CLAIMS

1. A computer-implemented method comprising:

configuring a hybrid classical-quantum computing device to execute a quantum circuit corresponding to a variational problem, wherein the configuring further comprises:

causing the hybrid classical-quantum computing device to execute the quantum circuit by performing an adiabatic progression operation;

generating a first increase in from a current state of a continuous parameter of a parametrized optimization problem corresponding to the variational problem, wherein athe current state of the continuous parameter corresponds to a solvable statefirst difficulty of thea parametrized optimization problem;

generating a set of variational parameters corresponding to the first increase, the set of variational parameters specifying a first configuration of a quantum circuit; and

replacing, responsive to determining that an outputcausing a hybrid classical-quantum computing device to execute the first configuration of the quantum circuit differs by less than or equal to a threshold amountand produce a first output;

concluding, from a known correct solutionthe first output, that the first increase is keeping the continuous parameter at or below a goal state; and

causing, responsive to the concluding, the hybrid classical-quantum computing device to execute a second configuration of the problem,quantum circuit, the second configuration of the quantum circuit specified by a second set of variational parameters generated from a second increase in the continuous parameter from the current state of the continuous parameter with the first increase.

2. The computer-implemented method of claim 1, wherein the hybrid classical-quantum computing device comprises a Noisy Intermediate Scale Quantum (NISQ) device.

3. The computer-implemented method of claim 2, further comprising:

producing, using the set of variational parameters corresponding towherein the first increase,configuration of the quantum circuit comprises a square quantum circuit, the square quantum circuit being suited for implementing on the NISQ device.

4. The computer-implemented method of claim 1, further comprising: wherein the goal state of the continuous parameter corresponds to a second difficulty of the parametrized optimization problem higher than the first difficulty, further comprising:

—controlling, according to a value of the first increase in the continuous parameter, a pace at which to progress thea difficulty of the variationalparametrized optimization problem.

5. The computer-implemented method of claim 4, wherein the first increase comprises a difference between a goal state of the continuous parameter and the current state of the continuous parameter.

65. The computer-implemented method of claim 4, wherein the first increase comprises a difference between athe goal state of the continuous parameter and the current state of the continuous parameter, the difference then divided by n, where n is a positive whole number.

6. The computer-implemented method of claim 4, wherein the first increase comprises a 1/n multiple of a difference between the goal state of the continuous parameter and the current state of the continuous parameter, where n is a positive whole number.

7. The computer-implemented method of claim 4, further comprising:

generating, responsive to determining that anthe first output of the quantum circuit differs by more than a threshold amount from a known correct solution of the parametrized optimization problem, a second increase in the continuous parameter fromknown correct solution of the current state, wherein the second increase is smaller than the first increase.parametrized optimization problem obtained using a classical computing device; and

generating the second increase in the continuous parameter from the current state of the continuous parameter, wherein the second increase is smaller than the first increase.

8. The computer-implemented method of claim 7, wherein the second increase is 1/n multiplied by the first increase, where n is a positive whole number.

9. A computer usable program product comprising one or more computer-readable storage devices, and program instructions stored on at least one of the one or more storage devices, the stored program instructions comprising:

program instructions to configure a hybrid classical-quantum computing device to execute a quantum circuit corresponding to a variational problem, wherein the configuring further comprises:

causing the hybrid classical-quantum computing device to execute the quantum circuit by performing an adiabatic progression operation;

generatinggenerate a first increase in from a current state of a continuous parameter of a parametrized optimization problem corresponding to the variational problem, wherein athe current state of the continuous parameter corresponds to a solvable statefirst difficulty of thoa parametrized optimization problem;

generatingprogram instructions to generate a set of variational parameters corresponding to the first increase, the set of variational parameters specifying a first configuration of a quantum circuit; and

replacing, responsive to determining that an outputprogram instructions to cause a hybrid classical-quantum computing device to execute the first configuration of the quantum circuit differs by less than or equal to a threshold amountand produce a first output;

program instructions to conclude, from a known correct solutionthe first output, that the first increase is keeping the continuous parameter at or below a goal state; and

program instructions to cause, responsive to the program instructions to conclude, the hybrid classical-quantum computing device to execute a second configuration of the problem,quantum circuit, the second configuration of the quantum circuit specified by a second set of variational parameters generated from a second increase in the continuous parameter from the current state of the continuous parameter with the first increase.

10. The computer usable program product of claim 9, wherein the hybrid classical-quantum computing device comprises a Noisy Intermediate Scale Quantum (NISQ) device.

11. The computer usable program product of claim 10, further comprising:

program instructions to produce, using the set of variational parameters corresponding towherein the first increase,configuration of the quantum circuit comprises a square quantum circuit, the square quantum circuit being suited for implementing on the NISQ device.

