Ludwig-Maximilians-Universität München
Institut für Informatik
Lehrstuhl für Mobile und Verteilte Systeme
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mobile and distributed systems group

Online Homework 3
Quantum Applications - S 22

Exercise 1: Programming a Quantum Simulator

(40 Pkt.)

In this task you will program a quantum simulator. Your task is to complete the file 'H3_A.py'.

All parts that require a completion are marked with a 'TODO' note and an explanation what needs to be done.

You can use the file 'Tests.py' to test your code. If all 9 test are correct this is a good indicator that your code is indeed correct. Note: passing all tests does not imply getting all 50p. We will check your code for cheating and we will run additional tests. Further, we want to remind you that you have to solve these tasks on your own. We will check all submissions for plagiarism!

Please submit the file 'H3_A.py' containing your completed code to Uni2Work. Do not rename the file, the file must have the name 'H3_A.py'.

Note: you are not allowed to import any further packages. In the file 'H3_A.py' you are just allowed to use the numpy package. You must use the Qiskit definition of the qubit ordering!

Hint: Use SWAP gates in the CNOT function to handle non-adjacent CNOT operations.

Exercise 2: Implementing qSVM with a Quantum Kernel

(10 Pkt.)

In this task you will program a quantum SVM. Your task is to complete the file 'H3_B.py'.

All parts that require a completion are marked with a 'TODO' note and an explanation what needs to be done.

You can use the file 'Tests.py' to test your code. If all 9 test are correct this is a good indicator that your code is indeed correct. Note: passing all tests does not imply getting all 50p. We will check your code for cheating and we will run additional tests. Further, we want to remind you that you have to solve these tasks on your own. We will check all submissions for plagiarism!

Please submit the file 'H3_B.py' containing your completed code to Uni2Work. Do not rename the file, the file must have the name 'H3_B.py'.

Note: you are not allowed to import any further packages. In the file 'H3_B.py' you are just allowed to use the numpy package, H3_A, the function zip_longest and the class svm.