

Planning Quantum Stack

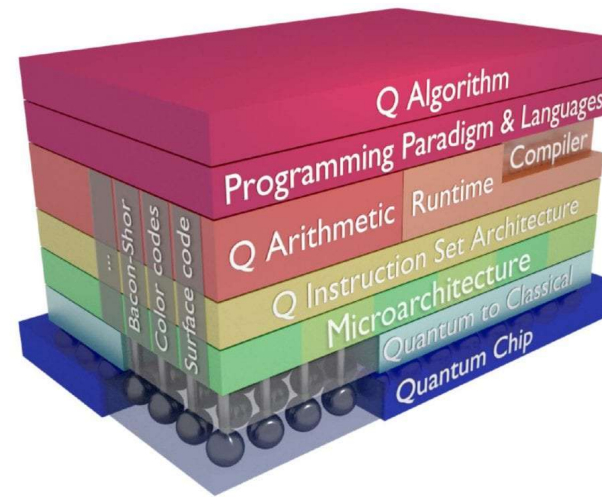
Minor Quantum Computing
Ed Kuijpers, e.a.kuijpers@hva.nl

26-4-2024

Creating Tomorrow

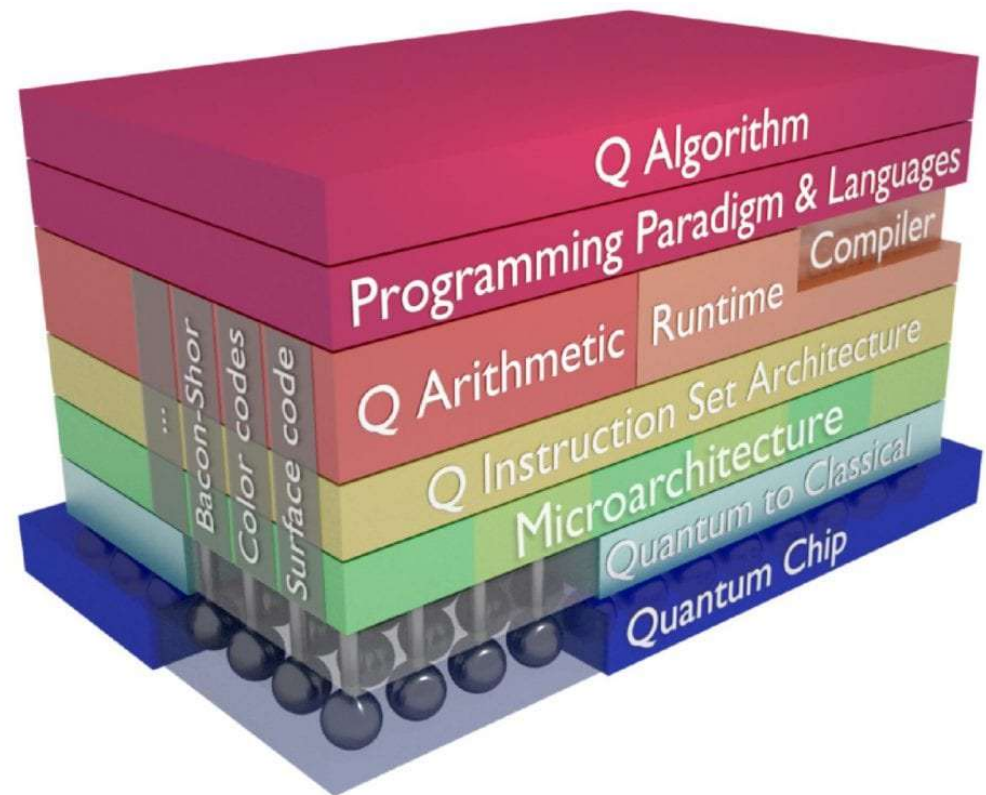
Topics

- Structure lessons
- Writing paper and presentation in phases
- Structure quantum stack
- Discussion topics for paper



Quantum Stack

- Abstraction layers
- Stack models



Structure lessons

- Each lesson presentation wil focus on a layer in Quantum Stack
- Students individually select Quantum stack topic for writing paper
- Students select, motivate and present a topic
- Students present draft paper/progress
- Finalize paper with final presentation



Draft schedule update

- Lesson 1: (19 April): introduction topics
- Lesson 2: (26 April) Quantum computing Languages + student paper proposals
- Lesson 3: (17 May) Transpiling and hardware + student paper proposals
- Lesson 4: (24 May) Quantum hardware + student proposals
- Lesson 5 (31 May): Quantum internet + progress reporting paper students
- Lesson 6 (7 June): Quantum Information, sensing and learning + progress reporting paper
- Lesson 7 (14 June): Quantum stack and ML + progress reporting
- Lesson 8 (18 June): Paper presentation
- Week B5 (Aug): Resit Presentation

