



Contribution ID : 103

Type : presentation (QT PhD program student)

On the Implementation of Fuzzy Inference Engines on Quantum Computers

venerdì 2 settembre 2022 19:10 (15)

Quantum computers can be a revolutionary tool to implement inference engines for fuzzy rule-based systems. In fact, the use of quantum mechanical principles can enable parallel execution of fuzzy rules and allow them to be used efficiently in complex contexts such as distributed and big data environments. Our research introduces the very first quantum-based fuzzy inference engine that is capable of providing exponential acceleration in fuzzy rule execution compared to its classical counterpart, and allows a quantum computer to be programmed by fuzzy linguistic rules. The proposed inference engine was implemented using a quantum algorithm design scheme based on the oracle notion. This scheme allows the modeling of a fuzzy rule-based system as a Boolean function, the oracle, which is able to reconstruct the relationships between the antecedent and consequent parts of fuzzy rules, and can be efficiently computed on a quantum computer. The suitability of the proposed quantum algorithm for use as a fuzzy inference engine was tested in typical benchmark scenarios, such as that provided by inverted pendulum control.

Primary author(s): Prof. ACAMPORA, Giovanni (Department of Physics 'Ettore Pancini', University of Naples Federico II); Mr. SCHIATTARELLA, Roberto (Department of Physics 'Ettore Pancini', University of Naples Federico II); Dr. VITIELLO, Autilia (Department of Physics 'Ettore Pancini', University of Naples Federico II)

Presenter(s): Mr. SCHIATTARELLA, Roberto (Department of Physics 'Ettore Pancini', University of Naples Federico II)

Session Classification : Students Talks 3