

F2FLDM: Latent Diffusion Models with Histopathology Pre-Trained Embeddings for Unpaired Frozen Section to FFPE Translation (Supplementary Document)

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1. An additional qualitative result

The supplementary results are presented in Figures 1 and 2.

2. Code Release

Our training and running codes are provided at https://github.com/minhmanho/f2f_ldm for review purposes only. Therefore, the trained model weights and training data have been excluded to meet the submission capacity limit. We utilize tissue segmentation and patch extraction in CLAM [1] to extract patches and will share the data processing details for fine-tuning SDXL with LoRA for this task. Please check images/testA_out for the pre-run translated images.

2.1. Folder Structure

```
/
├── diffusers/ #customized library
├── images/
│   ├── train*/ #training images
│   ├── val*/ #validation images
│   ├── test*/ #test images
│   └── testA_out/ #restored images
├── checkpoints/
├── embedding_translation/
│   └── train.py #train F2F embedding translation
├── username/ #dataset metadata
├── scripts/
│   ├── train.sh #train F2FLDM
│   └── test.sh #test F2FLDM
```

```
├── train_text_to_image_lora_sd-xl.py
├── pipeline.py
├── run_folder.py
├── README.md
└── feature_extractor.py
```

2.2. Environment Setup

2.2.1 Create Anaconda Environment

To create the Anaconda environment, run the following command:

```
conda create -n f2fldm python numpy pillow
conda activate f2fldm
```

2.2.2 Install Dependencies

To install the required dependencies, execute the following commands:

PyTorch:

```
conda install pytorch torchvision torchaudio pytorch-cuda=12.1
-c pytorch -c nvidia
```

Other packages:

```
pip install huggingface transformers diffusers pytorch-lightning==2.1.2 timm accelerate
```

Replace official diffusers with our customized version:

```
cd diffusers
pip install -e .
```

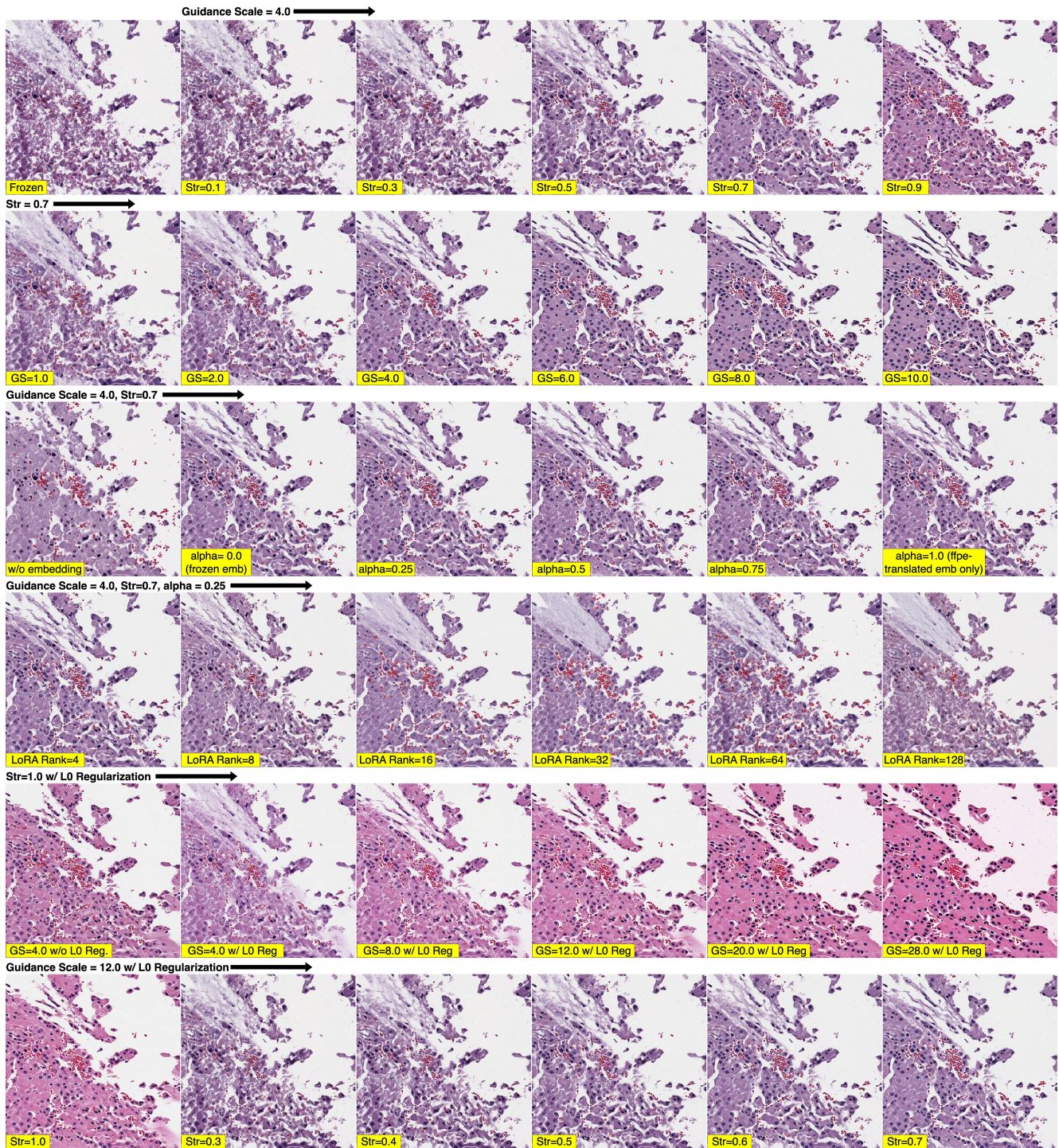


Figure 1. Ablation Study on Strength, Guidance Scale, LoRA Rank, and L0 Regularization.

