

Program reskilling Data/AI PO

Specific session for  SOCIÉTÉ
GÉNÉRALE

1: General Introduction

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Agenda

- Training instructor
- **Session 1:**
 - general introduction
 - Supervised learning + Deep : Lab on times series analysis and prediction
- **Session 2:**
 - Supervised learning and GBDT
 - Lab session on classification of loans
- **Session 3:**
 - Lab session on portfolio allocation

Your instructor



Eric Benhamou

- 20 years in model development and quantitative finance



- Founder of two startups:

- Pricing Partners fintech sold to



now



-  **For Alpha**

Strong academic background:

- Over 70 publications, regular speaker at Ai conferences

- World rank on SSRN : 9



- Education: X/ENSAE, 2 PhDs: Economics/Mathematics, finishing a PhD in Artificial intelligence

Agenda

Session 1: The Importance of AI in Banking

What is AI?

- How does a machine learn?

- Software requirements for the implementation of AI

- Neural networks and deep learning

- Hardware requirements for the implementation of AI

- Graphics processing units

- Solid-state drives

- Modeling approach—CRISP-DM

Understanding the banking sector

- The size of banking relative to the world's economies

- Customers in banking

Importance of accessible banking

- Open source software and data

- Why do we need AI if a good banker can do the job?

Applications of AI in banking

- Impact of AI on a bank's profitability

Summary

What is AI?

AI is different from automation!

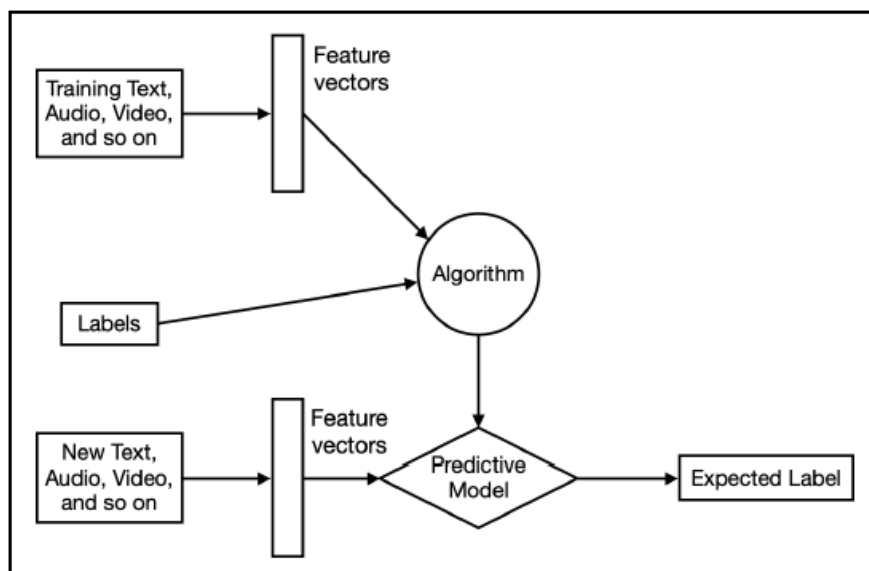
- **Artificial intelligence**, commonly known as **AI**, is a very powerful technology.
- AI, also known as **machine intelligence**, is all about creating machines that demonstrate the intelligence that is usually displayed by humans in the form of natural intelligence. John McCarthy coined the term *artificial intelligence* in 1955.
- AI has witnessed two winters so far: once in the 1970s with the reduction of funding by the **Defense Advanced Research Projects Agency** or **DARPA** ([https:// www. darpa. mil/](https://www.darpa.mil/)), then known as **ARPA**, and another time with the abandonment of an expert system by major IT corporates such as Texas Instruments ([http:// www. ti. com/](http://www.ti.com/)) and Xerox ([https://www. xerox. com/](https://www.xerox.com/)).
- In a way, AI aids in the process of **transferring decision making from humans to machines**, without any predefined rules. In the field of computer science, AI is also defined as the study of intelligent agents.
- An intelligent agent is **any device that learns from the environment and makes decisions based on what it has learned to maximize the probability of achieving its predefined goals**.

