

# Team 7

# Mid-term Project

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Improved Progressive Denoiser

Jaehyeon Lee, Chanwoo Cho



# EUROGRAPHICS 2022

43<sup>RD</sup> ANNUAL CONFERENCE OF  
THE EUROPEAN ASSOCIATION FOR COMPUTER GRAPHICS



**REIMS · FRANCE**  
**APRIL 25-29 / 2022**

## PROGRESSIVE DENOISING OF MONTE CARLO RENDERED IMAGES

ARTHUR FIRMINO, JEPPE REVAL FRISVAD, AND HENRIK WANN JENSEN

April 26<sup>th</sup>, 2022  
Centre des Congrès de Reims



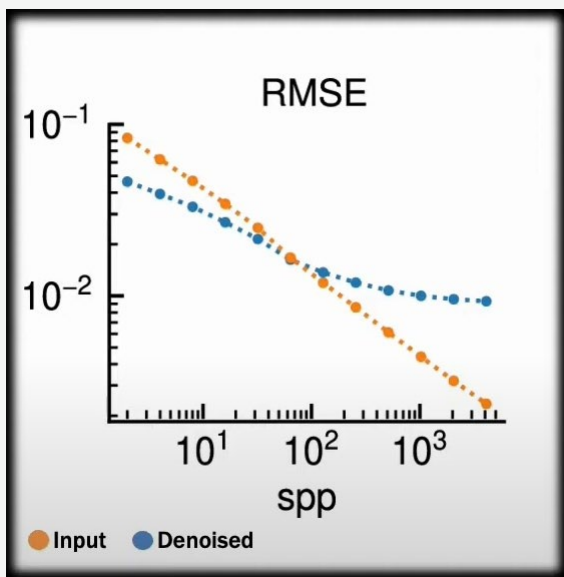
**LUXION**

DTU Compute  
Department of Applied Mathematics and Computer Science

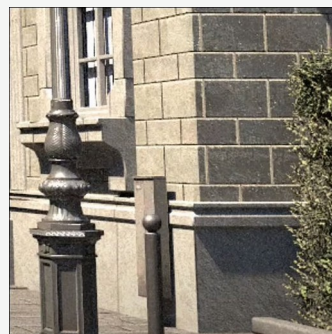


# Recap : Progressive Denoiser

Basic Idea : To solve **Non-converging** problem, mix rendered img. & denoised img.



$(1 - \alpha) \cdot$



Rendered img.

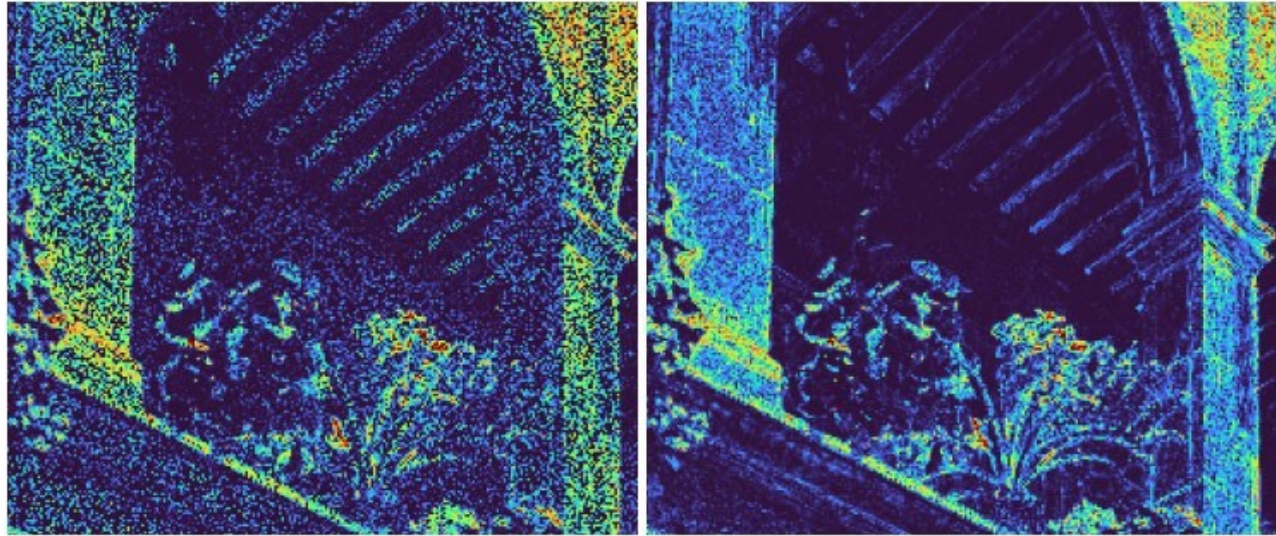
$+ \alpha \cdot$



Denoised img.

