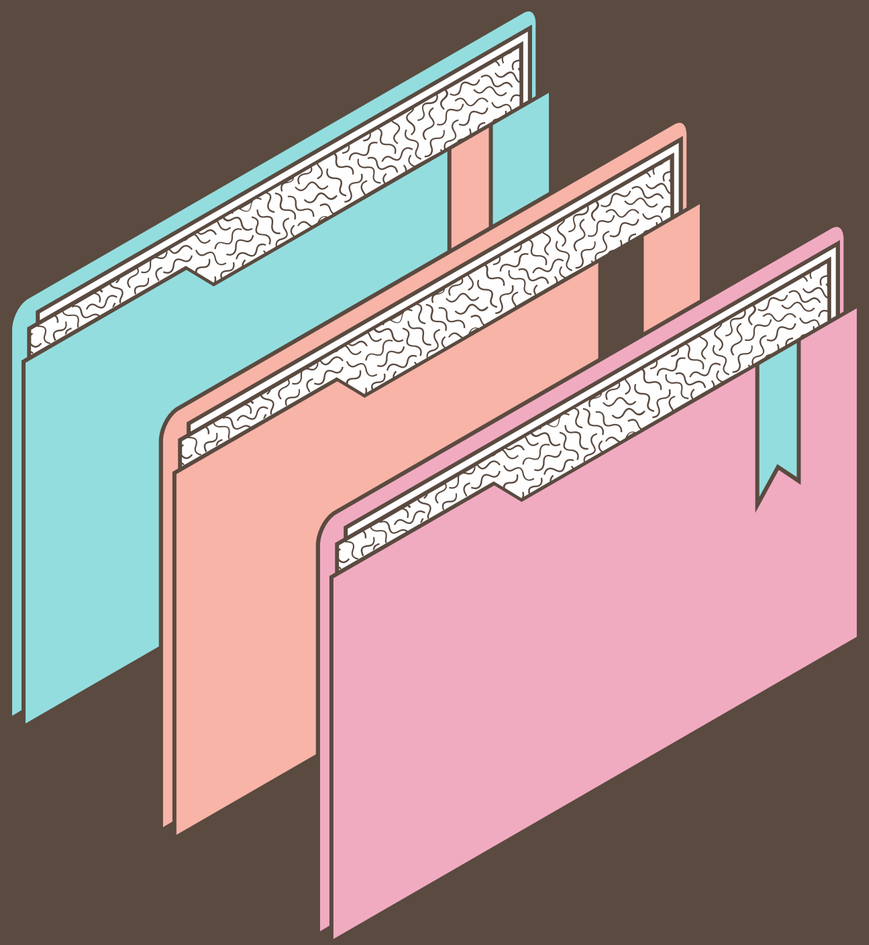
QAMP- FALL 2022 - CHECKPOINT 1

Longform content for the Qiskit Blog (Issue #14)

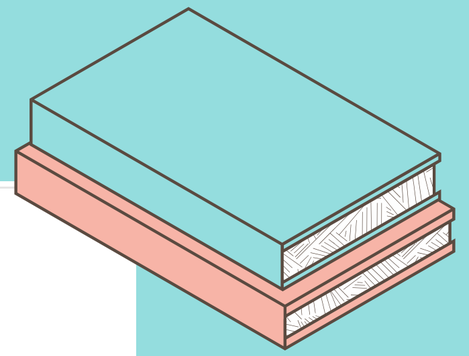
Mentee: Bruna Shinohara
Mentor: Ryan Mandelbaum



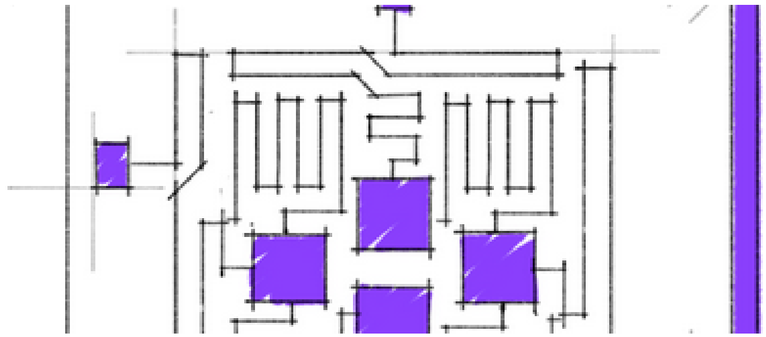
Topics

- I: Overview of project
- II: What we did so far
- III: What have I learned
- IV: What's next?

I. The project



Qiskit
Sep 28 · 11 min read



How The First Superconducting Qubit Changed Quantum Computing Forever

Read more...

