Assignment 2: Low Resources (CS326)

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Problem 1:

Augmentation methods	
[color jittering, translation, image cutout]	IS: 7.571378231048584 FID: 43.561305740549514
[color jittering, image cutout]	IS: 6.705403804779053 FID: 50.60106153916233
[translation, image cutout]	IS: 7.2690629959106445 FID: 42.9839761789156

Problem 2:

As shown in Fig. 1, training bigGAN model with CR and applying DiffAugment works great in the first 28000 epoch but suddenly the validation accuracy dropped. In my opinion, to avoid this sudden drop we can increase the data to more than 5% or use a smaller learning rate.

While training bigGAN model with CR only keeps learning about the training data (memorizing) and doesn't generalize.

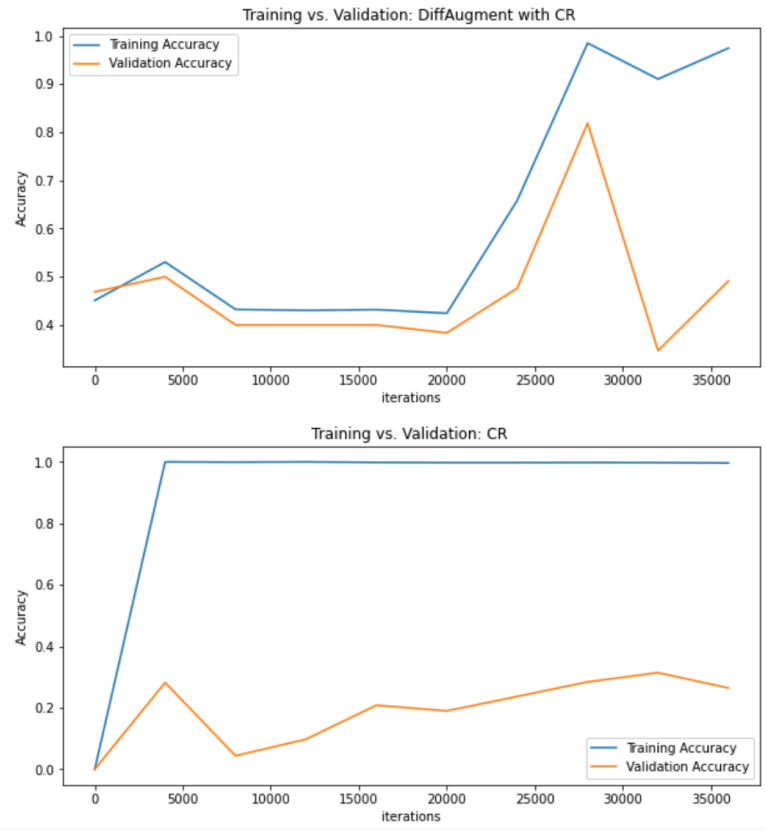


Fig. 1

Problem 3:

Training generative adversarial networks (GAN) using too little data leads to discriminator overfitting. In almost all areas of deep learning, Dataset Augmentation is the key solution against overfitting. For example, training an image classifier under flipping, color jittering, translation, image cutout, etc to reduce the gap and prevent overfitting. However, apply Dataset Augmentation to GANs is different. In the proposed paper, augment both the real and generated images when training the discriminator. They applied this technique to prevent the discriminator from overfitting, and to ensure that the generator will not generate augmented images.

However, in this assignment, we implement BigGAN model and experiment with it using different types of DiffAugment. As shown below all the models sever from overfitting but with different levels. Training BigGAN without any DiffAugment is the worst because the gap between the training and the validation accuracy is continues to increase over time (Fig.2). In contrast, applying different types of DiffAugment reduced this gap (Fig.2).