Fields of AI

- AI is capable of solving an extremely broad range of problems. These problems include, but are not limited to, simple mathematical puzzles, finding the best route from one location to another, understanding human language, and processing huge amounts of research data to produce meaningful reports.
- The following is a list of capabilities that the system must have in order to solve these problems along with a brief description of what each means:
 - **Reasoning:** The ability to solve puzzles and make logic-based deductions
 - **Knowledge representation:** The ability to process knowledge collected by
 - researchers and experts
 - **Planning:** The ability to set goals and define ways to successfully achieve them
 - **Learning:** The ability to improve algorithms by experience
 - **Natural Language Processing (NLP):** The ability to understand human language
 - **Perception:** The ability to use sensors and devices, such as cameras, microphones, and more, in order to acquire enough input to understand and interpret different features of the environment
 - **Motion:** The ability to move around

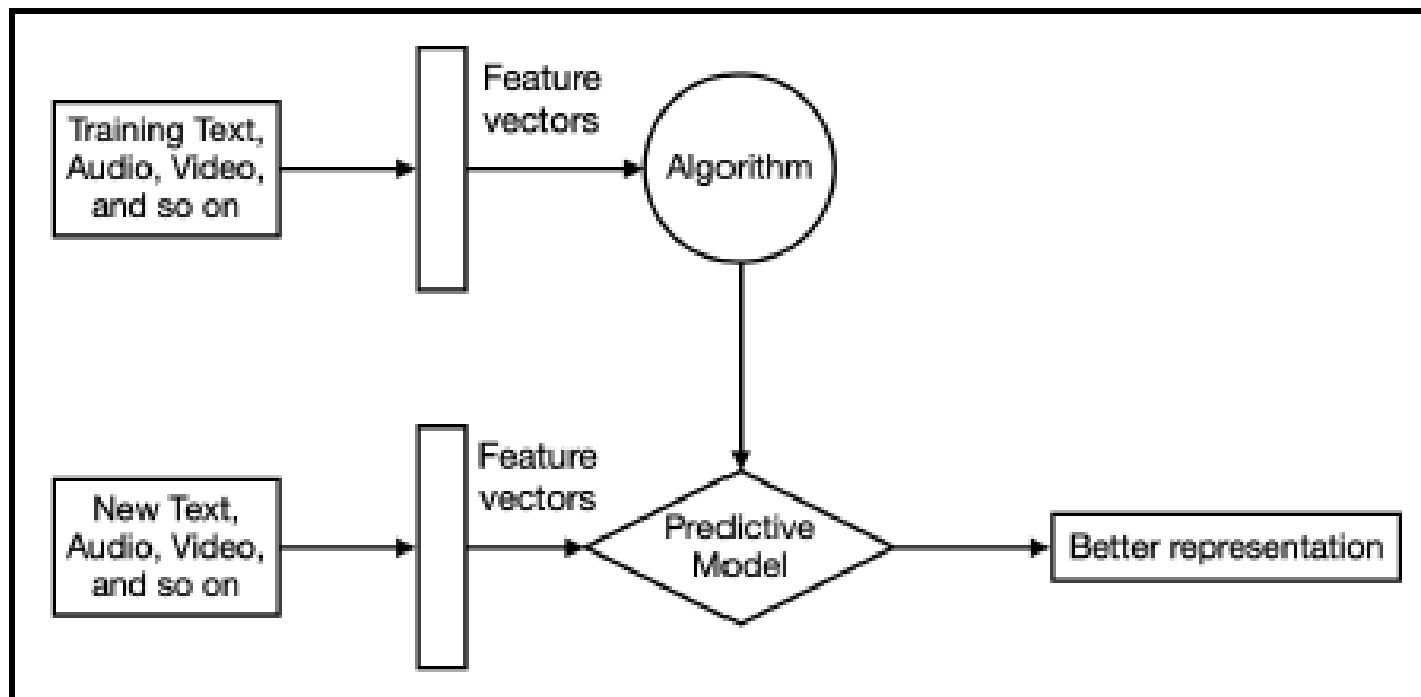
How does a machine learn? 1/3

- Let's take a quick look at the basics of machine learning. There are three methods that a machine can use in order to learn: supervised learning, unsupervised learning, and reinforcement learning, as described in the following list:
 - Supervised learning** is based on the concept of mining labeled training data. The training data is represented as a pair consisting of the supplied input (also known as a **feature vector**—this is a vector of numbers that can represent the inputted data numerically as features) and the expected output data (also known as **labels**). Each pair is tagged with a label. The following diagram illustrates the supervised learning method:



