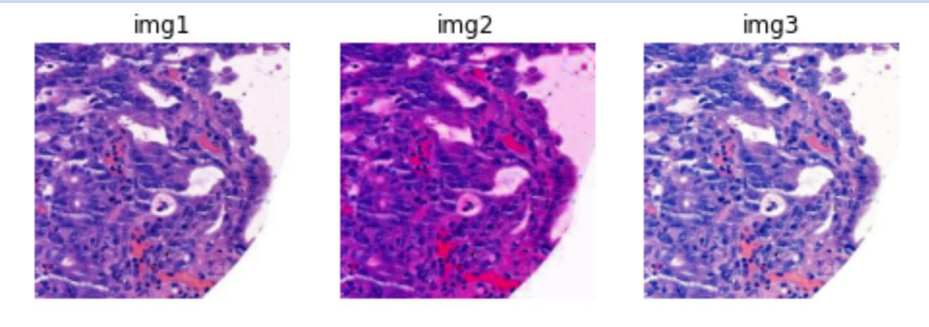
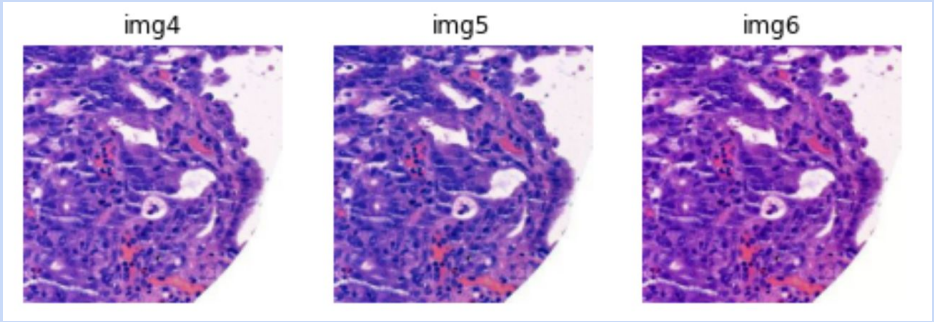
배경

Train dataset과 Real-world dataset 간 염색 등의 정도가 다르다.

-> 모델의 성능 담보 실패





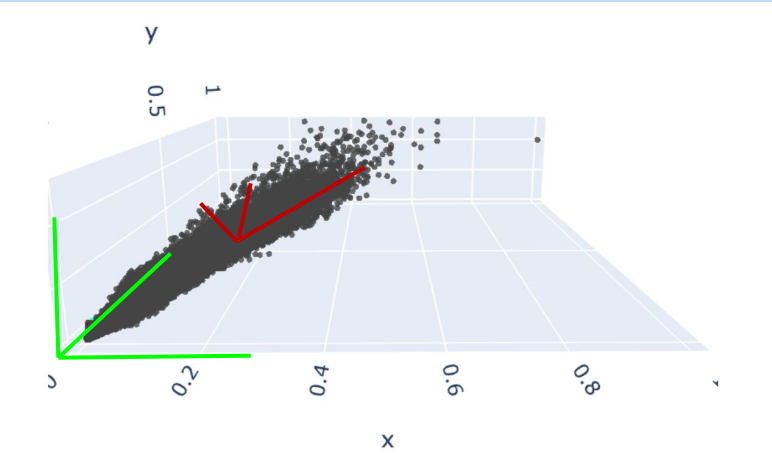
이에 대응할 수 있는 다양한 **dataset** 확보가 중요하다.

-> stain augmentation module 개발

Augmentation을 선형 변환이라고 가정해보자.

$$\mathbf{A} = \mathbf{Q}\mathbf{\Lambda}\mathbf{Q}^{-1}$$

For Q, use SVD(or PCA) per image



※ https://arxiv.org/pdf/1808.05896.pdf

log, scaling

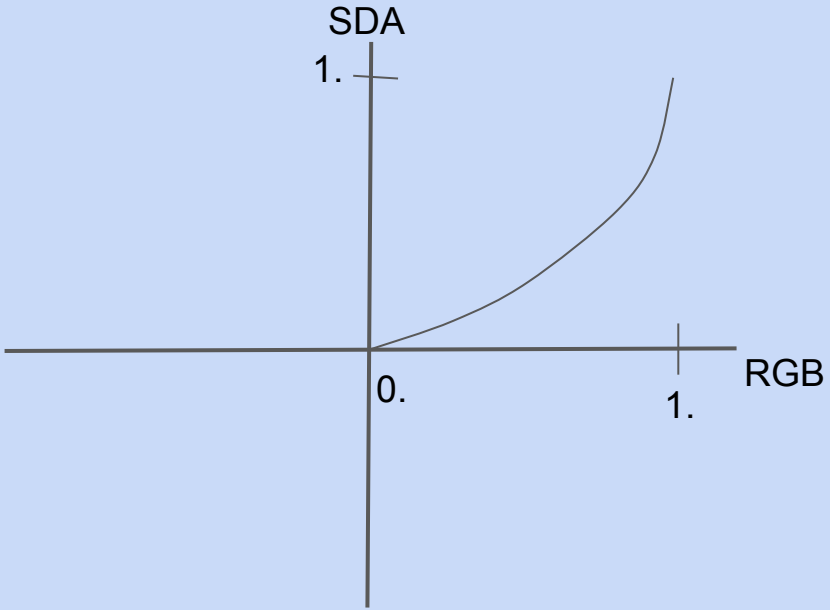
Axis change(to H&E)

