

TQCI Seminar

Algorithms Session

November 14, 2024
EDF LAB Paris-Saclay



with the support of  Pasqal  welinq  quobly

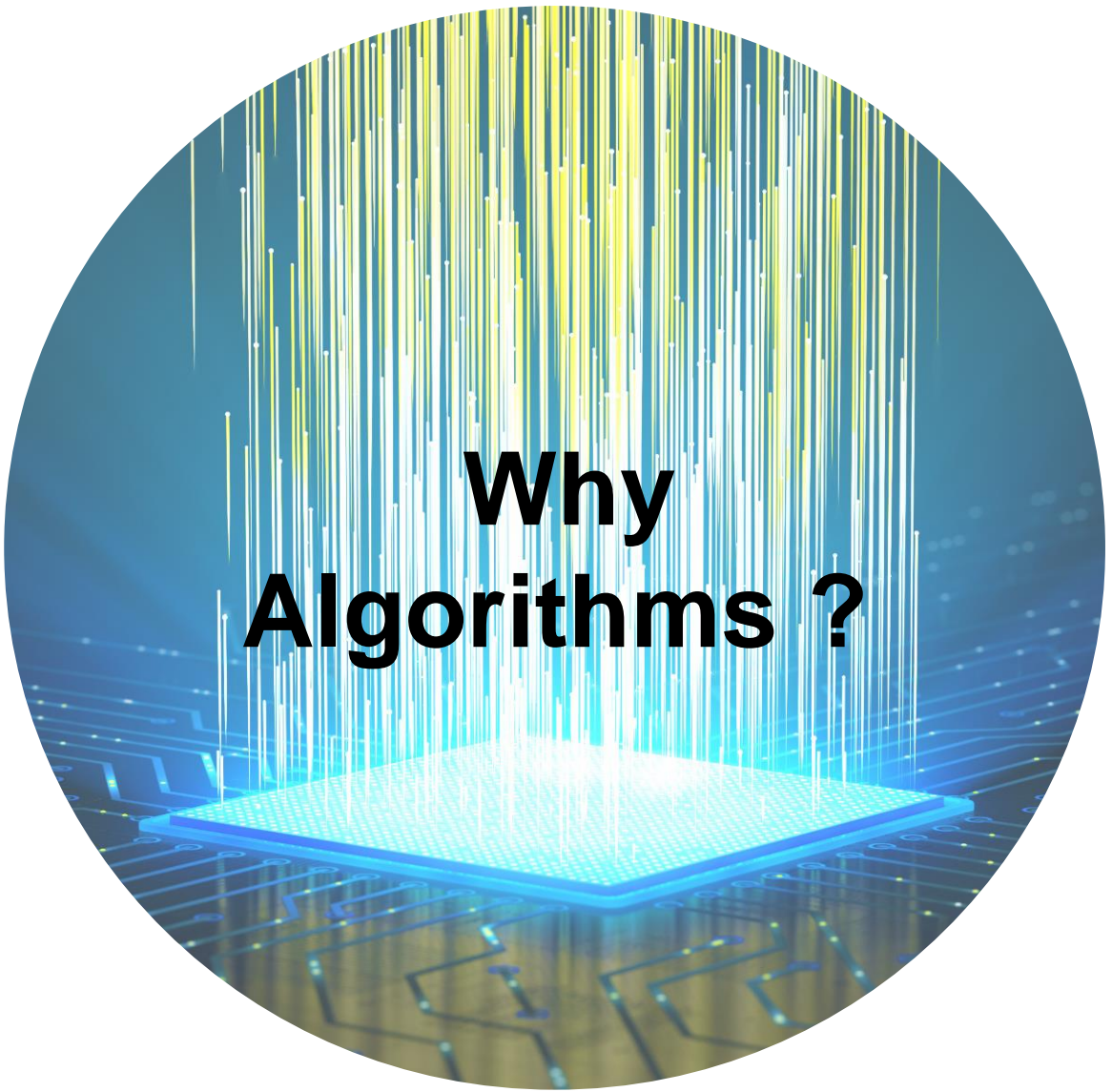


Welcome and Introduction

Antoine Michel, EDF
&
Christophe Domain, EDF

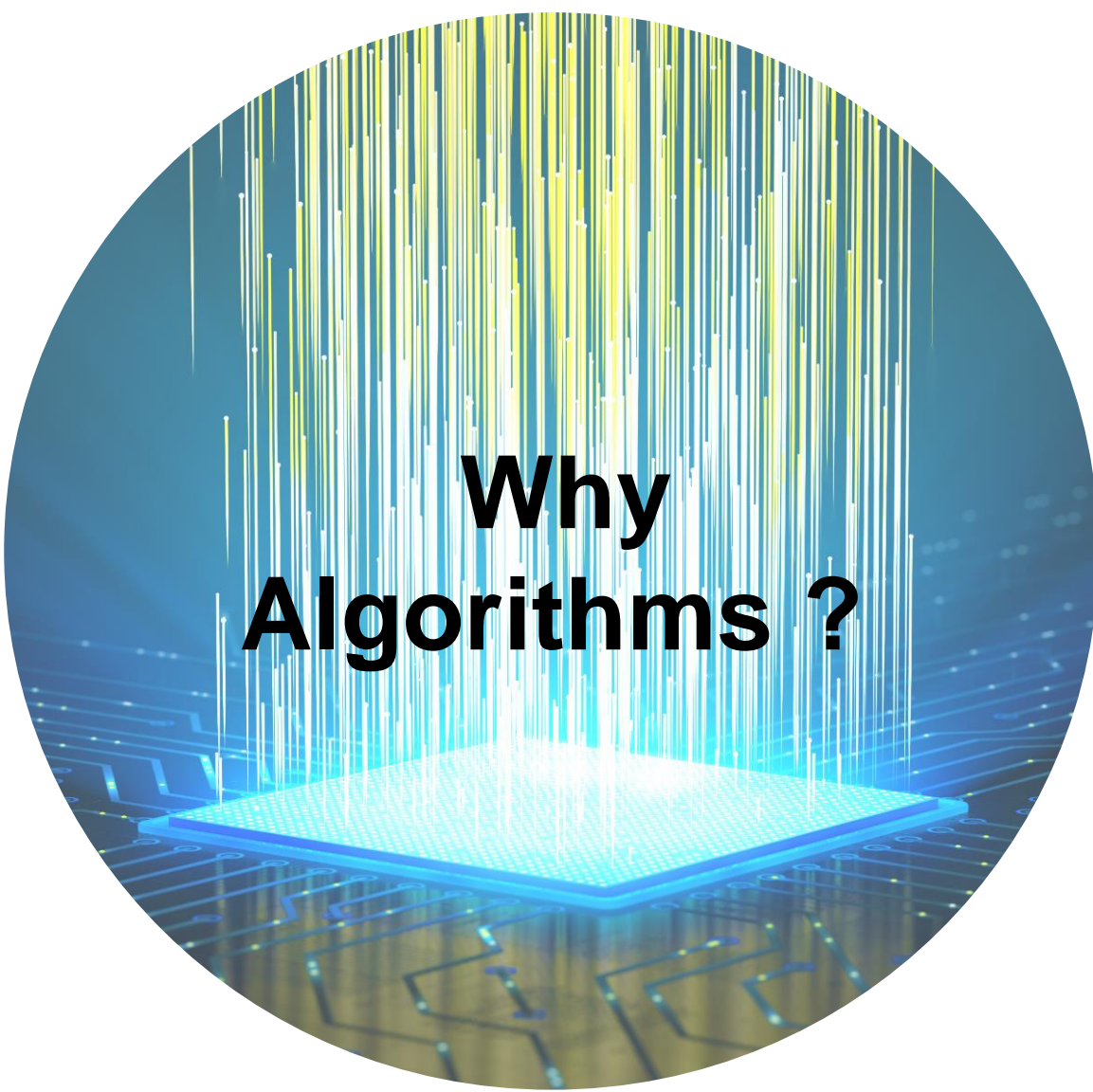


with the support of  Pasqal  welinq  quobly



**Why
Algorithms ?**

Quantum Computing



**Why
Algorithms ?**

**Why
Algorithms ?**

Quantum Computing



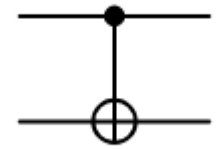
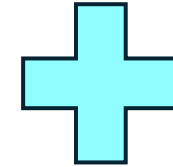
Quantum
Computer

**Why
Algorithms ?**

Quantum Computing



Quantum
Computer



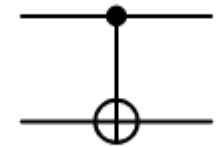
Quantum
Algorithm

**Why
Algorithms ?**

Quantum Computing



Quantum
Computer



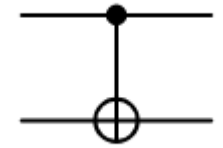
Quantum
Algorithm

**Why
Algorithms ?**

Quantum Computing



Quantum
Computer



Quantum
Algorithm

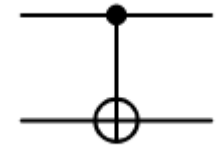
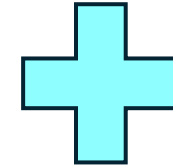
Classical
Algorithm

