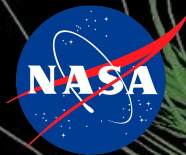
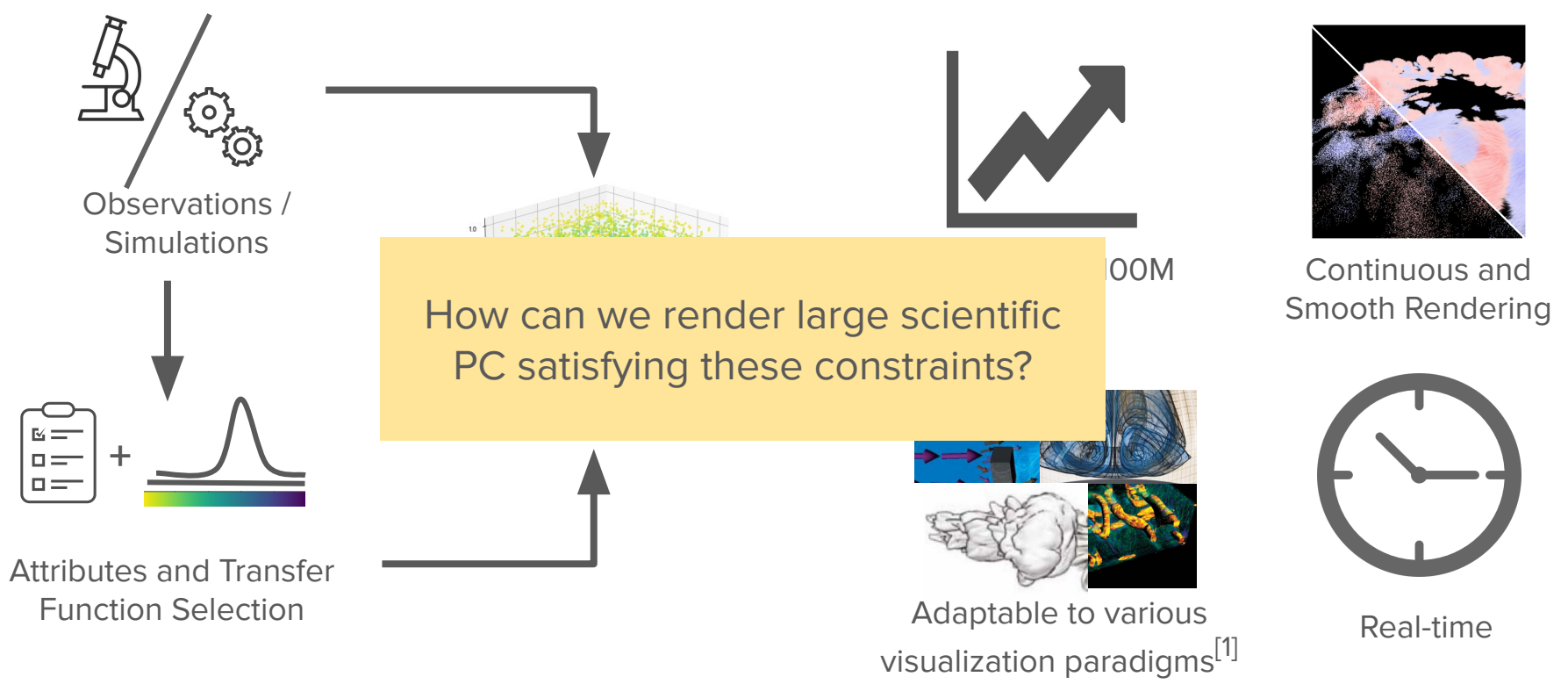


NARVis: Neural Accelerated Rendering for Real-Time Scientific Point Cloud Visualization

Srinidhi Hegde, Kaur Kullman, Thomas Grubb, Leslie Lait, Stephen Guimond, and Matthias Zwicker

