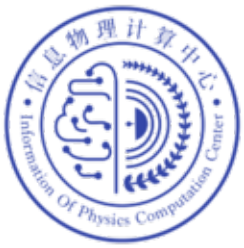

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信息物理计算中心

Quantum Generative Adversarial Network with Noise

Project Name: Quantum Generative Adversarial Network with Noise

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Dodument Type: Report

Project Start Time: 11/01/2017

Sourcecode Version: 0.0.1

Keywords: Variational Quantum Circuit, Machine Learning

Modify April 26, 2020

Submitted by:

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Contents

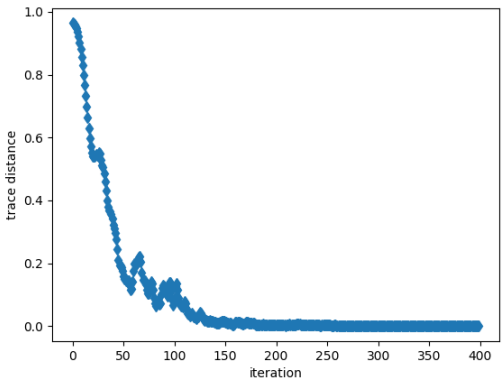
1 Experiment

I modified the code this week and successfully reproduced the original content, and modified the code structure. On the basis of C (G) = C (D) = C (T) = 2, I simulated the circuit, I got an ideal result.

In addition, I introduced flip noise according to the literature, and added flip noise after the generation state and evaluation state respectively. Run the code on the basis of C (G) = C (D) = C (T) = 2, two qubits. Compared with the trace distance curve when there is no noise, a significant noise effect can be observed.

2 Results

Based on C (G) = C (D) = C (T) = 2, three-bit qubits, I got the trace distance curves and the generate state.



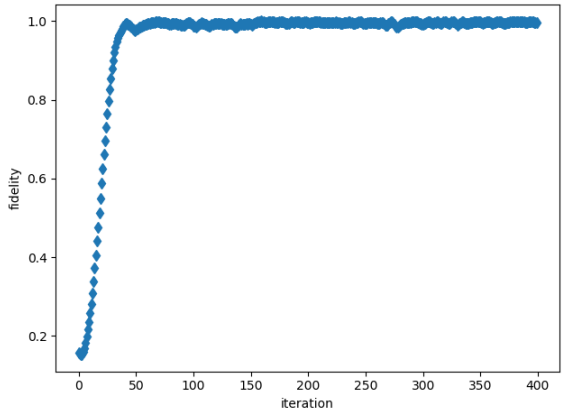
(a) trace distance

```
[[-0.09344036-0.21683415j]
 [ 0.69572442+0.00408388j]
 [-0.33114599+0.01879878j]
 [ 0.18311321+0.00222892j]
 [-0.36717912-0.18250788j]
 [-0.14419145-0.19014353j]
 [ 0.08619637+0.20332415j]
 [-0.01758698+0.20615778j]]
[[ 0.05248167+0.2302484j ]
 [-0.68337258-0.13054369j]
 [ 0.32902678+0.04174744j]
 [-0.17966187-0.03551533j]
 [ 0.32790701+0.24622371j]
 [ 0.10720498+0.21320558j]
 [-0.04775936-0.21558739j]
 [ 0.05481492-0.19946979j]]
```

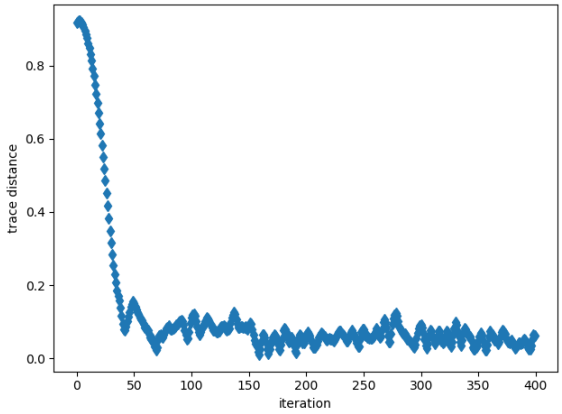
(b) target state and generate state

Figure 1

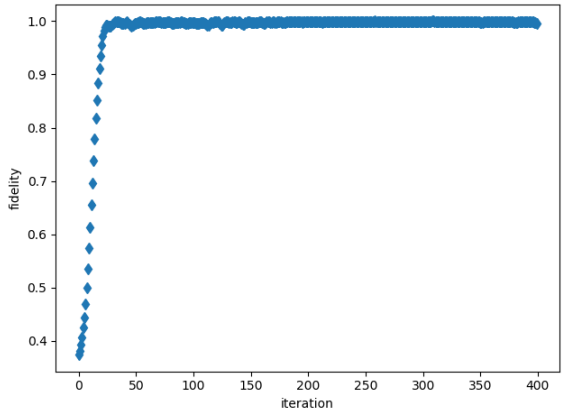
Based on C (G) = C (D) = C (T) = 1, two-bit qubits, respectively, run with or without noise. Comparing trace distance and fidelity curve, it's obvious to obtain the noise effect.



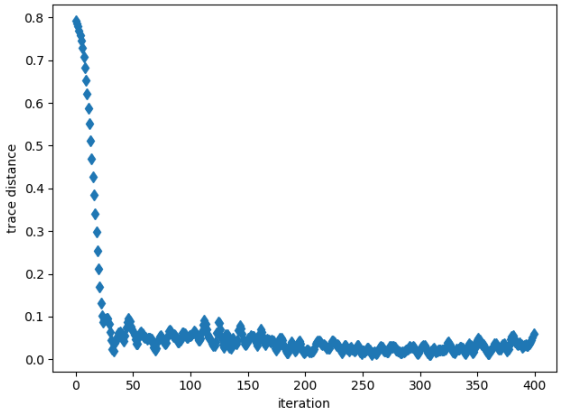
(a) noise fidelity



(b) noise trace distance



(c) without noise fidelity



(d) without noise trace distance

Figure 2

3 Next Plan

1. Try to add mixed noise.
2. Increase the scale and depth of the circuit and observe the effect of noise.

4 Appendix

A Source Code