# Fast Training of Neural Radiance Fields

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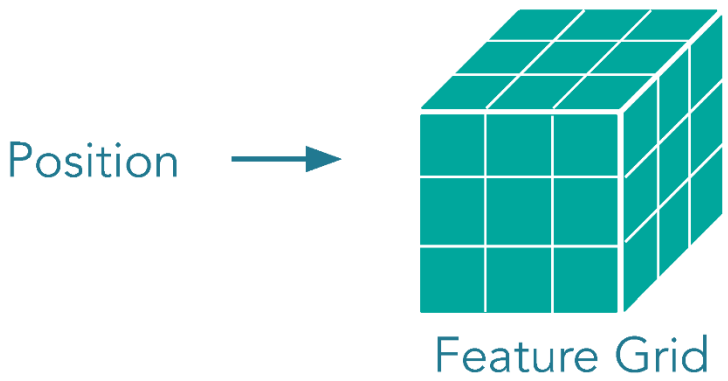
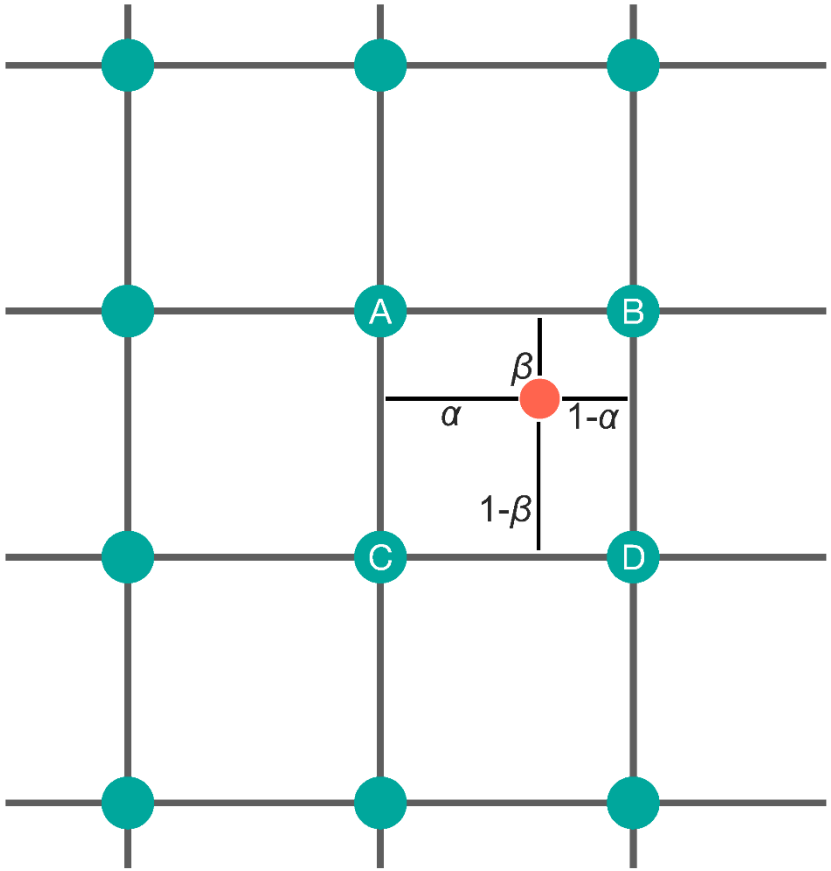
Plenoxels
DVGO
Instant
NGP
Tensorf
NeRF
Explicit
Implicit

