Alexandria Quantum Computing Group (AleQCG)

مركز التميز في الحاسبات الكمية
CENTER OF EXCELLENCE FOR QUANTUM COMPUTERS

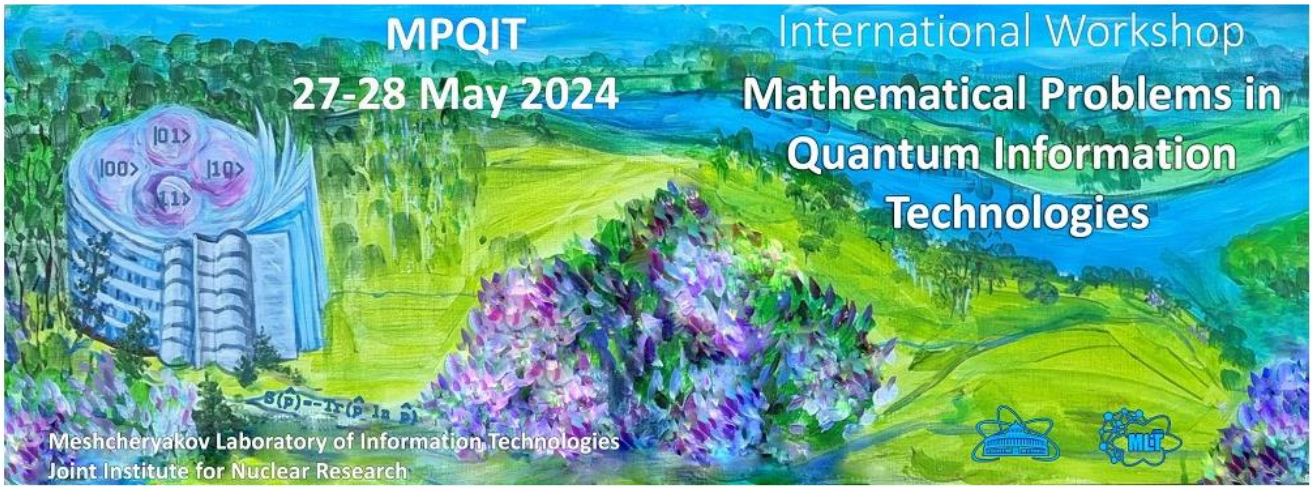
Advancements in Quantum Computing in Egypt: A Journey with the Alexandria Quantum Computing Group

Ahmed Younes

Vice-Dean for Education and Student Affairs

Professor of Quantum Computing, Alexandria University, Egypt

Founder & Leader of Alexandria Quantum Computing Group (AleQCG)



Who are we?

- **Alexandria Quantum Computing Group (AleQCG)** has been at the forefront of quantum computing research in Egypt since 2016. Situated in the Department of Mathematics and Computer Science at the Faculty of Science, Alexandria University, Egypt. AleQCG has started by the PhD and Master Students. AleQCG is currently a vibrant community of passionate individuals dedicated to advancing quantum computing knowledge, research, and applications.

- **Our Mission:**
  - **Research:** We aim to drive real-world impact by promoting quantum research and its practical applications.
  - **Innovation:** Explore cutting-edge developments in quantum hardware, software, and applications.
  - **Education:** We provide workshops, seminars, and hands-on sessions to demystify quantum concepts and algorithms.
  - **Collaboration:** Connect with like-minded peers, industry experts, and academia to foster collaboration and knowledge exchange.

http://www.sci.p.alexu.edu.eg/~aleqcg/

ALEQCG

Alexandria Quantum Computing Group (AleQCG)

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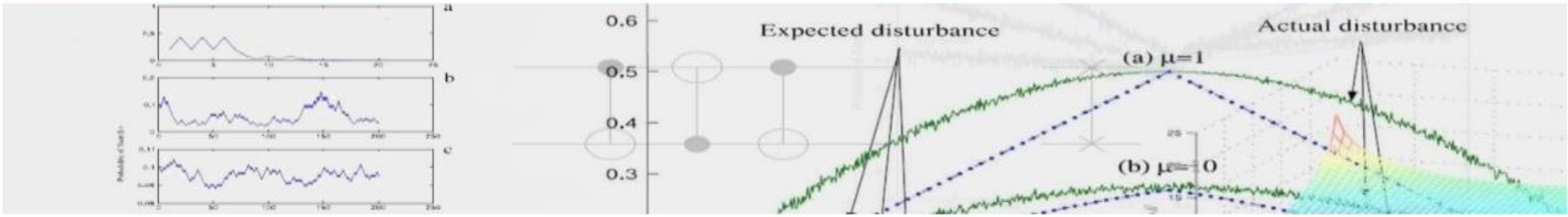


Overview

AleQCG is located in Department of Mathematics and Computer Science, Faculty of Science Alexandria University and has collaboration with researchers from:

- School of Computer Science, University of Birmingham, United Kingdom.
- Computer and Information Science Department, Universiti Teknologi PETRONAS, Malaysia.
- Mathematics Department, Zewail City of Science and Technology, Egypt.
- Department of Physics, Faculty of Science, Al-Azhar University, Egypt.
- College of Computing and Information Technology, Arab Academy for Science, Technology & Maritime Transport, Egypt.
- Egypt-Japan University of Science and Technology, Egypt.
- Department of Mathematics and Computer Science, Damanhour University, Egypt.
- Department of Information Technology, Institute of Graduate Studies and Research, Alexandria University, Egypt.
- Department of Mathematics, Faculty of Education, Alexandria University.

Faculty

Prof. Ahmed Younes
Professor of Quantum Computing

Dr. Ashraf Elsayed
Assistant Professor

Dr. Islam Elkabani
Assistant Professor

Post-Doctoral Staff

Dr. Rasha Montaser
Post-Doctoral

Dr. Mohamed Osman
Post-Doctoral

Sahar Saleh
PhD student

Master Students

Basma Elias
Demonstrator

Menna El-Masr
Demonstrator

Kholoud Elkholy
MSc student

Youstina Nabil
Demonstrator

Mohamed Shaban
Demonstrator

Mirna Hosny
Demonstrator

Sara Anwer
Demonstrator

Norhan Nasr
Demonstrator

Mariam Medhat
MSc Student

Doha Abd El-Fattah
Demonstrator

Kareem H. El-Safty
Researcher

Research in AleQCG

- Quantum Search Algorithms.
- Amplitude amplification techniques.
- Quantum Machine Learning.
- Synthesis and Optimization of Reversible/ Quantum Circuits.
- Quantum Data Encoding.
- Quantum Image Processing.
- Quantum Cryptography.
- Quantum Logic.
- Quantum Measurements.
- Quantum dot Cellular Automata.
- Quantum Internet.
- Merging between Quantum Computing and DNA Computing.

AleQCG Focus

1. **Quantum Algorithms:** AleQCG designs novel quantum algorithms to address complex computational problems, leveraging the unique properties of quantum systems.
2. **Quantum Circuit Synthesis and Optimization:** The group conducts pioneering research in optimizing quantum and reversible circuits, ensuring efficient utilization of quantum resources.
3. **Quantum Machine Learning:** AleQCG explores the intersection of quantum computing and machine learning, aiming to unlock new capabilities through quantum-enhanced models.
4. **Quantum Cryptography:** Investigating secure communication protocols based on quantum principles, AleQCG contributes to the field of quantum-safe cryptography.
5. **Quantum Dot Cellular Automata:** The group explores alternative quantum computing paradigms, including quantum dot cellular automata, which holds promise for future quantum technologies.

