**IBM WATSON**

**Technologies of Watson:**

**Watson and Data:**

Data is the Primary need for any AI to work and to be deployed in an enterprise. Watson is fed with needed data to process further.

**Quantitative vs. Categorical Data**

Businesses often produce and store a wide variety of different data types. Generating value from these data requires specific tools and applications depending on the kind of data being used. The applications and tools that compose IBM Watson are all tailored to work with specific types of data, depending on the business challenge at hand.

There are two major categories of data that businesses may collect and use:

**Quantitative Data**is data involving numeric variables representative of some kind of measurement. Quantitative data can be:

* **continuous**, meaning it can take on any value in a given interval (any number between 0 to 10, for example)
* **discrete**, meaning it can take on only specific values (2, 4, 6, and 8, for example)

Examples of quantitative data include height, weight, age, revenues, clicks, and salaries. Regardless of whether quantitative data is continuous or discrete, remember that it must always represent some sort of numeric measurement. 

**Categorical Data**is data captured in the form of certain categories or labels. Rather than a numerical measurement, categorical data capture the **qualitative**aspects of a point of data. Categories might include things like blood type, subscription type (free or premium), species (dog or cat), or highest education (high school, bachelor's, etc.). Categorical data can be further divided:

* **nominal,**meaning its values represent categories with no intrinsic ranking (for example, the department of the company in which an employee works). Examples of nominal variables include region, postal code, and religious affiliation
* **ordinal,**when its values represent categories with some intrinsic ranking (for example, levels of service satisfaction from highly dissatisfied to highly satisfied)

**Structured vs. Unstructured Data:**

Data can also be categorized based on the ways that they're stored and represented:

**Structured Data**is data that exists in a highly organized format. Think about tables, spreadsheets, relational databases and so forth.

**Unstructured Data**is data that lacks predefined structure and may come in many forms. Think about written documents, photographs and videos, audio files, or webpages that contain mixes of all of these formats.

## Why Businesses Struggle with Data:

## The following is an excerpt from The AI Ladder: Demystifying AI Challenges (2019) by IBM VP Rob Thomas:

"Data is the foundation and fuel for AI. Good data is needed for training machine learning models, and then for the resulting AI-infused business processes to do their work. There are three different kinds of data problems:

**Lack of data:**Companies need to start by collecting their data, acquiring additional data from third parties, and making data accessible throughout their organization.

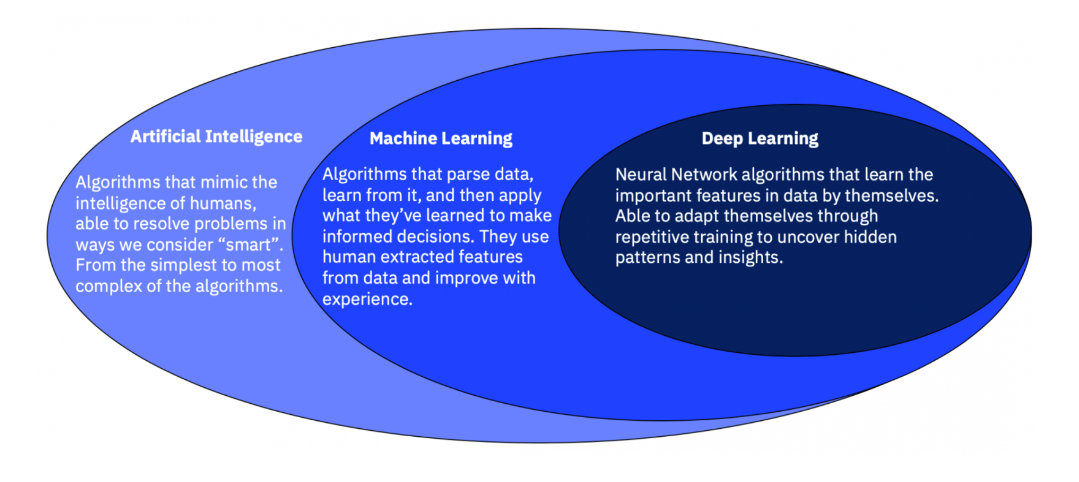
**Too much data:** Although a lack of data can hamper AI adoption, the same can be said for having too much data. When companies have too much data spread across different environments and databases, it quickly becomes a data engineering problem. In this instance, companies need to collect and organize their data to make it ready for AI.

