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Quantum Kernels: Challenges and Solutions

Prof Alessandra Di Pierro (University of Verona, Italy)

Monday, 3 July 2023 | 16h00 – 17h00 SAST

Venue: in person* and online

** Neelsie Cinema, Stellenbosch University*

--- Cheese and wine will be served at the venue ---

ABSTRACT

Kernel methods in machine learning rely on a mathematical theory similar to the theory of quantum computation, as they both use Hilbert spaces for accomplishing their tasks.

At the base of this similarity is the notion of feature map, embedding input data from their original domain into a Hilbert space of higher dimensionality in order to find a linear separation among data. Quantum kernels are essentially obtained from the inner product functions in the Hilbert space of quantum states encoding classical data. The use of this seemingly easy method actually brings about several problems in the choice of the appropriate embedding leading to an effective quantum advantage.

We discuss some of these problems and present possible solutions and their applications.

BIOGRAPHY

Alessandra Di Pierro has been an associate professor in the Department of Computer Science, University of Verona, Italy, since January 2011.

Before then she was a researcher in the Department of Computer Science at the University of Pisa, Italy. She also received her PhD in Computer Science there.

Alessandra's research interests are in theoretical computer science with a main focus on the theory of quantum computation and its applications to machine learning. She is the principal investigator of the QUILAB (Quantum Information Laboratory) research group in the department.

Since 2017 she has been both a member of the steering and organising committee of the annual QTML (Quantum Techniques in Machine Learning) conference, and field editor for Quantum Software, for Springer journal '*Quantum Machine Intelligence*'.

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