DLAB CTE-CAGLIARI

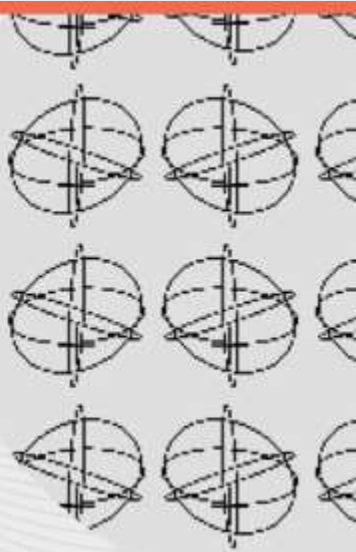
CRS4

ONLINE HACKATHON

Quantum code challenge

Innovative Quantum Algorithms for Smart Cities

22-25 OCTOBER 2024



THE EVENT IS ENDORSED BY

QITALY

PDC MIMIT - FSC 2014-2020 Programma di supporto tecnologie emergenti nell'ambito del SC Asse I Progetto "CDL - Casa delle Tecnologie Emergenti di Cagliari" CUP G37F22000040006

FSC abinsula GreenShare TIM WiData

TEAM QUANT-INO

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@Paolo Marino

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@Silviu Robert Plesoiu

https://github.com/crs4/QuantumCodeChallengeHackathon

IDEA Simulation Zone: Cagliari – 001

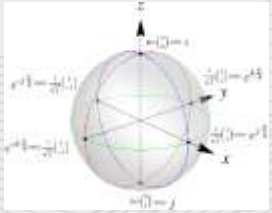
Monitoring

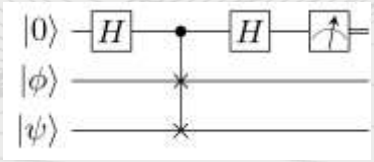
https://github.com/GitPabloCode/QUANT-ino

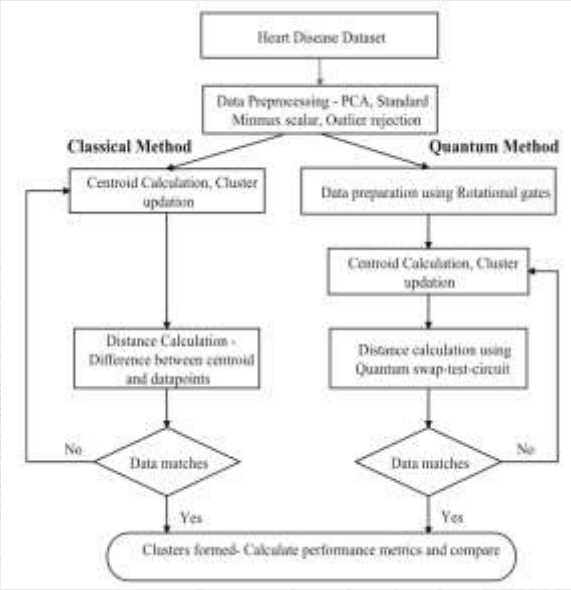
Q – means clustering

- Quantum k-means clustering is optimal for unsupervised learning to detect pattern and **anomalies** in dataset

- The proposed **methodology** involves preprocessing a dataset, converting the classical data to quantum states and calculating distances using a quantum circuit.







- The **quantum** approach showed **improvements** in processing time and clustering performance compared to classical K-means. The results showed improved accuracy, sensitivity and reduced processing times.

