# Structured Kernel Estimation for Photon-Limited Deconvolution
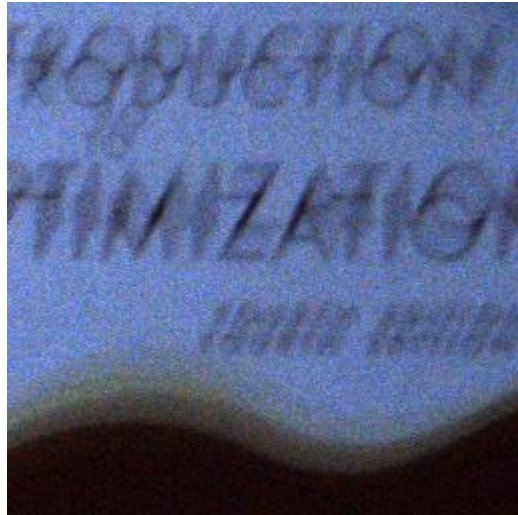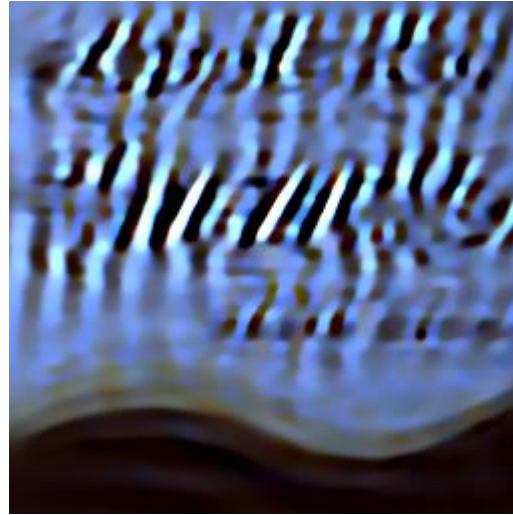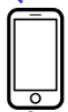


Motion Blur + Shot Noise
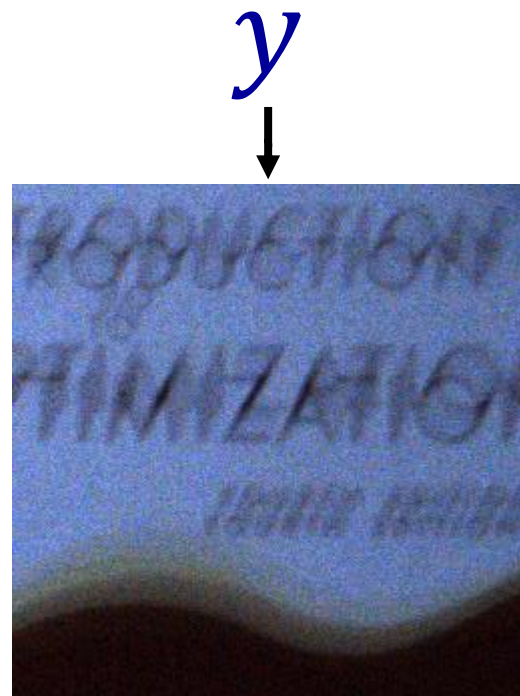


Conventional Blind Deconvolution[1]