56

Qiskit

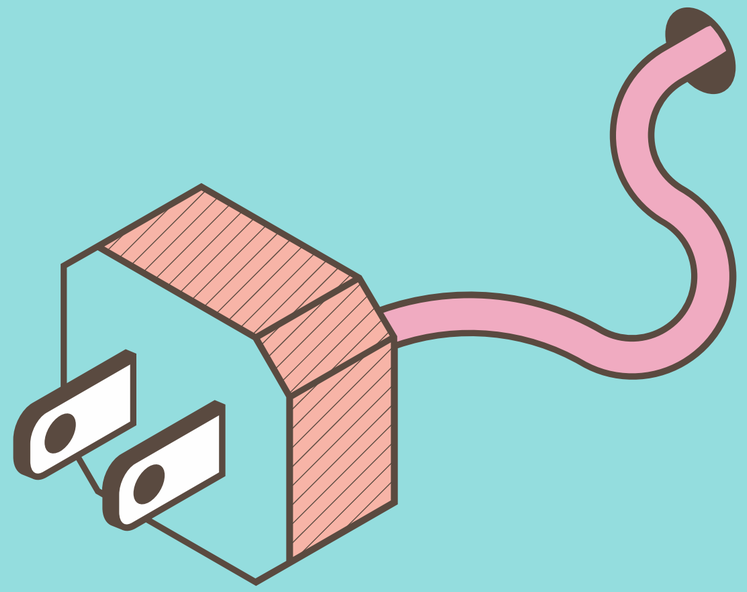
A community to discuss Qiskit, programming quantum computers, and anything else related to quantum computing.

More information

FOLLOWERS
6.7K

ELSEWHERE

I. The project



Deliverables

Mentees will produce two long-form, narrative contributions to the Qiskit Blog. These should each be 800 words or longer, telling stories about important work, interesting people, or ongoing research in the Qiskit community.

They should begin with well-researched briefs, will require interviews, and will require you work with any of the story's subjects to gather image, photo, or illustration assets.

Choice of theme

(THE FIRST ONE!)

Recent manuscript by IBM researchers:

related to my expertise: topology and physics.

Preparing Majorana zero modes on a noisy quantum processor

Kevin J. Sung,[1,*] Marko J. Rančić,[2] Olivia T. Lanes,[1] and Nicholas T. Bronn[1]

[1] *IBM Quantum, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598, USA*
[2] *TotalEnergies, Tour Coupole La Défense, 2 Pl. Jean Millier, 92078 Paris, France*

(Dated: June 2, 2022)

The simulation of systems of interacting fermions is one of the most anticipated applications of quantum computers. The most interesting simulations will require a fault-tolerant quantum computer, and building such a device remains a long-term goal. However, the capabilities of existing noisy quantum processors have steadily improved, sparking an interest in running simulations that, while not necessarily classically intractable, may serve as device benchmarks and help elucidate the challenges to achieving practical applications on near-term devices. Systems of *non*-interacting fermions are ideally suited to serve these purposes. While they display rich physics and generate highly entangled states when simulated on a quantum processor, their classical tractability enables experimental results to be verified even at large system sizes that would typically defy classical simulation. In this work, we use a noisy superconducting quantum processor to prepare Majorana zero modes as eigenstates of the Kitaev chain Hamiltonian, a model of non-interacting fermions. Our work builds on previous experiments with non-interacting fermionic systems. Previous work demonstrated error mitigation techniques applicable to the special case of Slater determinants. Here, we show how to extend these techniques to the case of general fermionic Gaussian states, and demonstrate them by preparing Majorana zero modes on systems of up to 7 qubits.

Interview with authors

DR. BRONN AND DR. SUNG

l systems with Qiskit

o-around. I think a lot of the initial pieces are
nk you can improve the piece that I left in the

e story starts by being about majoranas, but
anas by the end of it. I think it would be cool
t clear to readers that it's important to study
uantum overall.

ining a bit more about what they actually did
l me more about what system they simulated
the nut graf.

ther, we wrote a nut graf together today and
nd structured it around that thesis. Based on
t a nut graf that says "Majoranas may be
ng may be hard and far away, but they're still
computing community better. We simulated
echniques in this paper, and now we can take
ulations."

y because I may use this adjective when talking
wrote a letter to his university's dean saying that
n. But, just as fittingly, I can use "mysterious" to
quite difficult to be detected. The identification of
eld, leading even to retracted papers.

Commented [RFM1]: We h
biz called "show, don't tell."
opening stronger by just di
like "Back in (19xx, italian p
wrote a letter to his univers
needed to sail away, and w
The particles named for hir

Commented [RFM2]: Cool
lede, but if we're not going
retractions, we should prob

Commented [RFM3]: Kinda
this - rather than introducin
I think it'd be great if we sa
then answered that questio
topological quantum compi
to study more generally. th
that I propose in my openi

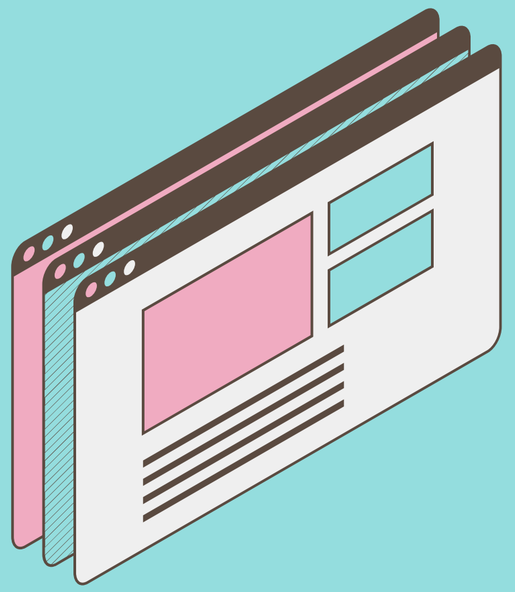
Commented [RFM4R3]: Als
need to quickly remark that
understand them aren't rea
behaviors in particles that e
system

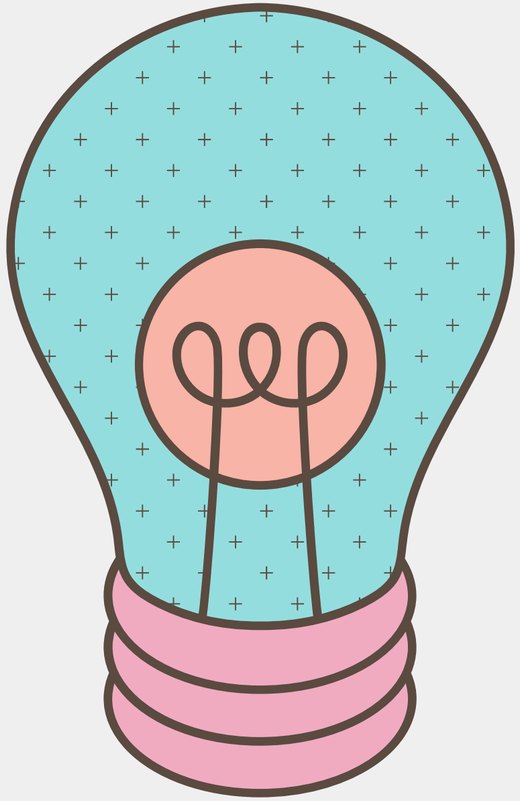
Commented [RFM5]: A nev
understand the leap from m
quantum computing. I think
sentence added before this
like, majoranas have prope
for storing and computing v

Commented [RFM6]: Do yo
majoranas here?

Commented [RFM7]: The i
part is probably too much i
I think we can maybe move

First draft and first review!





What have I learned so far?

- Journalism concepts: how to write, typical structure
- How to conduct interviews
- Best practices in Science Writing

What's next?

1 STEP

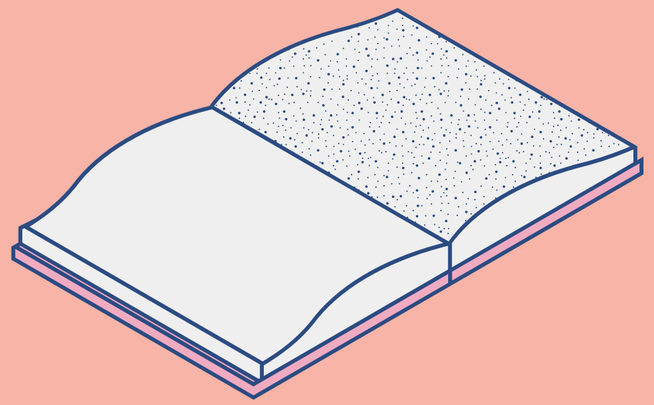
Second version

based on the latest' conversations

2 STEP

Ryan's review

A more in-depth review of the text



3 STEP

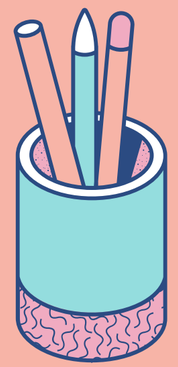
Send to interviewed authors

Check if any changes are needed.

4 STEP

Publish on Qiskit Blog

(Yay!)



5 STEP

Repeat

We will take similar steps for another theme.

Thank you for your attention!