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November 12, 2020

Dear Editors,

I am writing to submit an original work titled *Integer Programming with Quantum Annealing from an Open Quantum System* to Scientific Reports. This work has not been previously published and will not be submitted for publication elsewhere while under consideration. All authors have no competing interests. The corresponding author, Chia Cheng Chang, is affiliated with RIKEN, UC Berkeley, and Berkeley Lab, and is most easily contacted at chiachang@berkeley.edu.

Our work presents a method on how to solve integer linear programming (ILP) with quantum annealing; an important problem in a diverse set of science, engineering and mathematics applications. Alongside details of the ILP to qubit mapping, we further propose a method for improving the performance of quantum annealing. We define a new algorithm for the annealing schedule motivated from our understanding of many-body localization through the use of an inhomogeneous driving force. We verify improvements seen on hardware by numerically simulating the master equation for open quantum systems. We believe this is one of the first results which directly show agreement between real-world realization of inhomogeneous driving force and prediction from the theory of quantum mechanics.

We recommend the following scientific reviewers suitable for this work:
Eleanor Rieffel (NASA Ames, eleanor.rieffel@nasa.gov)
Carleton Coffrin (LANL, carleton@coffrin.com)

We recommend the following editorial board members:
Bikas Chakrabarti (Saha Institute of Nuclear Physics, India) whom I have previously worked with for Sci. Rep. 9, 10258 (2019)

as well as the following who were recommended previously by Franco Nori:
Alexandre Zagoskin (Loughborough University, UK)
Ting Yu (Stevens Institute of Technology, USA)
Alessandro Ridolfo (Universita di Catania, Italy)
Omar Di Stefano (Universita di Messina, Italy)

Yours Sincerely,

Chia Cheng Chang
on behalf of the authors