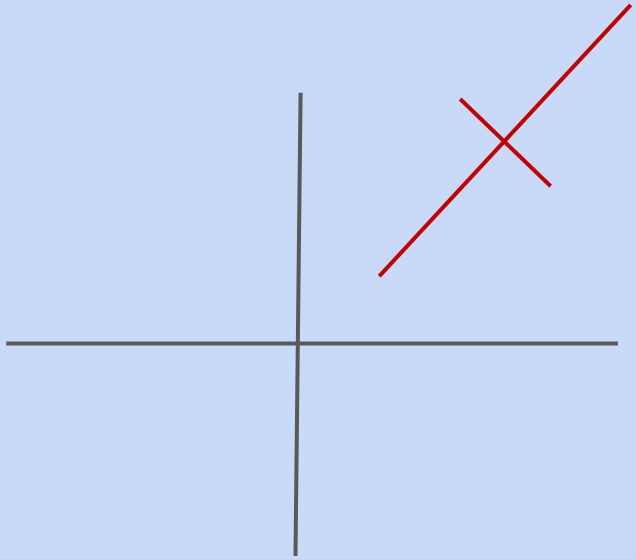
Scale and bias (using random)

Axis change(to RGB)

Rescaling

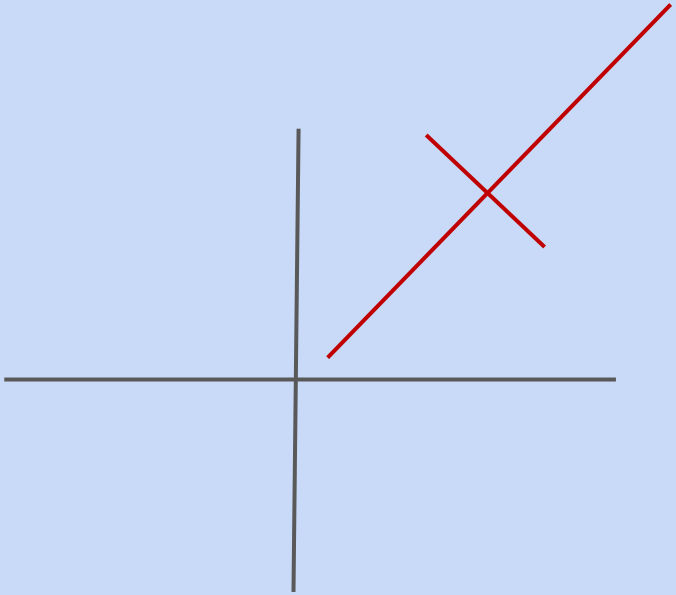
1. normalize by 255, take log, and reflection

