



### RESEARCH BACKGROUND/DESCRIPTION

- Our hope for this project is to use quantum machine learning to help render a 3D reconstruction. Specifically we want to use QML to improve the optimization of 3D Gaussian Splatting
- Gaussian Splatting is a relatively new, but revolutionary form of 3D reconstruction
- Gaussian Splatting offers a way to create clear 3D reconstructions in real time which had not been done



### GAUSSIAN SPLATTING PROCESS

- **Input Images** - Take a bunch of images of a particular object or scene
- **Initialization** - Create a sparse point cloud of the image and initialize gaussians at those points
- **Optimization** - Create a splat of the image and compare the splatted image to the actual image and get loss
- **Optimization** - Using the loss alter the Gaussians so they more match up with the ground truth images

#### Classical 3D Gaussian Splatting

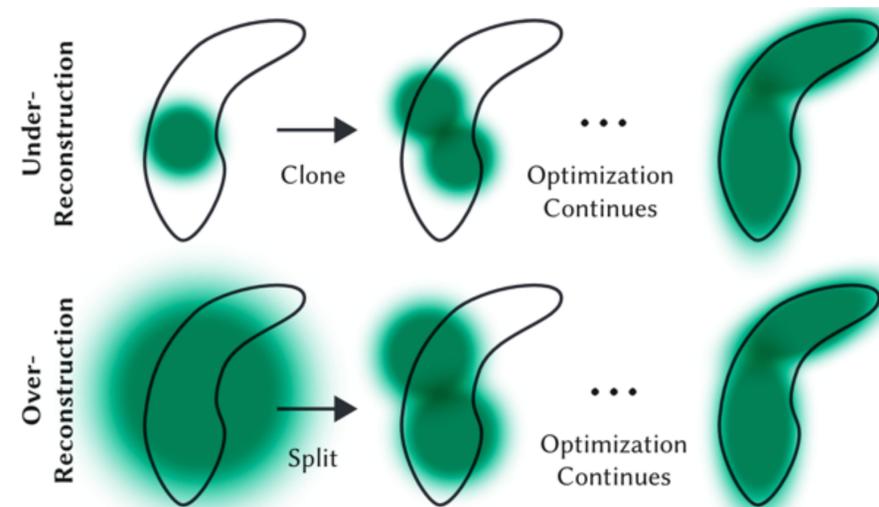
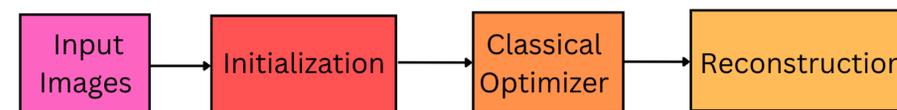


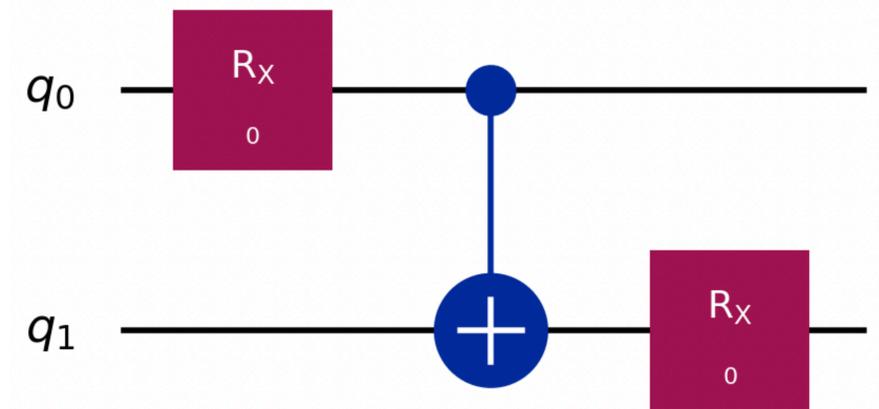
Figure from [1]

### GAUSSIAN SPLATTING PROCESS AND RESULTS

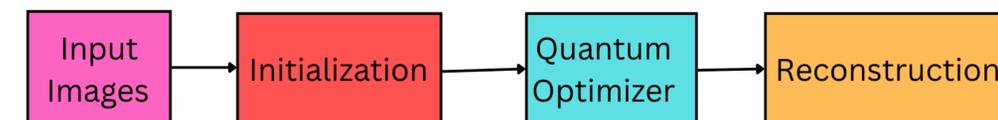
- Take the optimization step Gaussian Splatting process and convert to quantum.
- Splat a 3D gaussian to a 2D gaussian using the a quantum circuit
- Use this quantum gaussian to then get a quantum loss
- Take the quantum and the classical loss to create a hybrid loss
- Use this hybrid loss to generate a new 3D reconstruction

### CONCLUSION

- Our gaussian splatting works very well classically as we can see, we can reproduce the lego truck very well
- Our hope is that when we implemet the quantum loss we will be able to reveal other aspects of the image



#### Quantum 3D Gaussian Splatting



### REFERENCES

- [1] Kerbl, B., Kopanas, G., Leimkühler, T. and Drettakis, G., 2023. 3d gaussian splatting for real-time radiance field rendering. *ACM Trans. Graph.*, 42(4), pp.139-1  
[2] Ye, V. and Kanazawa, A., 2023. Mathematical supplement for the gsplat library. *arXiv preprint arXiv:2312.02121*, 7.