Simulation of the multi-view imaging system with differentiable ray tracing
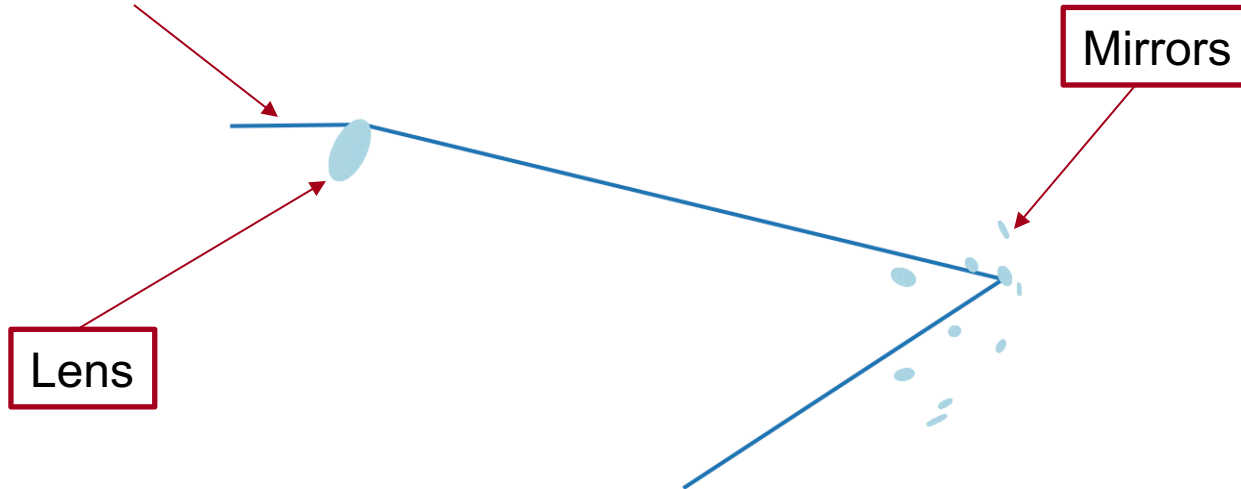
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March 2021

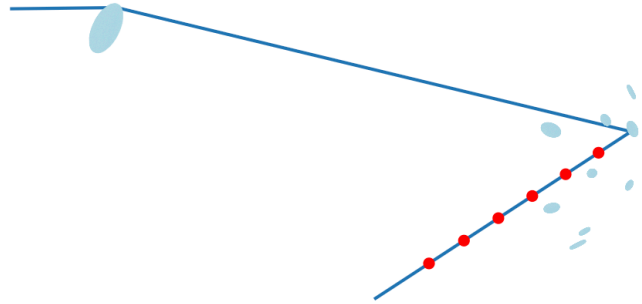U.S. DEPARTMENT OF **ENERGY**
Office of Science

SLAC NATIONAL ACCELERATOR LABORATORY

Ray Marching

- Going from the sensor to the scene.

What is the contribution of this light ray?
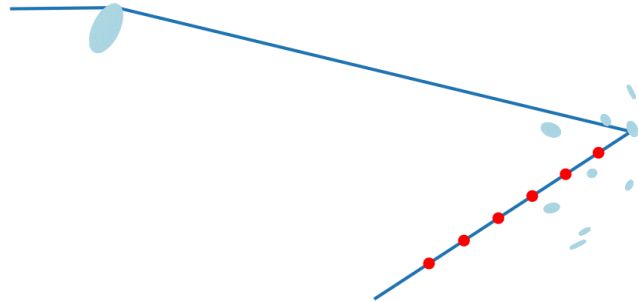
Mirrors

Lens

Ray Marching

- Two-step process.
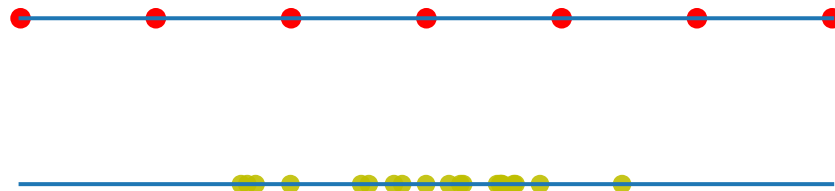 - Stratified sampling.