Quantum Computing in Egypt

Quantiki

Quantum Information Portal and Wiki

Groups

https://www.quantiki.org/groups

Quantiki

Quantum Information Portal and Wiki

Groups working in quantum computing and quantum information

Quantiki
Quantum Information Portal and Wiki

Groups working in quantum computing and quantum information

Alexandria Quantum Computing Group

Short name: AleQCG
Research type: Theory and Experiment
Web page: AleQCG

Location:
Alexandria University
El-Shatby Department of Mathematics and Computer Science, Faculty of Science
Alexandria
Egypt
31° 12' 27.1224" N, 29° 55' 8.094" E
See map: Google Maps
EG

Alexandria Quantum Computing Group (AleQCG) is located in Department of Mathematics and Computer Science, Faculty of Science, Alexandria University, Egypt.

AleQCG is interested in all aspects of research related to quantum computing, especially:
-Designing quantum algorithm to solve hard computational problems.
-Synthesis and optimization of quantum/reversible circuits.
-Quantum Inspired evolutionary algorithm.
-Quantum dot cellular automata.

Technical University of Denmark DTU – Center for Quantum Technologies (QuantumDTU)

University of Copenhagen – Niels Bohr Institute

Mexico

Instituto Politécnico Nacional – CITEDI

Finland

Aalto University – Quantum Computing and Devices (QCD)

South Korea

Sungkyunkwan University (SKKU) – Quantum Information Research Support Center (Q-Center)

Egypt

Alexandria University (AleQCG)

Singapore

Centre for Quantum Technologies (CQT) – National University of Singapore

Quantum Algorithms [2018-2024]

Quantum Algorithms ☆

Report from template

2018 to 2024

Data sources

Top countries/regions

Africa

reset filter

	Countries/Regions	Scholarly Output	Views Count	Field-Weighted Citation Impact	Citation Count
1.	Egypt	204	5,160	1.99	2,667
2.	South Africa	85	2,236	1.99	2,066
3.	Algeria	72	1,106	0.92	447
4.	Morocco	44	669	0.76	125
5.	Tunisia	33	491	1.28	250
6.	Nigeria	20	542	0.82	131
7.	Ghana	13	471	1.69	206
8.	Senegal	9	71	0.35	16
9.	Ethiopia	8	166	1.66	37
10.	Cameroon	6	81	0.27	19

Quantum Algorithms [2018-2024]

Quantum Algorithms ☆

Report from template

2018 to 2024

Data sources

Top Institutions

Africa | Egypt | All sectors | reset filter

	Institution	Scholarly Output	Views Count	Field-Weighted Citation Impact	Citation Count
1.	EGY **Alexandria University**	38	624	1.21	285
2.	EGY Al-Azhar University	25	667	1.71	414
3.	EGY Menoufia University	23	648	3.48	675
4.	EGY Sohag University	18	472	2.17	387
5.	EGY Cairo University	16	633	1.92	273
6.	EGY Zagazig University	14	310	1.53	110
7.	EGY Ain Shams University	13	475	0.84	151
8.	EGY Mansoura University	13	458	2.35	235
9.	EGY Zewail City of Science and Technology	13	585	2.62	355
10.	EGY Future University in Egypt	11	173	0.47	26

Topic T.7121 part of Topic Cluster TC.955 - Digital Signal Processing; Integrated Circuit Design; Theory of Computation

Logic Gate; Quantum Computer; Theory of Computation ☆

Report from template

2018 to 2024

Data sources

Top countries/regions

Worldwide

Table | Visualization

Metric guidance + Add to Reporting Export

	Countries/Regions	Scholarly Output	Views Count	Field-Weighted Citation Impact	Citation Count
1.	India	367	4,208	0.56	1,106
2.	Iran	55	1,253	1.04	314
3.	United States	45	501	0.82	185
4.	China	43	631	0.24	95
5.	Germany	30	353	1.54	93
6.	Austria	28	348	1.38	190
7.	Canada	16	150	1.08	57
8.	Bangladesh	11	103	0.25	24
9.	Iraq	11	284	0.39	48
10.	United Kingdom	11	183	0.75	48
11.	Malaysia	10	208	0.54	31
12.	Poland	10	106	0.11	6
13.	Spain	10	108	0.32	43
14.	Ukraine	10	251	0.50	22
15.	Egypt	9	126	0.91	26

Topic T.7121 | part of Topic Cluster TC.955 - Digital Signal Processing; Integrated Circuit Design; Theory of Computation

Logic Gate; Quantum Computer; Theory of Computation ☆

Report from template

About this Topic Beta

2018 to 2024

Data sources

Top Institutions

Africa | All countries/regions in Africa | All sectors | reset filter

Table | Visualization

Metric guidance | + Add to Reporting | Export

Top 100 Institutions in this Topic, by Scholarly Output.

Heatmap

Scroll to Home Institution

	Institution	Scholarly Output	Views Count	Field-Weighted Citation Impact	Citation Count
1.	EGY **Alexandria University**	7	106	0.41	23
2.	MAR Abdelmalek Essaâdi University	2	18	0.00	0
3.	EGY Academy of Scientific Research and Technology	2	21	0.30	4
4.	EGY Damanhour University	2	33	0.48	6
5.	DZA Frères Mentouri Constantine 1 University	2	30	1.45	7
6.	MAR Ibn Tofail University	2	18	0.00	0
7.	TUN University of Monastir	2	35	0.00	0
8.	MAR University of Moulay Ismail	2	18	0.00	0
9.	TUN University of Sousse	2	43	0.25	4
10.	DZA Yahia Fares University of Médéa	2	30	1.45	7

Topic T.3993 part of Topic Cluster TC.128 - Image Processing; Public-Key Cryptography; Quantum Computing

Quantum Computer; Grover Algorithm; Computational Complexity ☆

Report from template

2018 to 2024

Data sources

Top countries/regions

Worldwide

	Countries/Regions	Scholarly Output	Views Count	Field-Weighted Citation Impact	Citation Count
1.	China	133	2,061	0.52	594
2.	United States	130	1,433	0.84	588
3.	India	118	1,268	0.69	298
4.	Japan	49	579	0.78	165
5.	Russian Federation	44	812	0.34	108
6.	South Korea	41	497	0.72	154
7.	United Kingdom	37	554	1.65	332
8.	Brazil	32	317	0.20	53
9.	Spain	30	317	1.13	108
10.	Canada	29	446	0.54	151
11.	Italy	22	226	1.23	68
12.	Germany	21	376	1.08	95
13.	Hungary	20	183	1.65	74
14.	Taiwan	16	128	0.45	47
15.	Australia	15	156	0.40	75
16.	France	13	84	1.31	29
17.	Egypt	12	179	1.04	100

Topic T.3993 | part of Topic Cluster TC.128 - Image Processing; Public-Key Cryptography; Quantum Computing

Quantum Computer; Grover Algorithm; Computational Complexity ☆

Report from template

2013 to 2022

Data sources

Top Institutions

Africa | All countries/regions in Africa | All sectors | reset filter

	Institution	Scholarly Output	Views Count	Field-Weighted Citation Impact	Citation Count
1.	EGY **Alexandria University**	8	105	0.20	40
2.	EGY Sohag University	5	101	0.23	16
3.	EGY Zewail City of Science and Technology	5	96	1.69	82
4.	EGY Al-Azhar University	4	93	0.43	55
5.	NGA Kano University of Science and Technology	4	48	0.29	4
6.	EGY Ain Shams University	3	56	1.07	25
7.	EGY Mansoura University	3	73	4.65	101
8.	MAR Mohammed V University in Rabat	3	24	0.00	1
9.	ZAF University of KwaZulu-Natal	3	57	0.20	17
10.	NGA Abubakar Tafawa Balewa University, Bauchi	2	10	0.84	24