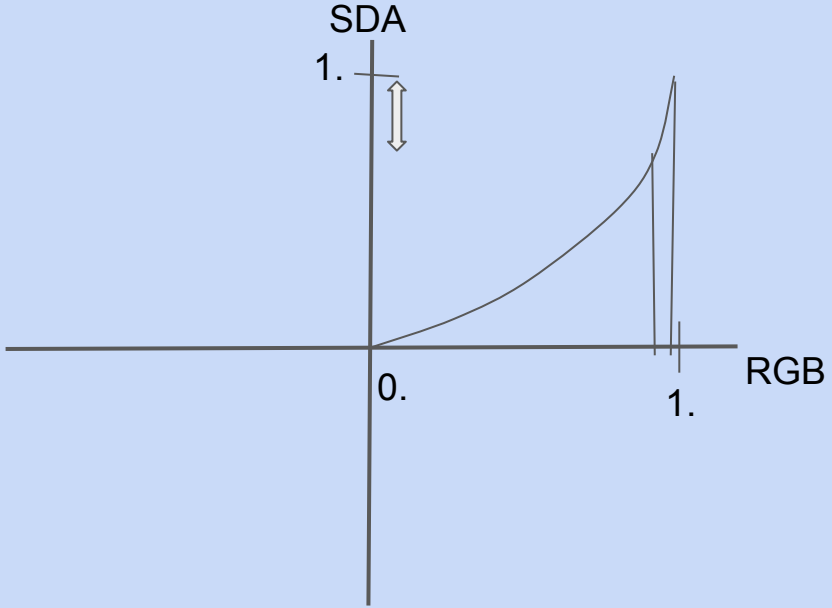




2. Shift and Linear Transformation
from sda to H&E(hematoxylin and eosin)

3. scaling and bias, inverse transform to SDA

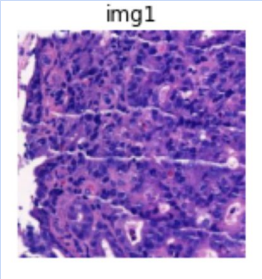


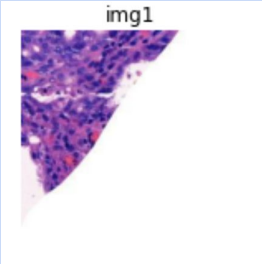


4. from SDA to RGB

배경에는 상대적으로 변화가 덜하다.

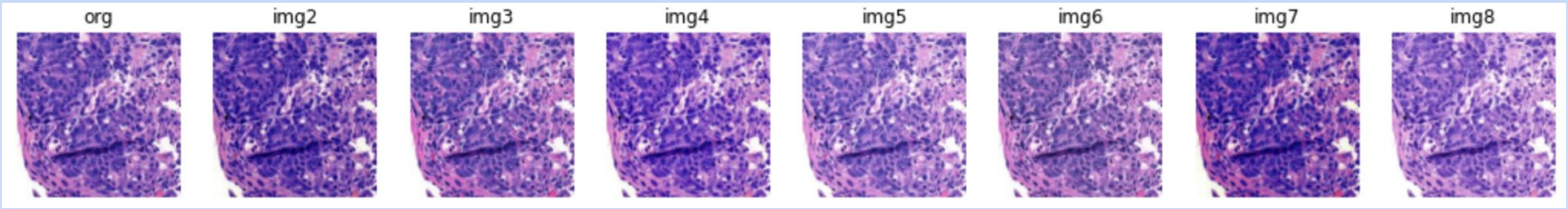
For Q, Use SVD per image, but there are bad case
SVD result is different, and carefully scaling is needed according to images

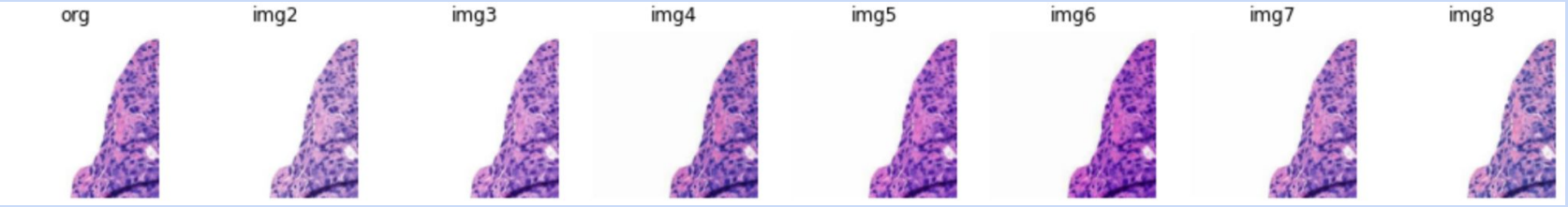


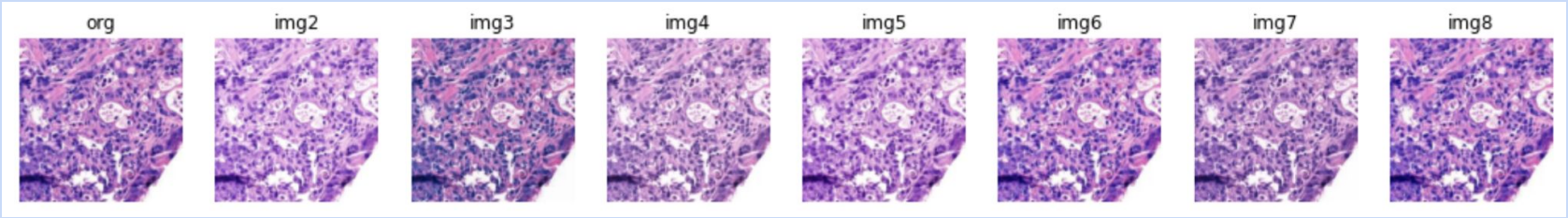


augmentation examples with different bias(sigma2)

HEColorAugment(sigma1=.4, sigma2=1., mat=None, p=1.)