**Why
Algorithms ?**

Quantum Computing



Quantum
Computer



Quantum
Algorithm

Classical
Algorithm



Quantum
Algorithm



**A very
active field
of
research**

**A very
active field
of
research**

Google Scholar

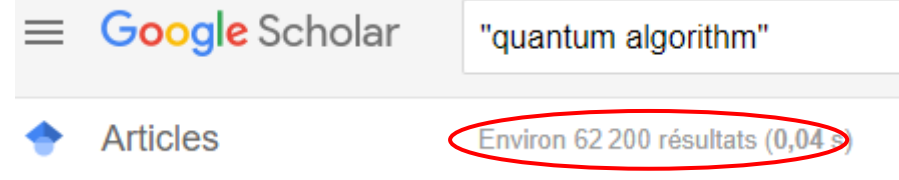
"quantum algorithm"

Articles

Environ 62 200 résultats (0,04 >)



**A very
active field
of
research**

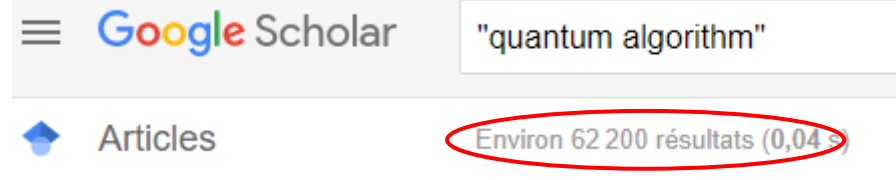


Applications

"quantum algorithm" and "machine learning" 12.100



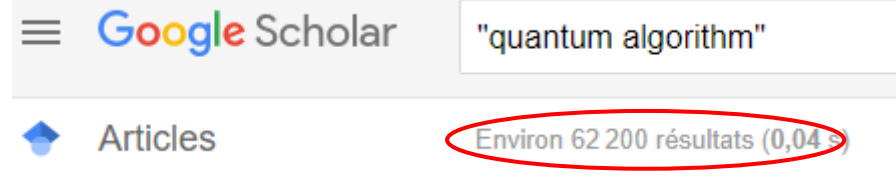
**A very
active field
of
research**



Applications

"quantum algorithm" and "machine learning" 12.100
"quantum algorithm" and "chemistry" 8.250

**A very
active field
of
research**

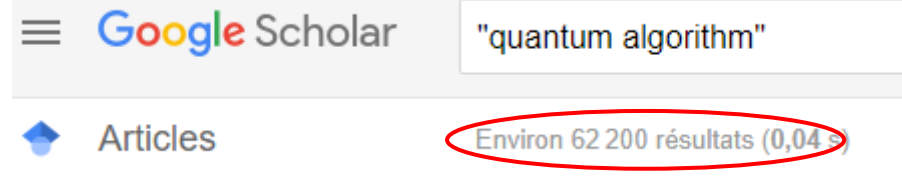


Applications

"quantum algorithm" and "machine learning" 12.100
"quantum algorithm" and "chemistry" 8.250
"quantum algorithm" and "materials science" 1790



**A very
active field
of
research**

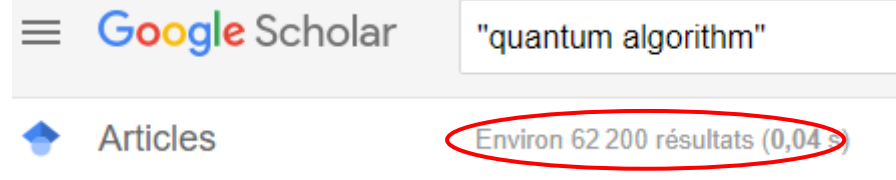


Applications

"quantum algorithm" and "machine learning" 12.100
"quantum algorithm" and "chemistry" 8.250
"quantum algorithm" and "materials science" 1790
"quantum algorithm" and "combinatorial optimization" 4290