Ray Marching

- Two-step process.
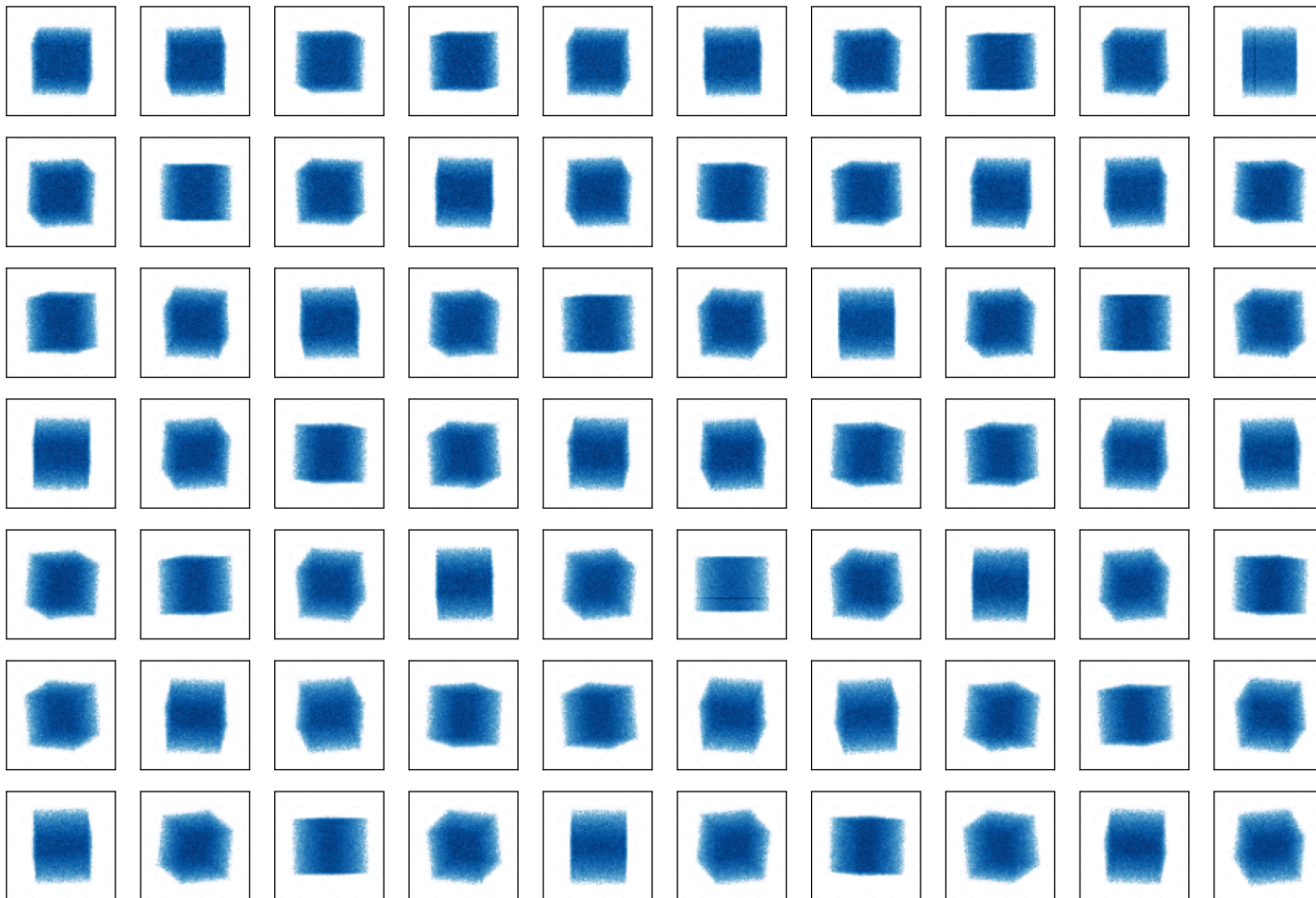
  - Stratified sampling.
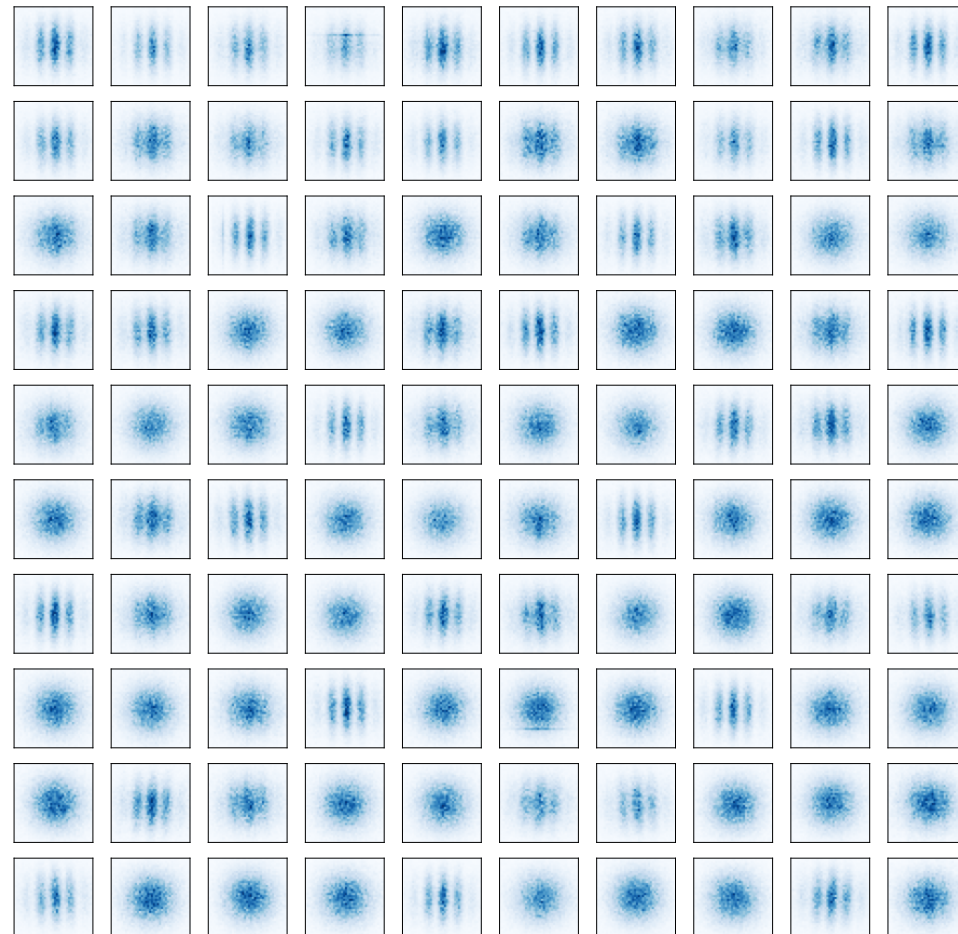
  - Hierarchical volume sampling.