**Bad data:**Garbage in, garbage out is as true in the days of AI as it was in the early days of programming when the phrase was first coined. The problem is that even though business leaders list improving the use of data as a top priority, 60% are challenged by managing data quality. Much of the most important work in AI involves data cleaning"

**AI and Machine Learning:**

The technology that powers AI is **Machine Learning (ML)**—computer algorithms that improve automatically through experience using data. Machine learning covers a wide range of different algorithms and approaches, all of which fall under the broad umbrella of AI. For now, you can think of AI as the general concept and ML as its specific implementations.

There's a further subfield of Machine Learning that's been generating a lot of excitement in recent years: **Deep Learning**. Deep Learning is the branch of machine learning that focuses on a specific kind of computer algorithm known as the **artificial neural network**. Neural networks try to mimic the ways information passes through the human brain. Since the early 2010's, they've proved extremely effective at particular AI-related tasks, such as those related to understanding, analyzing, and even generating human language—all tasks in the AI subfield **Natural Language Processing** (NLP).



**What does AI do? Virtually all AI applications fall under three categories:**

**Prediction—**systems that use data to predict novel or future events related to that data. For example, an AI that tries to predict changes in the price of a stock.

**Classification—**systems that use data to distinguish instances of data based on the category or “class” that they belong to. For example, an AI that recognizes whether images contain a cat or a dog (the two classes being “Cat” and “Dog”).

**Automation—**a broader term referring to systems that utilize the above two categories to automate processes that normally require human decision-making. For example, an AI system that predicts a user’s interests based on their clicks on a website, and then recommends products that they might like.

Linking these processes back to machine learning—remember that AI accomplishes these things with data. The algorithms powering these systems all use **training data**to iteratively improve their abilities to predict, classify, or automate.

**AI Use Cases:**

These functions of prediction, classification, and automation come together to form the full-fledged use cases for AI in business. Here are a few applications that IBM Watson helps enable:

* **Speech recognition:** computer speech recognition, or speech-to-text, and it is a capability which uses natural language processing (NLP) to process human speech into a written format. Many mobile devices incorporate speech recognition into their systems to conduct voice search—e.g. Siri—or provide more accessibility around texting.
* **Customer service:**  Online chatbots are replacing human agents along the customer journey. They answer frequently asked questions (FAQs) around topics, like shipping, or provide personalized advice, cross-selling products or suggesting sizes for users, changing the way we think about customer engagement across websites and social media platforms. Examples include messaging bots on e-commerce sites with virtual agents, messaging apps, such as Slack and Facebook Messenger, and tasks usually done by virtual assistants and voice assistants.
* **Computer vision:** This AI technology enables computers and systems to derive meaningful information from digital images, videos and other visual inputs, and based on those inputs, it can take action. This ability to provide recommendations distinguishes it from image recognition tasks. Powered by convolutional neural networks, computer vision has applications within photo tagging in social media, radiology imaging in healthcare, and self-driving cars within the automotive industry.
* **Recommendation engines:** Using past consumption behavior data, AI algorithms can help to discover data trends that can be used to develop more effective cross-selling strategies. This is used to make relevant add-on recommendations to customers during the checkout process for online retailers.
* **Automated stock trading:**Designed to optimize stock portfolios, AI-driven high-frequency trading platforms make thousands or even millions of trades per day without human intervention.

**Cloud Computing**or simply “**Cloud**” is on-demand access, via the internet, to computing resources—applications, servers, data storage, development tools, networking capabilities, and more—hosted at a remote data center. Cloud offers businesses a host of advantages over traditional IT infrastructure, such as increased capacity, security, and scalability. The AI applications and tools of Watson are all designed to run seamlessly on IBM Cloud and businesses' own private clouds.

## Cloud in Business:

All of the tasks that we do on our computers and devices require computational resources—data, processing, storage, and so forth. Sometimes these tasks can be very expensive in terms of those resources, so the hardware on-hand just won’t do. Other times it makes sense to store information or complete tasks remotely, online, for example to protect against hardware failures that may cause us to lose data. These facts apply especially to large-scale enterprises, which need to orchestrate very expensive computational tasks across many physical locations.

For such organizations, cloud computing provides an answer. IBM Cloud helps businesses transform virtually all aspects of their traditional IT infrastructure, providing applications, data storage, development tools and more through state-of-the-art data centers around the world.