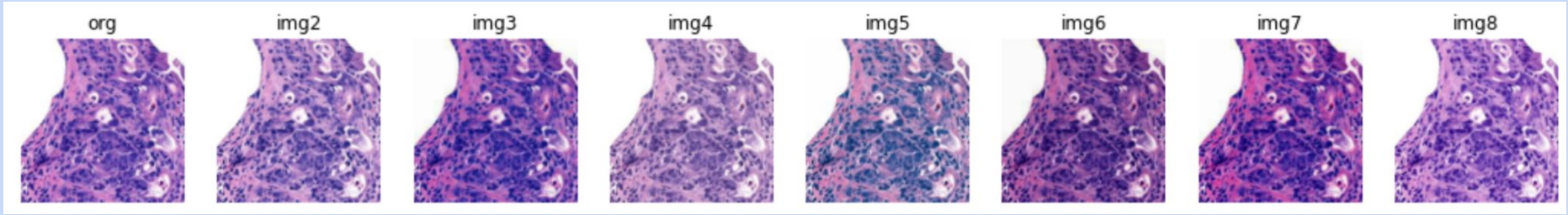


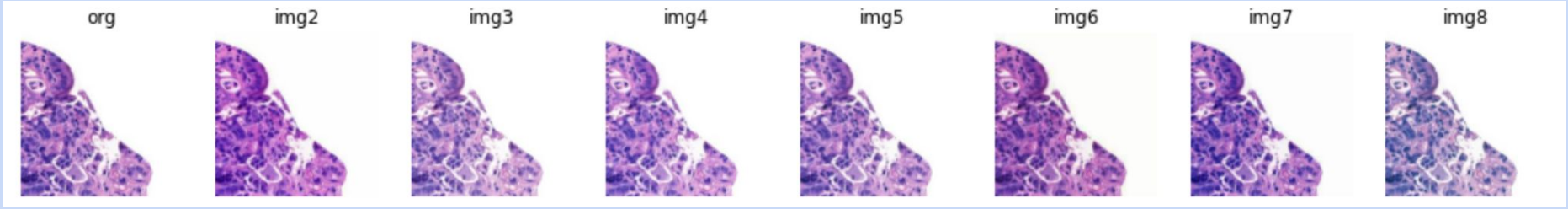


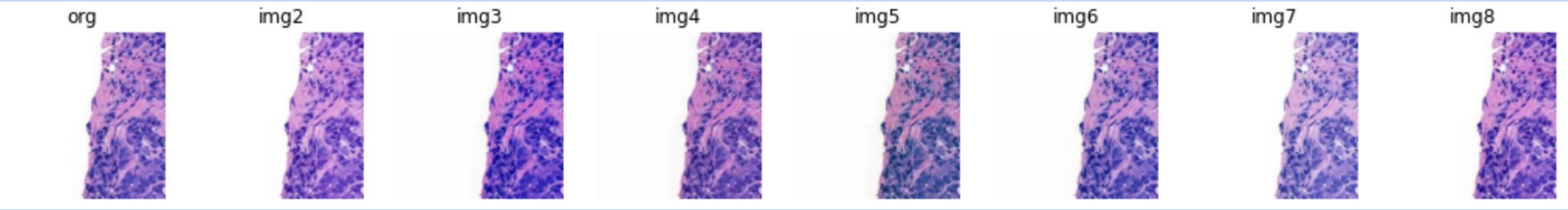


augmentation examples with different bias(sigma2)

HEColorAugment(sigma1=.4, sigma2=5., mat=None, p=1.)

