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Quantum methods for machine learning and classical dynamics

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Curriculum Vitae

I was born on the 28th of September 1993 in Suresnes, France. From a young age, and encouraged by my parents, I cultivated a deep curiosity for science, with a particular fascination for space. I followed a straightforward academic path through a scientific high school, preparatory classes, and finally an Aerospace Engineering degree at ISAE-Supaero, from which I graduated in 2016 after a gap year that brought me to Japan and Australia.

I began my career as an engineer in the space and defense industry. My first professional experience was an internship at the European Space Agency (ESA) in the Netherlands, which also marked my first encounter with Leiden. I then worked at Airbus Defence and Space in Stevenage, UK, followed by Thales in Sophia Antipolis, France, before joining ESA in Rome, Italy, as a staff member in the innovation lab of the Earth Observation directorate. There, I closely observed the transformative role of emerging technologies in the space sector, and it was in this context that quantum computing first came to my attention. This encounter ultimately led me to the joint PhD program between CERN and ESA on quantum computing, prompting me to shift my career trajectory toward research.

In 2022, I started my doctoral studies at CERN in the Quantum Technology Initiative (QTI) group led by S. Vallecorsa and M. Grossi, under the academic supervision of V. Dunjko and J. Tura in the Applied Quantum Algorithms group at Leiden University. My research developed along three main lines, two of which are at the core of this thesis. The first and primary line concerns the theoretical aspects of quantum machine learning, with a focus on the expressivity of parameterized quantum circuits and the study of quantum learning advantages. The second addresses quantum algorithms for the simulation of classical systems and related questions in complexity theory. The third explores quantum-inspired approaches, where I developed a tensor-network method for computing Betti numbers.

During my PhD, I supervised Bachelor and Master students and contributed to the teaching of introductory lectures on quantum computing. In 2024, I had the opportunity to attend the Los Alamos summer school, where I expanded my research horizon by studying the complexity of simulating interferometers with a large number of bosonic modes and connected with an international community of researchers.

In the upcoming period, I will continue my journey in quantum computing as a researcher at PsiQuantum, working on quantum algorithms for differential equations.