Here are a few key advantages for Cloud computing over traditional IT:

**Lower costs-**Businesses no longer need to buy, install, and manage on-premises (“on-prem”) hardware to support their IT infrastructure.

**Improve productivity and synchronicity-**Global access to data, applications, and computing resources across an organization’s physical locations helps employees work faster, smarter, and more synchronously.

**Enhanced security-**Hosting sensitive information and workflows across many different physical and virtual locations makes them vulnerable to leakage, infiltration, and failure. Moving to cloud backed by [world-leading cybersecurity](https://www.ibm.com/cloud/security) infrastructure secures sensitive information and workflows.

**Scalability-**As organizations grow and evolve, they require new computing resources and applications, in new places, for new people. Because IBM Cloud is offered through subscription and pay-as-you-go (PAYG) models, businesses can seamlessly shrink or scale cloud services to fit their needs.

Even in light of these advantages, only an estimated 25% of all business workloads have moved to the cloud. IBM is all-in on **hybrid cloud**—the bringing together of public cloud (like IBM cloud) and businesses’ unique private clouds (internal cloud networks) and on-prem hardware to help them get the most out of data and AI.

##### Services

The actual services delivered through cloud fall under a number of different categories. All of them are referred to as something "as a Service" (aaS). Here are the key categories relevant to Watson and IBM Cloud:

**Infrastructure as a service (IaaS):**A vendor provides clients pay-as-you-go access to storage, networking, servers, and other computing resources in the cloud.

**Platform as a service (PaaS):**A service provider offers access to a cloud-based environment in which users can build and deliver applications. The provider supplies underlying infrastructure.

**Software as a service (SaaS):**A service provider delivers software and applications through the internet. Users subscribe to the software and access it via the web or vendor APIs.

Where Cloud Meets AI: IBM Cloud Pak for Data:

You may be asking, how does cloud tie into AI on IBM Watson? The answer is that all Watson applications are cloud-native. This means that users access and use them through IBM Cloud, typically through their individual internet browsers.

The key advantage of delivering AI applications and development tools through cloud ties in to the more general advantages of cloud that we've already seen: It lets the end user plug and play with AI without having to download any huge software packages or run the code on their own computer. AI delivered through cloud means having the power of AI and machine learning in your browser, with all the expensive computational work taking place at state-of-the-art data centers around the world.

Businesses need a single place to store and access their data as well as put it to work with the newest approaches in data science and AI. That's where **IBM Cloud Pak for Data**comes in. As its name suggests, Cloud Pak for Data is IBM’s cloud-based data science and AI platform that enables businesses to put their data to use quickly and efficiently. Specifically, it helps businesses consolidate stored data from across their organizations and put that data to use with cutting edge Watson data science and AI applications, all remotely and synchronously through the cloud. You can think of it as kind of like Microsoft Office or Adobe Creative Suite, only for data science and AI applications like Watson Studio and Watson Assistant (more on these later) rather than Excel and Photoshop. It was made with a very specific user in mind: businesses looking to get the most out of their data from many sources and of many kinds.

2 Important uses of Watson in cloud:

1. Consolidate Software (Reduce Tool spend)
2. Container Platform (Run your Infrastructure on Red hat open-shift)

**Watson** is IBM’s portfolio of cloud native, business-ready tools, applications and solutions, designed to reduce the costs and hurdles of AI adoption while optimizing outcomes and responsible use of AI.

## How Watson Started:

In the Early 2000’s researchers at IBM Research set out on a “[Grand Challenge](https://www.ibm.com/blogs/think/nl-en/2014/10/20/watson-and-other-impossible-grand-challenges/)” to build an AI system that could compete with the top contestants on the hit American quiz show *Jeopardy!*The system would have to be able to understand human language questions (given as questions in the form of an answer) and match them to millions of potential answers from its memory. Early iterations of the system showed limited success, but by 2007 it showed real promise. It was called Watson—named after Thomas J. Watson, IBM’s founder and first CEO. In 2011, Watson competed live on *Jeopardy!* against two of the show’s most successful human contestants. Watson won in what is now regarded as one of the first and most prominent public displays of artificial intelligence in history. Since then Watson has grown into IBM’s leading data and AI platform for businesses around the world.

