Brianna Gopaul

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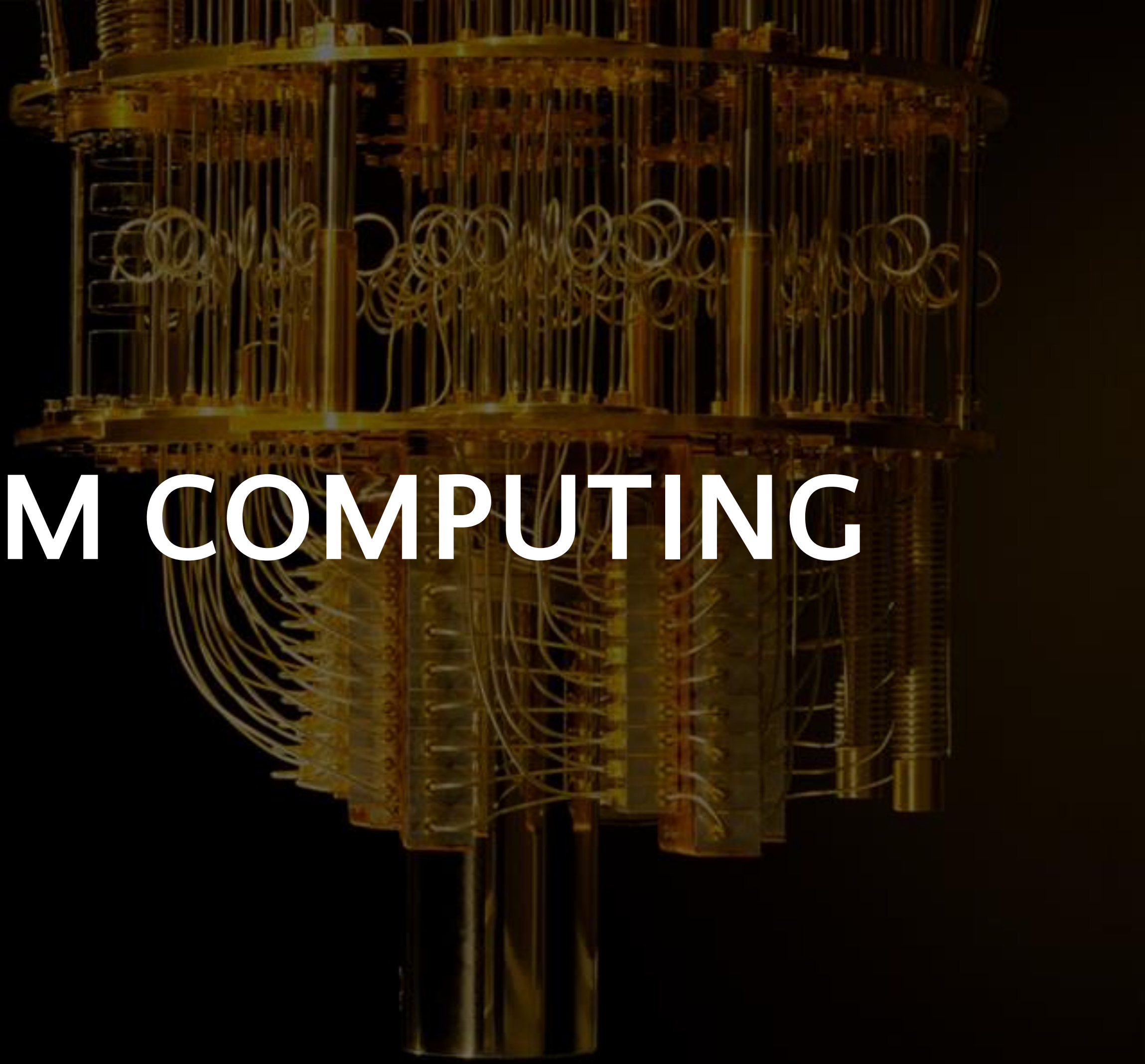
QUANTUM COMPUTING



