

NETWORK TRAFFIC ANOMALY DETECTION **WITH QUANTUM- NATIVE MACHINE LEARNING**

MARENOSTRUM ONA

Led by



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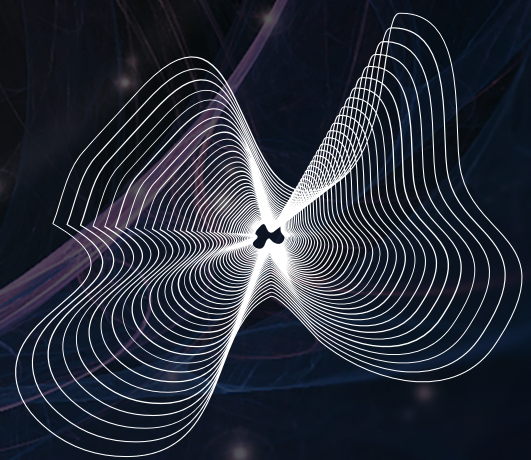
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1 BEYOND “CLASSICAL” QUANTUM MACHINE LEARNING



Most quantum machine learning algorithms are **direct adaptations of classical techniques**

This approach doesn't take into account **inherent quantum features with no classical equivalent** like superposition, interference or Hilbert space structure



The team's approach was to **exploit these quantum directly properties** to sort data, instead of “translating” classical algorithms

THE ROLE OF RES QUANTUM RESOURCES

2

They could **test the feasibility of their approach** thanks to having access to MareNostrum-Ona



This allowed to **test in real hardware conditions,** instead of using purely simulated environments

They could also **understand practical limitations** to the approach related to **noise and hardware constraints**

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DEVELOPING A NEW MODEL WITH QISKIT

The team developed **a new quantum-native classification model with Qiskit**



Jaime Bielza has been the responsible of the design and programming of the model

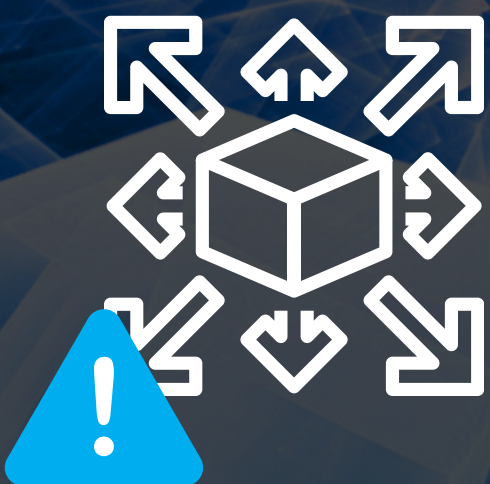
They tested the model **with standard benchmarks** (classifying flowers, wines, and potential breast cancers), **financial fraud detection data and network traffic datasets**



LAYING THE FOUNDATION FOR QUANTUM-NATIVE ALGORITHMS

4

The quantum-native algorithm **performed competitively in these benchmarks** under specific conditions



Scalability remains a key, open challenge that could be tackled **when quantum computers become more fault-tolerant** and less noisy

Cybersecurity is a promising potential application, where this approach **could detect threats that “classical” quantum algorithms couldn’t**





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