern recognition and the theory that computers can learn without being programmed to perform specific tasks.

Researchers interested in artificial intelligence wanted to see if computers could learn from data. However, the ability to automatically apply complex mathematical calculations to big data repeatedly and rapidly is a recent development thanks to new computing technologies. The iterative aspect of machine learning is important because, as mentioned before, models are exposed to new data and are able to independently adapt, as they learn from previous computations to produce reliable, repeatable decisions and results.

Here are a few widely publicized examples of machine learning applications you may be familiar with:

- The heavily hyped, self-driving Google car. The essence of machine learning.
- Online recommendation offers such as those from Amazon and Netflix. Machine learning applications for everyday life.
- Knowing what customers are saying about you on Twitter. Machine learning combined with linguistic rule creation.
- Fraud detection. One of the more obvious, important uses in our world today

Why machine learning is important today?

Resurging interest in machine learning is due to the same factors that have made data mining and Bayesian analysis more popular than ever. Things like growing volumes and varieties of available data, computational processing that is cheaper and more powerful, and affordable data storage.

In the nutshell, it's possible to quickly and automatically produce models that can analyze bigger, more complex data and deliver faster, more accurate results, even on a very large scale. By building precise models, an organization has a better chance of identifying profitable opportunities or avoiding unknown risks.

Machine learning on industries

Most industries working with large amounts of data have recognized the value of machine learning technology. By gleaning insights from this data, often in real time, organizations are able to work more efficiently or gain an advantage over competitors.

Financial services

Banks and other businesses in the financial industry use machine learning technology for two key purposes: to identify important insights in data and prevent fraud. The insights can identify investment opportunities, or help investors know when to trade. Data mining can also identify clients with high-risk profiles or use cybersurveillance to pinpoint warning signs of fraud.

Government

Government agencies such as public safety and utilities have a particular need for machine learning since they have multiple sources of data that can be mined for insights. Analyzing sensor data, for example, identifies ways to increase efficiency and save money. Machine learning can also help detect fraud and minimize identity theft.

Health care

Machine learning is a fast-growing trend in the health care industry, thanks to the advent of wearable devices and sensors that can use data to assess a patient's health in real time. The technology can also help medical experts analyze data to identify trends or red flags that may lead to improved diagnoses and treatment.

Retail

Websites recommending items you might like based on previous purchases are using machine learning to analyze your buying history. Retailers rely on machine learning to capture data, analyze it and use it to personalize a shopping experience, implement a marketing campaign, price optimization, merchandise supply planning, and for customer insights.

Oil and gas

Finding new energy sources. Analyzing minerals in the ground. Predicting refinery sensor failure. Streamlining oil distribution to make it more efficient and cost-effective. The number of machine learning use cases for this industry is vast – and still expanding.

Transportation

Analyzing data to identify patterns and trends is key to the transportation industry, which relies on making routes more efficient and predicting potential problems to increase profitability. The data analysis and modeling aspects of machine learning are important tools to delivery companies, public transportation and other transportation organizations.

Popular machine learning methods

Two of the most widely adopted machine learning methods are supervised learning and unsupervised learning, but there are also other methods of machine learning. Here's an overview of the most popular types.

Supervised learning algorithms are trained using labeled examples, such as an input where the desired output is known. For example, a piece of equipment could have data points labeled either “F” (failed) or “R” (runs). The learning algorithm receives a set of inputs along with the corresponding correct outputs, and the algorithm learns by comparing its actual output with correct outputs to find errors. It then modifies the model accordingly. Through methods like classification, regression, prediction and gradient boosting, supervised learning uses patterns to predict the values of the label on additional unlabeled data. Supervised learning is commonly used in applications where historical data predicts likely future events. For example, it can

anticipate when credit card transactions are likely to be fraudulent or which insurance customer is likely to file a claim.

Unsupervised learning is used against data that has no historical labels. The system is not told the "right answer." The algorithm must figure out what is being shown. The goal is to explore the data and find some structure within. Unsupervised learning works well on transactional data. For example, it can identify segments of customers with similar attributes who can then be treated similarly in marketing campaigns. Or it can find the main attributes that separate customer segments from each other. Popular techniques include self-organizing maps, nearest-neighbor mapping, k-means clustering and singular value decomposition. These algorithms are also used to segment text topics, recommend items and identify data outliers.