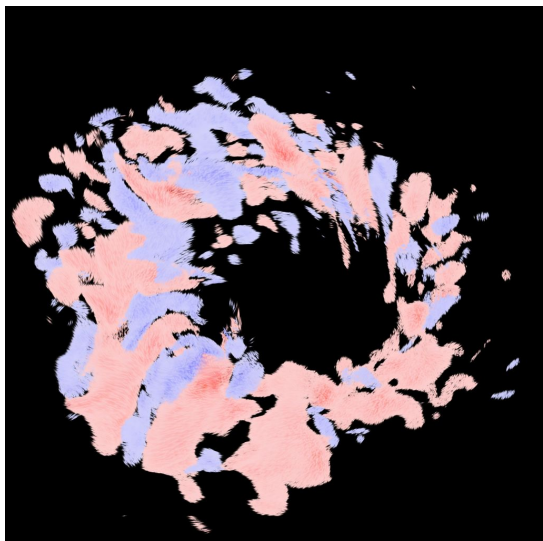


Overview

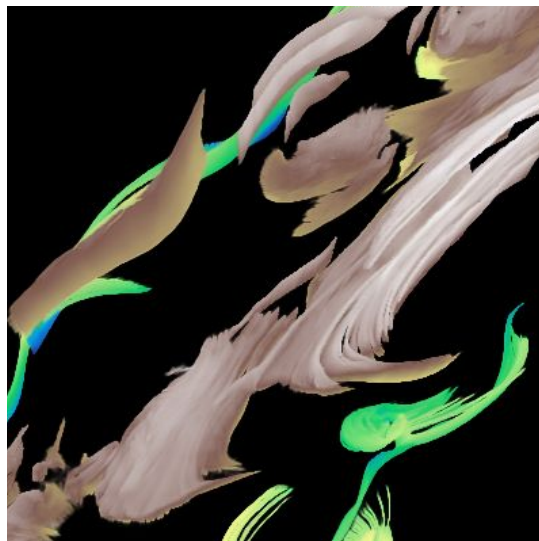
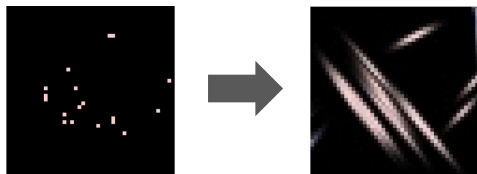


[1] Brambilla, A., Carnecky, R., Peikert, R., Viola, I., & Hauser, H. (2012). Illustrative flow visualization: State of the art, trends and challenges. *Visibility-oriented Visualization Design for Flow Illustration*.

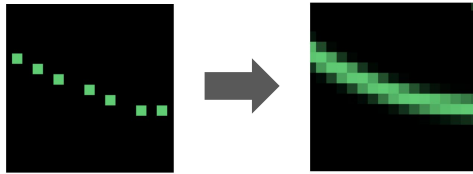
Visualization Requirements



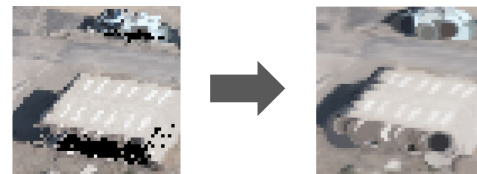
Hurricane (408K pts)
Static Vector Field



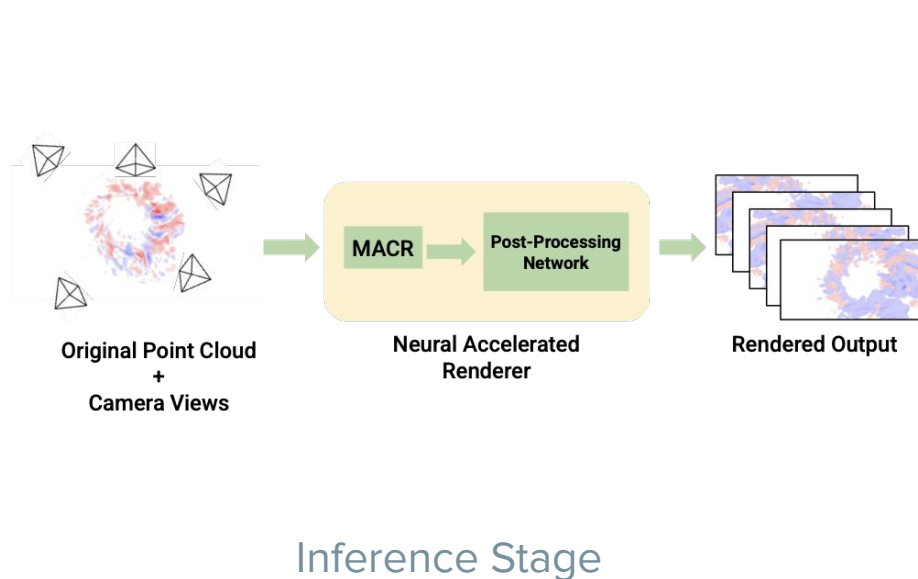
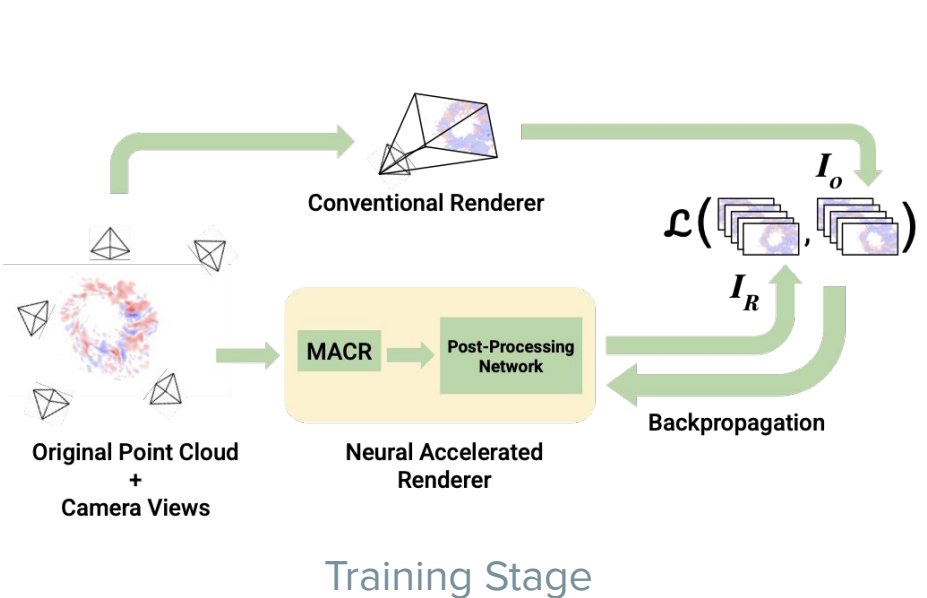
Storms (45M pts)
Particle Trajectory