3d reconstruction

- Optimizing $||A(x) - b||^2$ where x is a voxel.
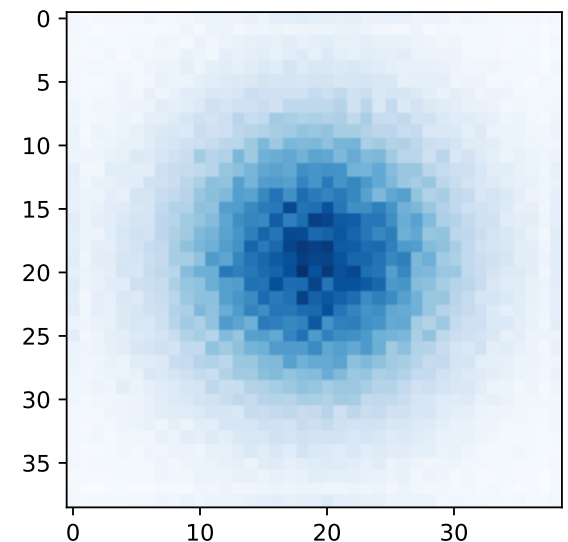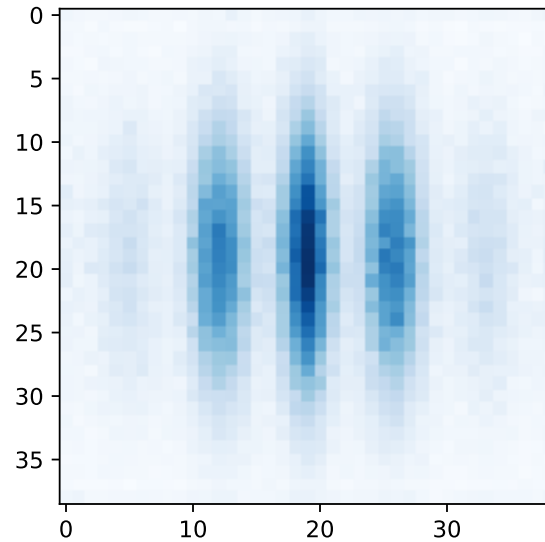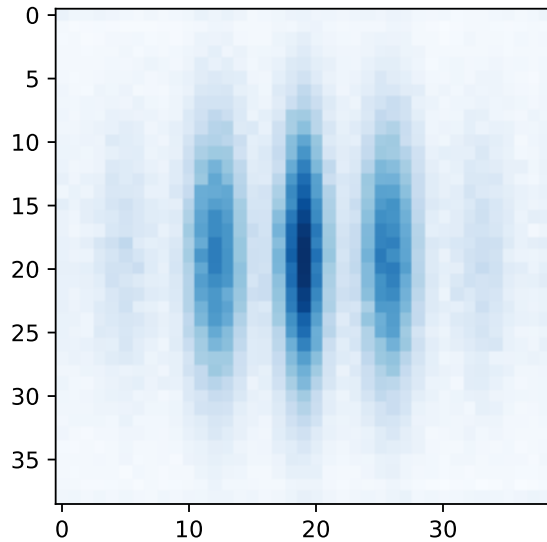 - Optimizing for the voxel densities.