[1] Jérémy Anger et al. *"Efficient blind deblurring under high noise levels."* International Symposium on Image and Signal Processing and Analysis (ISPA). IEEE, 2019.
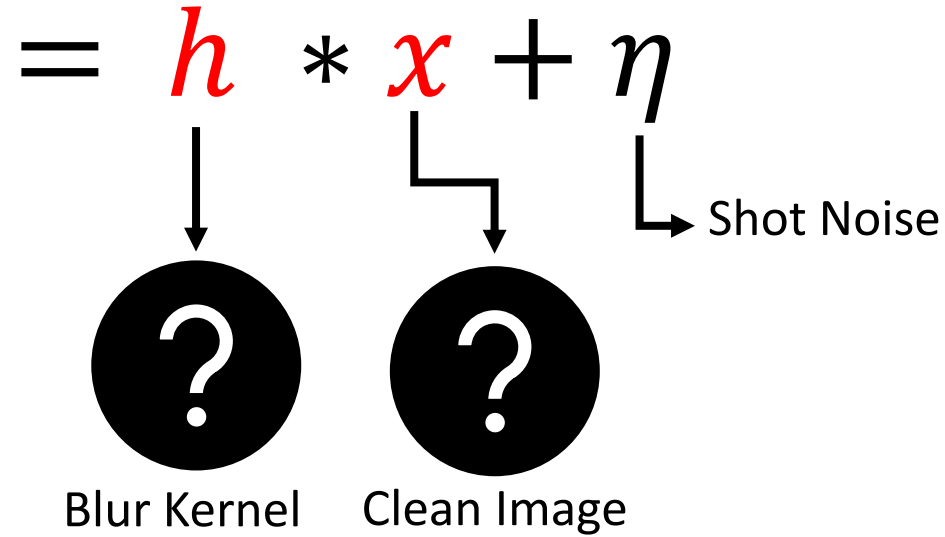
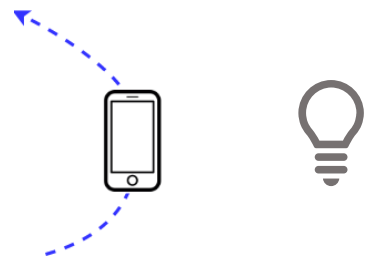# Structured Kernel Estimation for Photon-Limited Deconvolution
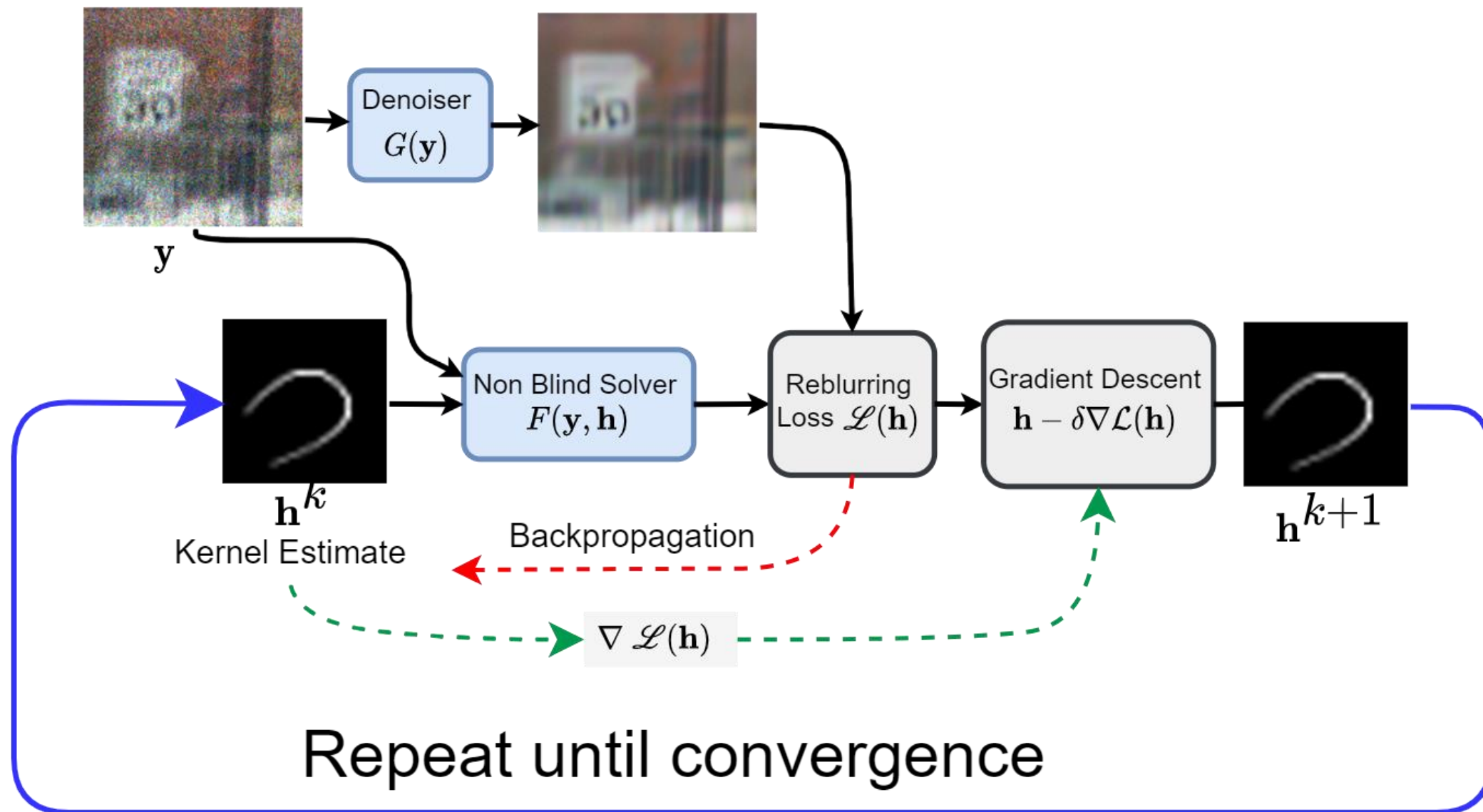
$$y = h * x + \eta$$