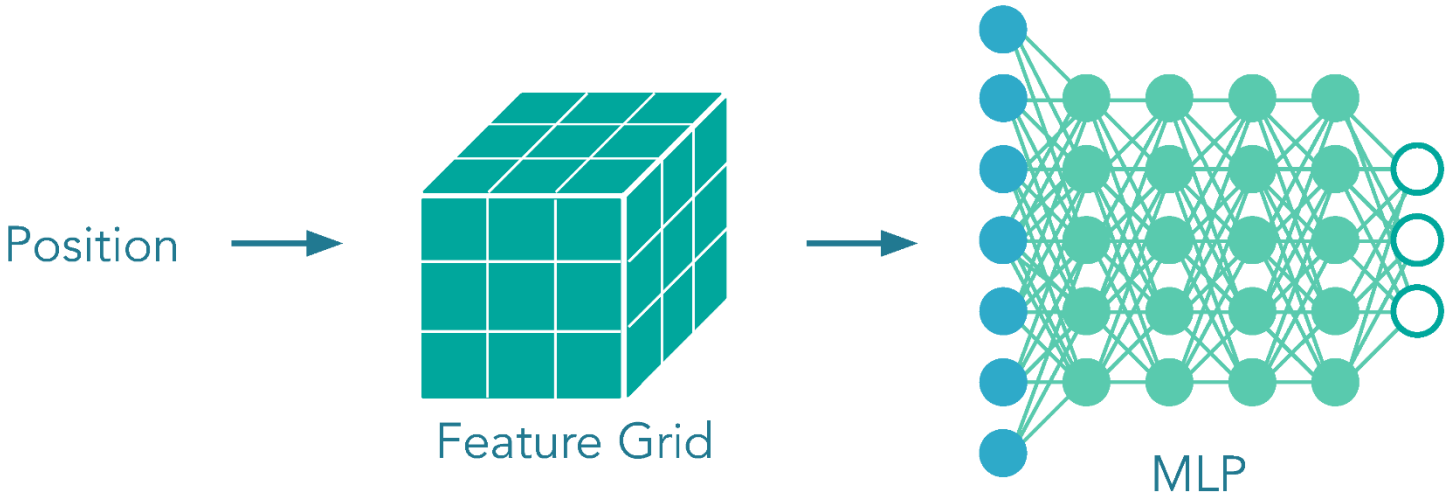
# Feature Grids as MLP Encodings



# Make continuous via interpolation



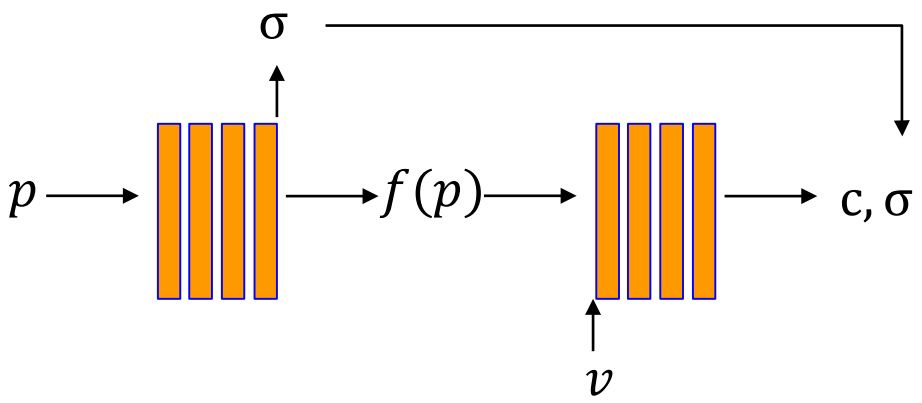
# Feature Grids as MLP Encodings



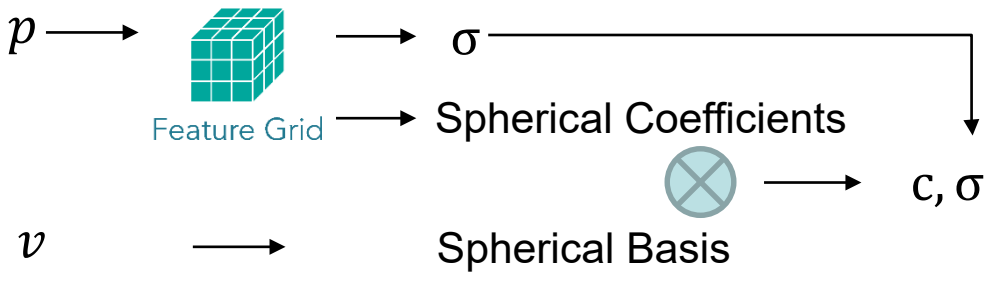
# Plenoxels

- Split NeRF's neural network into two separate networks: pose-dependent network and view-dependent network.

$$c(v;\mathbf{k}) = S\left(\sum_{\ell=0}^{\ell_{\max}} \sum_{m=-\ell}^{\ell} k_\ell^m Y_\ell^m(v)\right)$$

