Differentiable Ray Tracing Simulator

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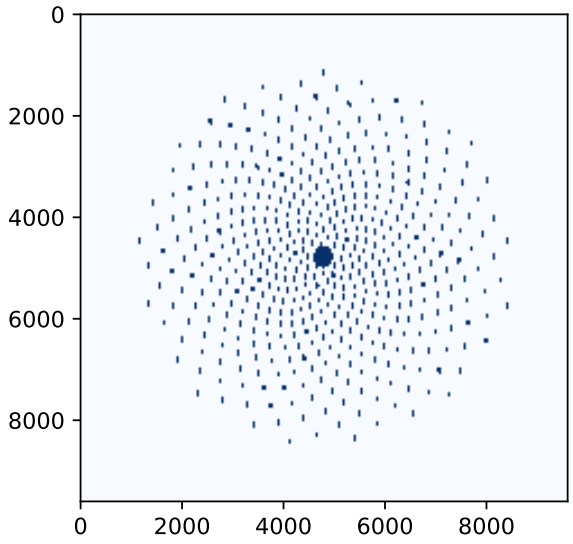
Setup

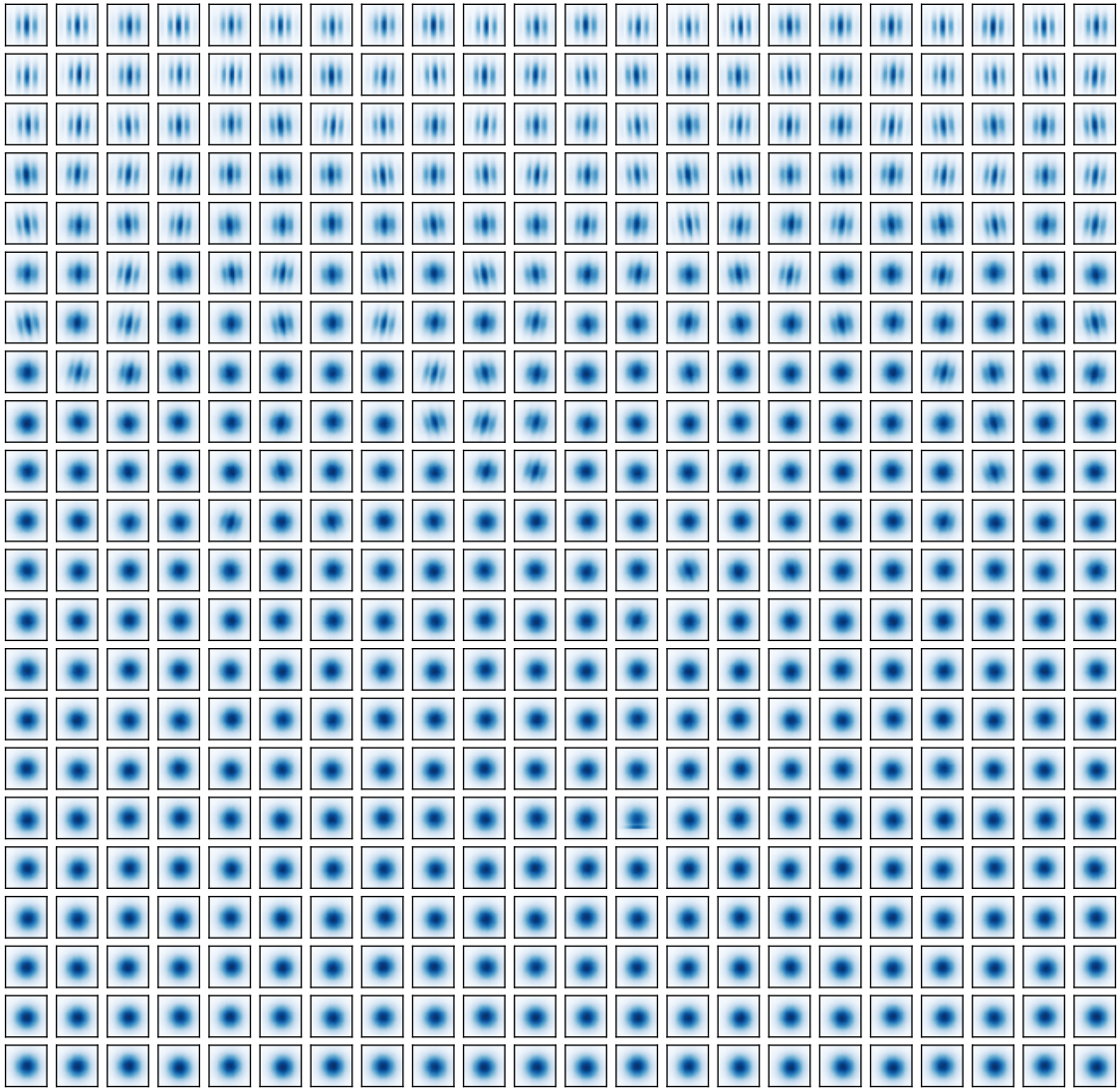
- Image of an interference pattern.