Shot Noise

Blur Kernel    Clean Image
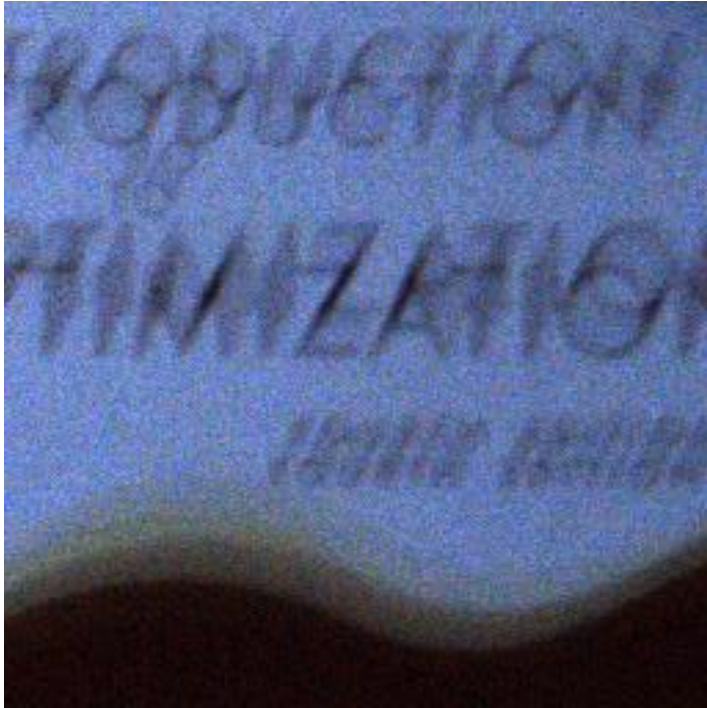
Motion Blur + Shot Noise

