EUROPEAN INFORMATION TECHNOLOGIES CERTIFICATION INSTITUTE, ASBL.

Brussels, Belgium, European Union

# CERTIFICATE

## Marcin Gulczynski

Has successfully completed test requirements of
The European Information Technologies Certification Programme

### EITC/AI/TFQML TensorFlow Quantum Machine Learning

**Certification Programme examination result:** 80%

**Certification Programme description:**

Introduction: introduction to Google AI Quantum, introduction to quantum computing; Implementing quantum computer: building a quantum computer with superconducting qubits; Programming quantum computer: programming a quantum computer with Cirq; Quantum supremacy: quantum supremacy explained, control of transmon qubits using a cryogenic CMOS integrated circuit, quantum supremacy: benchmarking the Sycamore processor, extracting coherence information from random circuits, estimation of statistical significance of quantum supremacy; Overview of TensorFlow Quantum: TensorFlow Quantum: a software platform for hybrid quantum-classical ML, layer-wise learning for quantum neural networks; Practical TensorFlow Quantum - binary classifier: using Tensorflow Quantum for simple quantum binary classification; Practical Tensorflow Quantum - XOR problem: solving the XOR problem with quantum machine learning with TFQ, quantum XOR decision boundary with TFQ; Quantum reinforcement learning: replicating reinforcement learning with quantum variational circuits with TFQ; Quantum Approximate Optimization Algorithm (QAOA): quantum Approximate Optimization Algorithm (QAOA) with Tensorflow Quantum; Variational Quantum Eigensolver (VQE): variational Quantum Eigensolver (VQE) in Tensorflow Quantum for single qubit Hamiltonians, variational Quantum Eigensolver (VQE) in TensorFlow-Quantum for 2 qubit Hamiltonians, optimizing VQE's with Rotosolve in Tensorflow Quantum

**Certificate Programme version/revision: EITC/AI/TFQMLv1r1**

CERTIFICATE ID: **EITC/AI/TFQML/SLJ24004598**

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