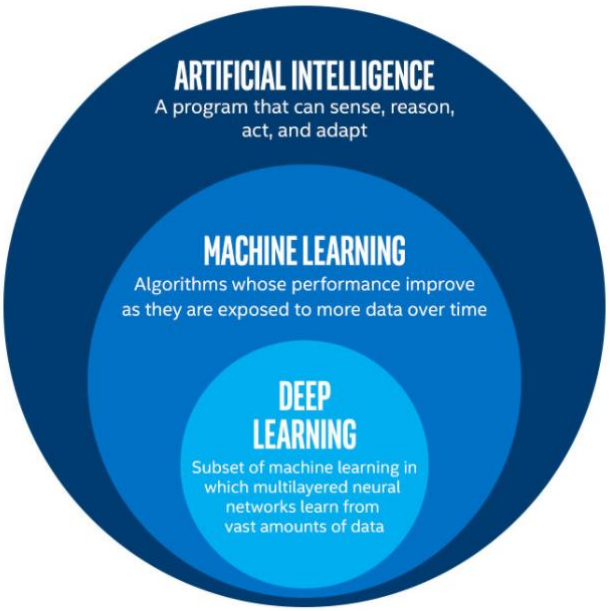
Semisupervised learning is used for the same applications as supervised learning. But it uses both labeled and unlabeled data for training – typically a small amount of labeled data with a large amount of unlabeled data (because unlabeled data is less expensive and takes less effort to acquire). This type of learning can be used with methods such as classification, regression and prediction. Semisupervised learning is useful when the cost associated with labeling is too high to allow for a fully labeled training process. Early examples of this include identifying a person's face on a web cam.

Reinforcement learning is often used for robotics, gaming and navigation. With reinforcement learning, the algorithm discovers through trial and error which actions yield the greatest rewards. This type of learning has three primary components: the agent (the learner or decision maker), the environment (everything the agent interacts with) and actions (what the agent can do). The objective is for the agent to choose actions that maximize the expected reward over a given amount of time. The agent will reach the goal much faster by following a good policy. So the goal in reinforcement learning is to learn the best policy.

Artificial Intelligence (AI): What it is and Why we use it

AI was first named in 1955 and was defined as the ability of machines to perform human-like tasks. The term has gained popularity ever since its first mention. However, there is still quite a bit of confusion about the difference between AI, machine learning and deep learning—but simply stated, AI encompasses the latter two.

"Artificial Intelligence (AI) is a science and a set of computational technologies that are inspired by, but typically operate quite differently from, the ways people use their nervous systems and bodies to sense, learn, reason and take action."[6]



Lately there has been a big rise in the day-to-day use of machines powered by AI. These machines are wired using cross-disciplinary approaches based on mathematics, computer science, statistics, psychology and more.[7]

Virtual assistants are becoming more common, most of the web shops predict your purchases, many companies make use of chatbots in their customer service and many companies use algorithms to detect fraud. These are just a few of the examples of how AI is used every day.

What has driven the development of AI?

With increasing computing power and more data, the potential value of algorithms became higher. People and companies saw possibilities to embed these smart systems into their companies to drive strategy and innovation. AI started to become an essential value. Companies saw that these systems could move them closer to their customers, drive efficiency, enhance employee experience and capability, automatize tasks, decrease costs and improve revenue.

Today we see AI as one of the big value drivers for companies, and to compete most companies must adopt AI strategies. Three topics have made AI available for many companies right now:

- The evolution of data: A factor contributing to the massive adoption of AI is the exponential growth of available data. With the introduction of the Internet, social media, proliferation of sensors and smart devices, and the

fact that data storage became cheaper, it became more accessible than ever before.

- The evolution of algorithms: Algorithms have been around since we could write. Recently, the development of more advanced algorithms has helped AI become more powerful and efficient.
- The evolution of computing: Another major factor in AI's current success is its computing power. Back when AI was just beginning to be developed, the computing power was minimal. Computers nowadays can take much more data and heavier algorithms than in the 1950s.