# Iterative Kernel Estimation

# Blind Deconvolution as Iterative Kernel Estimation

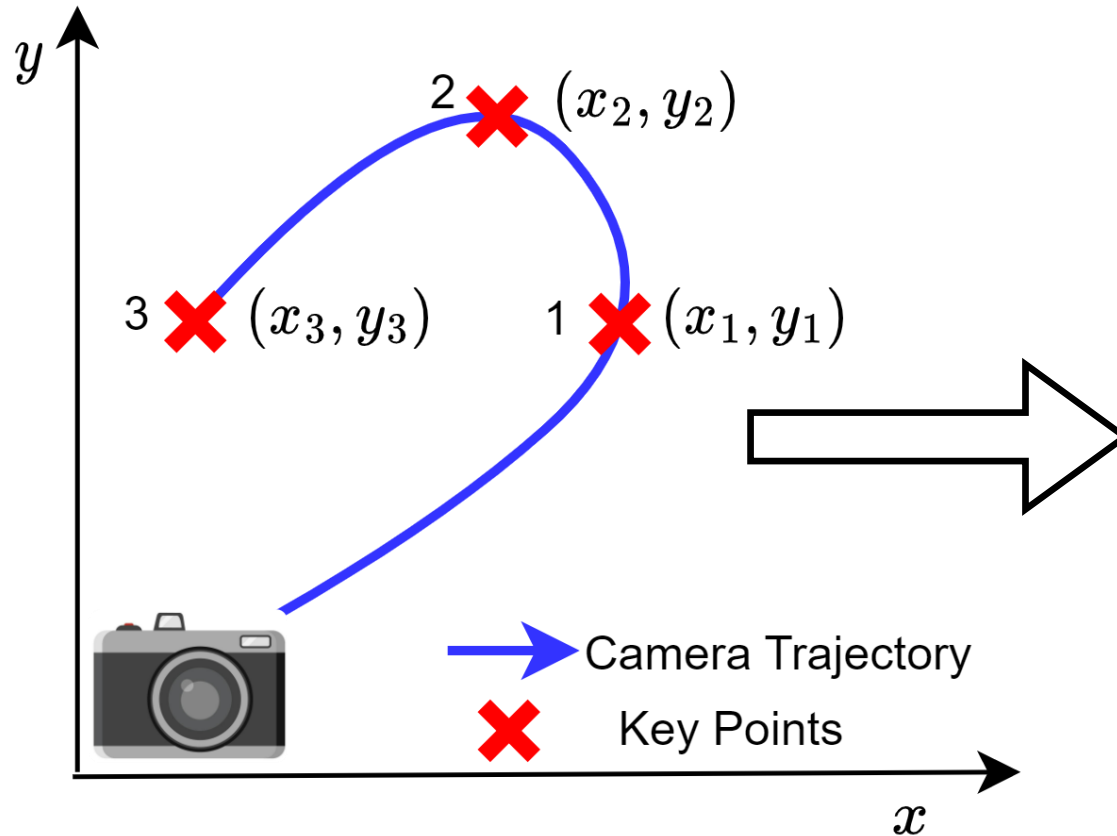