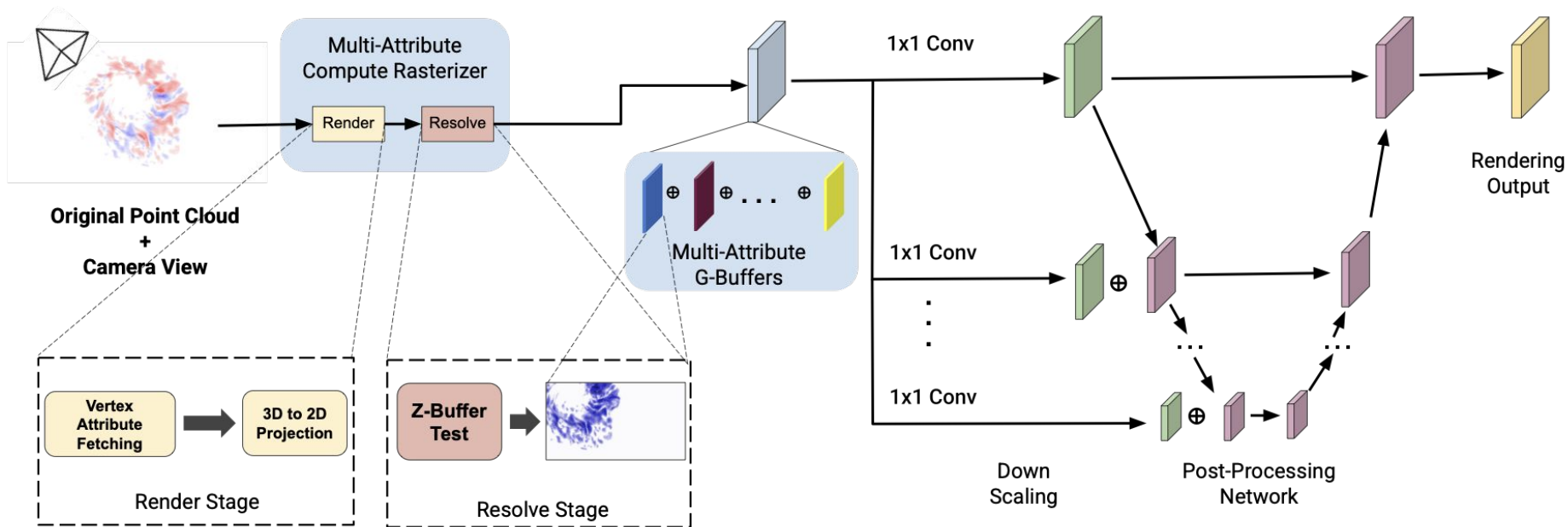
Morro Bay (350M pts)
Photometric LiDAR Scan



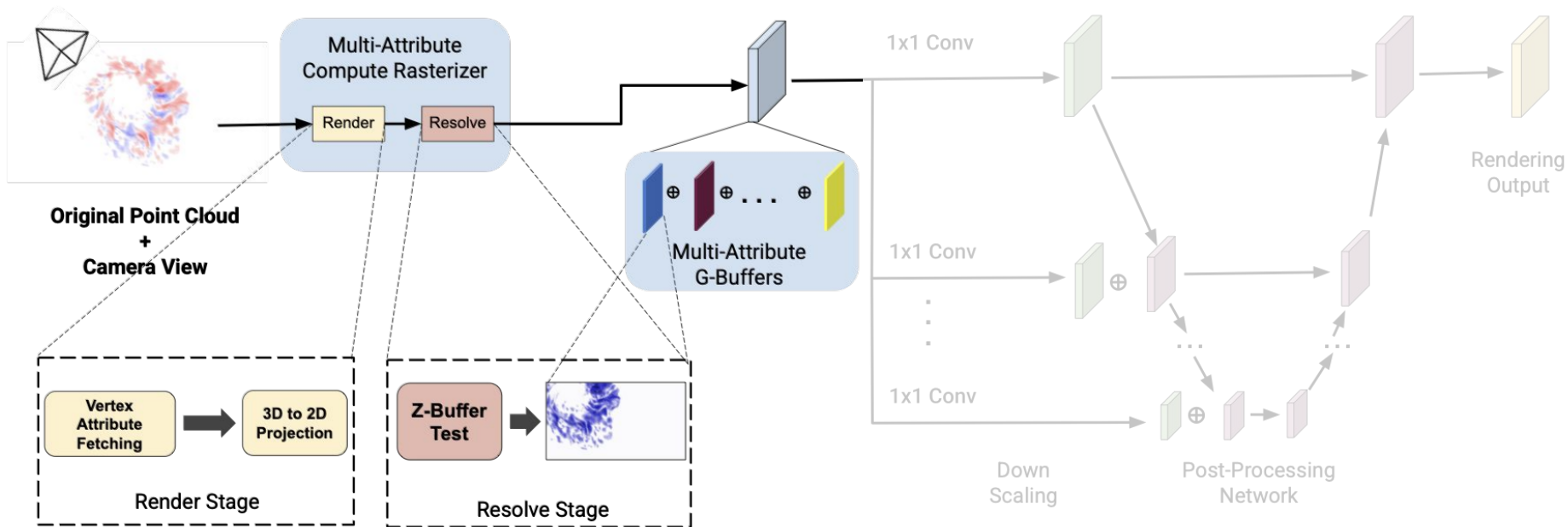
Neural Accelerated Rendering - NARVis Framework