What are the areas in which AI provides the most value today?

While relevant AI use cases span various areas across virtually every industry, there are three main macro domains that continue to drive the adoption as well as the most economies across businesses. They are:

- Cognitive engagement: Involves how to deliver new ways for humans to engage with machines, moving from pure digital experiences (such as the ability to run transactions digitally) into human-like natural conversations.
- Cognitive insights and knowledge: Addresses how to augment humans who are overwhelmed with information and knowledge.
- Cognitive automation: Relates to how to move from process automation to mimicking human intelligence to facilitate complex and knowledge-intense business decisions.

AI in business

Here are some examples of uses and applications of AI technology in business.

Real time interactions with the customer - Chatbots

The most powerful application of artificial intelligence in business is making the customer experience better and comfortable. Through artificial intelligence (AI), we have got chatbot, which is an AI-based virtual conversation agent, virtual assistant. Chatbots are designed in such a way that they can answer customer queries 24 hours. When we visit a website, then we find a chatbot has opened automatically. We can ask queries about the website content to the chatbot. They are capable of understanding and interpreting natural languages. So, they can understand human conversations and can guide the appropriate customer in finding out the appropriate items or guidelines by extracting the inflammations from the website or web page.

Dynamic pricing

Another most splendid application of AI in business is dynamic pricing or demand pricing. It is a process of e-commerce pricing strategy of a product or item based on the interest level of the target customer through the use of big data. AI in e-commerce is a proactive approach. A proactive reach through AI can search patterns based on customer's behavior and then can take appropriate actions to achieve the desired goal. In e-commerce, AI can also be used for making predictions like which

item will purchase a customer, which time they prefer to purchase, which kind of device they use to visit the site, and many more.

Social media

With more than 2.77 billion active profiles across platforms like Twitter, Facebook and Snapchat, social media is in a constant battle to personalize and cultivate worthwhile experiences for users. With its ability to organize massive amounts of data, recognize images, introduce chatbots and predict shifts in culture, AI is highly valuable to an industry with billions of users and about $45 billion in annual revenue. Take for example Messenger chatbots, algorithmic newsfeeds, photo tagging suggestions or ad targeting; AI is deeply embedded in Facebook's platform. The company's AI team recently trained an image recognition model to 85% accuracy using billions of public Instagram photos tagged with hashtags. The method is a major breakthrough in computer vision modeling. Facebook is already using a combination of AI and human moderation to combat spam and abuse. With breakthroughs in image recognition and a doubling-down on AI research, Facebook is counting on AI to help it police the world's largest media platform. Another example of AI in social media can vastly be found on Twitter. The social media giant’s algorithms suggest people to follow, tweets and news based on a user’s individual preferences. Additionally, Twitter uses AI to monitor and categorize video feeds based on subject matter. The company's image cropping tool also uses AI to determine how to crop images to focus on the most interesting part. Twitter’s AI was recently put to work identifying hate speech and terroristic language in tweets. In the first half of 2017, the company discovered and banned 300,000 terrorist-linked accounts, 95% of which were found by non-human, artificially intelligent machines.

The role of Cloud Services

The top cloud computing platforms are all betting big on democratizing AI. Over the past three years, Amazon, Google, and Microsoft have made significant investments in AI and machine learning, from rolling out new services to carrying out major reorganizations that place AI strategically in their organizational structures.

What are the Benefits of Machine Learning in the Cloud?

It is not necessary to use a cloud provider to build a machine learning model for your business. There are plenty of open source machine learning frameworks, such as TensorFlow, MXNet, and CNTK that companies can run on their own hardware. However, when companies build complicated machine learning models in-house, it is highly possible to run into issues scaling their workloads, as training real-world models typically requires large compute clusters.

The specialized skills required to build, train, and deploy machine learning models and the computational and special-purpose hardware requirements add up to higher costs for labor, development, and infrastructure.

