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# OPEN RESEARCH PROBLEMS

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# SPEED IN GENERAL

- Heterogeneous volumes – volume lookups
- Unidirectional estimators are not robust
- Combined bidir estimators slow



# NULL COLLISION ALGORITHMS AND MIS

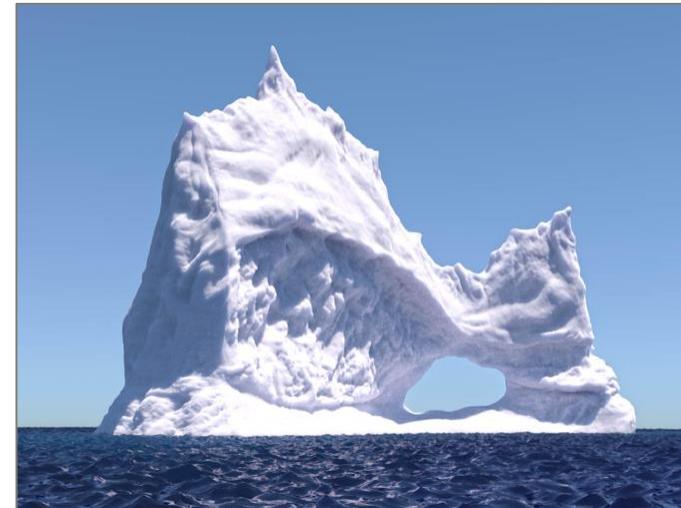
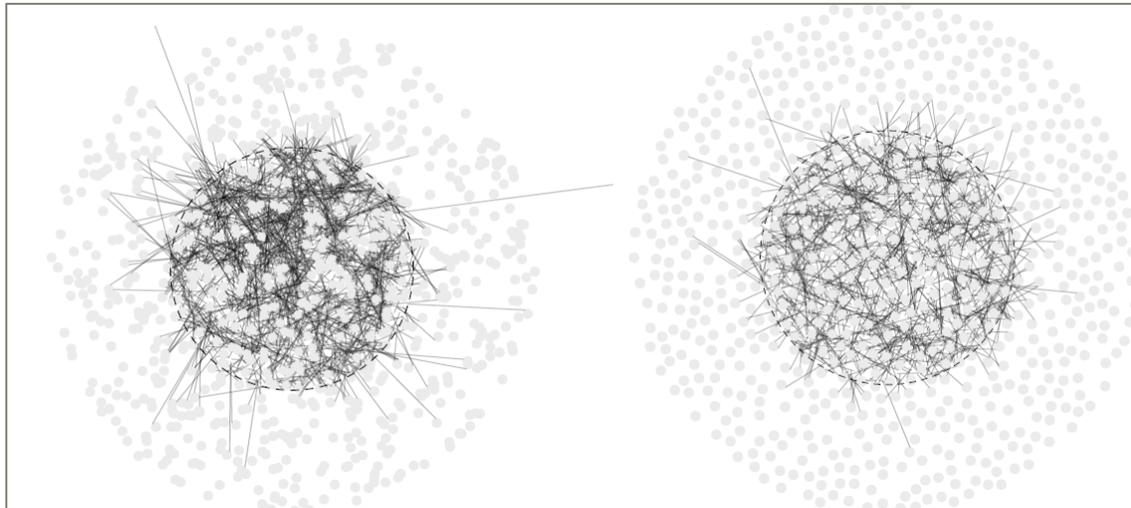
- **“How do I combine Woodcock tracking with equi-angular sampling?”**
- MIS could do that – but we need the Woodcock tracking PDF
  - PDF not easily available – it’s a rejection method
- Can we estimate the PDF (for MIS)?
  - Ray marching – accurate but slow, bias does not matter (it’s just for the MIS weights)

# LEVERAGE MACHINE LEARNING

- Path guiding for volumes
  - [Herholz et al. 2019], still needs improvements
- Denoising of volumes – currently does not work well
  - No features available
- Learn a BSSRDF for dense media
  - Can be done for fluffy clouds, but becomes harder for more structured media
  - Difficult to bound error

# CORRELATED SCATTERERS

- Core assumption of exponential path length – uncorrelated particles
- Particles can be very correlated (biological tissue – cells, sand particles)
- Some existing work [d'Eon 2018, Jarabo et al. 2018, Bitterli et al. 2018]



# SURFACES & VOLUMES

- **Joint handling of surfaces and volumes**
- Represent surfaces as volumes, too?
  - ... and then jointly downscale for LOD

# THANK YOU!

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