2.3. Run Frozen Section to FFPE Image Translation

To run the Frozen Section to FFPE Image Translation, use the following command:

```
scripts/test.sh
```

2.4. Finetune Pre-trained SDXL with LoRA for Frozen Section to FFPE Image Translation

To finetune the pre-trained SDXL model for FS to FFPE Image Translation, use the following command:

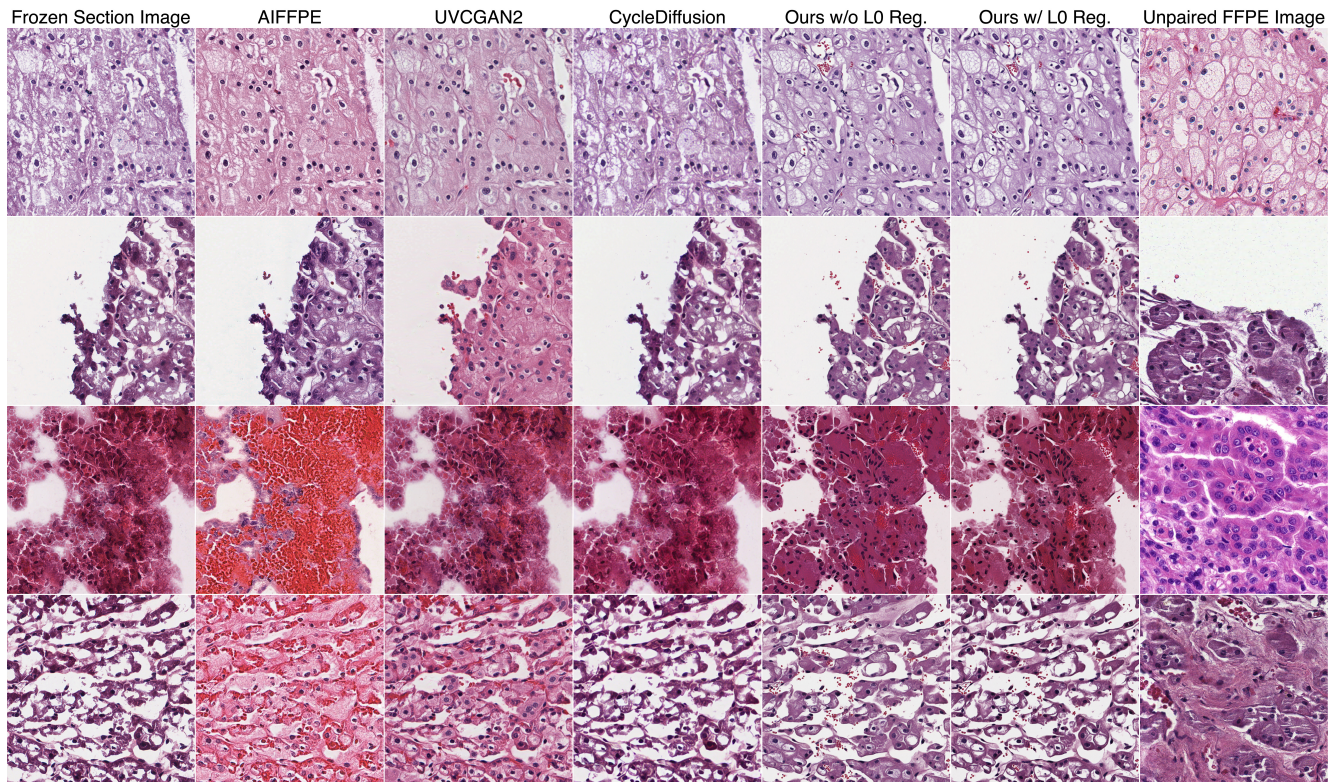


Figure 2. A qualitative comparison between AIFFPE [2], UVCGAN2 [3], CycleDiffusion [4], and ours. Unpaired FFPE images are from a different tissue within the same case.

scripts/train.sh

References

- [1] Ming Y Lu, Drew FK Williamson, Tiffany Y Chen, Richard J Chen, Matteo Barbieri, and Faisal Mahmood. Data-efficient and weakly supervised computational pathology on whole-slide images. *Nature biomedical engineering*, 5(6):555–570, 2021. 1
- [2] Kutsev Ozyoruk, Sermet Can, Berkan Darbaz, Kayhan Başak, Derya Demir, Irem Gokceler, Gurdeniz Serin, Payam Hacisalihoglu, Emirhan Kurtuluş, Ming Lu, Tiffany Chen, Drew Williamson, Funda Yılmaz, Faisal Mahmood, and Mehmet Turan. A deep-learning model for transforming the style of tissue images from cryosectioned to formalin-fixed and paraffin-embedded. *Nature Biomedical Engineering*, 6, 12 2022. 3
- [3] Dmitrii Torbunov, Yi Huang, Huan-Hsin Tseng, Haiwang Yu, Jin Huang, Shinjae Yoo, Meifeng Lin, Brett Viren, and Yihui Ren. Rethinking cyclegan: Improving quality of gans for unpaired image-to-image translation. *arXiv preprint arXiv:2303.16280*, 2023. 3
- [4] Chen Henry Wu and Fernando De la Torre. Unifying diffusion models’ latent space, with applications to cyclediffusion and guidance. *arXiv preprint arXiv:2210.05559*, 2022. 3