Topic T.4450 | part of Topic Cluster TC.9 - Quantum Optics; Quantum Key Distribution; Photonics

Quantum Cryptography; Secret Sharing; Authentication ☆

Report from template

2013 to 2022

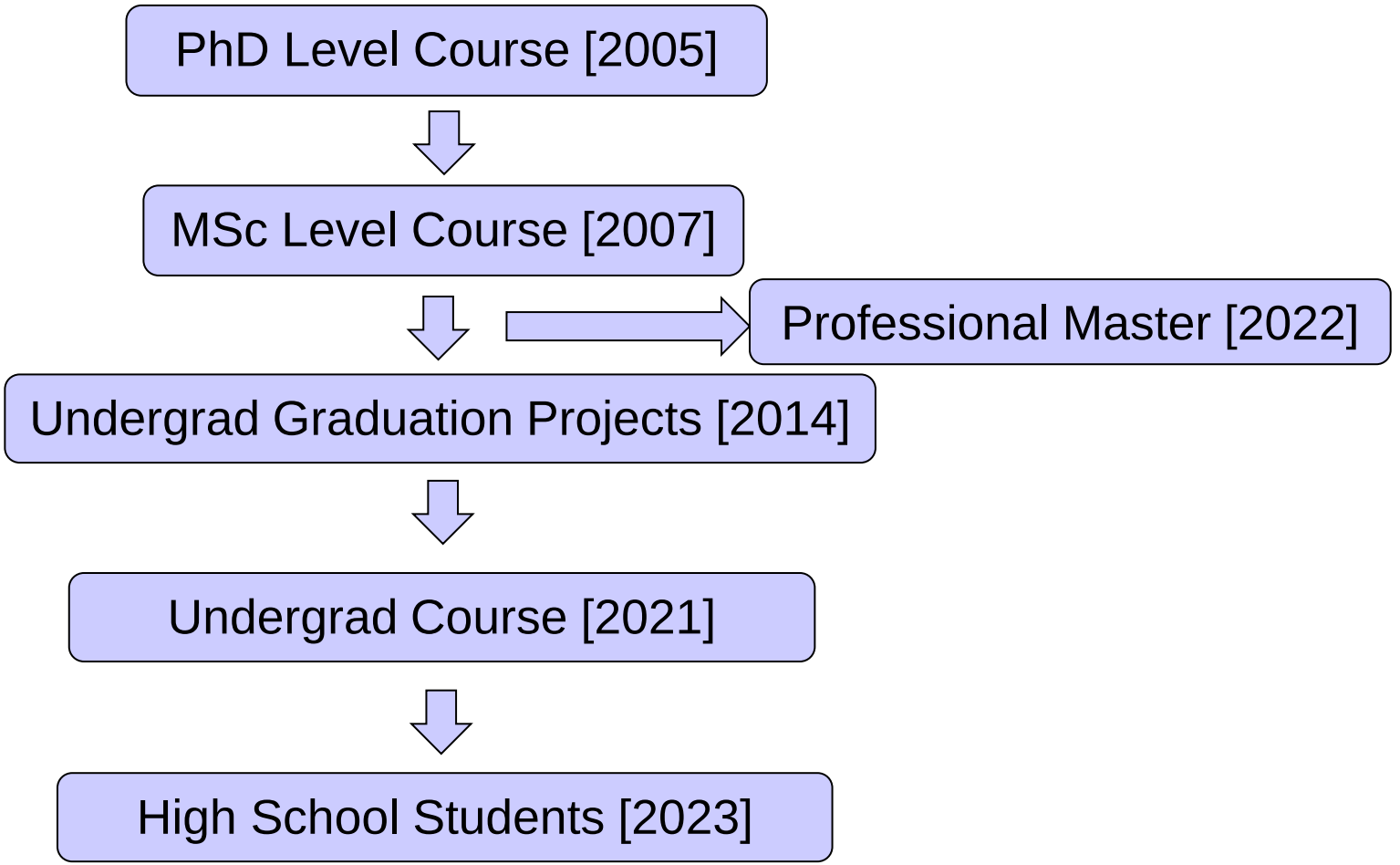
Data sources

Top countries/regions

Worldwide

	Countries/Regions	Scholarly Output	Views Count	Field-Weighted Citation Impact	Citation Count
1.	China	1,580	24,502	1.19	24,079
2.	Taiwan	126	2,084	1.17	2,320
3.	India	109	1,713	1.23	1,960
4.	United States	87	1,290	1.04	1,254
5.	United Kingdom	46	945	2.06	1,776
6.	Iran	40	806	1.00	547
7.	South Korea	39	768	0.58	388
8.	Australia	37	798	0.89	490
9.	Canada	36	718	1.51	1,033
10.	Poland	31	581	0.72	462
11.	Egypt	29	511	1.19	491

Establishment of AleQCG



One day conference of Quantum Computer and Quantum Information

Faculty os Science, Alexandria University
July 26, 2016, Egypt

AlexU-QCSS19
Alexandria Quantum Computing Summer School, 14-20 July 2019

Alexandria One Day Conference on Quantum Computing and Quantum Information

July 2019. (AlexU-QCQIC19)

AlexU-QCWS21

Alexandria Quantum Computing Winter School, 1-5 February 2021

Workshop of Quantum Computer and Quantum Information, 3 February 2021

AlexU-QCSS19

Alexandria Quantum Computing Summer School, 14-20 July 2019

AlexU-QCSS19 .. Conference Day

ALEΦCG

Alexandria One Day Conference on Quantum Computing and Quantum Information

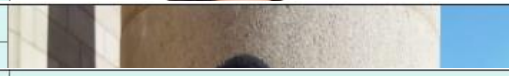
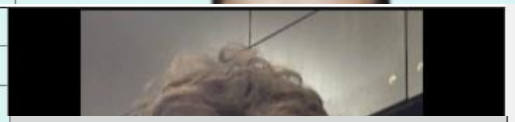
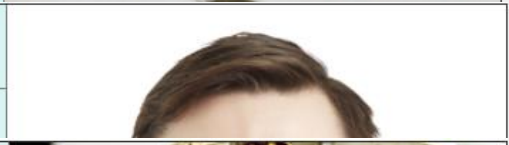
July 2019. (AlexU-QCQIC19)

AlexU-QCWS21

Alexandria Quantum Computing Winter School, 1-5 February 2021

Workshop of Quantum Computer and Quantum Information, 3 February 2021

Invited Talks

Title:Quantum Game Theory: The Quest for Optimal Quantum Technology Speaker:Faisal Shah Khan	
Title:An Introduction to Quantum Machine Learning. Speaker:Amira Abbas	
Title:Quantum computing in Africa. Speaker:Farai Mazhandu	
Title:Non-Classical Computing Problems: Toward Novel Type of Quantum Computing Problems Speaker:Dr. Mohamed Zidan	
Title:A Gentle Introduction to the Quantum Approximate Optimization Algorithm Speaker:Zoltán Zimborás Time:1:00 PM to 1:45 PM	
Title:The Application of Quantum Annelaing to Solving VRP and its Variants. Speaker:Bio Pawel Gora Time:3:00 PM to 3:45 PM	
Title:Quantum Machine Learning with PennyLane Speaker:Thomas Bromley	
Title:"Superconducting Qubit Architecture" Speaker:Nick bronn Time:5:00 PM to 5:45 PM After earning his Ph.D. in Condensed Matter Physics from the University of Illinois, supported in part by a National Science Foundation Graduate Research Fellowship, Nick joined IBM Quantum as a post-doctoral researcher in 2013. Continuing as a Research Staff Member since 2015, he has been responsible for developing and integrating quantum hardware and deploying quantum systems over the cloud, and now focuses on enabling Qiskit on different hardware platforms, hardware-focused quantum applications, and education of the quantum community at large.	