$$N \times f_\gamma \times \left[1 + Cos\left(\frac{2\pi}{\lambda}x + \phi\right)\right] \times \frac{1}{\sigma} e^{-\frac{1}{2}\left[\frac{x-\mu}{\sigma}\right]^2}$$

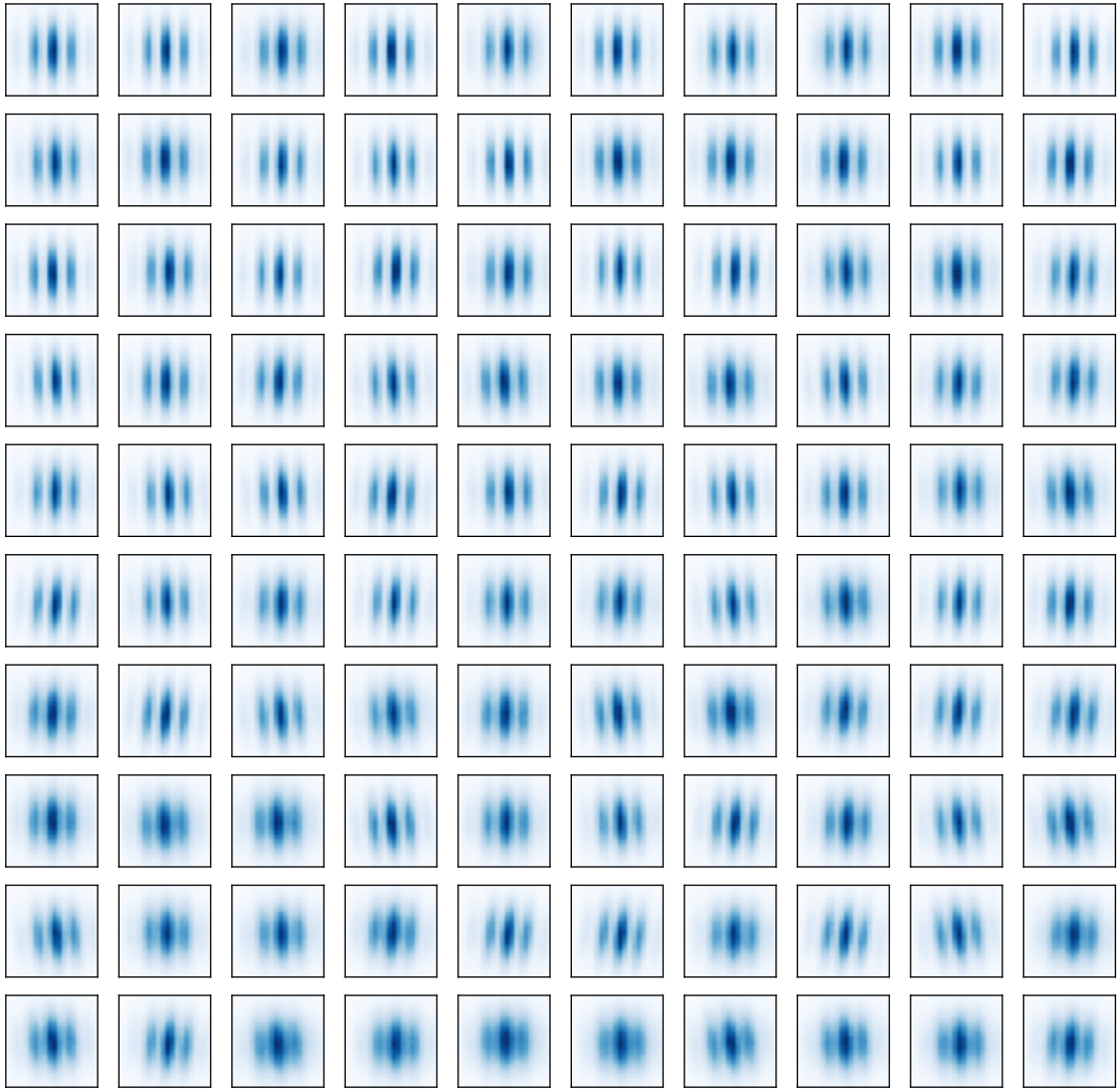
  - N = 1e6, f=1e3.
    - With 500 mirrors, 220M photons are collected at the sensor.
      - → 22% acceptance rate but some will be lost…