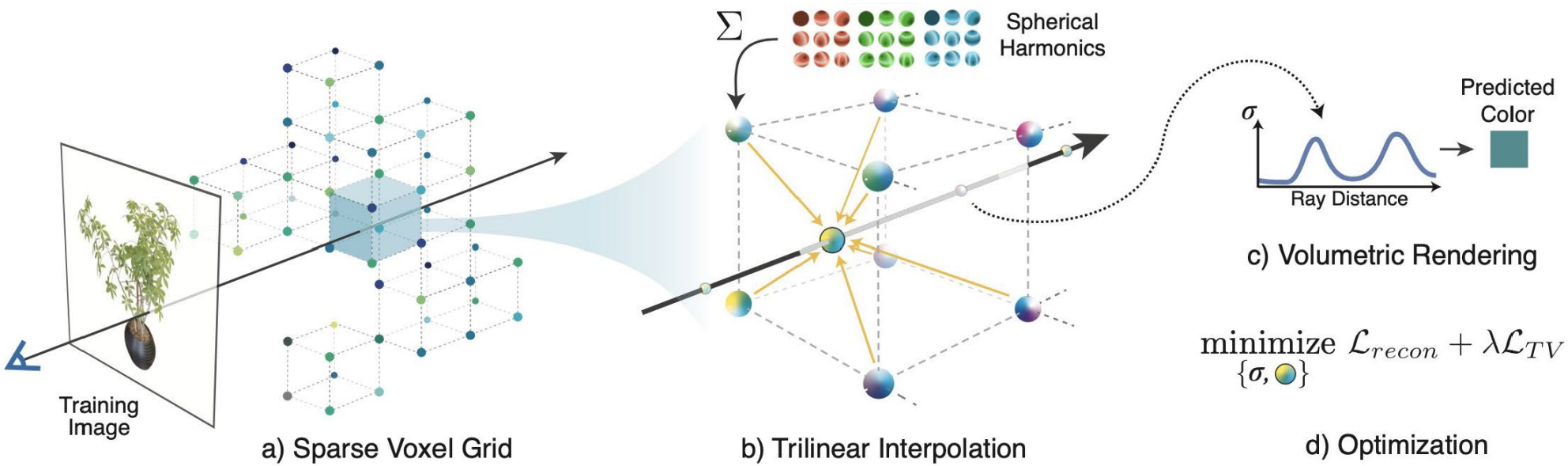



Original NeRF Network




Network Design in [Yu et al. 2021]

# MLPs are not required…




Yu*, Friedovich-Keil* et al. 2021, Plenoxels: Radiance Fields without Neural Networks

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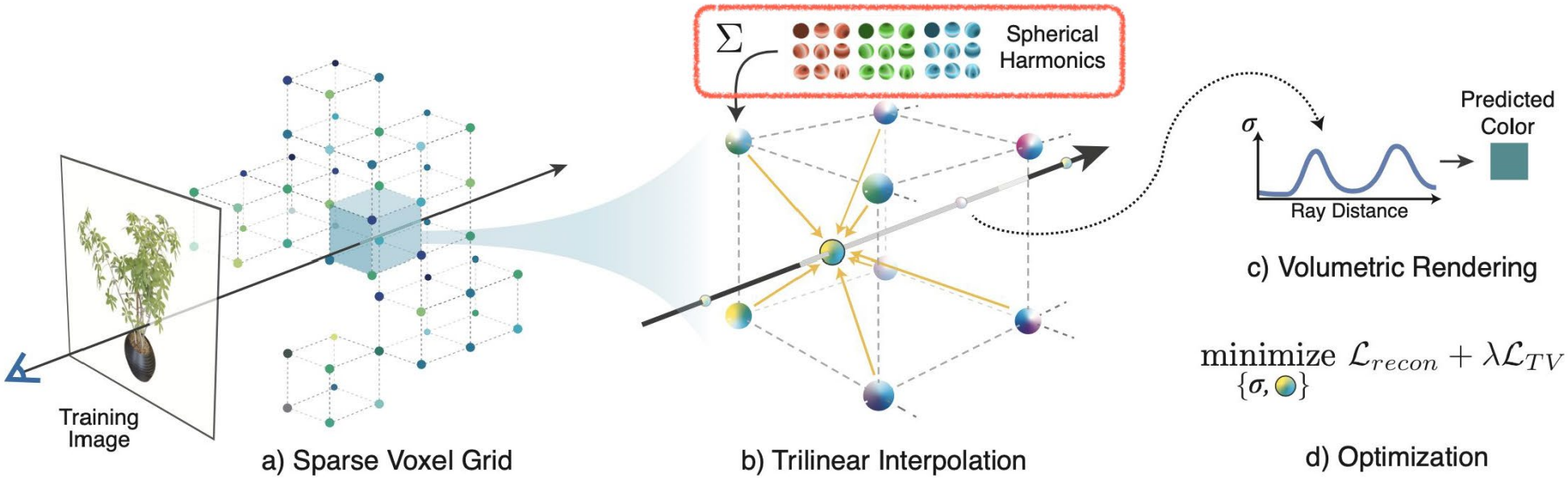
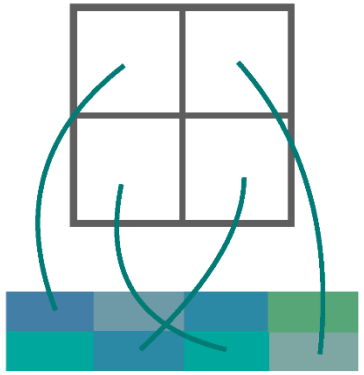