Approach

- Assignment-1 proposed content paper
 - ✓ Title
 - ✓ Research questions
 - ✓ Motivation
 - ✓ Literature reference(s)
- Assignment-2 intermediate results
 - ✓ Draft paper material
 - ✓ Presentation intermediate results
- Intermediate feedback via paper and presentations
- Assignment-3 upload final paper
- Final presentation
- Grading

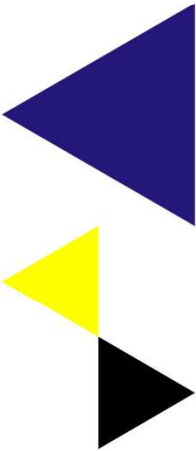


Background

- Previous experience for the Software for Science minor (before Quantum Computing)
- Number of pages (in English): effort in accordance with Credits (3 ECTS) and quality (7 – 12 pages) including some good figures
➤ <https://studiegids.hva.nl/co/hbo-ict-vt/100000042/100888>)
- In assessment: mix of software experiments with documentation appreciated
- Scientific format paper (LaTeX), backup pdf after MSWord conversion
- Diversity in topics to avoid too much overlap, interesting,
- Avoid grading work twice, i.e. team project result assessment and paper assessment not overlapping
- Topics lessons will be adapted to research questions as far as possible (lesson will not limited to one layer)
- New Qubit material (Graphene, gold based, superconduction at higher temperatures)

Paper proposals

1. Optical computing
2. Quantum coding (recent developments at Microsoft and IBM)
3. Transpiling comparisons/noise?
4. Theoretical design of a QPU
5. Quantum memory
6. Qubit interaction and physics/electronics



Discussion of paper topics

- Who is missing idea for topic?
- What information you need?
- References ?



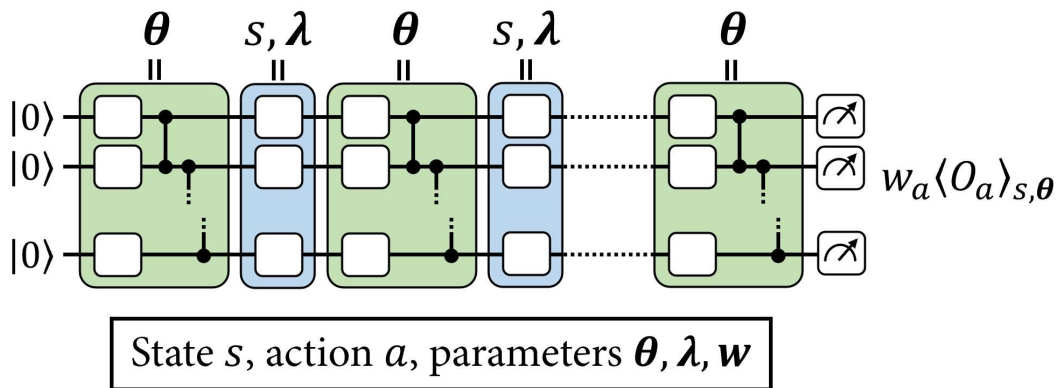
Python originates from Amsterdam

- Python developed by Guido van Rossum op het CWI
- https://nl.wikipedia.org/wiki/Guido_van_Rossum
- In 2015: <https://www.cwi.nl/en/news/25-years-of-python-at-cwi/>
- <https://www.cwi.nl/nl/stories/interview-guido-van-rossum-201cid-rather-write-code-than-papers201d/>
- Benevolent Dictator for Life (BDFL)

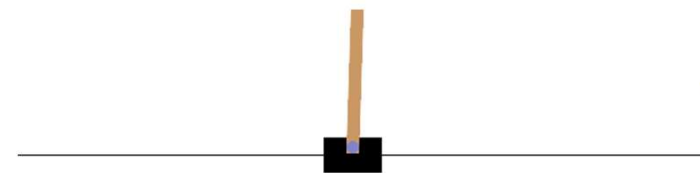


Tensorflow quantum

- <https://www.tensorflow.org/quantum>
- cartpole demo



		Type of Algorithm	
		<i>classical</i>	<i>quantum</i>
Type of Data	<i>classical</i>	CC	CQ
	<i>quantum</i>	QC	QQ



Creating Tomorrow