

PATH TRACING REAL TIME DL DENOISING

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Advised by Liam Dugan



Credit: <https://alain.xyz/blog/ray-tracing-denoising>

OUR TEAM



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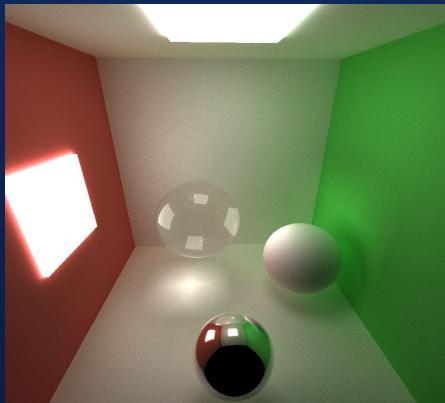
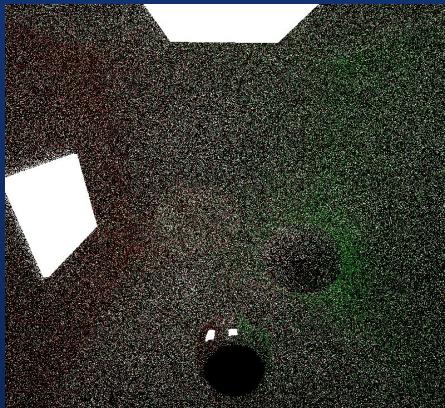
INSPIRATION



Source: NVIDIA Optix



PROJECT OVERVIEW



- Real-Time Denoiser
 - Implemented in the path tracer
- Deep Learning Approach
 - Denoiser CNN paper
 - Fine-tuned for path tracer
- Real-Time Performance
 - 30 FPS goal
 - cuDNN, cuBLAS, CUDA

APPROACH

- Restructure DnCNN
 - Halve depth
 - GBuffer channels
- Fine-tune DnCNN
 - Collect dataset
 - Pytorch training
- Load DnCNN
 - Pytorch checkpoint to CSV
 - cuDNN
- Restructure and optimize path tracer
 - BVH
 - Optimized denoising integration

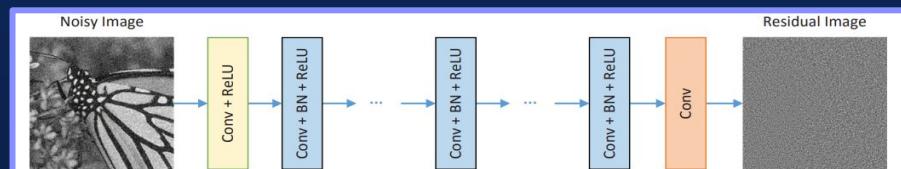
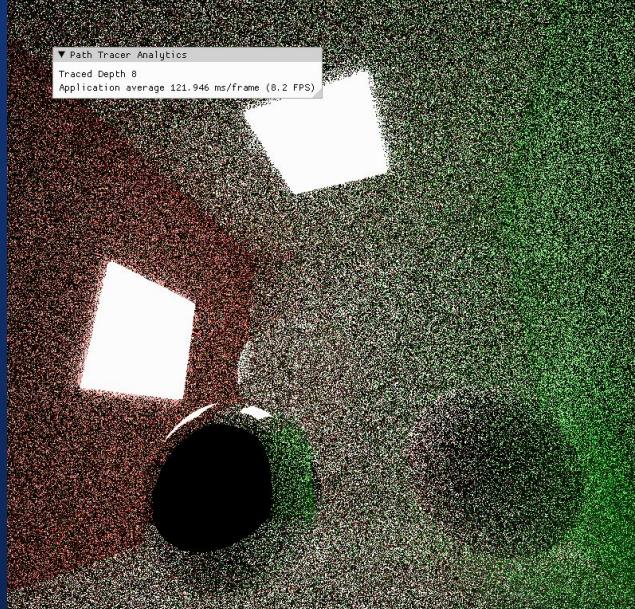


Fig. 1. The architecture of the proposed DnCNN network.