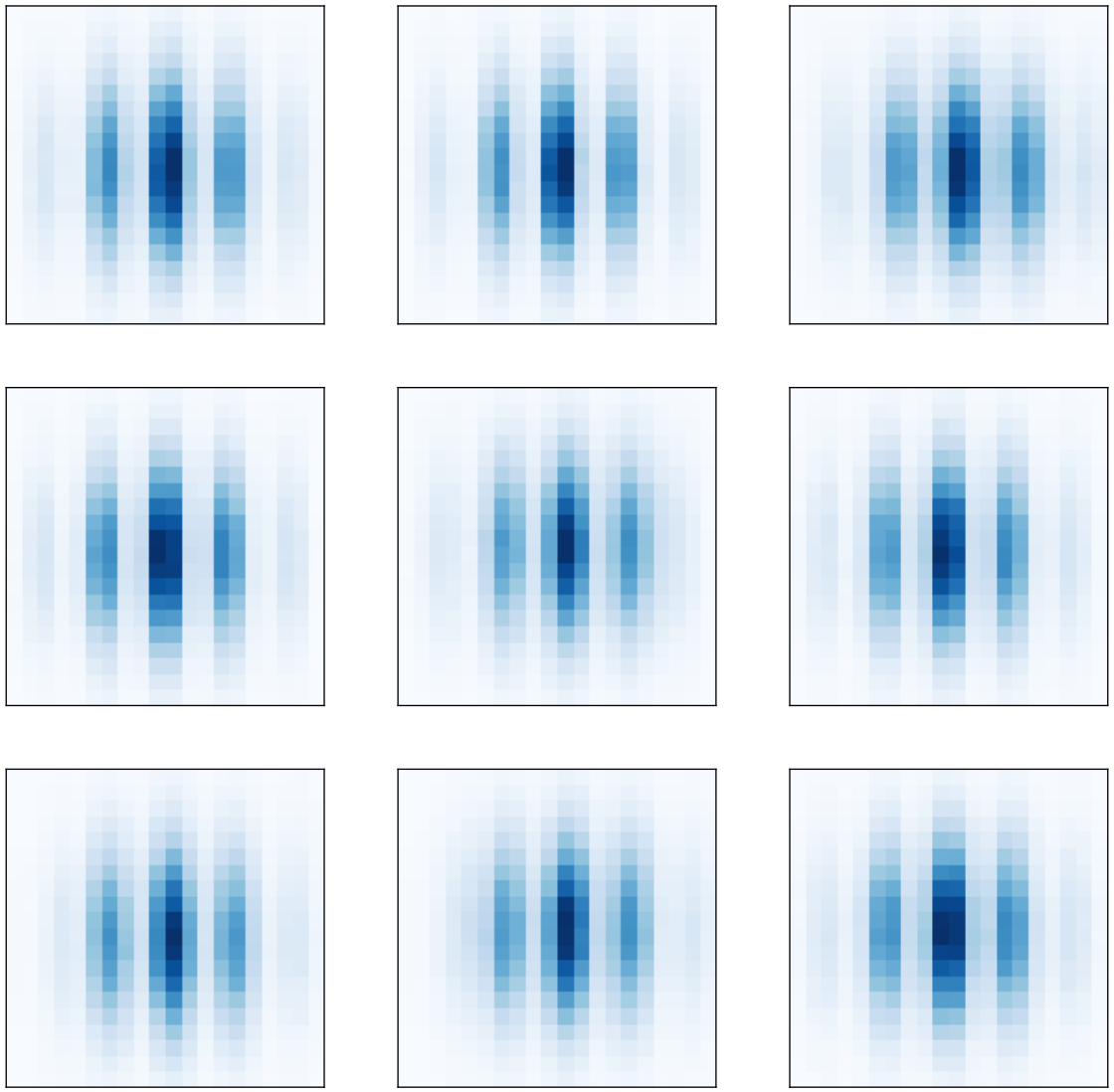
Produced image (1)



Produced image (2)



Produced image (3)



Some numbers

- 407 ± 1196 photons per pixel (pixels without photons are not taken into account).
  - Median: 18.
- 430k ± 389k photons per view.
  - Some views still collect more light than others.

Gradients and 3d reconstruction

SLAC

- We have switched from JAX to PyTorch (still Python).
  - Will ease optimization and 3d reconstruction.