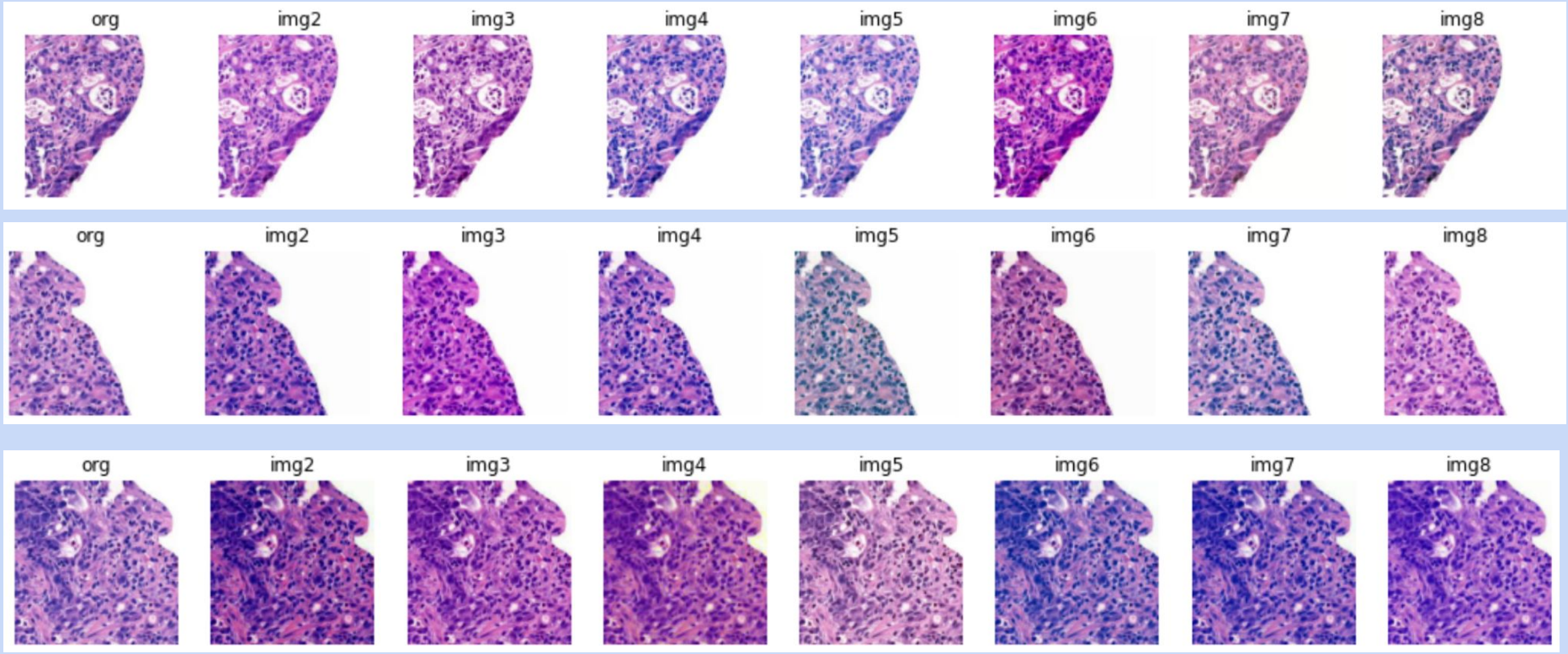






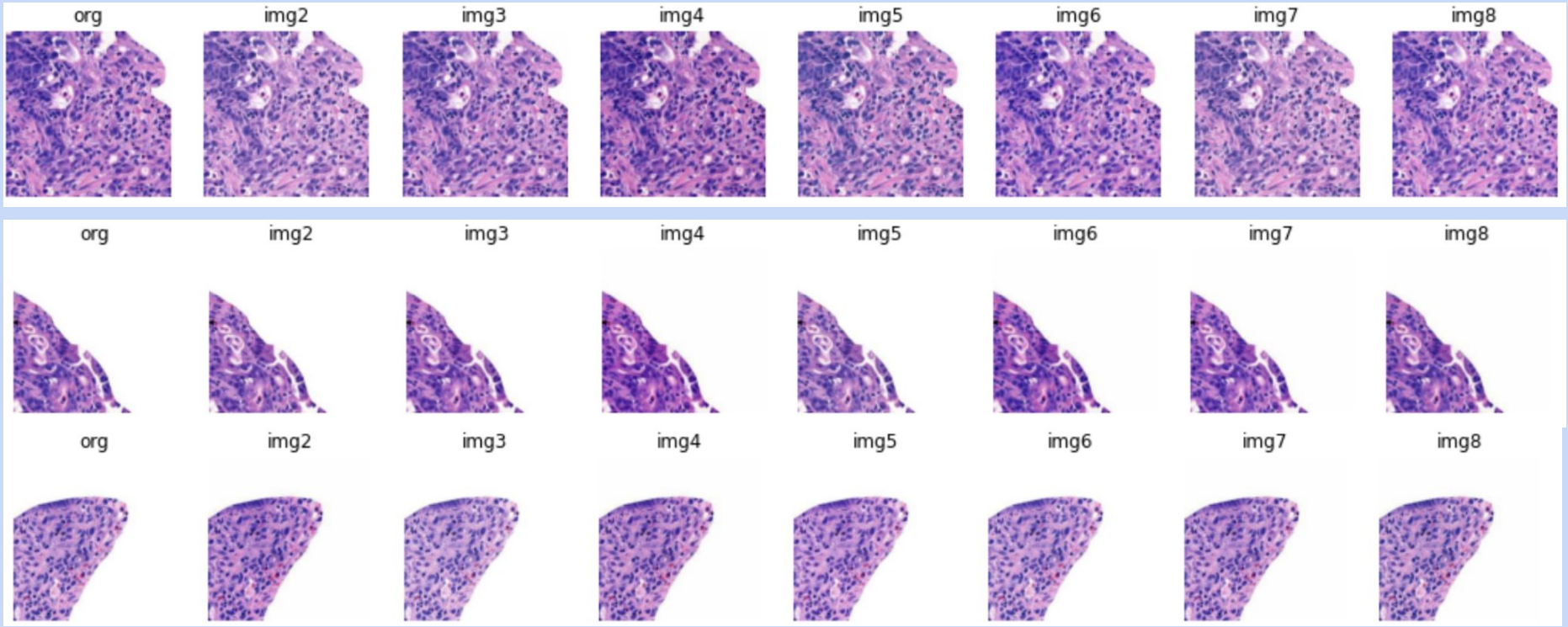
augmentation examples with different bias(sigma2)

HEColorAugment(sigma1=.4, sigma2=10., mat=None, p=1.)