# Recap : Progressive Denoiser

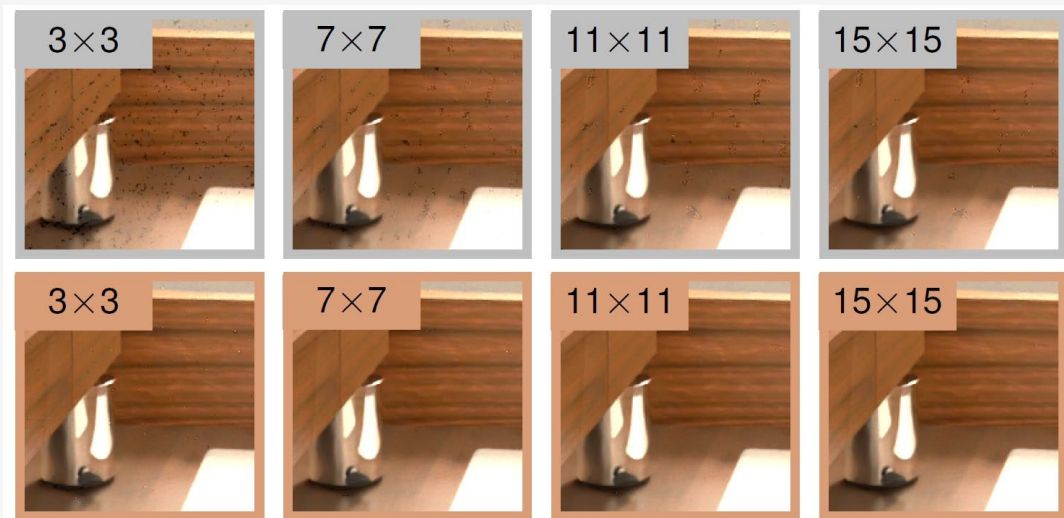
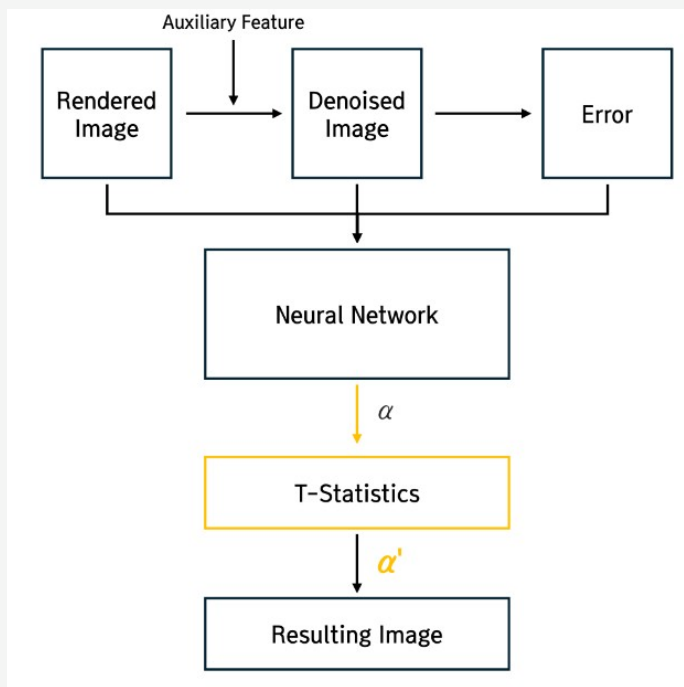
Basic Idea : To solve **Non-converging** problem, mix rendered img. & denoised img.



**Figure 3:** *Per-pixel squared error estimate of a denoised image using SURE (left), and its actual squared error (right).*