Alexandria Quantum Computing Hypatia Series

#hypatia_aqc

Hypatia
(born c. 350–370; died 415 AD)

https://en.wikipedia.org/wiki/Hypatia

Alexandria Quantum Computing Hypatia Series

#hypatia_aqc

Hypatia
(born c. 350–370; died 415 AD)

https://en.wikipedia.org/wiki/Hypatia

Center of Excellence for Quantum Computers, Faculty of Science, Alexandria University, 2020

In Cooperation with

- Quantum Computing and Information Group, Theoretical Physics Department, Wigner Research Centre for Physics, Budapest, Hungary.
- Quantum AI Foundation, The Warsaw Quantum Computing Group, Faculty of Mathematics, Computer Science, and Mechanics, University of Warsaw, Banacha 2, 02-097 Warszawa, Poland.
- ITI – Information Technology Institute, Alexandria, Egypt.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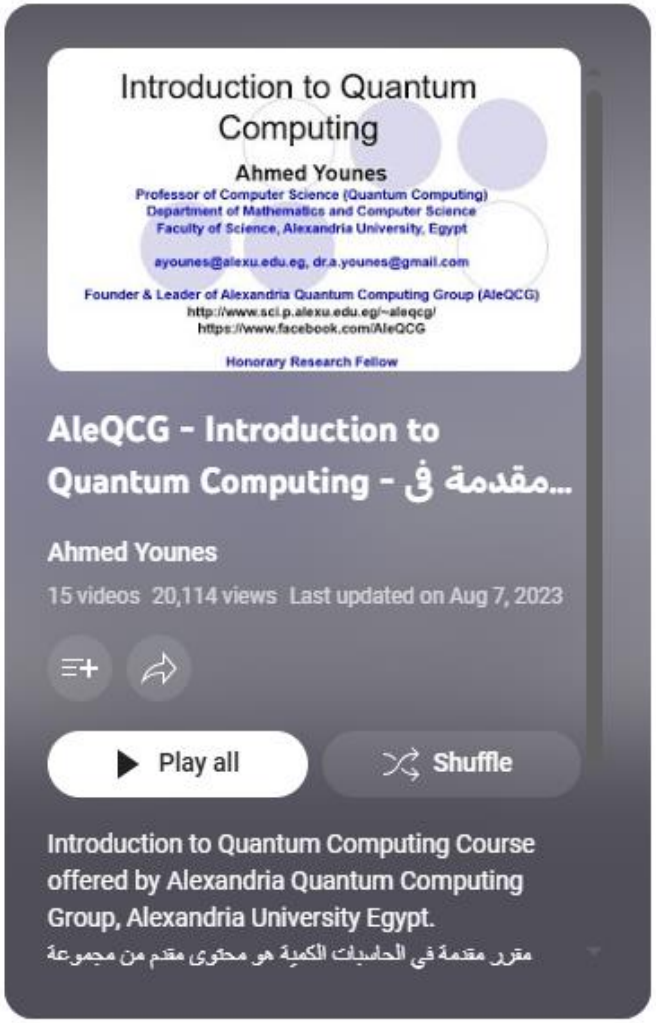
UNIVERSITY
مركز التميز في الحاسبات الكمية
CENTER OF EXCELLENCE FOR
QUATUMN COMPUTERS



1 

1-Quantum Computing - Introduction | AleQCG

Ahmed Younes • 6.6K views • 4 years ago

2 

2- Quantum Computing - Basics of Quantum Computing | AleQCG

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3- Quantum Computing - Linear Algebra for QC | AleQCG

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4 

4- Quantum Computing- Quantum Measurement and Entanglement | AleQCG

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5 

5- Quantum Computing - Single Qubit Gates | AleQCG

Ahmed Younes • 2.2K views • 4 years ago

6- Quantum Computing - Universal Single Qubit Gates |

https://www.youtube.com/playlist?list=PLkpYqKNqc_Cud5sLg896FsnbkoQiHlkpZ

QWORLD

QCOUSINS

Egypt

JOINT INSTITUTE FOR NUCLEAR RESEARCH
1956 - 2016

QUANTUM AI
FOUNDATION

Tennessee TECH

GUC
German University in Cairo

GUC Microptics Lab.
Enabling innovative photonic systems

أكاديمية البحث العلمي والتكنولوجيا
Academy of Scientific Research & Technology
ScienceUP

معهد تكنولوجيا المعلومات
Information Technology Institute (ITI)
وزارة الإتصالات وتكنولوجيا المعلومات

PRINCE OF SONGKLA UNIVERSITY

WORLD QUANTUM DAY
APRIL 14

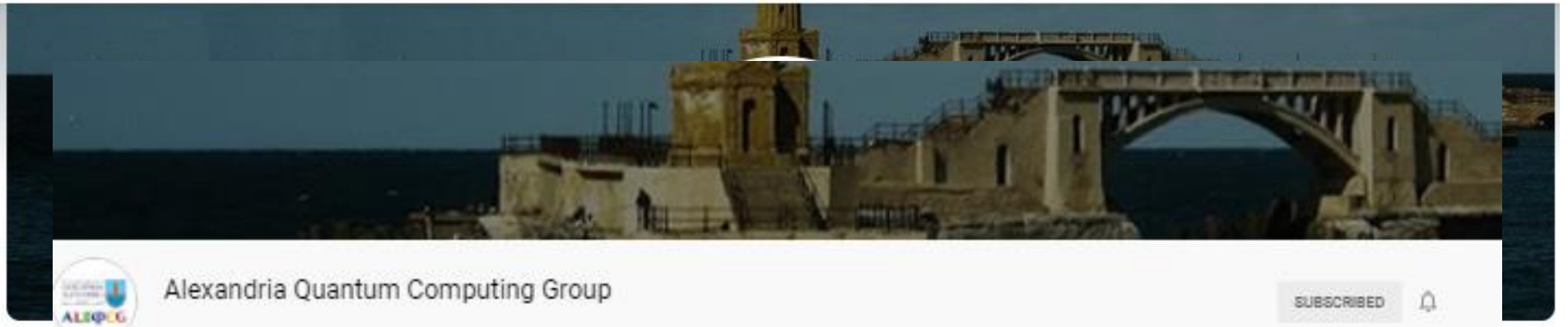
wigner
Wigner Research Centre for Physics
All Colors of Physics

Technical University of Munich

ONE QUANTUM AFRICA

Warsaw Quantum Computing Group

Washington DC Quantum Computing Meetup Group



Alexandria Quantum Computing Group

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Quantum Logic Circuits
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IBM Quantum Experience
7 views · 1 month ago

Quantum Simulators using Qiskit, exploring Qiskit gate...

Closing Notes and Future Directions of The Quantum...

Introduction to Quantum Computers

Quantum Algorithms: Teleportation & Dense...

Quantum Simulators using Qiskit, exploring Qiskit gate...