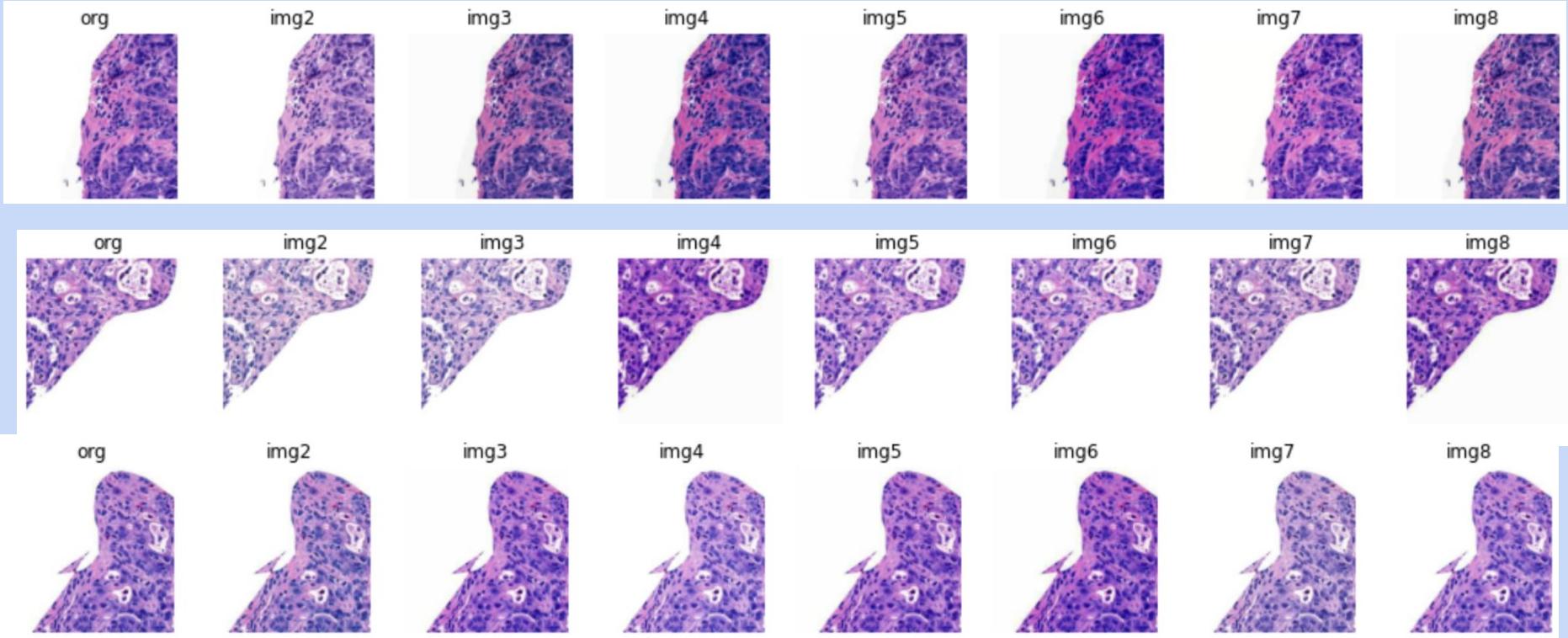
augmentation examples with different scale(sigma1)

HEColorAugment(sigma1=.2, sigma2=1., mat=None, p=1.)