Real blurred and noisy image

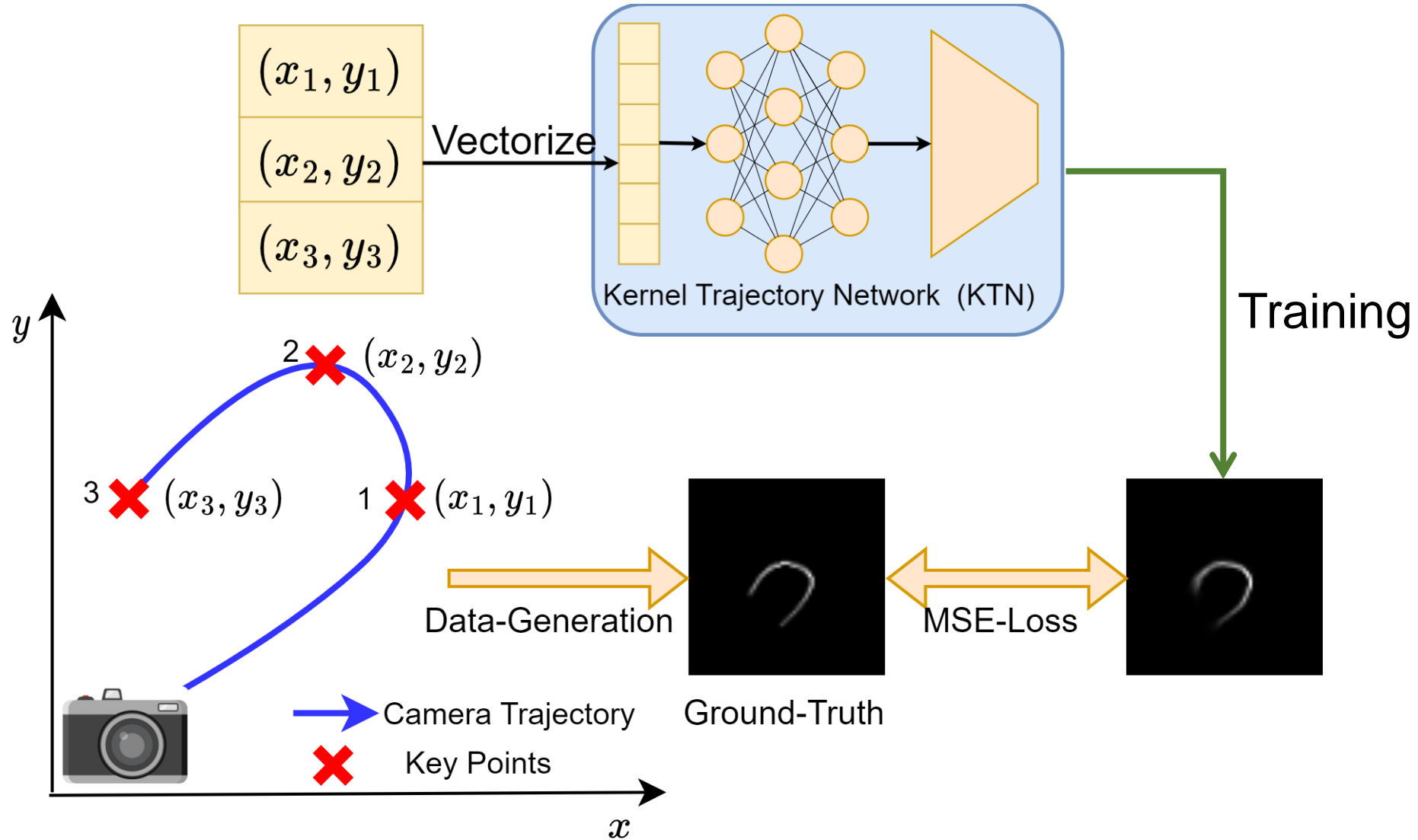Restored image, kernel in inset

Search Space too large