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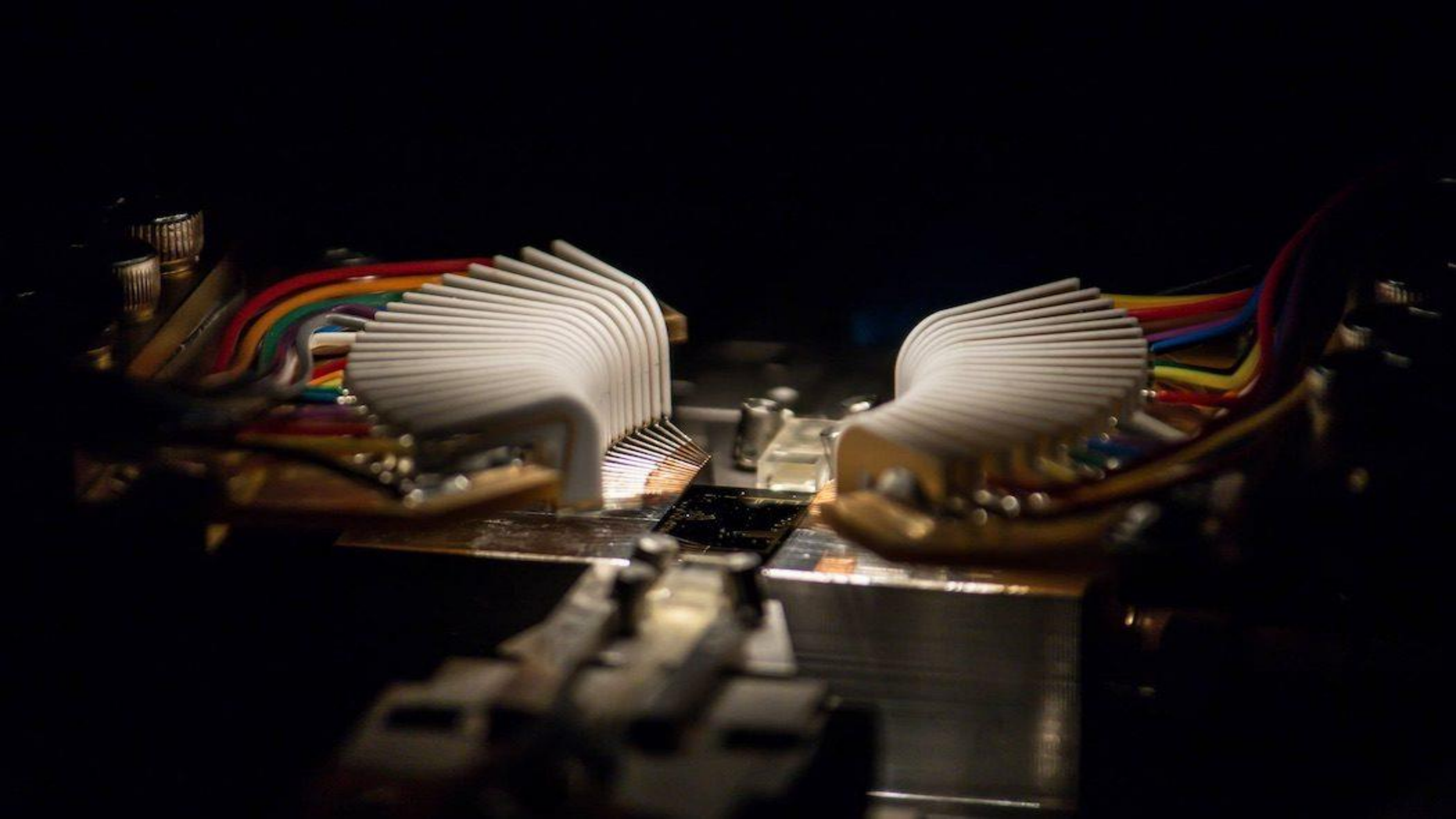


CV quantum gate visualizations

Author: Brianna Gopaul

In a conventional quantum circuit, qubits represented by wires are operated on by quantum gates which collectively perform computations. Similarly, continuous variable quantum computing uses qumodes that represent bundles of interacting photons. To perform computations on qumodes, we leverage Gaussian and non-Gaussian gates.

Gaussian and non-Gaussian gates can be described within the phase space. This space is shown by the position and momentum axes.

Gaussian gates such as the squeezing and rotation gate act linearly on modes. These gates can only reach positive quasi-probability distributions and can be classically simulated. On the other hand, non-Gaussian gates such as the Kerr gate and Cubic Phase gate act nonlinearly. This property allows them to be in negative quasi-probability distributions and not be classically simulated.

In this notebook, we'll learn about various single mode Gaussian and non-Gaussian gates and apply them to a state using Strawberry Fields.

[1]:
```
import strawberryfields as sf
from strawberryfields.ops import *

import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
```

Vacuum State

The vacuum state is the lowest energy Gaussian state. It has no displacement or squeezing in phase space.