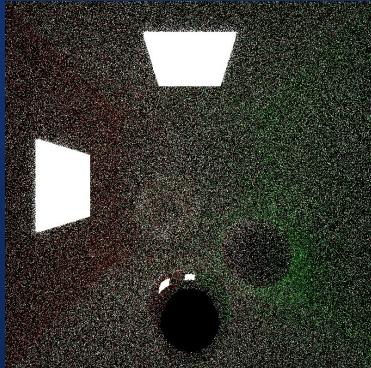
DnCNN: <https://arxiv.org/abs/1608.03981>



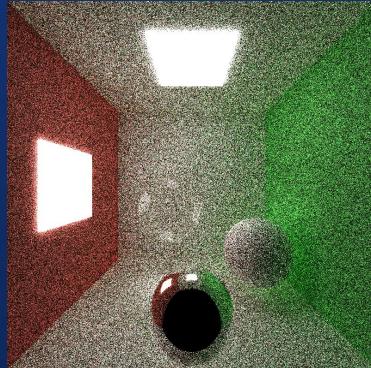
RESULTS

Original Image

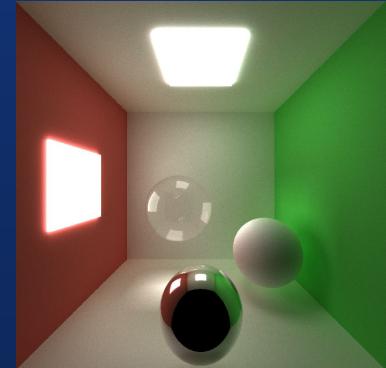
1 SPP



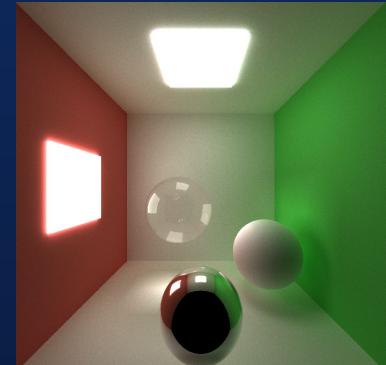
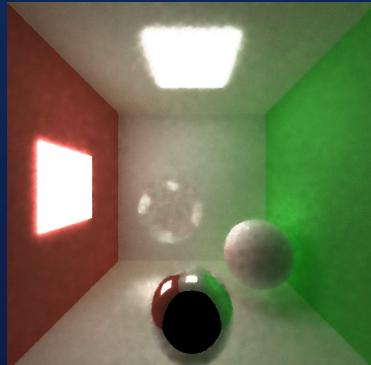
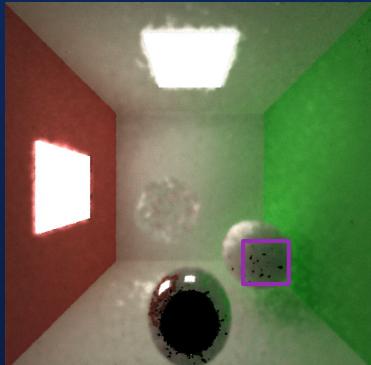
16 SPP



GT (5000 SPP)