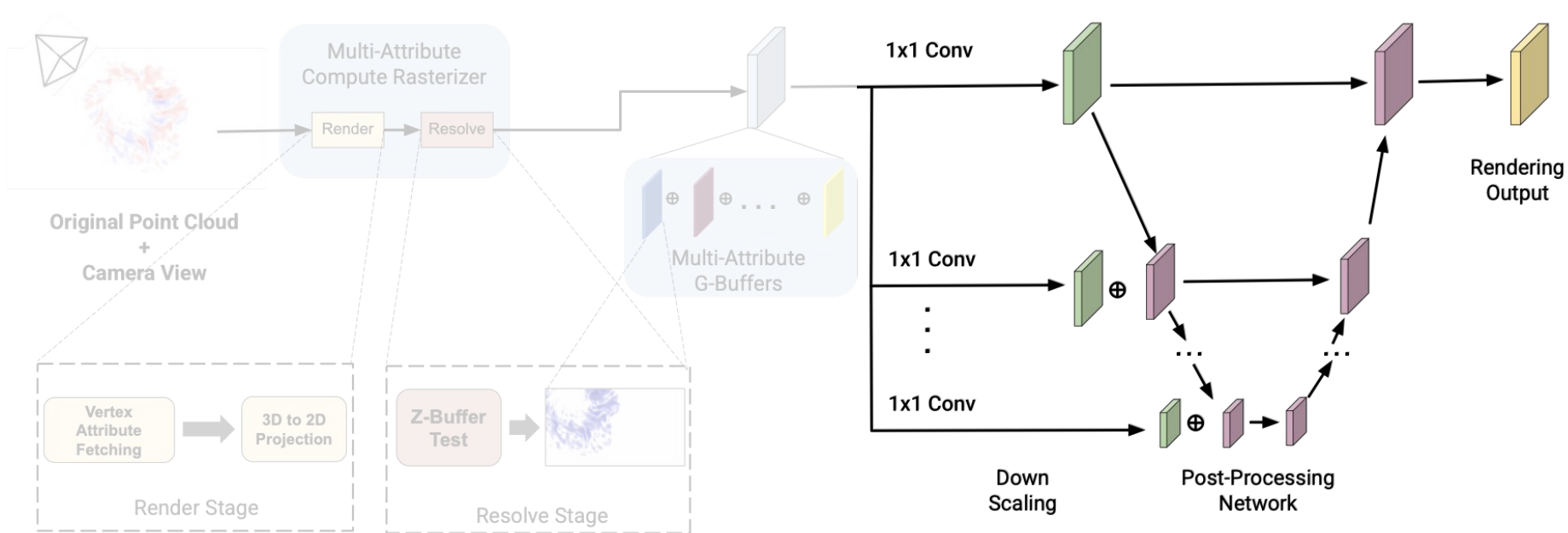
NARVis Components



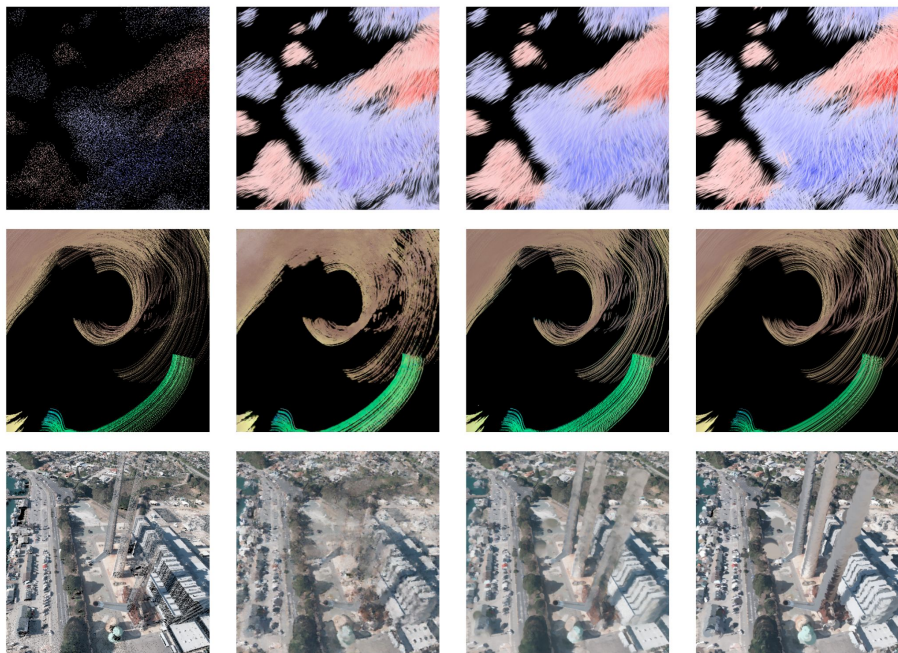
NARVis Components



NARVis Components



Rendering Results