## IBM Watson® Tools:

IBM Watson® tools help you build, run, and manage AI models, as well as optimize decisions at scale across any cloud. Let's start by looking at two of these tools:

**1. IBM Watson Studio**which helps you build, run, and manage AI models anywhere using open source code or visual modeling. This includes easily leveraging go-to open source libraries and frameworks for Machine Learning as well as coding frameworks for R, Spark, and Python.

Watson Studio is a great tool to:

* Develop AI functionality using open-source frameworks like PyTorch, TensorFlow and scikit-learn, either as standalone code or together with other IBM tools for Machine Learning, Software Engineering, and Data Science. You can use Jupyter notebooks, JupyterLab and CLIs — or languages such as Python, R and Scala.
* Automate the development of AI models using **Auto AI** to assist you in critical development steps, including the data preparation, model development, feature engineering, and hyper-parameter optimization. Auto AI automatically builds models, scales experimentation and deployment, and boost trust and transparency.
* Optimize decisions anywhere on IBM Cloud Pak® for Data
* Unite teams by using the collaborative features such as tagging, comments, and co-editing functionality. You can also automate AI lifecycles and speed time to value on an open multicloud architecture.

### **2. IBM Watson Knowledge Catalogue is an intelligent data catalog for the AI era. It helps you leverage intelligent cataloguing by activating your business-ready data for AI and analytics.**

Watson Knowledge Catalog powers intelligent, self-service discovery of data, models and more. The cloud-based enterprise metadata repository activates information for AI, including machine learning and deep learning. You can access, curate, categorize and share data, knowledge assets and their relationships, wherever they reside, which helps considerably to have your data ready for AI.

## IBM Watson® Applications:

IBM Watson applications are products designed to develop a specific type of AI capability. These are some of the most popular Watson Applications

**IBM Watson Assistant -**Drive fast, accurate, and personalized customer interactions using data and AI, across any channel at the scale you and your customers need

**IBM Watson Discovery -**Surface answers and insights from complex enterprise data with AI-powered search and text analytics

**IBM Watson Natural Language Understanding** – The natural language processing (NLP) service for advanced text analytics

**IBM Watson Natural Language Classifier** - Text classification made easy

**IBM Watson Speech to Text -**Transform voice into written text with powerful machine learning technology

**IBM Watson Text to Speech -**Convert written text into natural-sounding audio in a variety of languages and voices

**IBM Watson Knowledge Studio -**Teach IBM Watson the language of your domain

**IBM Watson Language Translator** - Dynamically translate text such as news, patents, conversational forums, or legal documents.

**Further reading:**[**https://www.ibm.com/watson/products-services**](https://www.ibm.com/watson/products-services)

## IBM Watson® Solutions

**IBM Watson AI Solutions**

AI Solutions are bundled and pre-configured Watson Tools and Watson Applications, specifically designed to accelerate the adoption of AI to address specific business challenges. For any business challenge IBM customers face, there is an IBM Watson Solution for them. These are some general of our most sought-after AI solutions:

**AI for Customer Service**helps companies assist their customers faster and efficiently by augmenting their customer service capabilities

**AI for Business Automation**helps IBM customers increase efficiency, reduce churn, and manage their applications and infrastructure across multiple environments.

**Natural Language Processing** helps IBM customers detect trends, perform, predictive analytics, and gain insights from text and unstructured data.

**Trustworthy AI**helps IBM customers promote trust and transparency in their AI models

Other AI solutions that might be relevant to you:

**AI for IT operations** - Reduce monitoring time and resolve problems quickly, so your IT team can focus on what really matters.

**AI for advertising** - Understand your customers better and reach them with the right messaging at the right time.

**AI for healthcare** - Simplify operations and improve patient care experiences with a data-driven approach.

**AI for financial operations** - Use modern planning, budgeting and forecasting tools to drive more informed decision-making.

**AI for risk and compliance** - Improve governance, reporting, compliance and risk management, while also reducing costs.

**AI for video** - Boost the overall reach and engagement of your livestreamed and on-demand video content.

**AI for security** - Detect, investigate and respond to the most critical cybersecurity threats facing your organization.

**AI for supply chain** - Gain end-to-end insights and visibility into your supply chain, helping reduce disruption and better meet demand.

**AI for return to work** - Ensure the health, safety and productivity of your employees and environment in a changing workplace.