12. The computer usable program product of claim 9, wherein the goal state of the continuous parameter corresponds to a second difficulty of the parametrized optimization problem higher than the first difficulty, further comprising:

program instructions to control, according to a value of the first increase in the continuous parameter, a pace at which to progress thea difficulty of the variationalparametrized optimization problem.

13. The computer usable program product of claim 12,

wherein the first increase comprises a difference between athe goal state of the continuous parameter and the current state of the continuous parameter.

14. The computer usable program product of claim 12, wherein the first increase comprises a 1/n multiple of a difference between the goal state of the continuous parameter and the current state of the continuous parameter, where n is a positive whole number.

~~wherein the first increase comprises a difference between a goal state of the continuous parameter and the current state of the continuous parameter, the difference then divided by n, where n is a positive whole number.~~

15. The computer usable program product of claim 12, further comprising:

program instructions to ~~generate, responsive to determining~~determine that ~~an~~the first output of the quantum circuit differs by more than a threshold amount from a known correct solution of the parametrized optimization problem, ~~a~~the known correct solution of the parametrized optimization problem obtained using a classical computing device; and

program instructions to generate the second increase in the continuous parameter from the current state~~,~~ of the continuous parameter, wherein the second increase is smaller than the first increase.

16. The computer usable program product of claim 15, wherein the second increase is 1/n multiplied by the first increase, where n is a positive whole number.

17. The computer usable program product of claim 9, wherein the computer usable code is stored in a computer readable storage device in a data processing system, and wherein the computer usable code is transferred over a network from a remote data processing system.

18. The computer usable program product of claim 9, wherein the computer usable code is stored in a computer readable storage device in a server data processing system, and wherein the computer usable code is downloaded over a network to a remote data processing system for use in a computer readable storage device associated with the remote data processing system, further comprising:

program instructions to meter use of the computer usable code associated with ~~the~~a request; and

program instructions to generate an invoice based on the metered use~~.~~.

19. A computer system comprising one or more processors, one or more computer-readable memories, and one or more computer-readable storage devices, and program instructions stored on at least one of the one or more storage devices for execution by at least one of the one or more processors via at least one of the one or more memories, the stored program instructions comprising:

program instructions to ~~configure a hybrid classical-quantum computing device to execute a quantum circuit corresponding to a variational problem, wherein the configuring further comprises:~~

causing the hybrid classical-quantum computing device to execute the quantum circuit by performing an adiabatic progression operation;

generatinggenerate a first increase in from a current state of a continuous parameter of a parametrized optimization problem corresponding to the variational problem, wherein a, wherein the current state of the continuous parameter corresponds to a solvable statefirst difficulty of thea parametrized optimization problem;

generatingprogram instructions to generate a set of variational parameters corresponding to the first increase, the set of variational parameters specifying a first configuration of a quantum circuit; and

replacing, responsive to determining that an outputprogram instructions to cause a hybrid classical-quantum computing device to execute the first configuration of the quantum circuit differs by less than or equaland produce a first output;

program instructions to a threshold amountconclude, from a known correct solution of the problem,first output, that the current state offirst increase is keeping the continuous parameter withat or below a goal state; and

program instructions to cause, responsive to the program instructions to conclude, the hybrid classical-quantum computing device to execute a second configuration of the quantum circuit, the first increasesecond configuration of the quantum circuit specified by a second set of variational parameters generated from a second increase in the continuous parameter from the current state of the continuous parameter.

20. The computer system of claim 19, wherein the hybrid classical-quantum computing device comprises a Noisy Intermediate Scale Quantum (NISQ) device.

21. The computer system of claim 20, further comprising:

program instructions to produce, using the set of variational parameters corresponding towherein the first increase,configuration of the quantum circuit comprises a square quantum circuit, the square quantum circuit being suited for implementing on the NISQ device.

22. The computer system of claim 19, wherein the goal state of the continuous parameter corresponds to a second difficulty of the parametrized optimization problem higher than the first difficulty, further comprising:

program instructions to control, according to a value of the first increase in the continuous parameter, a pace at which to progress thea difficulty of the variationalparametrized optimization problem.

23. The computer system of claim 22, wherein the first increase comprises a difference between athe goal state of the continuous parameter and the current state of the continuous parameter.

24. ~~-~~The computer system of claim 22, wherein the first increase comprises a 1/n multiple of a difference between ~~a~~the goal state of the continuous parameter and the current state of the continuous parameter, ~~the difference then divided by n,~~ where n is a positive whole number.

25. ~~-~~The computer system of claim 22, further comprising:

~~—~~program instructions to ~~generate, responsive to determining~~determine that ~~an~~the first output of the quantum circuit differs by more than a threshold amount from a known correct solution of the parametrized optimization problem, the known correct solution of the parametrized optimization problem obtained using a classical computing device; and program instructions to generate the second increase in the continuous parameter from the current state of the continuous parameter, wherein the second increase is smaller than the first increase.

~~26. A computer program comprising program code means adapted to perform the method of any of claims 1 to 8 when said program is run on a computer.~~