Need for a low-dimension search space!
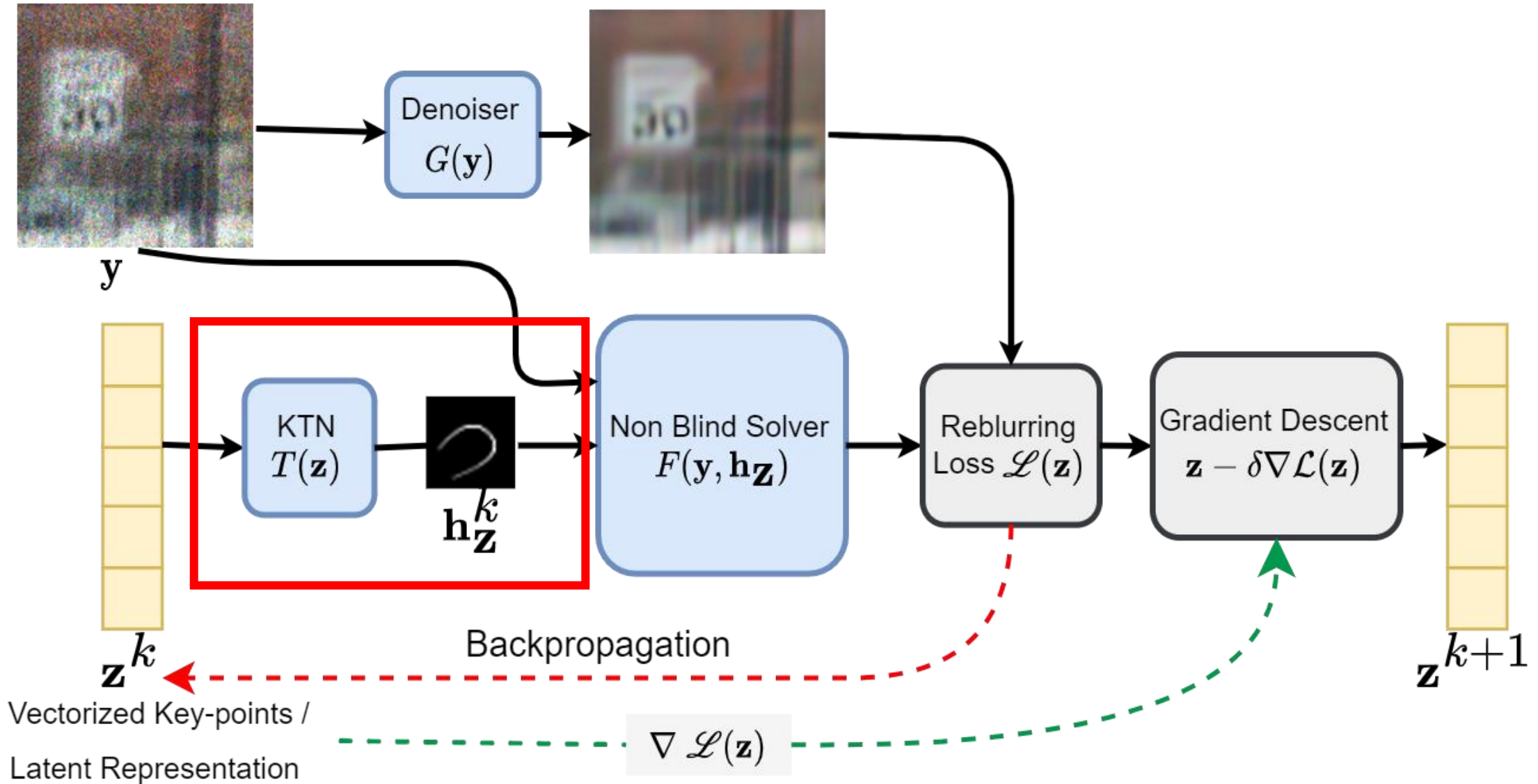
# Changing the Search Space
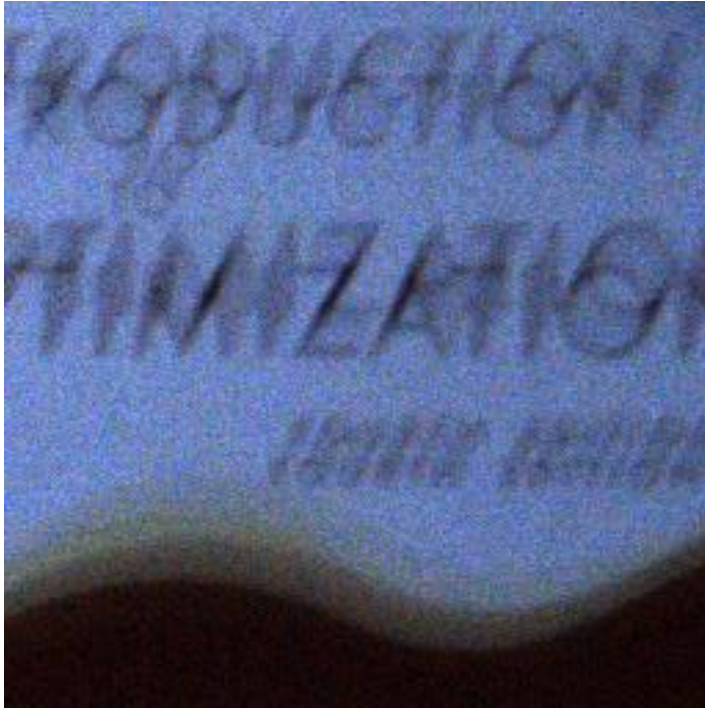