**A very
active field
of
research**



Applications

"quantum algorithm" and "machine learning" 12.100

"quantum algorithm" and "chemistry" 8.250

"quantum algorithm" and "materials science" 1790

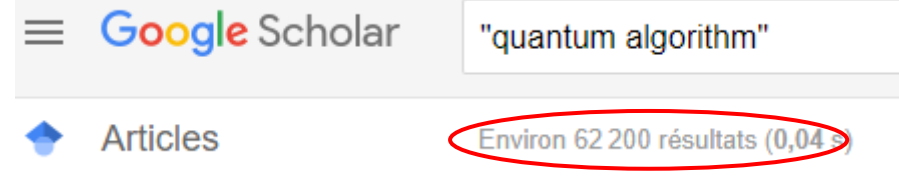
"quantum algorithm" and "combinatorial optimization" 4290

"quantum algorithm" and "linear algebra" 4290

And many more...



**A very
active field
of
research**



Applications

"quantum algorithm" and "machine learning" 12.100

"quantum algorithm" and "chemistry" 8.250

"quantum algorithm" and "materials science" 1790

"quantum algorithm" and "combinatorial optimization" 4290

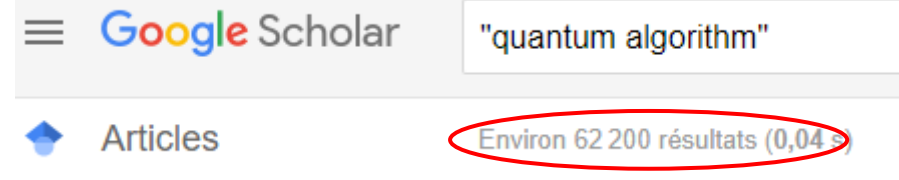
"quantum algorithm" and "linear algebra" 4290

And many more...

More than **100 articles** published **by month** in 2023



**A very
active field
of
research**



Applications

"quantum algorithm" and "machine learning" 12.100

"quantum algorithm" and "chemistry" 8.250

"quantum algorithm" and "materials science" 1790

"quantum algorithm" and "combinatorial optimization" 4290

"quantum algorithm" and "linear algebra" 4290

And many more...

More than **100 articles** published **by month** in 2023

**Today, the state-of-the-art in
several applications is presented**



Program

Algorithms Sessions

November 14th - morning

9h20

WELCOME AND INTRODUCTION
Antoine Michel, EDF

QUANTUM ALGORITHMS IN THE NISQ ERA

9h30

Probing many-body quantum states in large-scale experiments with an upgraded randomized measurements toolbox
Benoit Vermersch, QUOBLY

10h00

Materials science and chemistry with quantum algorithms: from the textbook to the processor
Thomas Ayrat, EVIDEN

10h30

COFFEE BREAK

TOWARDS INDUSTRIAL APPLICATIONS OF QUANTUM ALGORITHMS

11h00

Designing quantum algorithms for the electronic structure of strongly correlated systems
Matthieu Saubanère, CNRS Research Fellow, Bordeaux (LOMA)

11h30

Quantum computing for optimization problems
Philippe Lacomme, associate professor at the University of Clermont Auvergne (LIMOS)

12h00

Sampling rare events on quantum computers
Michel NOWAK, Thales Research & Technology

12h20

Quantum Algorithms for Distributed Quantum Computing
Ioannis Lavdas, Weling

Algorithms Sessions

November 14th - afternoon

TOWARDS INDUSTRIAL APPLICATIONS OF QUANTUM ALGORITHMS

14h00

Quantum Algorithms for Fracture Mechanics
Ulysse Rémond, EDF

14h20

Quantum Computing for Partition Function Estimation of a Markov Random Field in a Radar Anomaly Detection Problem
Timothé PRESLES, Thales Defense Mission Systems

MITIGATION OF NOISE : QUANTUM ERROR CORRECTION

14h40

From cat qubit to large scale fault-tolerant quantum computer: Alice & Bob's approach
Elie Gouzien, Alice & Bob

15h10

Algorithmic Fault Tolerance for Fast Quantum Computing
Chen Zhao, Quera

15h40

COFFEE BREAK

QUANTUM MACHINE LEARNING

16h10

Unsupervised Feature Selection Using Gaussian Boson Sampling
Jesusa Epequin, EDF China R&D

16h30

Subspace Preserving Quantum Machine Learning Algorithms
Léo Monbroussou, Naval group/LIP6

16h50

Reservoir quantum computing
Naomi Chmielewski, EDF

17h10

Understanding the role of data and learning through a quantum lens
Jarrod MCClean, Google



with the support of



Pasqal

weling



**Thank you very much
and enjoy !**