## Success Stories of IBM Watson Customers and Partners:

IBM Customers from across multiple industries including Finance, Travel, Healthcare, Retail, Services, Security, and Supply Chain, leverage IBM Watson to achieve their business goals. IBM Watson is continuously changing how business gets done. These are some success stories from IBM Customers:

**Humana - Expertise on call with Conversational AI**

Humana, a leading health insurance provider, reduced costly per-service calls and improved the provider experience with conversational AI.

**Challenge:**Humana’s interactive voice response (IVR) system was transferring far too many calls to human agents, at tremendous cost to the company and its customer satisfaction scores. Humana receives over 1 million provider calls every month, and most callers were opting out of the IVR system to be directed to outsourced call centers, for which Humana paid by the call. More than 60% of these calls were related to routine, specific, pre-service questions with well-defined answers.

**Solution: Getting healthcare professionals the information they need, when they need it**Humana chose to work with Watson, the industry leader in enterprise AI, and began a collaboration with IBM’s Data and AI Expert Labs & Learning (DAELL). After a three-month proof of concept, Humana and IBM began development of what became the Provider Services Conversational Voice Agent with Watson. The solution combines multiple Watson applications in a single conversational assistant, run on the IBM cloud, while the Watson Assistant for Voice Interaction runs on premise at Humana.

The Voice Assistant uses significant speech customization with seven language models and two acoustic models, each targeted to a specific type of user input collected by Humana. Through speech customization training, the solution achieves an average of 90-95% sentence error rate accuracy level on the significant data inputs. The implementation handles several sub-intents within the major groupings of eligibility, benefits, claims, authorization and referrals, enabling Humana to quickly answer questions that were never answerable before. In the previous IVR system, a request for “benefits” could lead to a seven-page fax. Now, the Watson solution is able to respond with a specific “point” benefit, such as, “the co-pay for chiropractic visits is USD 100.”

Humana’s Voice Agent with Watson provides a faster, friendlier and more consistent way for administrative staff at healthcare providers to access pre-service, medical eligibility, verification, authorization and referral information without the need to speak with a live agent. The solution relies on AI to understand the intent of a provider’s call, verify they are permitted to access the system and member information, and then determine how best to provide the information requested.

#### **Credit Mutual - Expert service, 60% faster**

Crédit Mutuel, one of France’s leading banks, has over 5,000 branches that receive more than 350,000 online inquiries a day — and volume is growing 23% a year. Maintaining the quality of client relationships, while dealing with an ever-rising stream of customers and client requests, meant reinventing the role of client advisor or losing their competitive edge.

After running a diagnosis of how client advisors were spending their time, Crédit Mutuel found that a significant part of their work involved answering simple and repetitive questions. With this in mind, the bank turned to IBM to find a solution that could speed up everyday processes and allow client advisors time to address more complicated and nuanced problems.

Watson gave Crédit Mutuel a competitive edge by using AI to build upon its strength in customer service expertise. Crédit Mutuel has trained Watson to help advisors provide customers with quick and comprehensive information on an array of offerings, from car and housing insurance to a range of savings and investment products. “It’s impossible for our customer advisors to know all of our 200 products. So we provide them with tools to have the right information for the right client,” said Mathieu Dehestru, Head of Transformation, Marketing and Big Data at Crédit Mutuel insurance. “Watson gives more time to our client advisors, so they have more time for client relationships,” he said.

Thanks to its Watson-infused email analyzer and four virtual assistants, Crédit Mutuel is able to enrich interactions between client advisors and customers. Watson has made it possible to find the right answers 60% faster, and it can help deflect and address 50% of the 350,000 daily emails received by the bank’s client advisors.

##### Other IBM Watson AI Success Stories

##### **Korean Air - Airplane maintenance done 90% faster**

With Watson, Korean Air is developing an intelligent detection system to improve operational efficiency and on-time performance.

**Lucy and Equals 3 - Market data in plain language**  
With Watson, Lucy and Equals 3 deliver results to Fortune 1000 companies and the agencies serving them. 

##### **Thomson Reuters - Answer tomorrow**'s legal questions

Thomson Reuters is working with Watson to help clients deepen their expertise on global data privacy laws.

**Insurance claims assessed 25% faster**

Insurance companies use Watson to give their agents insight on claims eligibility.