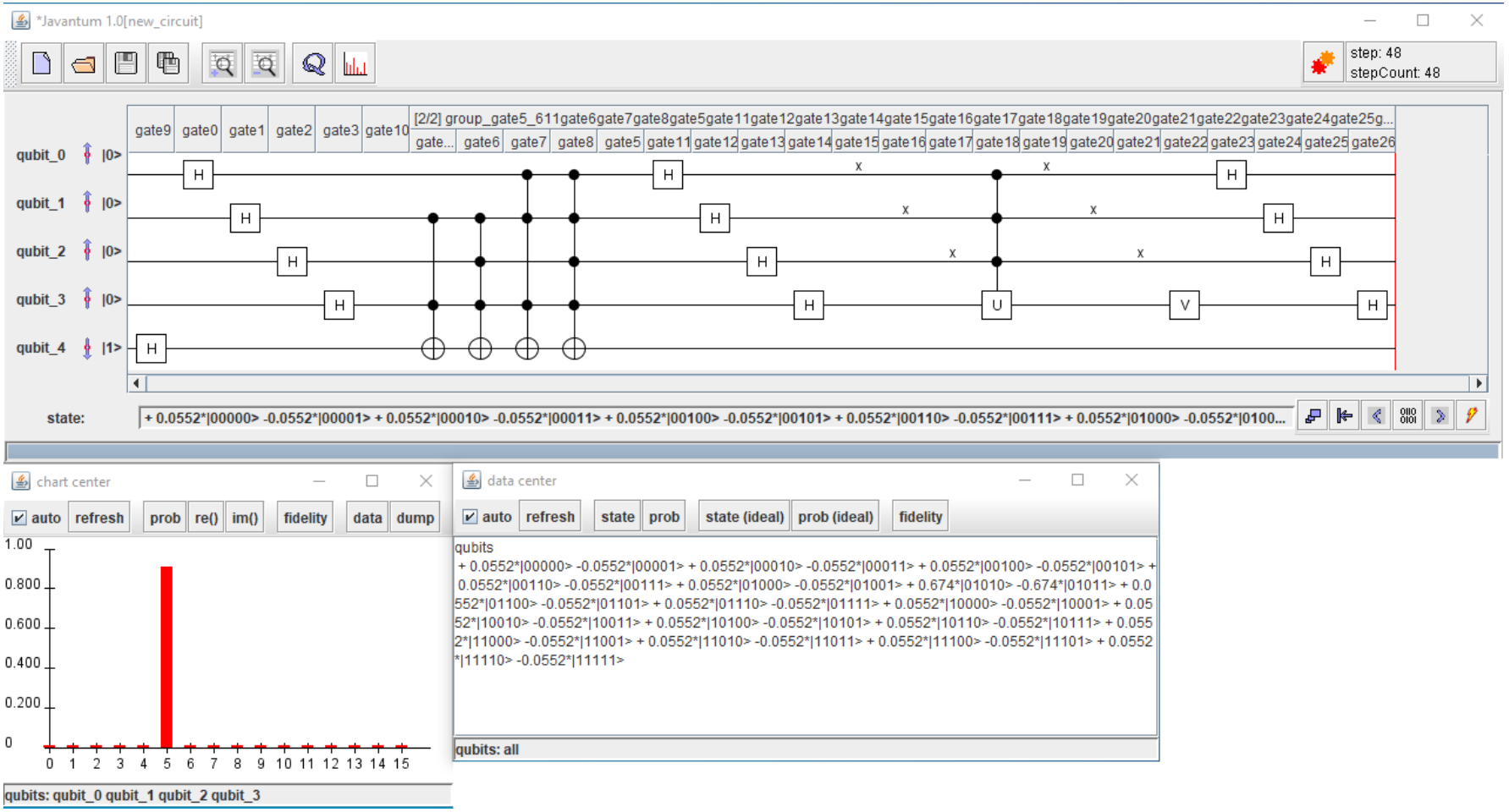
Quantum Boolean Circuits Practical session using RC...

Software and Simulators

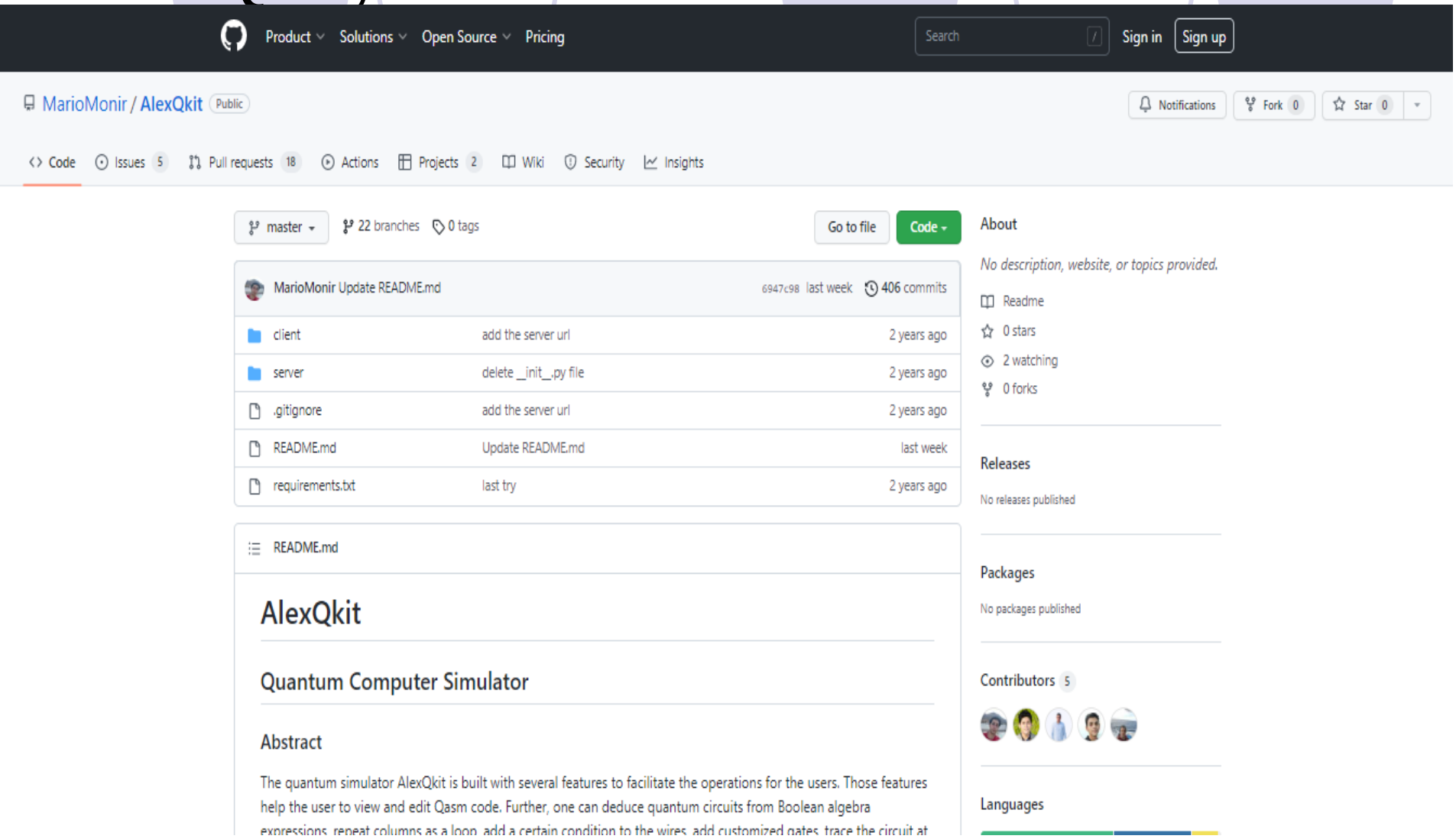
AlexQkit is an interactive quantum simulator that is used to visualize and simulate quantum computing. The quantum circuits can be exported to run on IBMQ devices.. AlexQkit has been developed as a graduation project under the supervision of Prof. Ahmed Younes and Eng. Kareem H. El-Safty in 2020 from Department of Mathematics and Computer Science, Faculty of Science, Alexandria University by Mario Monir, Freddie Samy, Mohamed Hassan, and Mohamed Hamdy.