Denoised



9 Channels, 10 Layers, 15,000 iterations, ~3,200 images

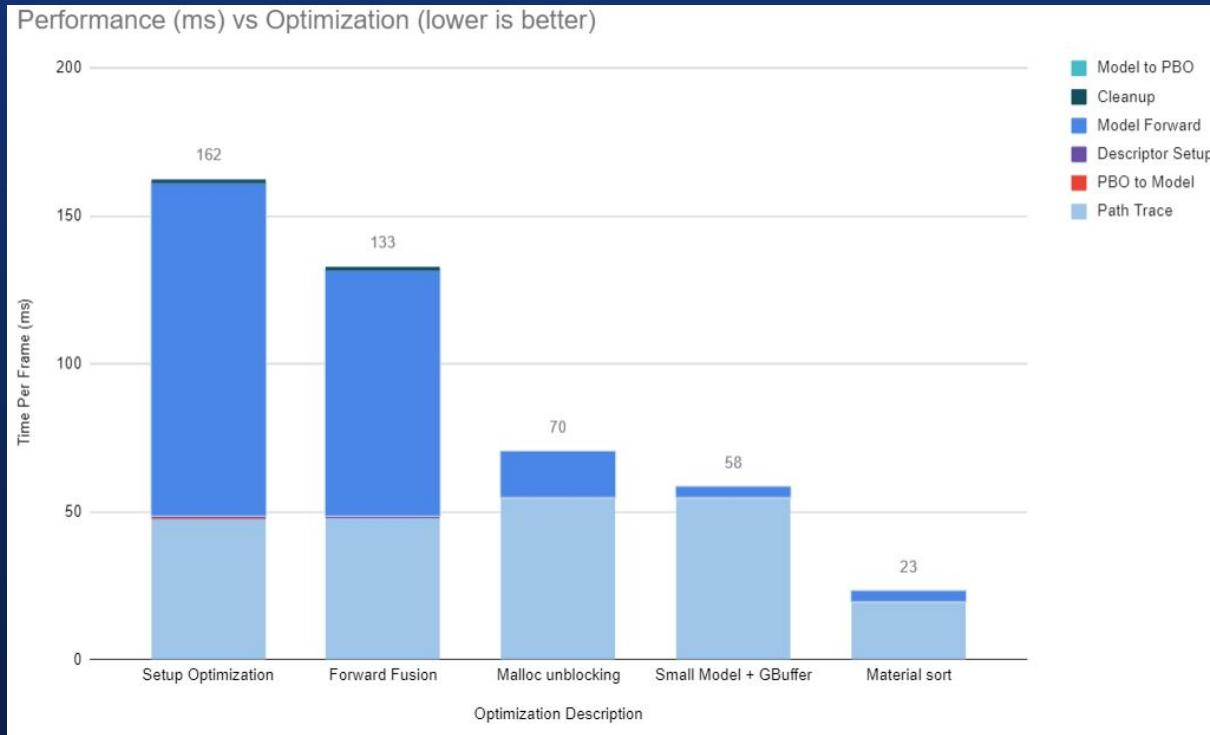


DEMO

<https://youtube.com/shorts/PGrzJflkskQ?feature=share>



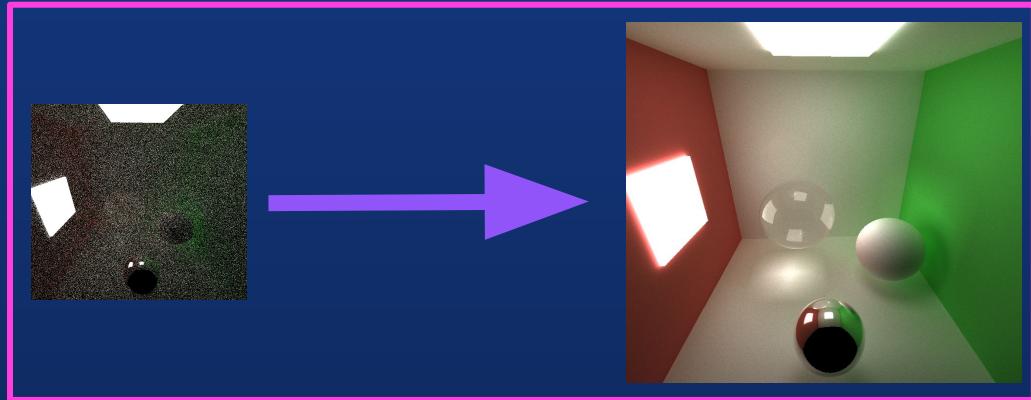
PERFORMANCE



Results from 800x800 Cornell Box scene using a RTX 3070



FUTURE WORK



- Better model
 - RCNN + Encoder Decoder
- Super Sampling
- Even more optimizations
 - Faster path tracing
- More Data and Training time