# Recap : Progressive Denoiser

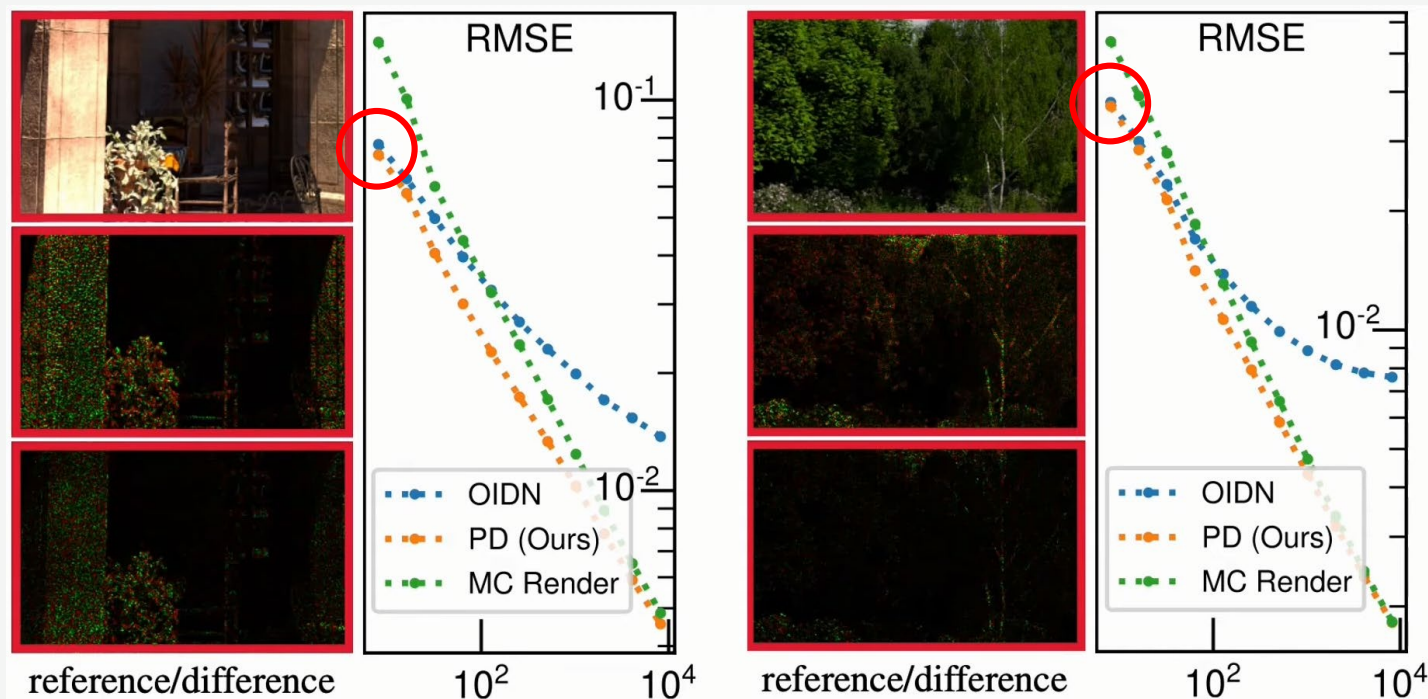
Basic Idea : To solve **Non-converging** problem, mix rendered img. & denoised img.





# Recap : Progressive Denoiser

Problem : Low-spp cases



Rely on underlying denoiser

# Recap : Progressive Denoiser

**Problem** : Low-spp cases



**Figure 13:** *Limitation of our method at very low sample counts, 2spp in this example, arising from insufficiently accurate sample variance estimates.*