Javantum is an interactive quantum simulator that is used to visualize and simulate quantum computing on classical computers. It is purely developed using Java 8 based on the interactive quantum computer simulator jaQuzzi 0.1 . Javantum has been developed as a graduation project from Department of Mathematics and Computer Science, Faculty of Science, Alexandria University in 2016 by Fatimah Ahmed, Yehya Beram, Muhammad Al-Alem, Muhammad Kamal, Muhammad Mahmoud, Muhammad Salah and Nayera Ali under the supervision of Dr. Ahmed Younes.

Javantum, 2016



AlexQkit, 2020



QWORLD

QCOUSINS

QWorld (Association) is a non-profit global organization that brings quantum computing researchers & enthusiasts together.

Our main goal is to popularize quantum technologies and software.

Also, through education and skill development opportunities, QWorld is training the next generation of quantum scientists.

qworld.net

qworld.net

QWORLD

EVENTS PROJECTS QCOUSINS QEDUCATION QRESEARCH ABOUT US QWORLD

OUR DEPARTMENTS

qworld.net/qegypt/

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EVENTS PROJECTS QCOUSINS QEDUCATION QRESEARCH ABOUT US QWORLD

QCOUSINS

QEgypt is founded in April 2021 by the main pillars of the Alexandria Quantum Computing Group (at Faculty of Science, Alexandria University) that abides by the law of the Ministry of Higher Education in Egypt. The main advantage of those pillars is that Alexandria Quantum Computing Group has members from different academic backgrounds and universities. QEgypt is established on embracing innovative ideas and the strong belief of communicating the revolution of Quantum Computing to the community.

The main goal is to create a more engaging and fruitful environment for creating new quantum educational material and a strong research base that can help researchers and universities in academia and also pave the way for new industrial adopters of quantum technologies. Our diverse team below is eager to widen its circle of connections and open to collaborations in different research areas within the field of quantum information science.

2021

We invite you to our social media channels!

Facebook | LinkedIn

QWORLD

QBronze

The introductory level workshop series on the basics of quantum computing and quantum programming.

QWORLD

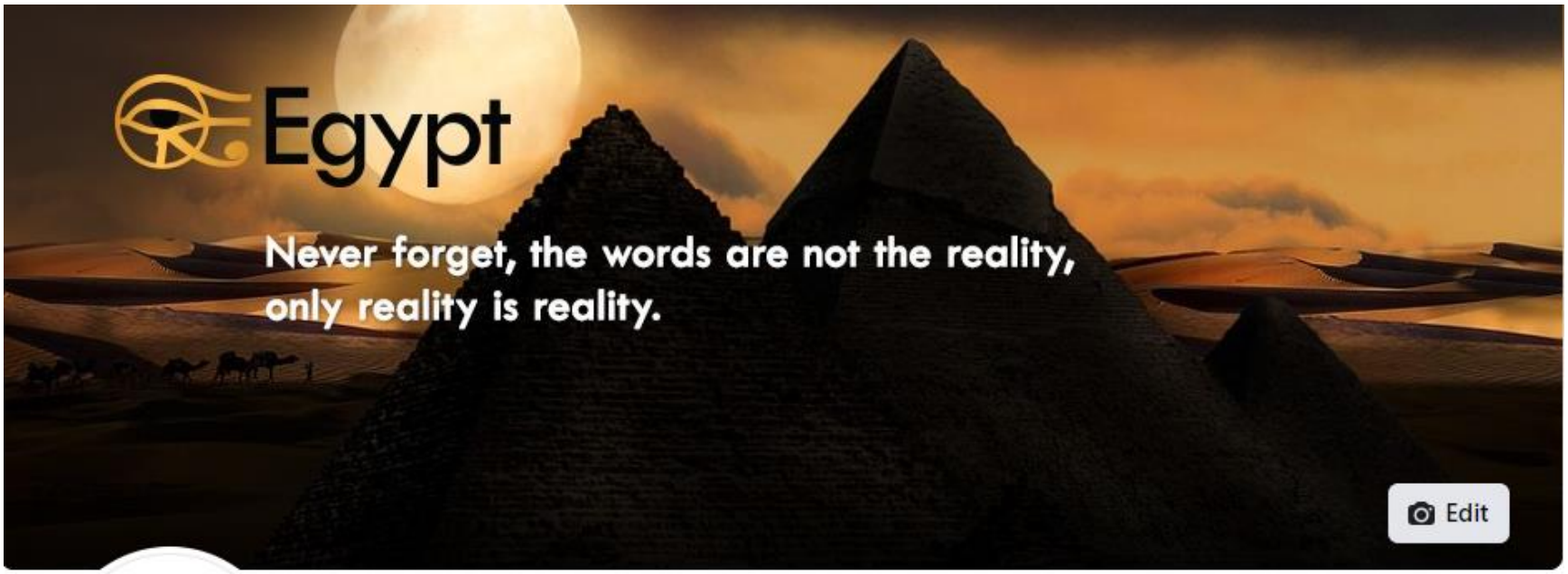
QNickel

The elementary level workshop series on quantum computing and programming focusing on oracular quantum algorithms.

QWORLD

QSilver

The intermediate level workshop series on quantum computing and programming.



QEgypt

@QuEgypt · Educational Research Center

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QEgypt

QEgypt is affiliated with QWorld collaborating on education and implementation of Quantum Computing technologies.