Acknowledgements

- Thank you Liam Dugan for great advice and support throughout the project!
- Thank you to our shadow team for great ML and presentation advice!
- DnCNN
 - <https://arxiv.org/abs/1608.03981>
 - <https://github.com/cszn/KAIR>
- NVIDIA Optix
 - https://research.nvidia.com/sites/default/files/publications/dnn_denoise_author.pdf
- Alain Galvan
 - <https://alain.xyz/blog/ray-tracing-denoising>



Thank You!

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Appendix:

Original Image

1 SPP



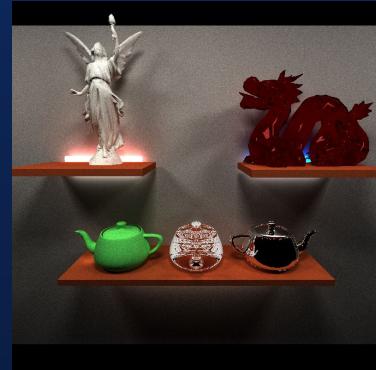
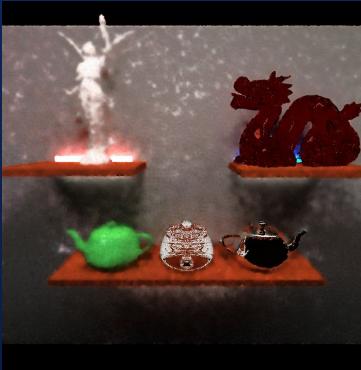
16 SPP



GT (5000 SPP)



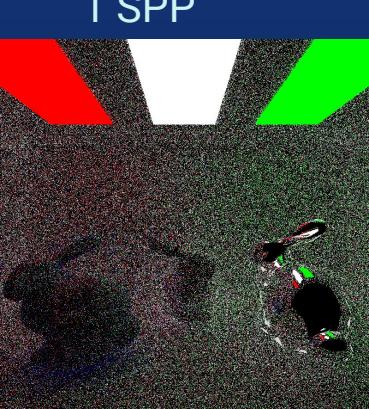
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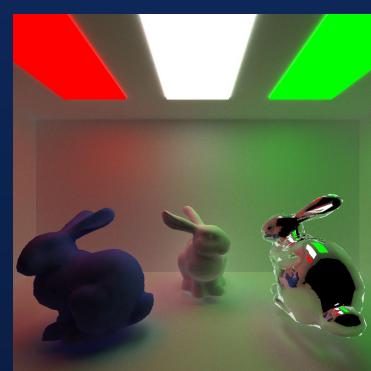
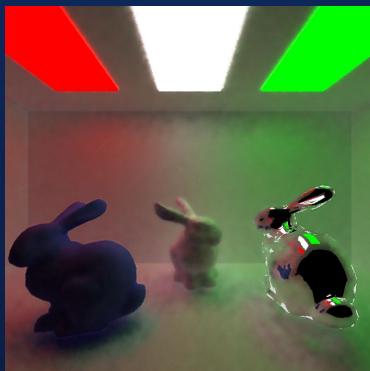
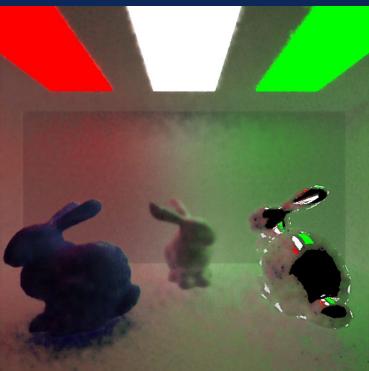


Appendix:

Original Image



Denoised





Appendix:

