

# QUANTUM COMPUTING AT YOUR FINGERTIPS

## Workshops 2025-2026



A modern office interior with a green overlay containing text. The background shows a bright, open-plan office space with large windows and a person working at a desk in the distance. The green overlay is semi-transparent and contains four paragraphs of white text.

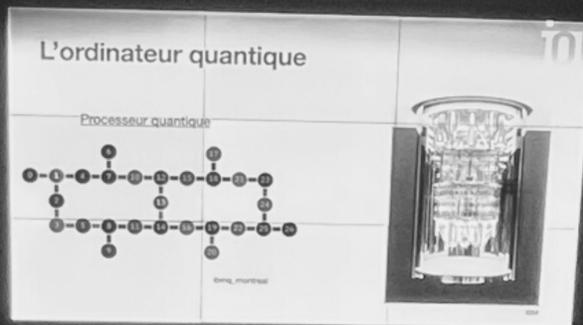
Institut quantique's Quantum AlgoLab developed a series of workshops for businesses and educational institutions. Since 2020, the AlgoLab has reached more than 5,000 people through its quantum computing trainings and has expanded its workshop offerings.

The AlgoLab has a unique expertise in quantum programming in Quebec. Our team works with companies and government agencies on research projects, including in optimization and quantum machine learning (QML). Our project partners include the Bank of Canada, Lockheed Martin, Statistics Canada and Thales.

With the growing interest in educational content and training in quantum computing, IQ's Quantum AlgoLab offers a variety of workshops for different levels to help you on your quantum journey. You can explore in a practical way the potential of quantum computing in your field using *IBM Quantum* systems.

From an introduction to quantum computing to optimization and quantum machine learning (QML), we have a workshop for you.

Your next quantum computing workshop is here.



LES  
ÉNIGMES  
QUANTIKES



# 01. Introduction to quantum computing

This introductory workshop covers the key principles and allows you to take your first steps in quantum computing on *IBM Quantum* systems.

## First steps in quantum computing

Introduction level

Duration 3 hours

1. Classical computing
  - Bit, simple operations and hardware
2. Quantum computing
  - Qubit
  - Entanglement
  - Superposition
  - Interference
  - Control and measure
  - Quantum parallelism and quantum advantage
3. *IBM Quantum* and circuit composer
  - Operations on qubits and quantum circuits
  - Experiments and qubit entanglement exercises
  - Running a quantum algorithm to generate a quantum teleportation
4. Discussion on the notion of measuring and error
5. Perspectives in quantum computing



# 02. State of the art in quantum computing & case study

This in-company workshop provides an up-to-date overview of quantum computing and features industrial and academic case studies.

## Workshop schedule

Introduction level

Duration 3 hours

09h00 State of the art in quantum computing presentation

- About Institut quantique
- Global interest in quantum computing
- Why and for who?
- Promising sectors
- Overview of the quantum computer

09h45 Questions period

10h15 Pause

10h30 Project 1 presentation with Q&A

11h00 Project 2 presentation with Q&A

11h30 Project 3 presentation with Q&A

12h00 End of workshop

Choice among case studies on our collaborative projects with :

- Québec's National Market Authority
- Lockheed Martin, Quantum optimization application scale up with NISQ systems, QML
- Thales, Temporal data classification, QML
- Bank of Canada, Quantum optimization of the bank note distribution system
- Natural Resources Canada, GQML
- Modeling the properties of molecules, simulating physical systems



# 03. INVESTing and positioning yourself in quantum

For managers, this workshop offers a current overview of quantum technologies, including quantum computing, as well as the challenges and opportunities to help them with their investments and strategic positioning in the field.

## Workshop schedule

Executive level

Duration 1 hour

### 1. Quantum state of the art presentation

- Quantum technologies
- What does the term Quantum 2.0 mean?
- National and international geopolitical context of quantum
- Quantum computing market and applications
- Quantum sensor market and applications
- Developing your own quantum strategy
- Building and developing your team
- Designing your projects

### 2. Questions period

# 04. Introduction to variational quantum algorithms

This intermediate level workshop introduces you to the basics of variational quantum algorithms (VQA) and their applications in optimization, simulation and quantum machine learning (QML).

## Variational quantum algorithms

Intermediate level

Duration 3 hours

1. A look back at the basics of quantum computing
  - Qubit
  - Quantum gates
  - State vector
  - Observable
2. Basics of variational quantum algorithms
  - Parameterized quantum circuits
  - Measure of an observable
3. Overview of variational quantum algorithms and applications
  - Eigenvalue solution (EQV) in quantum chemistry
  - Quantum approximate optimization algorithm (QAOA)
  - Variational quantum classifier (VQC) in supervised machine learning



# 05. Quantum optimization with Qiskit

This intermediate level workshop offers you an opportunity to develop your knowledge with Qiskit and acquire a concrete foundation in quantum optimization as well as a practical exercises module.