3d reconstruction

- Optimizing $||A(x) - b||^2$ where x is a voxel.
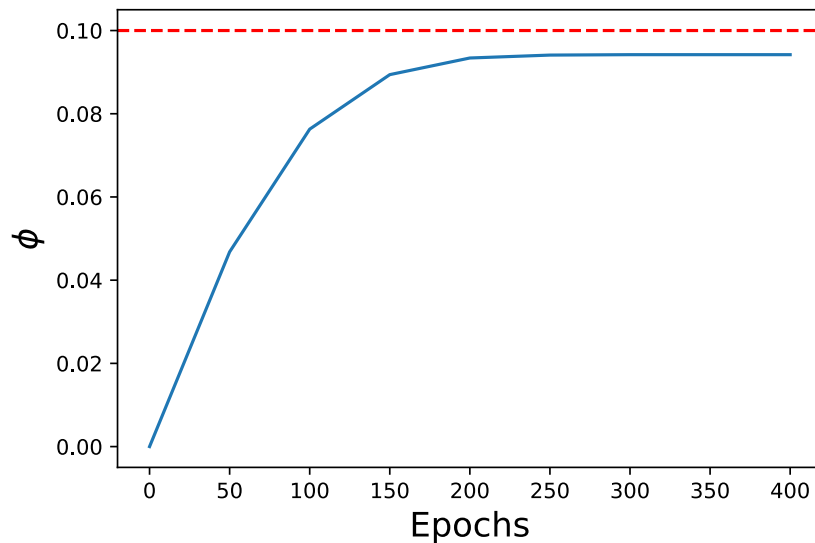 - After ~5k training steps, $A(x)$ is similar to the observed image b.

3d reconstruction

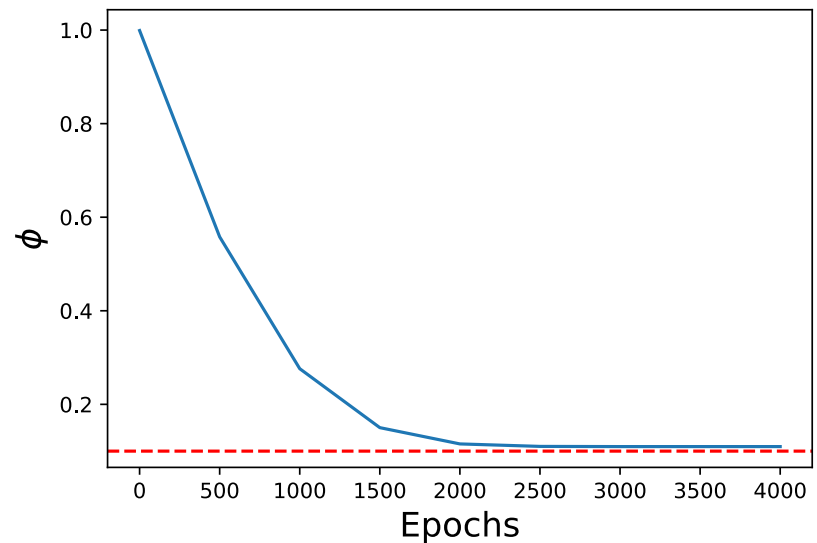- Optimizing $||A(x) - b||^2$ where x is a voxel.

Projections of x (learned).

3d reconstruction

- Optimizing $||A(x) - b||^2$ where x is a parameterized wave function.

    - Optimizing for the parameter ϕ.

Target: 0.1
Final value: 0.0942
Initialization: 0.0

Target: 0.1
Final value: 0.1097
Initialization: 1.0

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