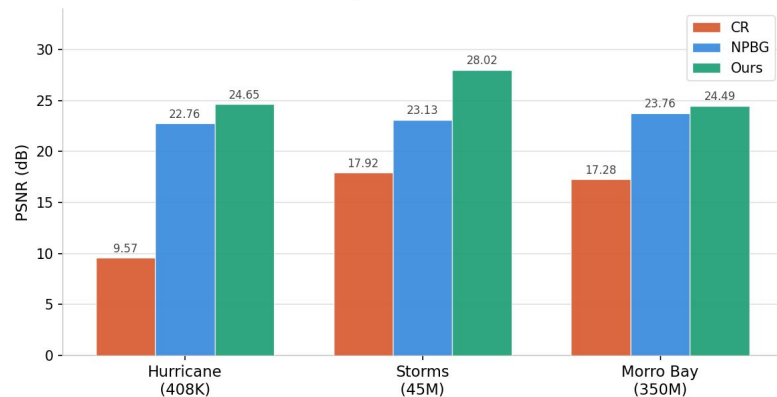
CR

NPBG

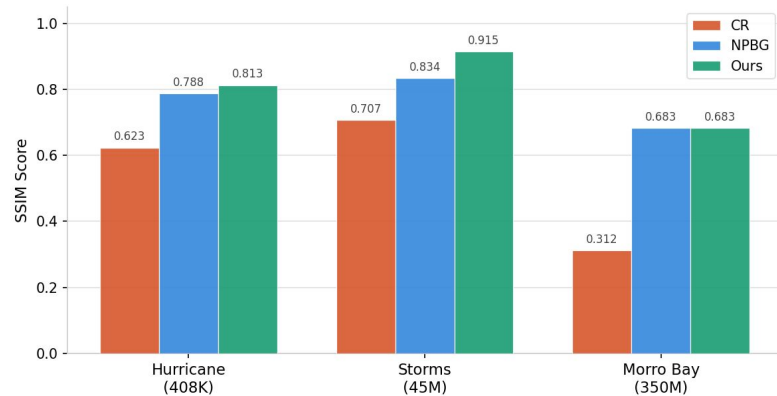
Ours

GSplat

PSNR Comparison Across Datasets

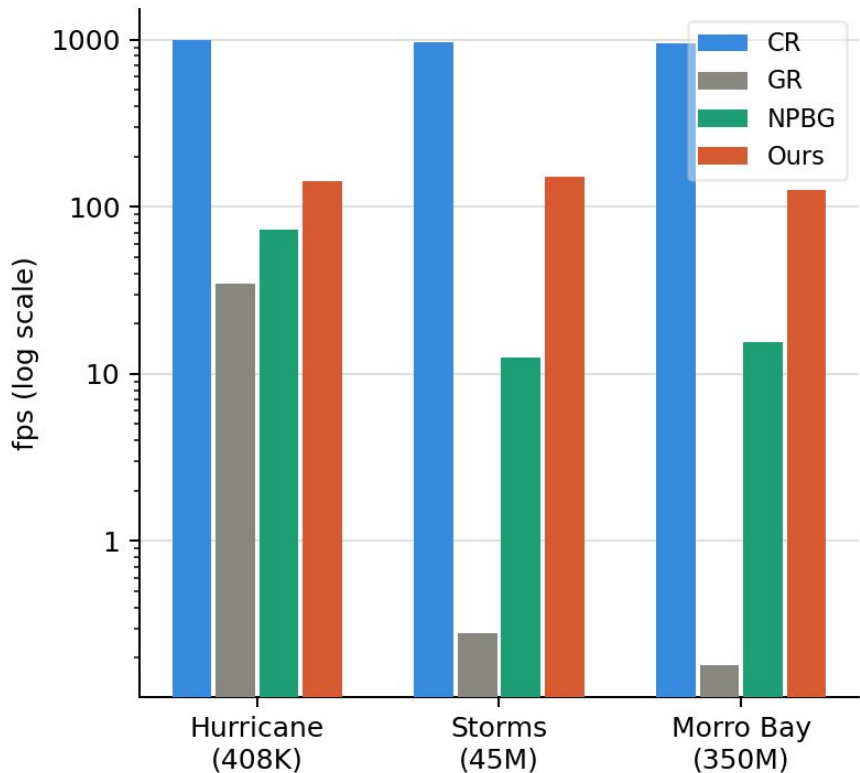