Yu*, Friedovich-Keil* et al. 2021, Plenoxels: Radiance Fields without Neural Networks

# Compression Techniques

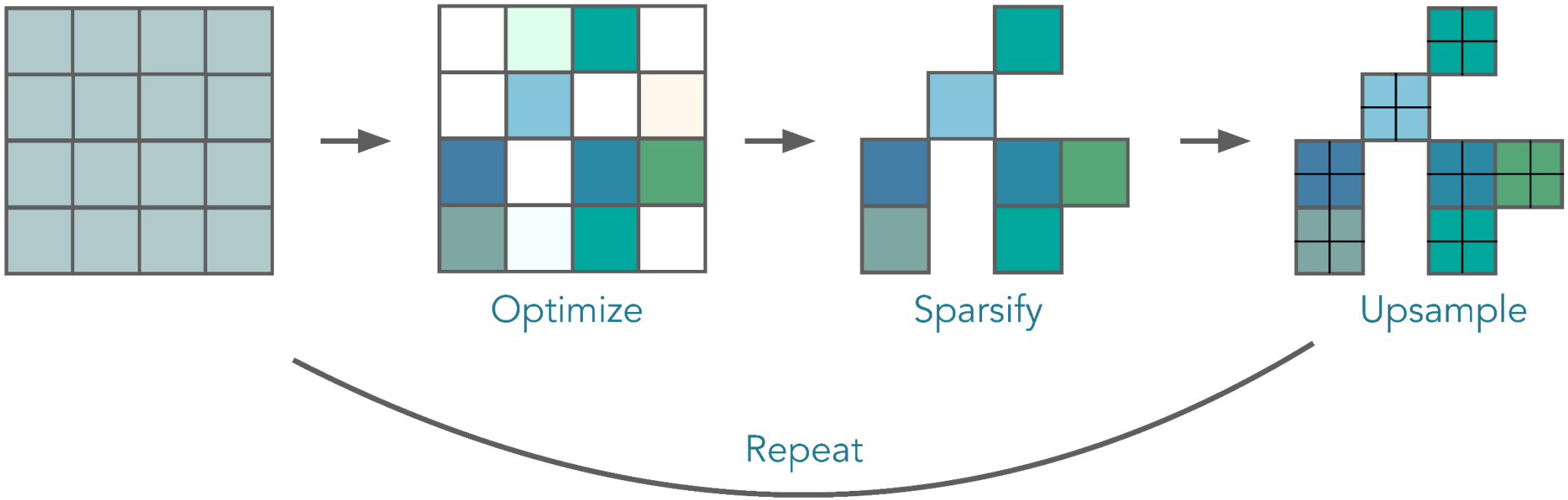
Sparsity

Low Rank



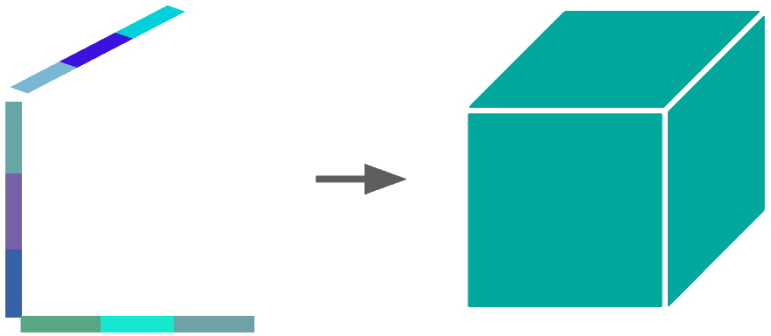
Dictionary

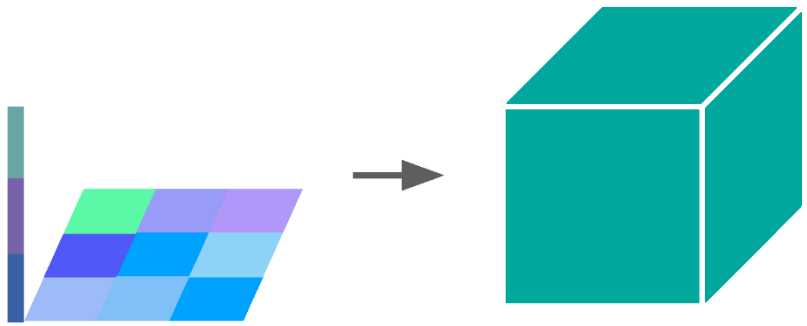
# Sparsity




Lui et al. 2020, Neural Sparse Voxel Fields
Yu*, Friedovich-Keil* et al. 2021, Plenoxels: Radiance Fields without Neural Networks
Sun et al. 2021, Direct Voxel Grid Optimization: Super-fast Convergence for Radiance Fields Reconstruction

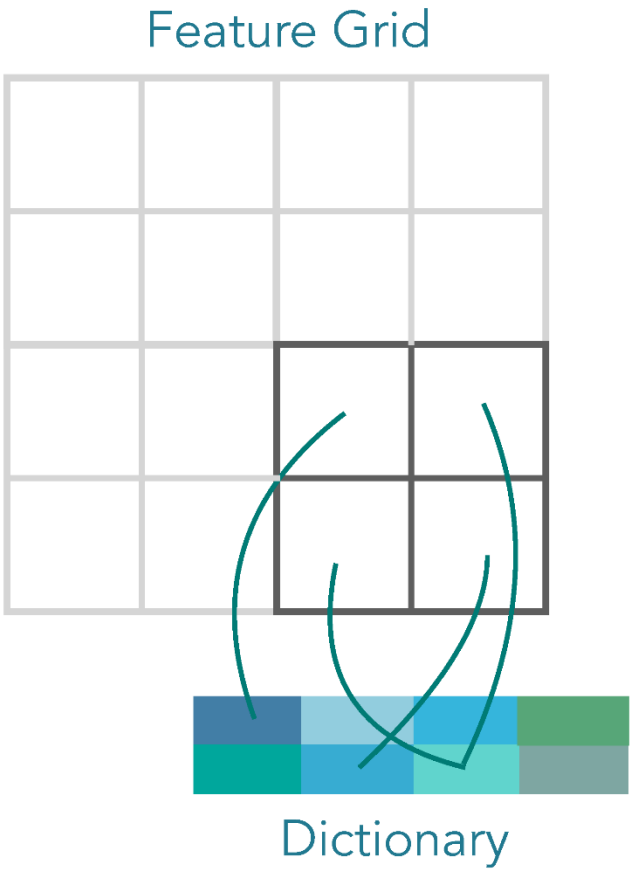
# Low Rank Approximations





Chen*, Xu* et al. 2022, TensoRF Tensorial Radiance Fields
Chan*, Lin*, Chan*, Nagano* et al. 2022, EG3D: Efficient Geometry-aware 3D Generative Adversarial Networks

# Dictionary Methods




Feature Grid > Dictionary

Mapping with collisions

Müller et al. 2022, Instant Neural Graphics Primitives with a Multiresolution Hash Encoding

# Acknowledgments


- Advances in Neural Rendering (Tutorial)
- Neural Fields in Visual Computing and Beyond (Tutorial)
- awesome-NeRF: a curated list of awesome neural radiance fields papers
- MPII Summer Semester 2023: Computer Vision and Machine Learning for Computer Graphics
- Neural Volumetric Rendering for Computer Vision (Tutorial)

# Any Questions?