Quantum Computing

In brief

Course langage: English

Presentation

Learning objectives

Companies are now implementing advanced digital solutions to meet the growing need for latency reduction (conversational interfaces, simulation, optimisation, diagnostics, etc.) and complex algorithmic processing (High-Performance Computing).

Quantum computing exploits the non-classical properties of quantum systems (electrons, atoms, photons, etc.) to transmit, encrypt and manipulate information. The realisation of operational configurations on a nanometric scale would, in principle and in an as yet undetermined future, ensure minimal energy consumption and a boosted computing power.

Quantum technologies, which are currently in the industrialisation phase, are intended to renew business lines, reduce decision-making times, shift value centres and revolutionise business models.

Quantum computer scientists, for their part, are confronted with new paradigms and have to think differently...

The aim of this course is to provide future data science engineers with the fundamental elements of quantum physics that will help them to develop Machine Learning applications using specific quantum computing algorithms.

Description of the programme

* **A reminder of Quantum Mechanics**
  Superposition of states
  Qubits (two-level systems)
* **Quantum cryptography** (BB84 protocol)
* **The quantum computer**
  Shor and Grover algorithms
  Technological achievements
  Notion of decoherence
* **Quantum AI**

Concepts of quantum machine learning
Quantum perceptron algorithms
* **Quantum algorithms on (quantum) simulators**

How knowledge is tested

Evaluation on machine.

Bibliography

Schuld, Maria, and Francesco Petruccione. Supervised learning with quantum computers. Vol. 17. Berlin: Springer, 2018.

Teaching team

* Thomas Durt
* Hachem Kadri

Total des heures		**8h**
CM	Master class	8h

Useful info

Name responsible for EU

Lead Instructor

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