Feature 3DGS: Supercharging 3D Gaussian Splatting to Enable Distilled Feature Fields

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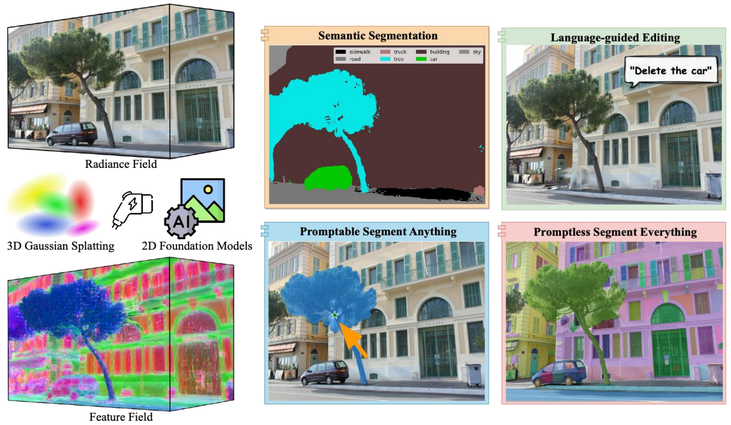
Contributions

- **A brand new semantic, editable, and promptable explicit 3D scene representation** empowered by 3D Gaussian Splatting[1] and 2D foundation models.
- **A general feature field distillation framework** capable of working with a variety of foundation models such as CLIP-LSeg, Segment Anything (SAM) and so on.
- **Performance and runtime improvements** over the highest-quality previous NeRF-based method.



- Beyond mere novel view synthesis, Feature 3DGS now encompasses a range of functionalities, including semantic segmentation, language-guided editing, and promptable segmentations from any novel view.

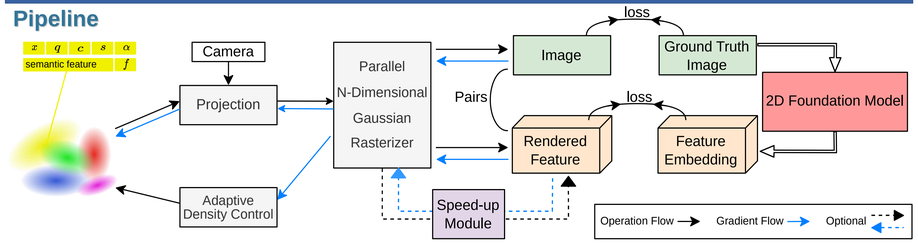
References

[1] Kerbl, Bernhard, et al. "3d gaussian splatting for real-time radiance field rendering." ACM Transactions on Graphics (2023).
[2] Kobayashi, Sosuke, et al. "Decomposing nerf for editing via feature field distillation." Advances in Neural Information Processing Systems (2022).

https://feature-3dgs.github.io/

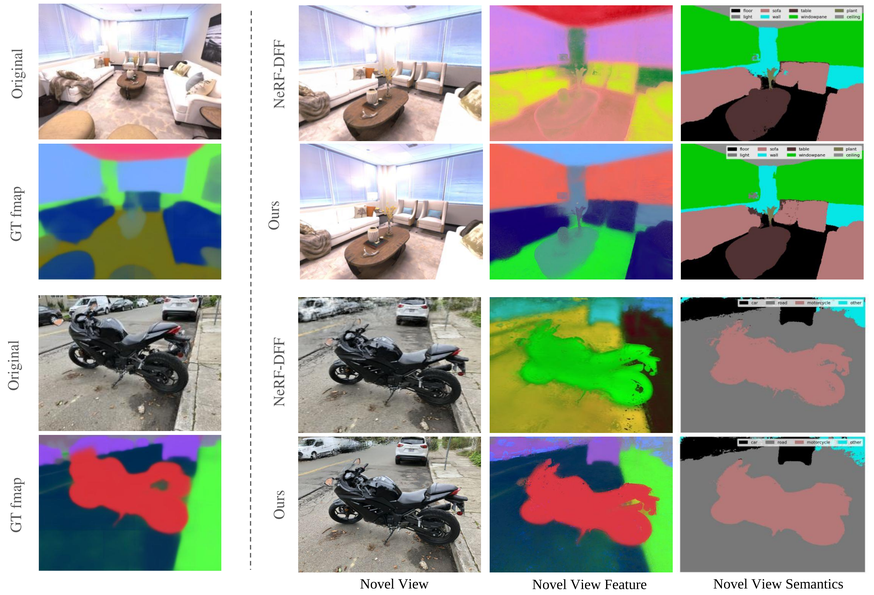
Method

Pipeline



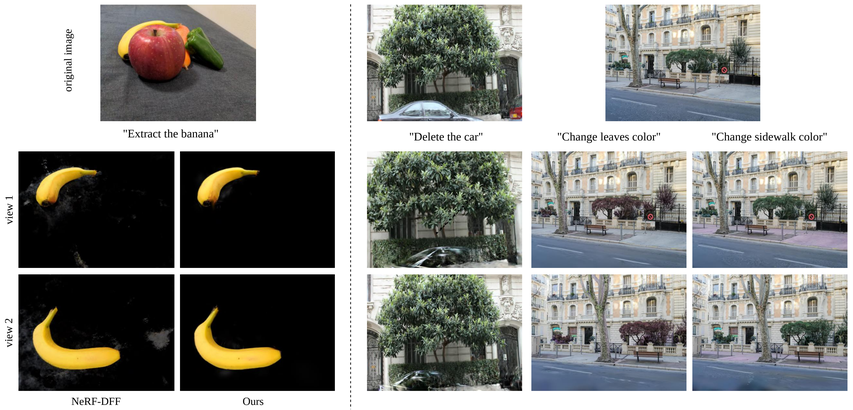
- By incorporating a ***semantic feature*** as an essential attribute on each 3D Gaussian, our key innovation is the Parallel N-dimensional Gaussian Rasterizer, complemented by an optional convolutional speed-up module. This approach efficiently renders **arbitrary high-dimensional features** without compromising downstream performance.

3D Semantic Feature Field compared with NeRF-DFF[2]

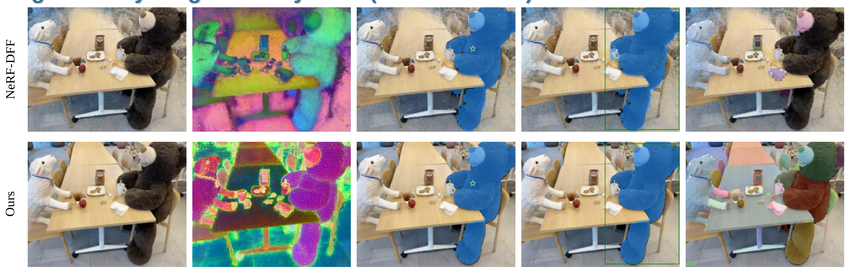


Experimental Results

Language-guided Editing (CLIP Features)



Segment Anything from Any View (SAM Features)



Ablation Studies

- We study the effect of different rendered feature dimensions regarding training time and downstream performance.