Blur kernel

# Differentiable Search Space

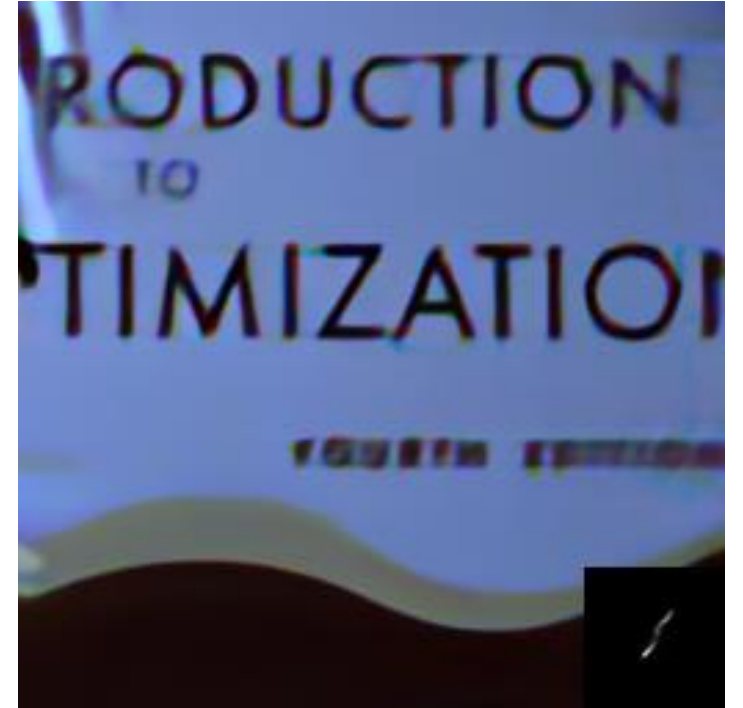# Iterative Scheme in the New Search Space

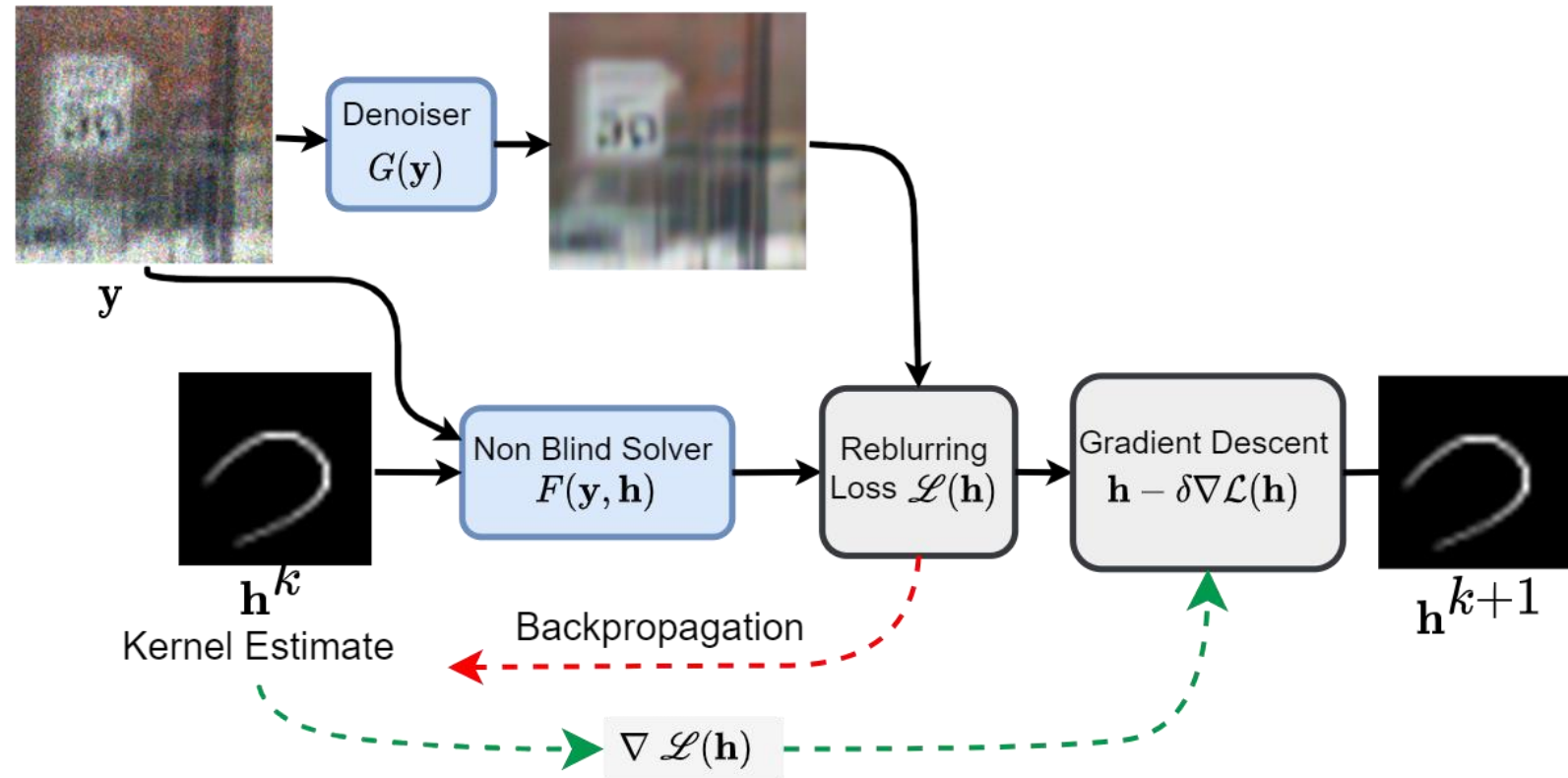# Improved Deconvolution!



