QUantum algorithms for massive DATA

Academic partners

Industrial partner

Coordinators

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https://www.irif.fr/~magniez/qudata/

Quantum algorithms

- The first generation of quantum algorithms has mostly addressed theoretical problems
- A second generation of quantum algorithms has made the field ripe for concrete applications, in part due to the recent development of new quantum algorithmic techniques for linear algebra

Quantum technology

- In a near future, will emerge at first
  - few devices manipulating limited quantum ressources
  - a mixed network of classical and quantum computing devices

Today problems

- An unprecedented amount of data is being constantly generated
- Already many efficient classical algorithms

Project goal

- A comprehensive analysis
  - of the potential of quantum computing
  - for processing massive data sets

Emerging directions

Machine learning and optimization

- Quantum machine learning: iterative methods, neural networks,…
- Optimization: linear/semi-definite programming, dynamic programming

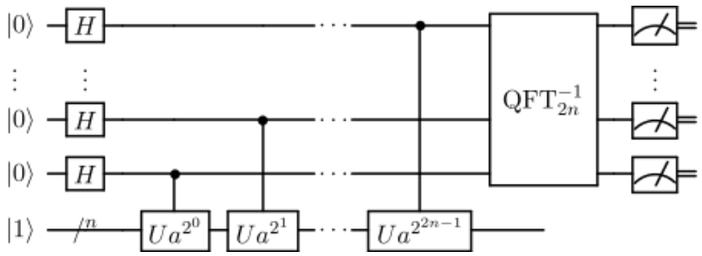
Models with restricted access to data

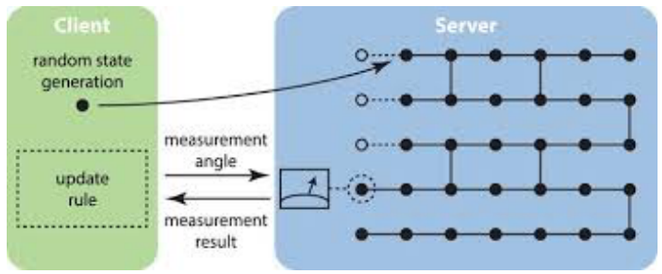
- Huge data, small memory
- Distributed input
- Delegated computation

Quantum software and resource optimization

- Real data sets / use cases
- quantum error correction

3 complementary groups





IRIF-LIP6: Quantum information

- Algorithms, complexity, cryptography
- Classical algorithms for massive data

  Streaming, Sampling, Distributed
- Communication complexity
- Quantum cloud computing, delegated quantum computation

LaBRI: Distributed computing

- Distributed algorithms, routing protocols
- Information theory
- Non-locality of quantum information
- Quantum error correcting codes

ATOS/Bull

- HPC, Big Data
- Machine learning
- Quantum computer simulator, "ATOS Quantum Learning Machine"

  Models for quantum hardware

Kickoff meeting - Today

- 10h-10h30: Bertrand MARCHAND (Atos)

  General overview of the Atos QC platform
- 10h30-11h: Anupam PRAKASH (IRIF)

  A quantum interior-point method for SDPs and LPs
- 11h30-12h: Alessandro LUONGO (Atos and IRIF)

  Quantum machine learning algorithms
- 13h30-14h: Simon MARTIEL (Atos)

  Overview of Atos research activities on NISQ
- 14h-14h30: Dominik LEICHTLE (LIP6)

  Post-quantum digital signatures
- 15h-15h30: Ghazal KACHIGAR (LaBRI)

  Distributed coloring with non-local ressources
- 15h30-16h: Yassine HAMOUDI (IRIF)

  Quantum Chebyshev's inequality and applications

Thematic meeting - February 20-21, 2019

- Focus on quantum distributed computing.