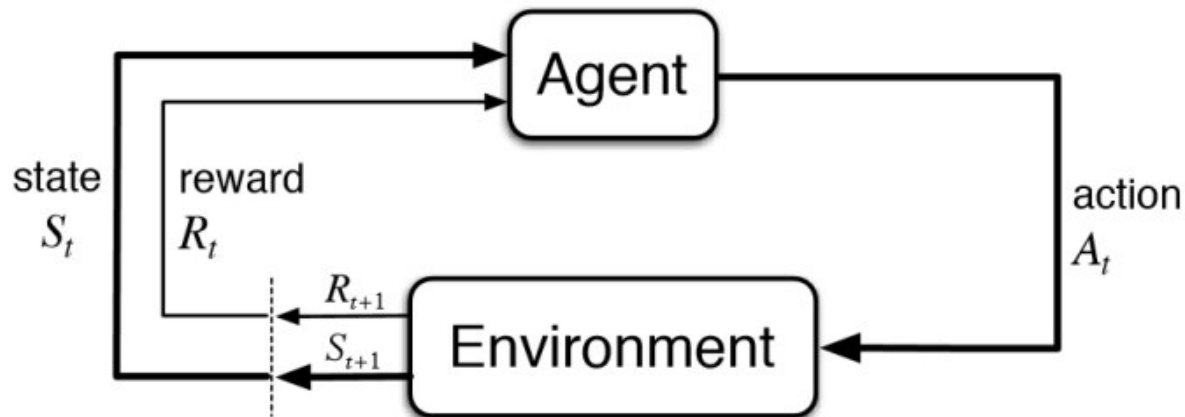
How does a machine learn? 2/3

- **Unsupervised learning** is based on a situation where the training data is provided without any underlying information about the data, which means the training data is not labeled. The unsupervised learning algorithm will try to find the hidden meaning for this training data. The following diagram illustrates the unsupervised learning method:



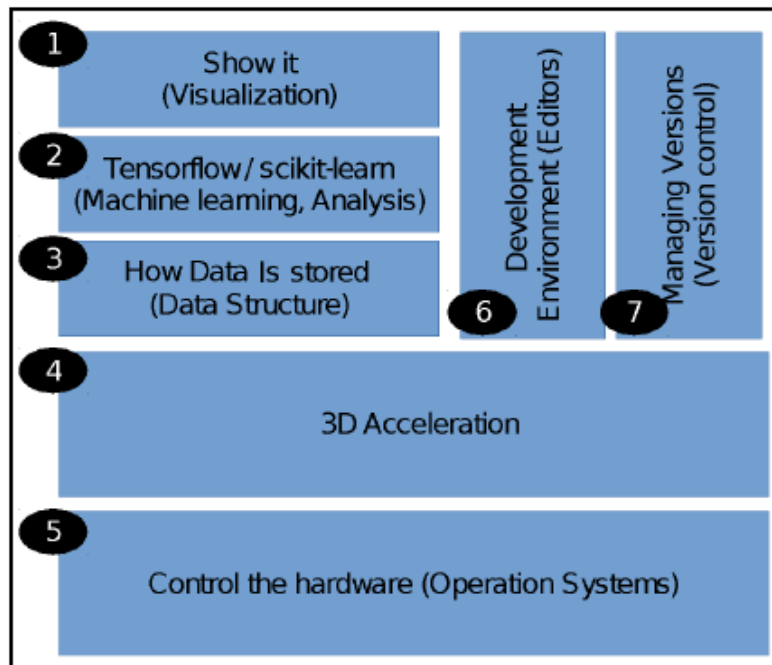
How does a machine learn? 3/3

- **Reinforcement learning** is a machine learning technique that does not have training data. This method is based on two things—an agent and a reward for that agent. The agent is expected to draw on its experience in order to get a reward. The following diagram depicts the reinforcement learning method:



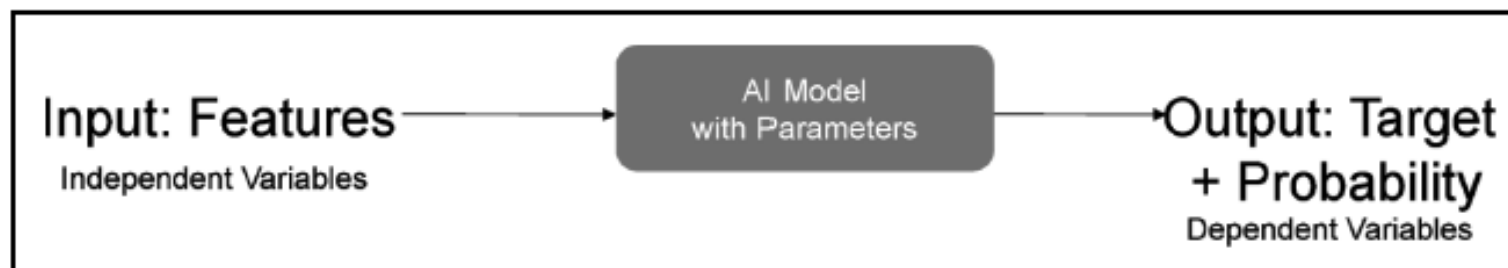
Software requirements

- The open source movement propels software development. The movement is coupled with the improvement of hardware (for example, GPU, CPU, storage, and network hardware).
- The following diagram depicts the typical technology stack that we should consider whenever we implement software to perform machine learning projects:



Neural networks and deep learning

- Deep learning is a special subfield or branch of machine learning. The deep learning methodology is inspired by a computer system that is modeled on the human brain, known as a neural network.
- The major impact of deep learning is that the performance of the model is better as it can accommodate more complex reasoning. What we expect from a smart machine is as simple as **input, process, and output**, as shown in the following diagram:



- In **most financial use cases**, we deploy **supervised learning**, which resembles the process of training an animal—here, you provide a loss function to say if you are correct or incorrect. That's why we need to have the outcome (that is, the target variable) for training to happen.

Applications of AI in banking

- According to the McKinsey Global Institute (<https://www.mckinsey.com/~media/mckinsey/industries/advanced%20electronics/our%20insights/how%20artificial%20intelligence%20can%20deliver%20real%20value%20to%20companies/mgi-artificial-intelligence-discussion-paper.ashx>), out of 13 industries, financial services ranked third in AI adoption, followed by the high-tech, telecommunications, and automotive and assembly industries
- As the Mckinsey report does not mention the use case in banking, with a bit of research, perhaps we can take a look at the four ways in which AI creates values, as shown in the following list:
 - **Project:** Forecast and anticipate demand, improve sourcing, and reduce inventory (capital).
 - **Produce:** Provide services at a lower cost or higher quality.
 - **Promote:** Provide offers for the right price with the right message for the right customers at the right time.
 - **Provide:** Rich, personal, and convenient user experiences.
- <https://www.mckinsey.com/industries/financial-services/our-insights/ai-bank-of-the-future-can-banks-meet-the-ai-challenge>

Different use cases

Participants	Project: better forecast	Produce: lower processing cost	Promote: personalized offer	Provide: convenience
Commercial banks	Optimize funding needs.	Using AI, trade finance processing can be automated, which will result in increased efficiency.	AI can provide a real-time quotation of export/import financing as the goods move to different stakeholders with different types and levels of risk.	Improve client services with an NLP-enabled chatbot.
Investment banks	Valuation of corporations.	With AI, it becomes faster and cheaper to reach the market signal by identifying the market's sentiments.	AI can match the needs of asset sellers and buyers through automated matching.	Mobile workforce with access to information at any time.
Asset management	Asset valuation and optimization.	AI can help here by automating trading and portfolio balancing.	AI can recommend investments to customers.	Fast and convenient portfolio updates.
Consumer banks	Project a realistic savings plan.	Personalized bot advisers can capture the data from receipts without human help.	AI can understand the right time at which consumers need financing or investment products.	Serve clients 24/7 anywhere using smart bots.

Impact of AI on a bank's profitability

- To give you an idea of AI's impact on a bank's profitability, let's take a look at some simple estimates from two perspectives: the improvement of model accuracy and the time spent to run/train the model.
- Over the past 10 years, the clock rate and the number of cores have improved tenfold, from around 300 cores to around 3,000 cores.
- I have compared the shallow machine learning or statistical model I experienced a decade ago to what I see today with deep neural networks. The model accuracy of neural networks improves the model from around 80% to over 90%, with a 12.5% rate of improvement.

Year	Processors	Core clock	Memory data rate	Memory bus width	Memory size
2007	8800 Ultra[42]	612 MHz	2.16 GHz	384 bit	768 MB
2018	Titan X[43]	1417 MHz	10 GHz	384 bit	12 GB
2018	GeForce RTX 2080 Ti	1545 MHz	14 GHz	352 bit	11 GB GDDR6

Summary

- We began this training by explaining what AI is all about.
 - AI is the technology that **makes machines perform tasks** that humans can do, such as weather prediction, budget forecasting, and more.
 - It enables **machines to learn based on data**.
 - We looked at the various techniques of AI and how this can have **a major impact on banking**
- In the next session, we will continue our journey of AI in banking.
 - We will focus on **time series analysis and forecasting**.
 - We will explain **how to measure the accuracy of machine learning-based forecasting**.