Research · Alexandria · 168 followers

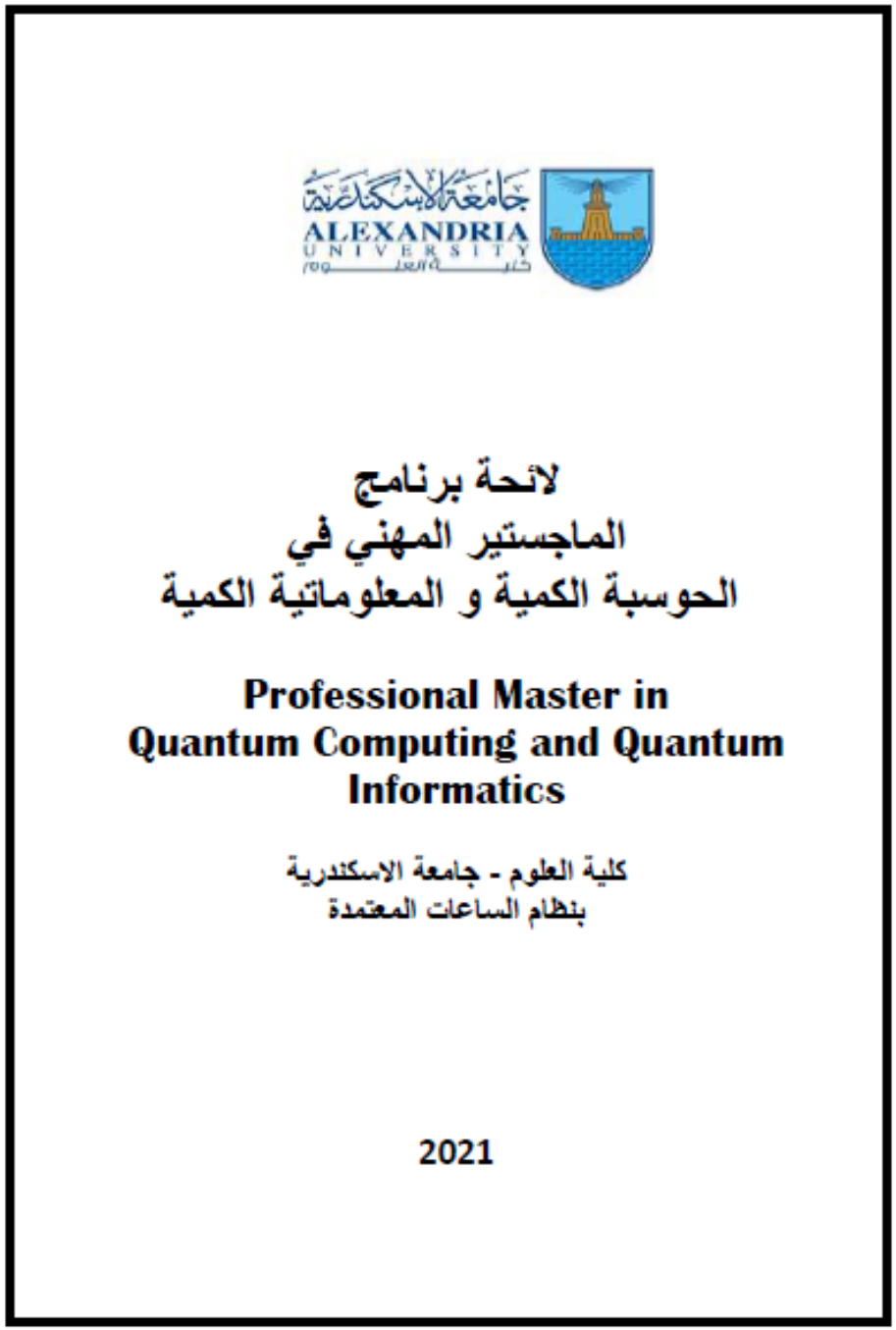

Egypt
Young Researcher 2022
ALEXANDRIA UNIVERSITY
مركز التميز في الحاسبات الكمية
CENTER OF EXCELLENCE FOR QUANTUM COMPUTERS
ALEXANDRIA UNIVERSITY
ALEQCG
#QEYR22

Professional Master in Quantum Computing and Quantum Informatics

36 Credits

- Mandatory Courses: 15 Cr.
- Elective Courses: 15 Cr.
- Project: 6 Cr

- Cover All required background
  - Mathematics
  - Computer Science
  - Physics
  - Engineering



Core Courses

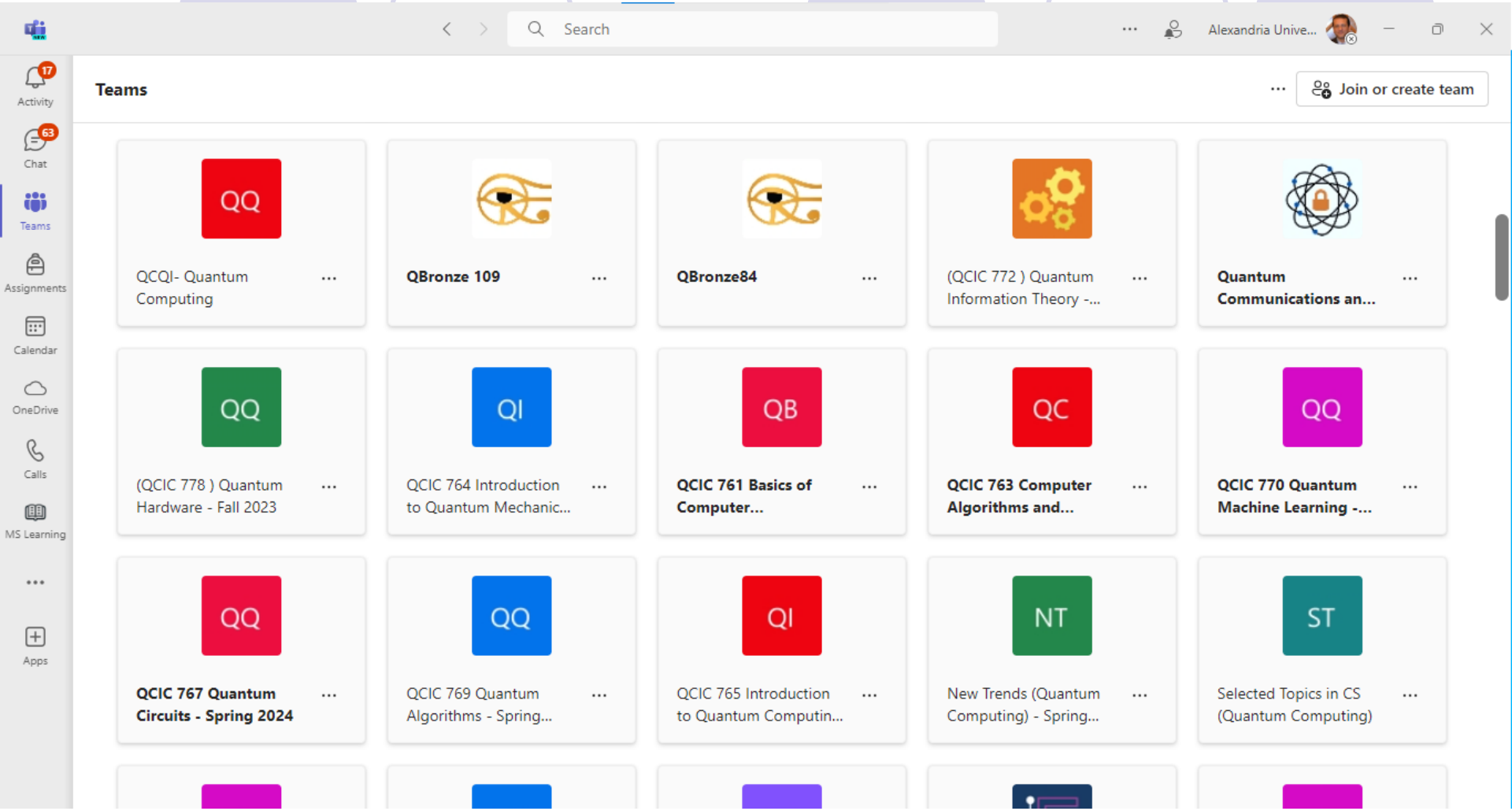
15 Cr + 6 Cr Research Project

Course Title	Lec.	Lab.	Cr.
Basics of Computer Programming	2	2	3
Introduction to Probability and Statistics	2	2	3
Computer Algorithms and Models of Computations	2	2	3
Introduction to Quantum Mechanics	2	2	3
Introduction to Quantum Computing	2	2	3
Project	6	-	6