## Quantum optimization with Qiskit

Intermediate level

Duration 3 hours

1. Quantum optimization basic concepts
  - Binary combinatorial optimization
  - Quadratic programs and MaxCut example
  - Notion of observable and cost function
  - QAOA et algorithmes hybrides quantiques-classiques
2. Programme d'optimisation en Python avec Qiskit
  - Construction of a graph
  - Conversion to an observable (Hamiltonian)
  - Evaluation of the cost function and the notion of optimizer
  - QAOA circuit assembly, implementation and results

## Practical Exercises Module

Intermediate level

Duration 3 hours

This module offers a series of practical exercises in quantum optimization applied to combinatorial optimization problems.



# 06. Quantum machine learning with Qiskit

This intermediate level workshop explores the possibilities offered by Qiskit in quantum machine learning for classification tasks as well as a practical exercises module.

## Quantum machine learning (QML)

Intermediate level

Duration 3 hours

1. Definition of the binary classification problem in machine learning
2. Basic concepts in quantum computing
3. Projection of classical data into quantum feature space
4. Variational quantum classifier (VQC)
5. Perspectives in quantum machine learning (QML)

## Practical Exercises Module

Intermediate level

Duration 3 hours

This module offers a series of practical exercises in applied quantum machine learning, including training a model for data set classifying tasks.



# 07. Deep dive workshop and applied implementation

Designed for scientific teams with a programming profile, this workshop offers an in-depth introduction to quantum computing tailored and applied to your field of interest, exploring different papers and their implementation.

## Workshop schedule

Intermediate level

Duration 20 hours on 10 weeks

Groups up to 6 people

1. Introduction to quantum computing from its foundations
2. Appropriation of the required quantum programming tools
3. Exploration of the first scientific paper and algorithm implementation
4. Exploration of the second scientific paper and algorithm implementation
5. Discussions on the approaches and results

# 08. Two-day quantum seminar

This two-day quantum seminar offers organizations a series of training courses in quantum programming as well as a tailored approach to identify avenues for exploring potential projects in quantum computing.

## Day 1

8h30 Welcome

9h00 Overview of Institut quantique and quantum computing

10h00 Break

10h15 Introduction to quantum computing

11h00 Introduction to quantum programming

12h30 Lunch break

13h30 Workshop on programming with Qiskit

15h00 Break

15h15 Recap and discussion on the organization's computational challenges

16h00 End of the day

## Day 2

8h30 Welcome

9h00 Choice among the following workshops:

- 04. Introduction to variational quantum algorithms
- 05. Quantum optimization with Qiskit
- 06. Quantum machine learning with Qiskit

10h00 Break

10h15 Continuation of the selected workshop

12h30 Lunch break

13h30 Programming workshop in connection with the morning workshop

15h00 Break

15h15 Recap and discussion on the organization's computational challenges

16h00 End of the day



# 09. Roadmap towards a quantum computing project

Organizations wishing to establish their strategic positioning in quantum computing can opt for a day workshop and a roadmap report towards a quantum computing project<sup>1</sup>.

## Workshop schedule

- 8h30 Discussion on the organization's computational challenges - group 1
- 9h45 Discussion on the organization's computational challenges - group 2
- 11h00 Discussion on the organization's computational challenges - group 3
- 12h00 Lunch break
- 13h00 Introduction to quantum computing
- 14h00 The state of the art in quantum computing
- 15h00 Break
- 15h15 Recap and discussion on the organization's computational challenges
- 16h00 End of the workshop

## Proposed report content<sup>2</sup>

- Introduction on quantum computing
- Identification of the organization's computational challenges
- Identification of exploratory avenues in quantum computing
- Roadmap on the next steps for starting a quantum computing project

(1) Gate-based approach to quantum computing

(2) 60-minute presentation of the final report to the organization

# Pricing 2024–25

Workshop	Pricing*	Fee per additional person
Basic workshop / Practical exercises module	2,500\$	250\$
Applied implementation workshop (20h)	7,800\$**	-
Two-day quantum seminar	8,250\$	825\$
Roadmap towards a quantum computing project	12,500\$	250\$

\* Pricing for groups up to 10 people

\*\* Maximum 6 people in the group

15% administration fee included

Additional travel and lodging expenses for in-person workshops apply

Prices shown exclude taxes

## Contact us

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Your quantum  
advantage starts  
here