Real Blurred and Noisy Image

Restored Image using iterative kernel estimation

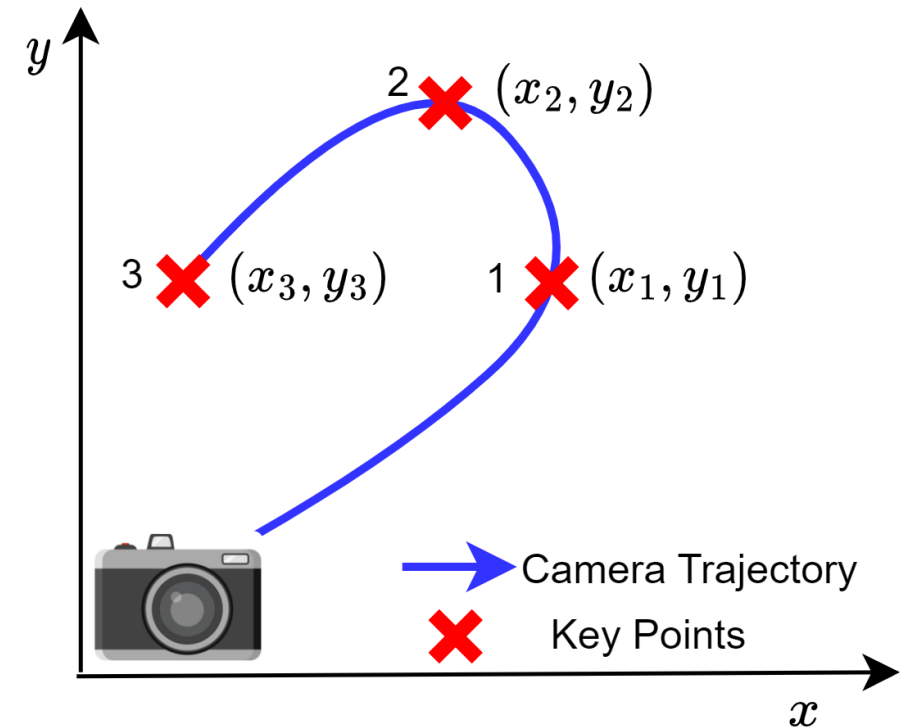**Ours,** structured kernel estimation

# Conclusion

- Iterative kernel estimation scheme for blind deconvolution

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- New lower-dimensional search space for kernel estimation

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- Refer to our paper *"Structured Kernel Estimation for Photon-Limited Deconvolution"* on arxiv for more details