These are the benefits of building machine learning models on Cloud:

- The cloud's pay-per-use model is good for bursty AI or machine learning workloads.
- The cloud makes it easy for enterprises to experiment with machine learning capabilities and scale up as projects go into production and demand increases.
- The cloud makes intelligent capabilities accessible without requiring advanced skills in artificial intelligence or data science.
- IBM Cloud, AWS, Microsoft Azure, and Google Cloud Platform offer many machine learning options that do not require deep knowledge of AI, machine learning theory, or a team of data scientists.

Cloud computing can solve the above issues and the leading public cloud platforms are on a mission to make it easier for companies to leverage machine learning capabilities to solve business problems without the full tech burden.

There are many good reasons for moving some, or all, of your machine learning projects to the cloud. The cloud's pay-per-use model is good for bursty AI or machine learning workloads, and you can leverage the speed and power of GPUs for training without the hardware investment. The cloud also makes it easy for enterprises to experiment with machine learning capabilities and scale up as projects go into production and demand for those features increases.

Even more importantly, the cloud makes intelligent capabilities accessible without requiring advanced skills in artificial intelligence or data science—skills that are rare and in short supply. A survey by Tech Pro Research found that just 28% of companies have some experience with AI or machine learning, and 42% said their enterprise IT

personnel do not have the skills required to implement and support AI and machine learning.

AWS, Microsoft Azure, and Google Cloud Platform offer many options for implementing intelligent features in enterprise applications that do not require deep knowledge of AI or machine learning theory or a team of data scientists.

Why NousPratIT?

NousPratIT, a software technology vendor that adds value to customers using the Mind (Nous in Greek) to make (Prato in GR) intelligent IT solutions. With individuals that have many years of experience in Software Development, Sales, Business Analysis and Project Management we provide Machine Learning and AI services.

Currently, there are four main providers of cloud services: Google, Microsoft, Amazon and IBM with whom NousPratIT has strong collaborations.

IBM

IBM focuses heavily on Watson as it is trying to make it into a cloud-based data operating system and at the same time keeping its business clients happy in satisfying their need in the analytics field. IBM supports AI-assisted experiences and combines cognitive services with data management, analytics, and the entire suite of Bluemix developer tools. What currently makes it unique are AI-guided ‘experiences’ for business analytics via a common application framework. IBM’s AI strategy is lazor-focused on its enterprise customers. In giving them the control of their data and insights, IBM tries to assist them increase efficiency, lower costs or augment human intelligence. Simultaneously, open source projects in the fields of AI are supported and APIs to solutions built by other vendors like Google’s TensorFlow are endorsed.

Microsoft

Microsoft Azure has gained traction at an incredible speed. Microsoft is adding to its Azure platform more and more services like Azure Data Lake, Azure Data Catalog and Azure Cloud Functions. It is close to Google and IBM in the race for AI dominance through Azure Machine Learning and manages to integrate other services like business intelligence solutions quite well. Microsoft entire AI efforts are well linked with the Azure cloud.

Google

Google offers a very broad toolset regarding AI and machine learning. Googles AI and machine learning products for example offer full machine learning automation with (hyper-) parameter tuning, container management and a dedicated API management. Google Cloud fits you perfectly if you need flexibility in early trials but at the same time extreme scalability in the long run. If your developers already know Google Cloud Services, they will find their way around quite easily when starting off with machine learning. Downsides of using the Google platform are its business and real-time analytics tools that to this date are still immature in comparison to the

other service providers. Google's AI strategy is to create a strong position in core data science with corresponding patents and related computer technology areas as its business relies heavily on machine learning. With TensorFlow, Google developers already delivered the leading open-source software library in the ML space

Amazon

Amazon leads the pack in regards of cloud services with AWS. At the same time, its voice assistant Alexa developed into the household name when talking about practically implemented AI from a consumer's perspective. Amazon upsells AI and machine learning services to its existing cloud customers. Advantages of AWS can especially be seen in the performance when dealing with large data volumes, in the completeness and maturity of its services and in its openness regarding APIs to other services — even to competitors like Microsoft. Following the success of Alexa, Amazon continues to build around voice, virtual assistants and natural language processing.

For more information

To learn more about NousPratIT Data Science and AI Solutions, please contact your NousPratIT representative or NousPratIT Business Partner, or visit: www.nouspratit.gr/en/

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