Elective Courses

15 Cr

Course Title	Lec.	Lab.	Cr.
Quantum Circuits	2	2	3
Reversible Computing	2	2	3
Quantum Algorithms	2	2	3
Quantum Machine Learning	2	2	3
Quantum Communications and Cryptography	2	2	3
Quantum Information Theory	2	2	3
Quantum Error-Correction	2	2	3
Quantum Image Processing	2	2	3
Quantum Dot Cellular Automata	2	2	3
Adiabatic Quantum Computing	2	2	3
Nanoelectronics for Quantum Computing	2	2	3
Quantum Hardware	2	2	3
Photonic Quantum Computing	2	2	3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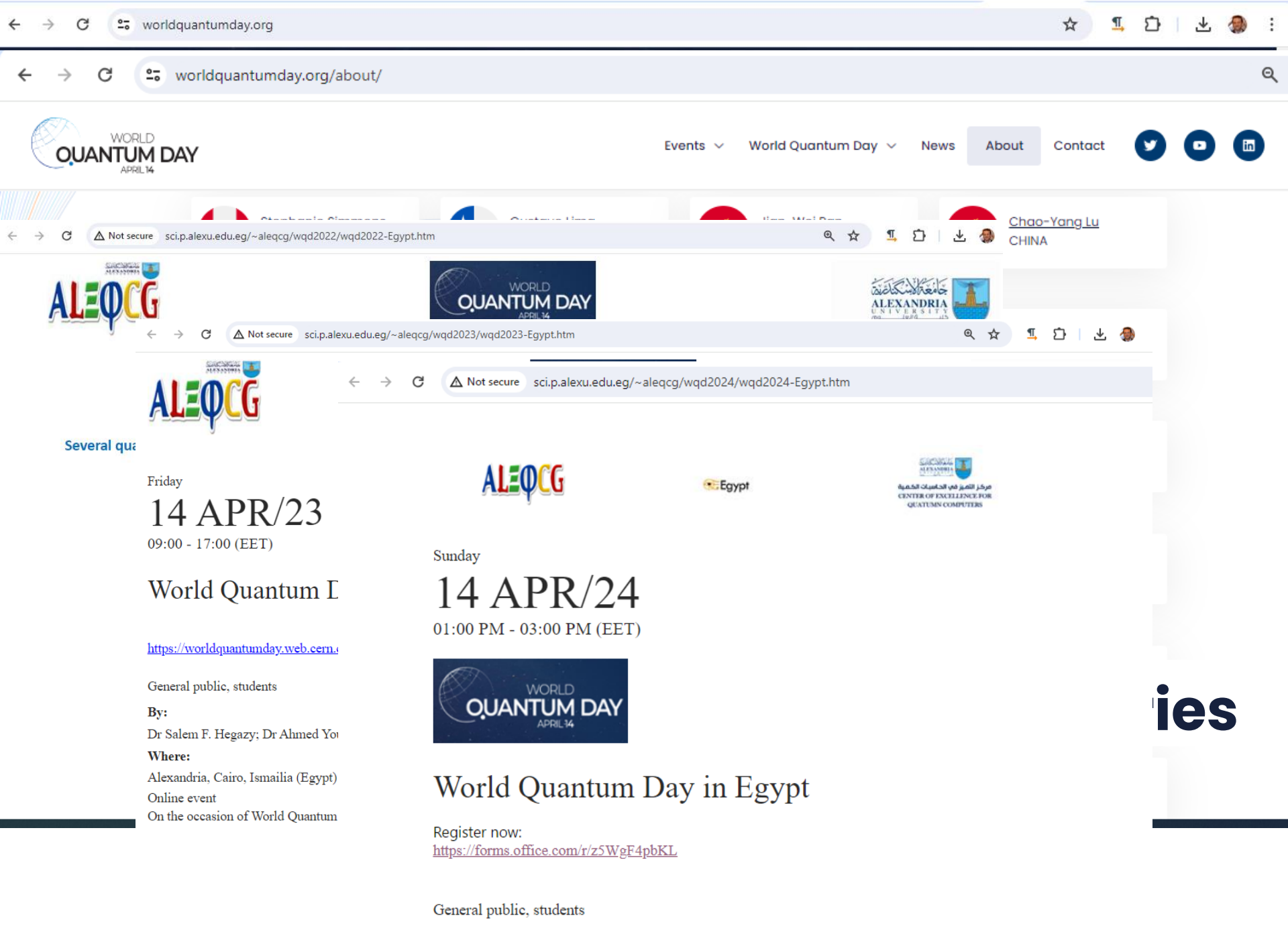
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General public, students
By:
Dr Salem F. Hegazy; Dr Ahmed Yo
Where:
Alexandria, Cairo, Ismailia (Egypt)
Online event
On the occasion of World Quantum
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مركز التميز في الحاسبات الكمية
CENTER OF EXCELLENCE FOR QUATUMN COMPUTERS
Sunday
14 APR/24
01:00 PM - 03:00 PM (EET)
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World Quantum Day in Egypt
Register now:
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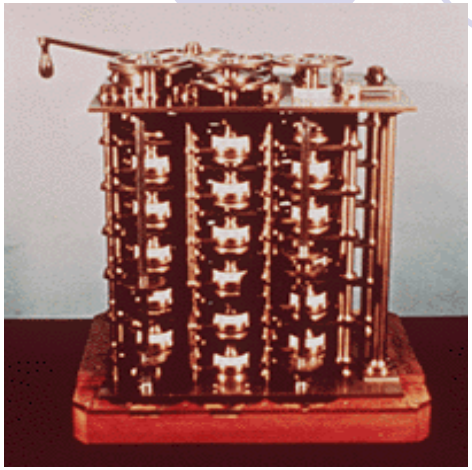
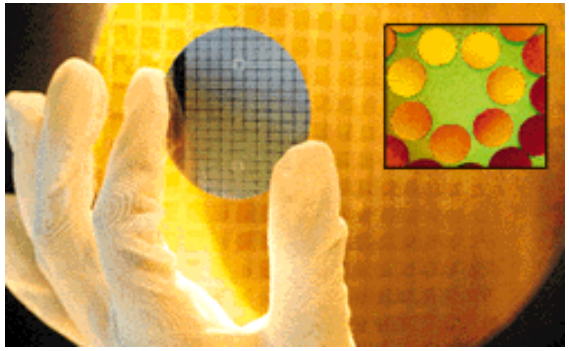
Quantum Computer Programming for High School Students

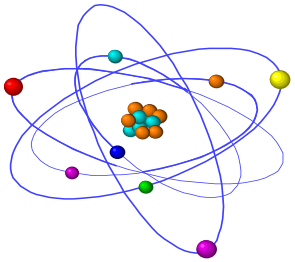
Future Plan

1. **Industry Demand:**
   - **Challenge:** Many software companies in Egypt and the Middle East seek guidance on integrating quantum computing into their technology stack.
   - **Opportunity:** Address this demand by providing expertise and solutions.
2. **Our Role:**
   - **Advisory Services:** Offer advice on quantum computing adoption.
   - **Talent Acquisition:** Connect companies with skilled professionals.
   - **Startup Support:** Facilitate the establishment of quantum-focused startups.
3. **Benefits:**
   - **Innovation:** Quantum computing enables breakthroughs in various fields.
   - **Economic Growth:** Supporting startups contributes to the region's tech ecosystem.

Thank You …. Questions!!!







Computer technology is making devices smaller and smaller…

…reaching a point where classical physics is no longer a suitable model for the laws of physics.

ayounes.page.tl

ayounes@alexu.edu.eg