SSIM Comparison Across Datasets

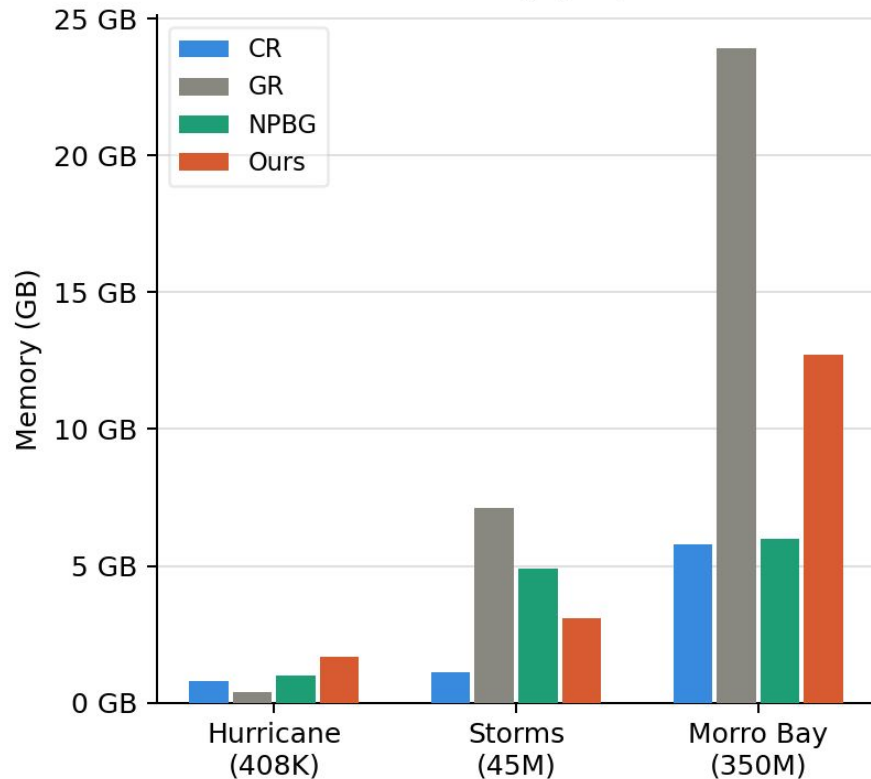


Rendering Performance and Memory Footprint

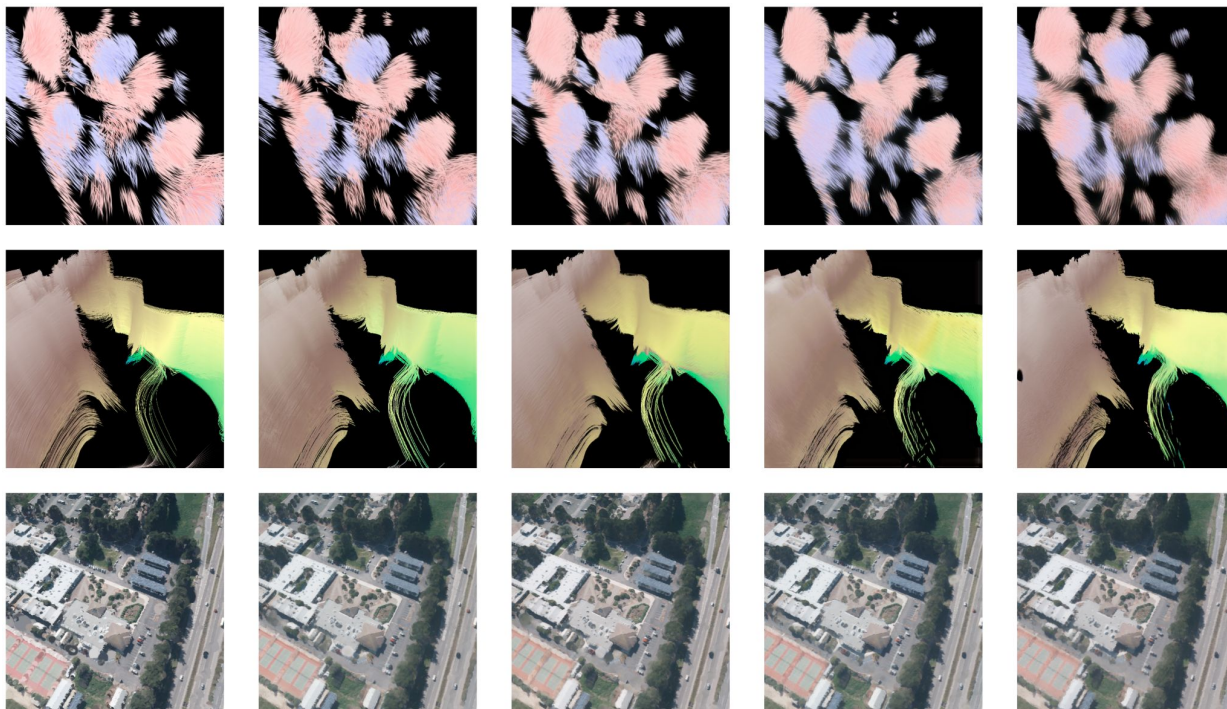
Speed (fps)



Memory (GB)