**Error estimation failure**  
at low spp

→ Bad Composition

# Recap : Progressive Denoiser

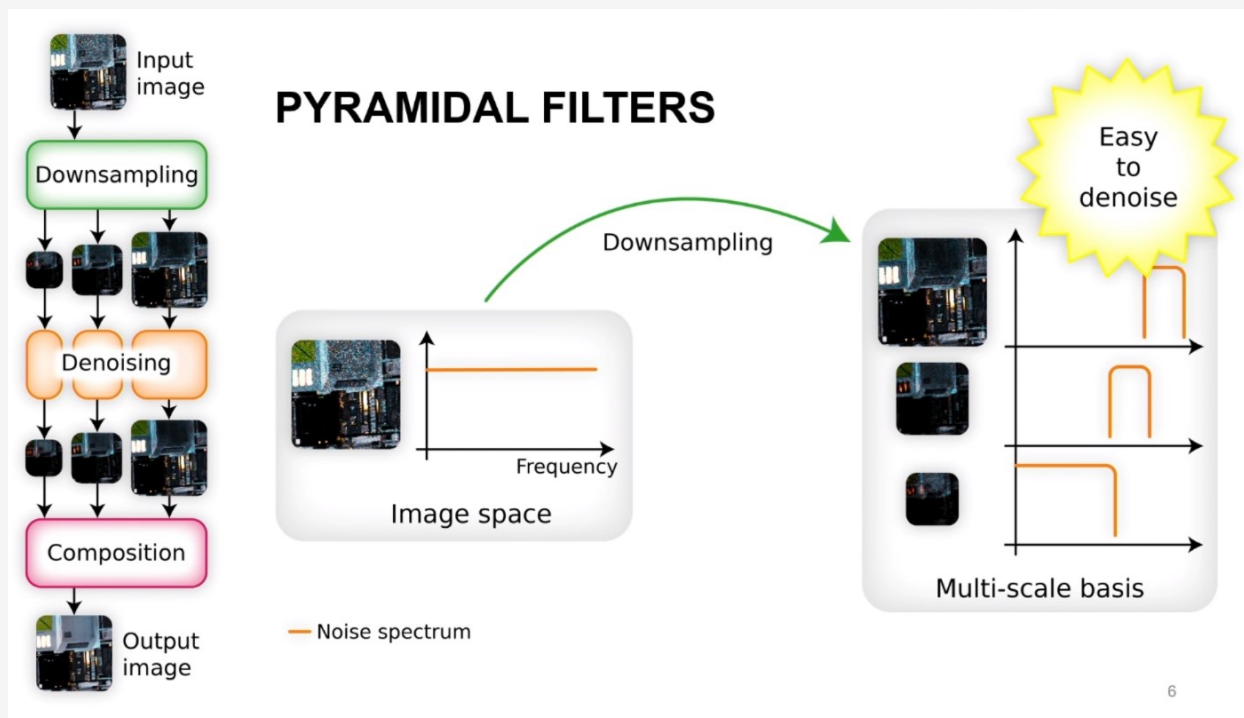
**Problem** : Low-spp cases

1. Limit of underlying denoiser
2. Error estimation failure



# Better Denoiser(low-spp) : NPPD

Neural Partitioning Pyramids for Denoising Monte Carlo Rendering  
(SIGGRAPH 2023)

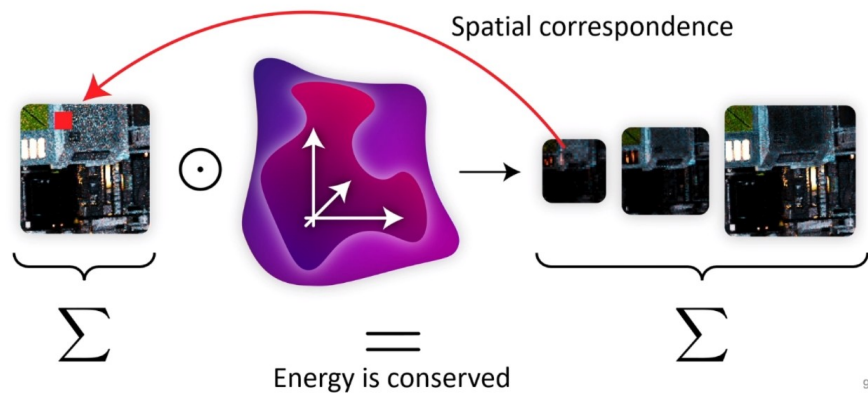


# Better Denoiser(low-spp) : NPPD

## Neural Partitioning Pyramids for Denoising Monte Carlo Rendering (SIGGRAPH 2023)

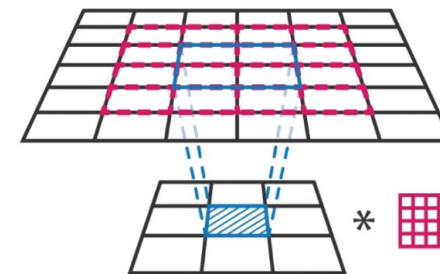
### IMPLICIT DOWNSAMPLING

How to redistribute energy?



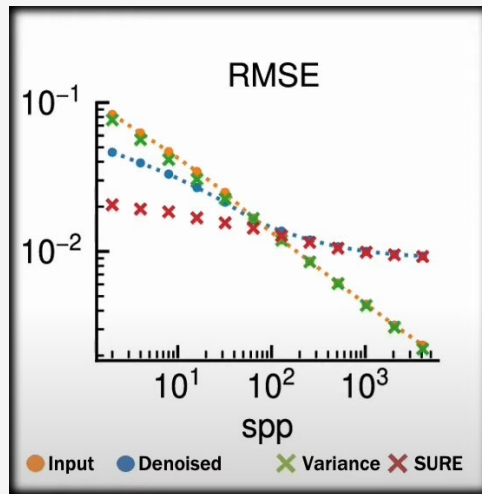
### COMPOSITION

- Implicit basis
  - Hidden from us
- Let network predict upsampling kernels
  - Very similar to denoising kernels



# Error Estimation

**Progressive Denoiser** : Used t-statistics (Based on local coherency)  
+ Extend temporal coherency?



# Error Estimation

**Progressive Denoiser** : Used t-statistics (Based on local coherency)  
+ Extend temporal coherency?

## Better Estimators

- Denoising with Kernel Prediction and Asymmetric Loss Functions  
(ACM Transactions on Graphics Vol 37, Issue 4)
- Practical Error Estimation for Denoised Monte Carlo Image Synthesis  
(SIGGRAPH 2024)

# Todo

- ~~- Prepare environment~~
  - ~~- Compile OIDN & Progressive Denoiser~~
  - ~~- Setup NPPD~~
- Dataset manipulation
- Modify Progressive Denoiser

# Roles

## **Jaehyeon Lee**

- Combine NPPD & Progressive Denoiser
- Manipulate dataset

## **Chanwoo Cho**

- Improve error estimation



**Q & A**

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