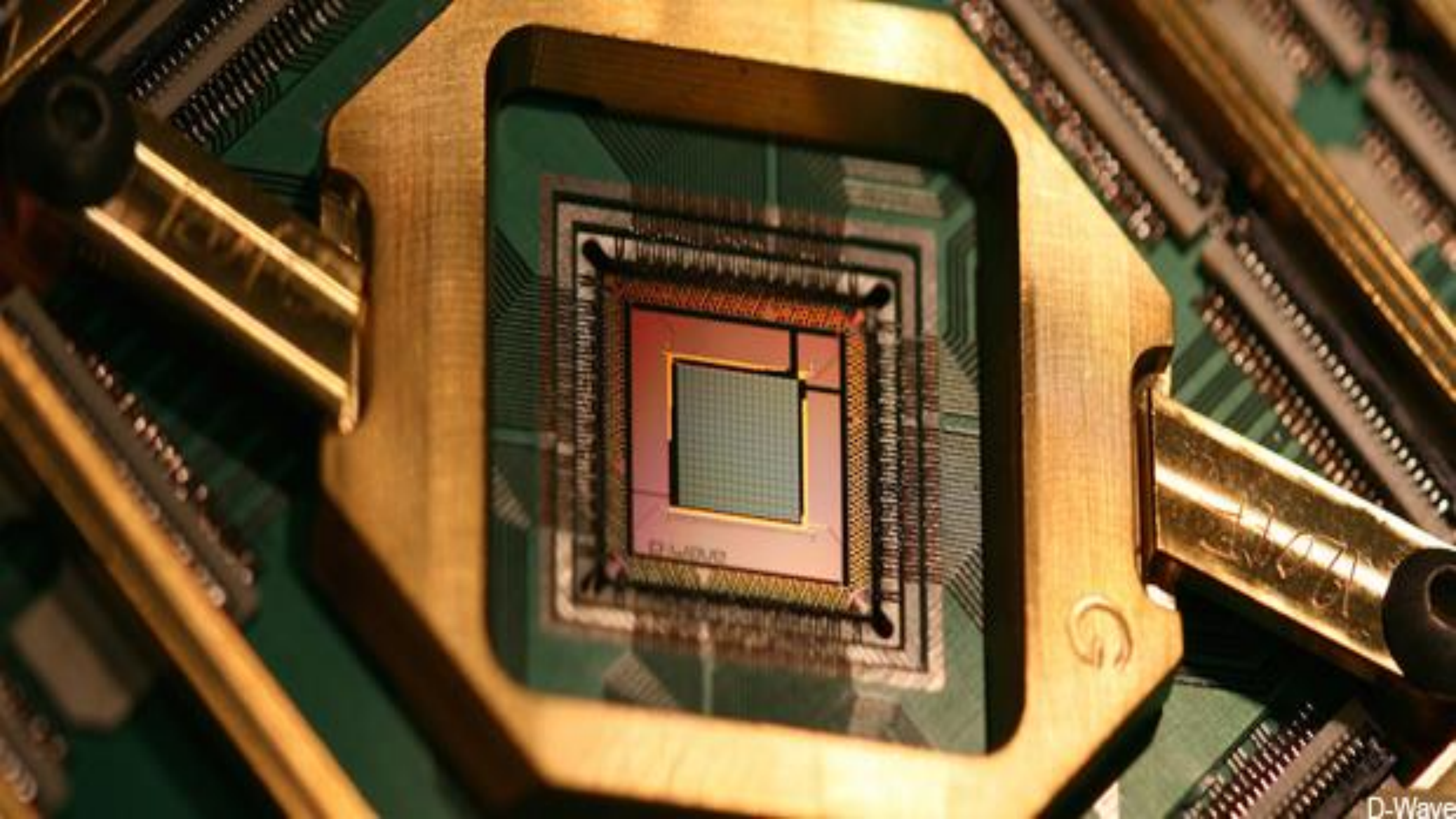
Here we learn how to create the vacuum state on a quantum circuit with one qumode.

We initialize the Strawberry Fields program. `q` represents a qumode and below we start with one qumode for our circuit.

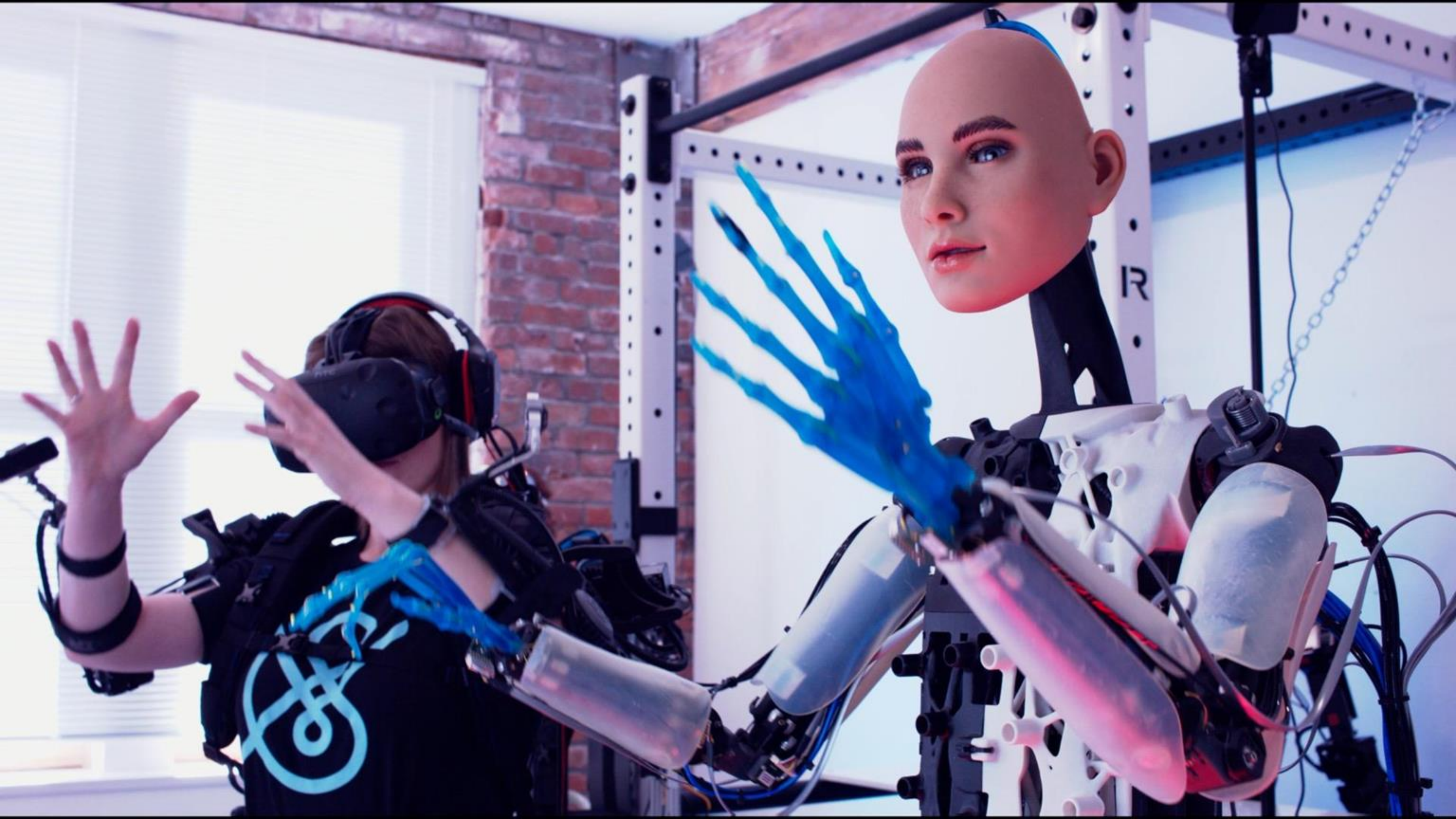
[2]:
```
prog = sf.Program(1)
```

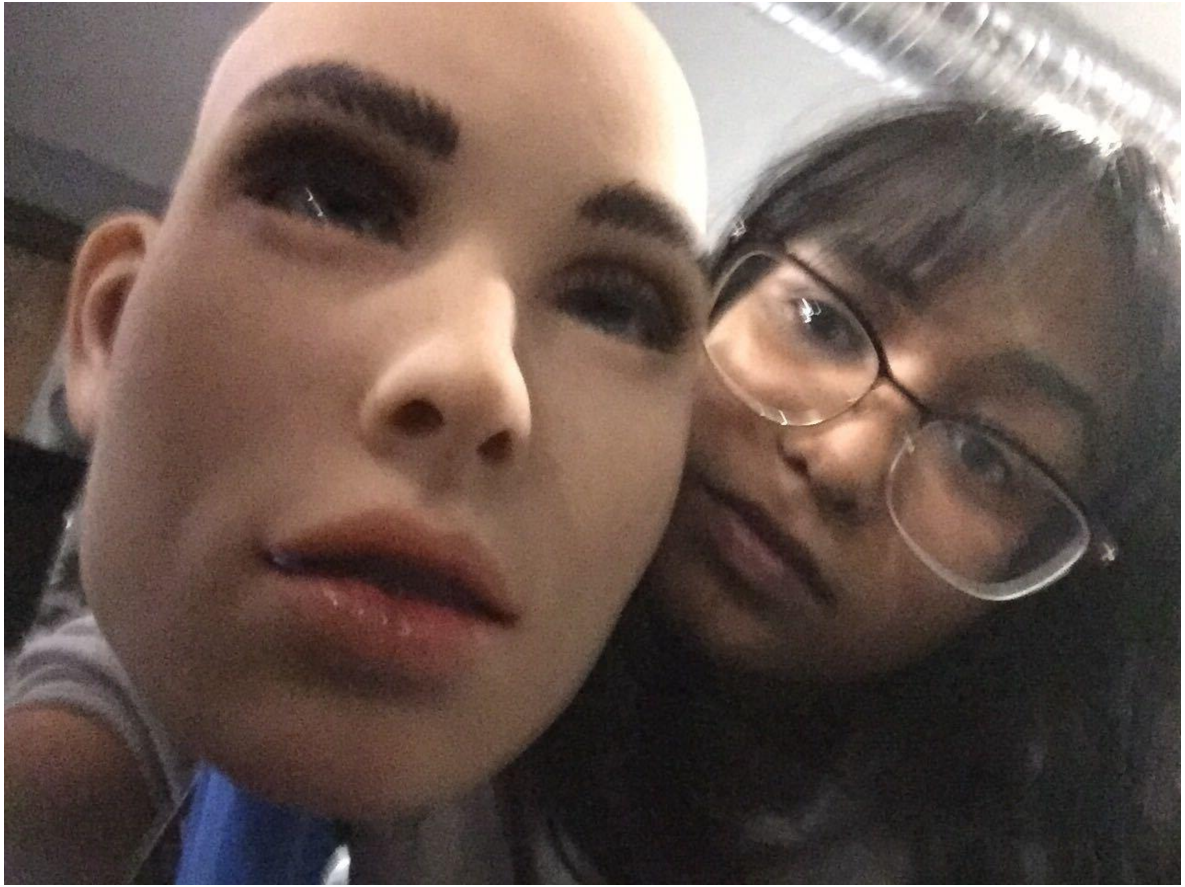
ARTIFICIAL INTELLIGENCE

Geordie Rose


D-Wave

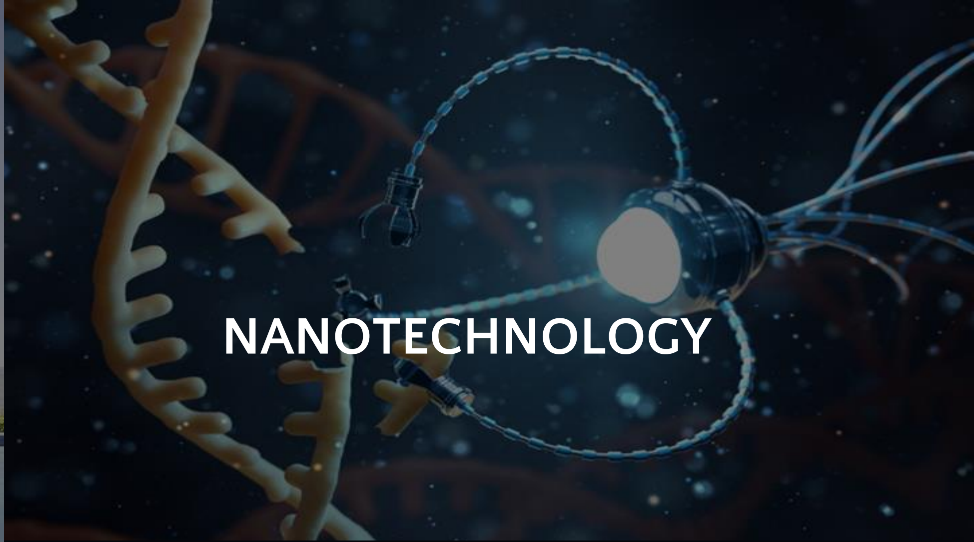

Fun Pak
POPS
Fun Pak
Lysol
Cascade
Lysol





Self-imposed limits


ADVANCED TRANSPORTATION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