Rendering Quality under Varying Point Cloud Sparsity



GSplat

1x

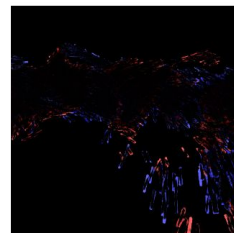
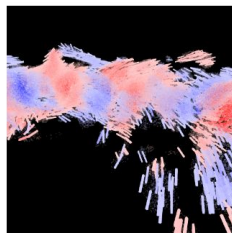
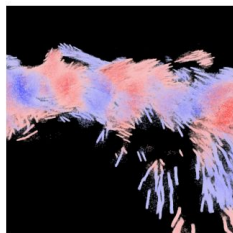
2x

4x

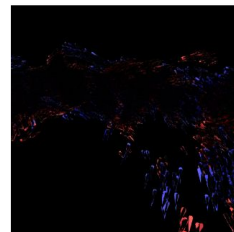
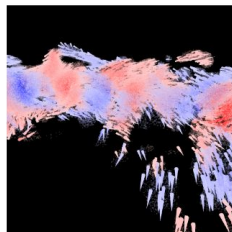
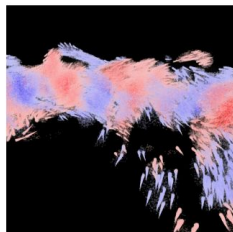
10x

Glyph Stylization Support

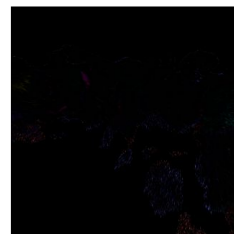
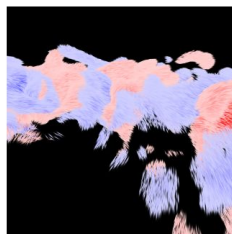
Boxes



Cones



Gaussians

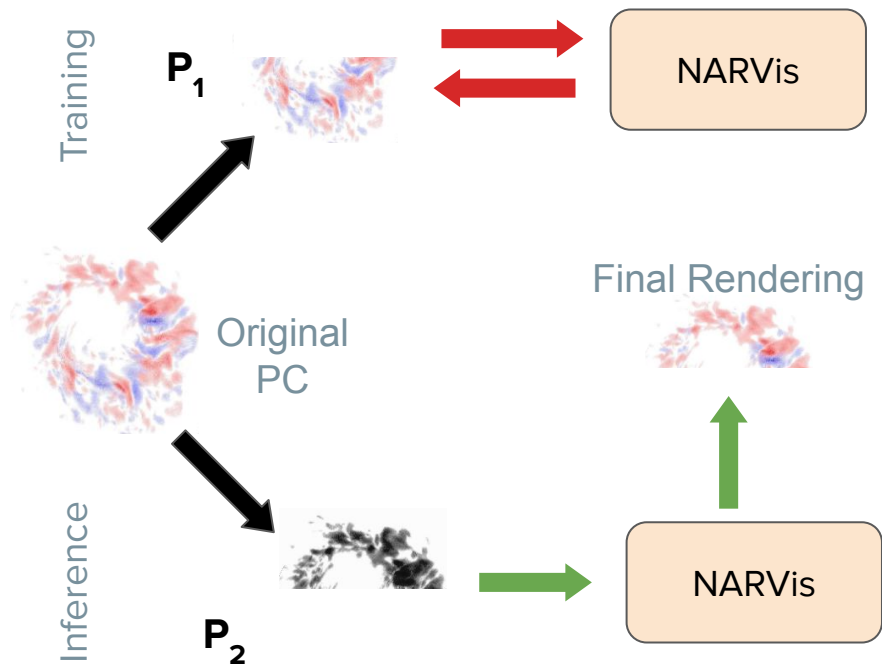


NARVis

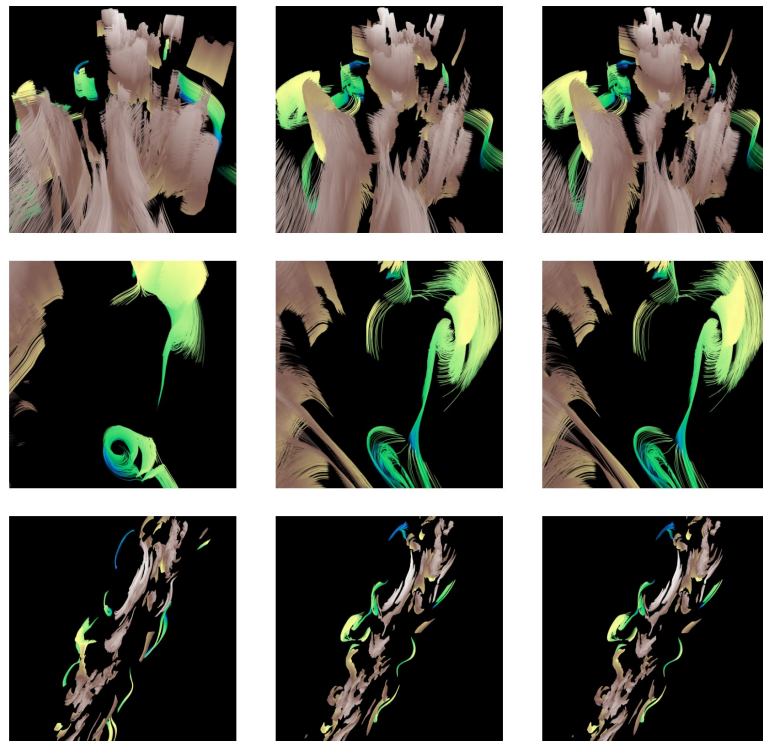
Ground Truth

Residual

Intra-Dataset Generalizability



(Works even when $P_1 \cap P_2 = \Phi$)