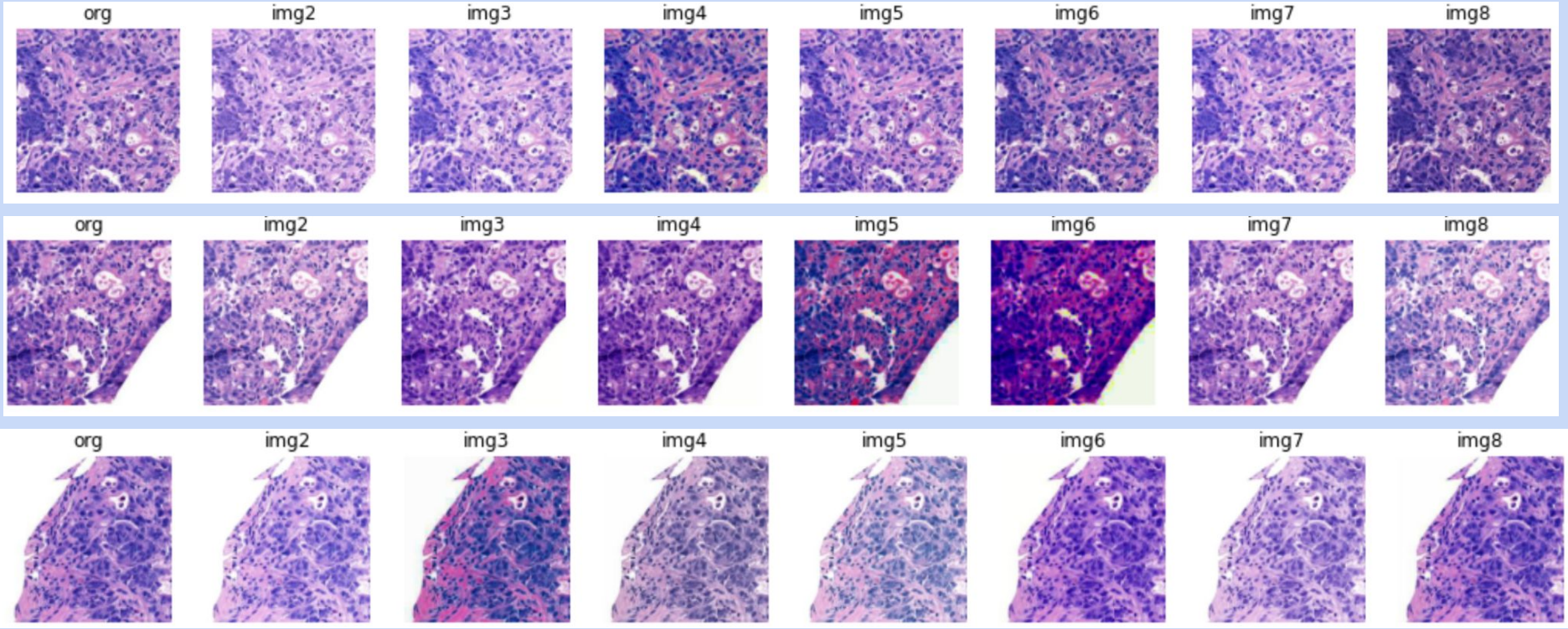
augmentation examples with different scale(sigma1)

HEColorAugment(sigma1=.4, sigma2=1., mat=None, p=1.)



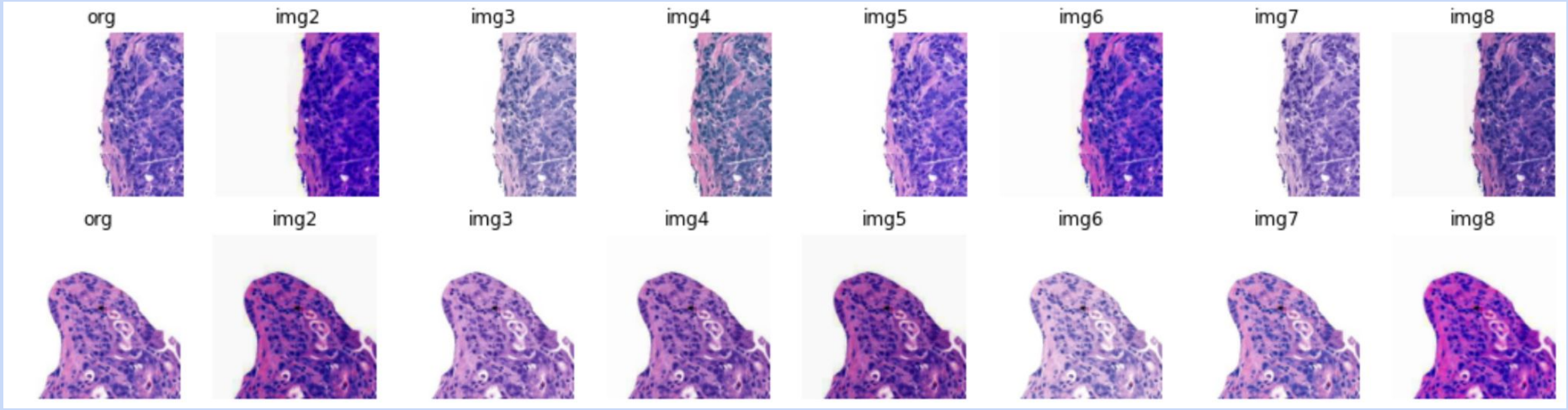
augmentation examples with different scale(sigma1)