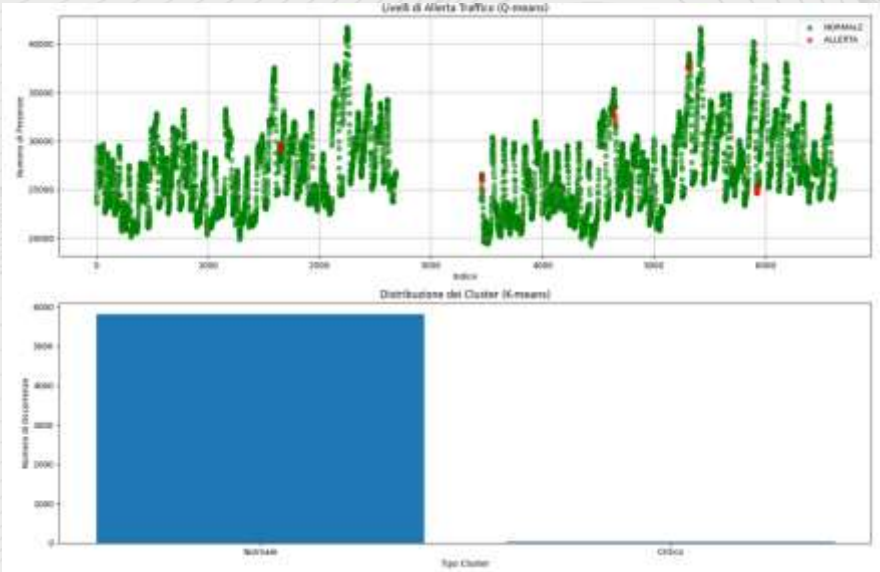
❑ Kavitha, S. S., & Kaulgud, N. (2022). "Quantum K-means clustering method for detecting heart disease using quantum circuit approach." In Soft Computing (Vol. 27, Issue 18, pp. 13255–13268). Springer Science and Business Media LLC. https://doi.org/10.1007/s00500-022-07200-x

IMPLEMENTATION

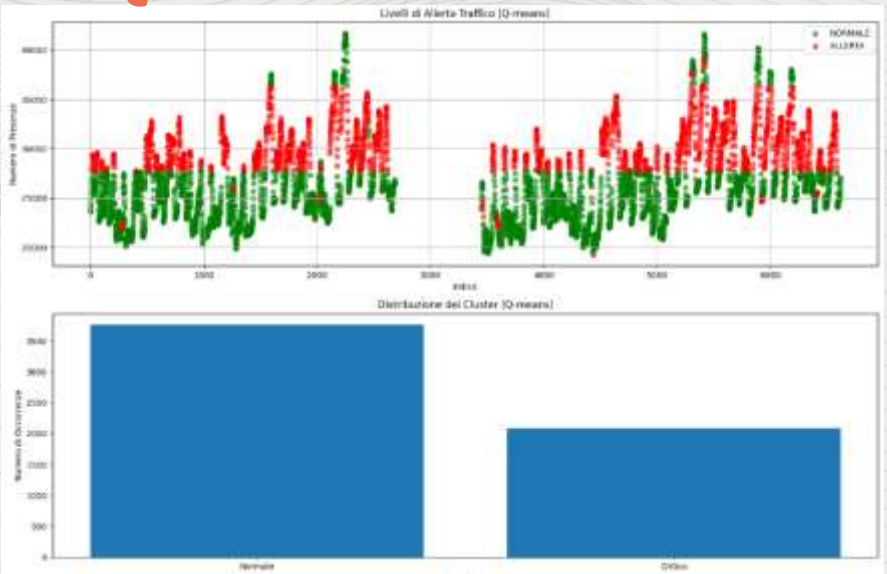
qBraid

PENNYLANE

Classic k-means



Quantum k-means



https://github.com/GitPabloCode/QUANT-ino

Unity

Cagliari - 001

CityGen3D is a Unity plugin for procedurally generating 3D cities using real map data such as OpenStreetMap.

VIDEO

https://www.youtube.com/watch?v=Q6rhuSUnB9Q

PROPOSALS
(to improve the project)

- **Real time** data thanks to improvement of data processing with **quantum** machine learning

- **Virtual reality** application to facilitate **user** access to data, like police officer

- **Large language model** to interpret data

- **Grover**'s Algorithm to enhance Q-means by accelerating centroid searches and convergence speed (using **Qbraid's Nec Machine**)

Thanks for your attention