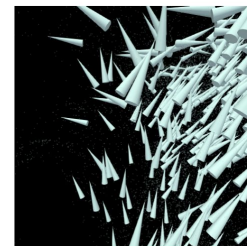
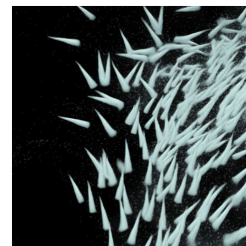
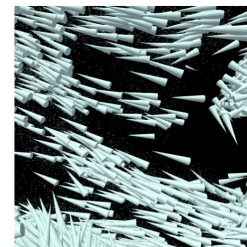
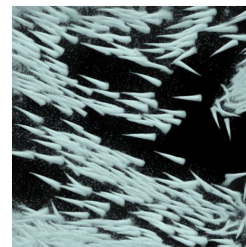
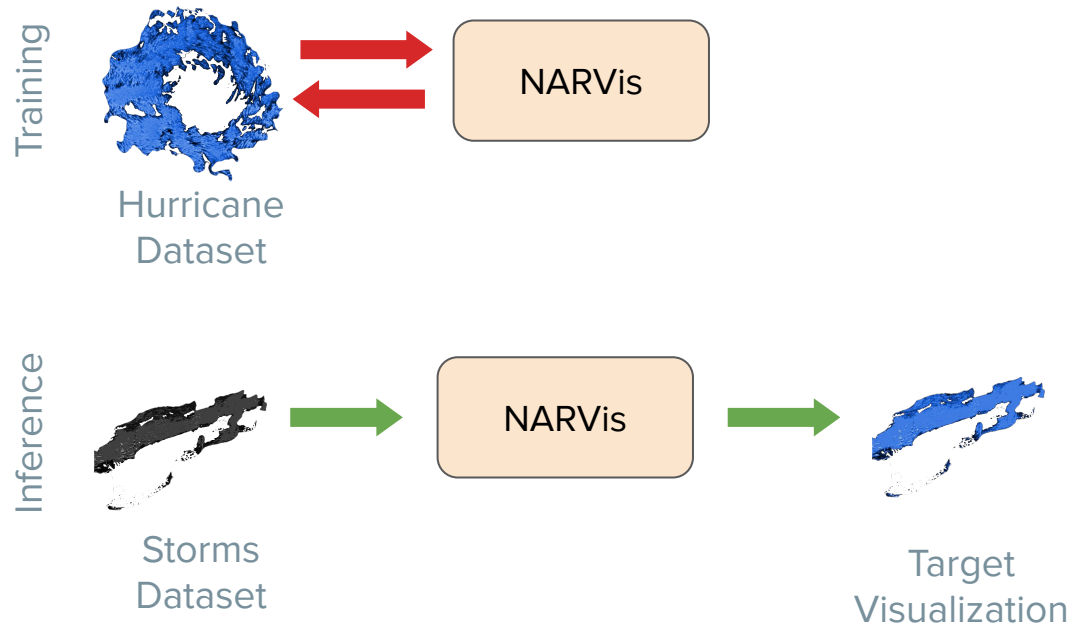


Source PC

Target PC

GSplat

Inter-Dataset Generalizability

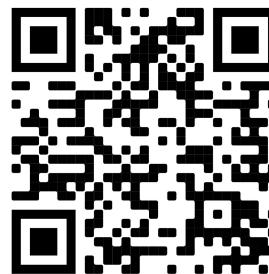


NARVis

Ground Truth

Conclusions

- Real-time visualization framework with low memory footprints
- Adaptable to different visualization requirements/renderers
- Generalizable across different PC geometry
- Virtually scalable to large number of points



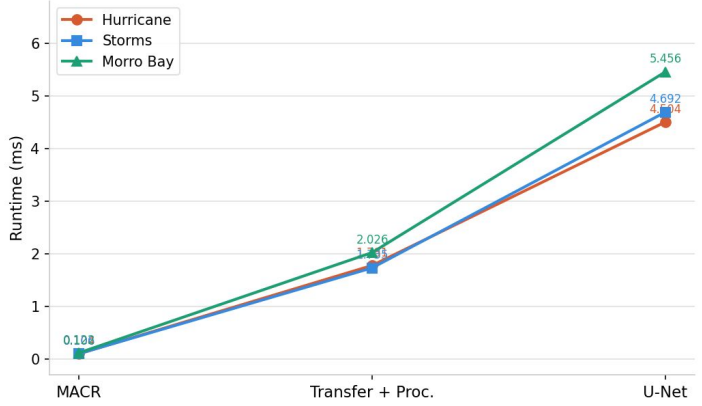
Questions?
Reach out to srihegde@umd.edu

For code and video results
visit our webpage

Backup

Ablation Analysis

NARVis Component Runtimes by Dataset



Ablation Study — U-Net Variants (Hurricane Dataset)