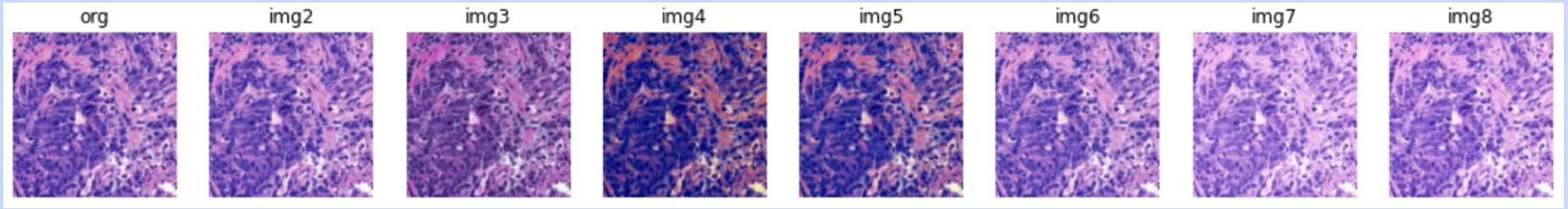
HEColorAugment(sigma1=.6, sigma2=1., mat=None, p=1.)



augmentation examples with different scale(sigma1)

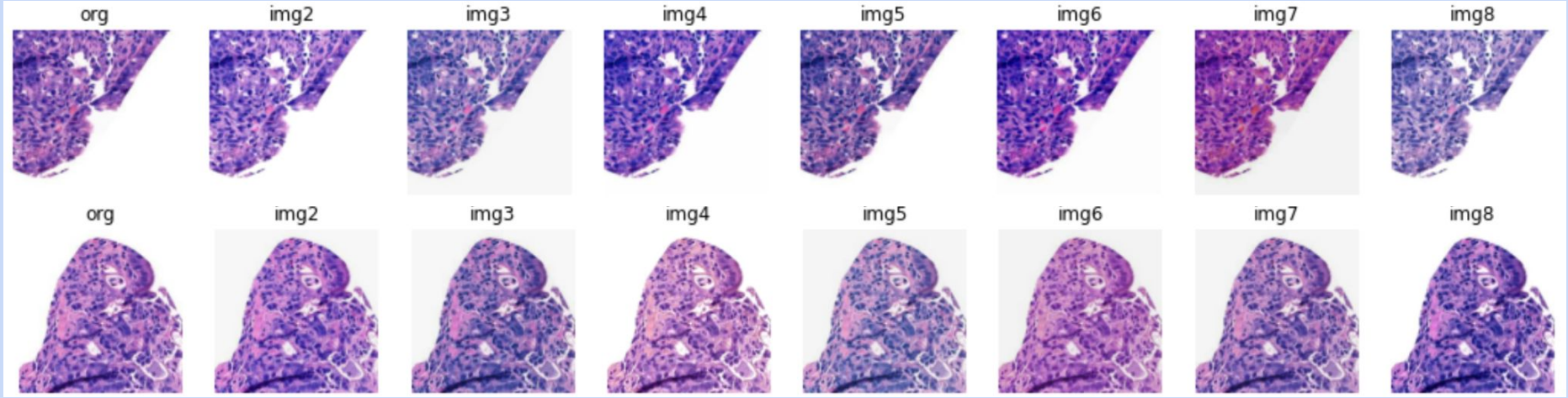
HEColorAugment(sigma1=.8, sigma2=1., mat=None, p=1.)

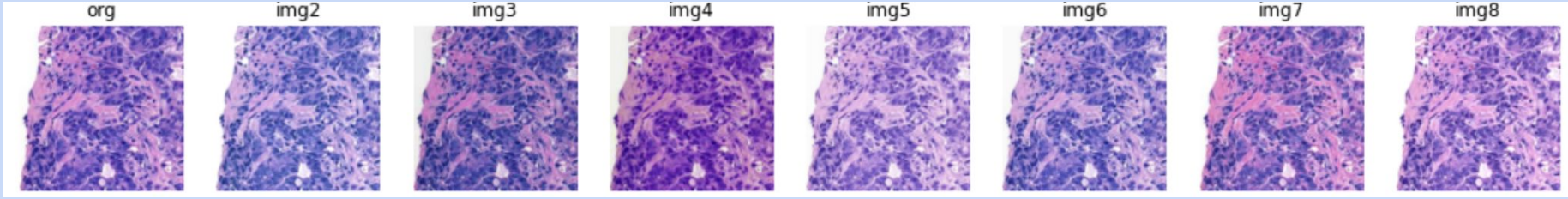




augmentation examples with HSV and Stain augmentation

HEColorAugment(sigma1=.4, sigma2=1., mat=stain_mat, p=1.),
A.transforms.ColorJitter(brightness=0.05, contrast=0.05, saturation=0.05, hue=0.05, p=1.)





augmentation examples with HSV and Stain augmentation

HEColorAugment(sigma1=.4, sigma2=1., mat=stain_mat, p=1.),
A.transforms.ColorJitter(brightness=0.1, contrast=0.1, saturation=0.1, hue=0.1, p=1.)