





Unpaired compression: Learn rich Vector-Quantized discrete 2D and 3D spaces independently. (2) Model p(c|X) with a diffusion model parameterized with an unconstrained transformer. • C: VQ codes of 3D data.

• $oldsymbol{X} = \{oldsymbol{x}_1, \cdots, oldsymbol{x}_n\}$: set of VQ codes of all 2D views.



[1] Xingde Ying, et al. X2CT-GAN: Reconstructing CT from bi-planar X-rays with generative adversarial networks. CVPR, 2019. [2] Md Aminur Rab Ratul, et al. CCX-rayNet: A Class Conditioned Convolutional Neural Network For Biplanar X-Rays to CT Volume. ISBI, 2021. [3] Abril Corona-Figueroa, et al. MedNeRF: Medical Neural Radiance Fields for Reconstructing 3D-aware CT-Projections from a Single X-ray, EMBC, 2022.

Unaligned 2D to 3D Translation with Conditional Vector-Quantized Code Diffusion using Transformers

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- Can we model complex 3D objects from two **2D** images?
- **Unaligned inputs** for real-world applications. \rightarrow
- → Improve feature learning and speed up 3D sampling.

Modeling Objects in Baggage Screening



-Contributions

- **Full-coverage attention allows unaligned inputs.**
- **Domain-invariance (e.g. imaging modalities).**
- **★** Fast high-quality 3D samples.
- **Data likelihood representation.**
- ★ Generative control (e.g. feature level).
- ★ Mode coverage (i.e. 2D & 3D distributions).
- **Global context of conditional 2D inputs.**



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Baggage Security Screening dataset					
ethod	↓ NLL	↑ Density	↑ Coverage	↑ SSIM	↑ PSNR
X2CT-GAN	N/A	0.95	0.80	0.655	34.68
CCX-rayNet	N/A	1.28	0.89	0.886	35.45
Jrs	0.007	2.01	0.97	0.899	39.45
LIDC-IDRI (chest) dataset					
X2CT-GAN	N/A	0.87	0.88	0.321	19.68
CCX-rayNet	N/A	1.41	0.98	0.386	22.66
Irs	0.10	1.42	0.97	0.436	25.05

Not requisite of:

- **Camera priors like in NeRF.**
 - Local alignment of inputs like in CNNs.
 - Many input views (i.e. 2 views suffice).
 - **Continuous latent representations.**
 - Hierarchical architectures.
 - **Deep architectures with skip-connections.**