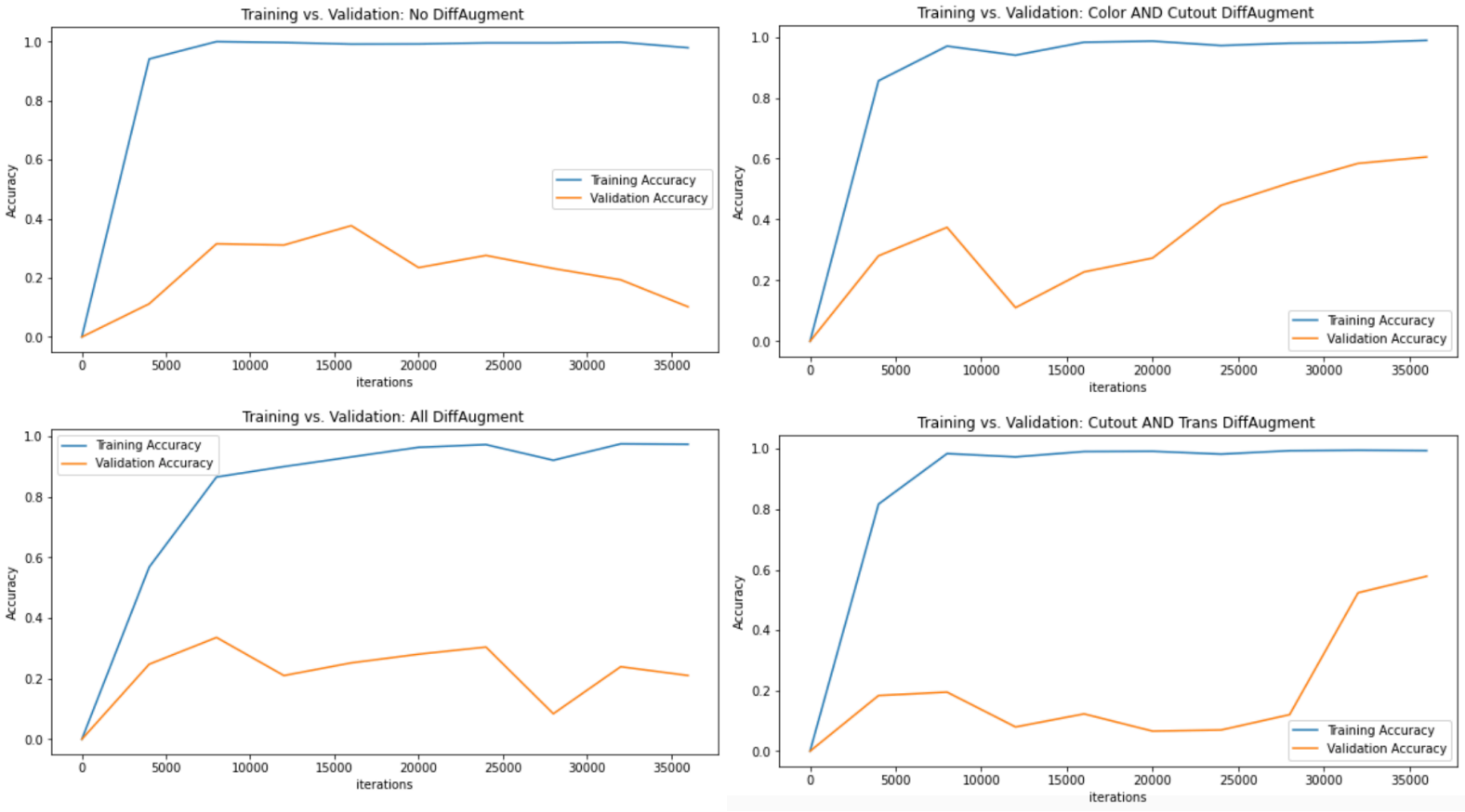


Fig. 2

Problem 4:

The result for IS and FID is as I expected (Fig.3). However, applying only color and cutout to the data seems to generate images far from the distribution although it reduces the overfitting in the training data. Also, using the NoDiffAugment server from the same issue.

However, using all DiffAugment types generate better images and reduces the overfit gap as shown in (Fig. 2). As well as using CR with DiffAugment.

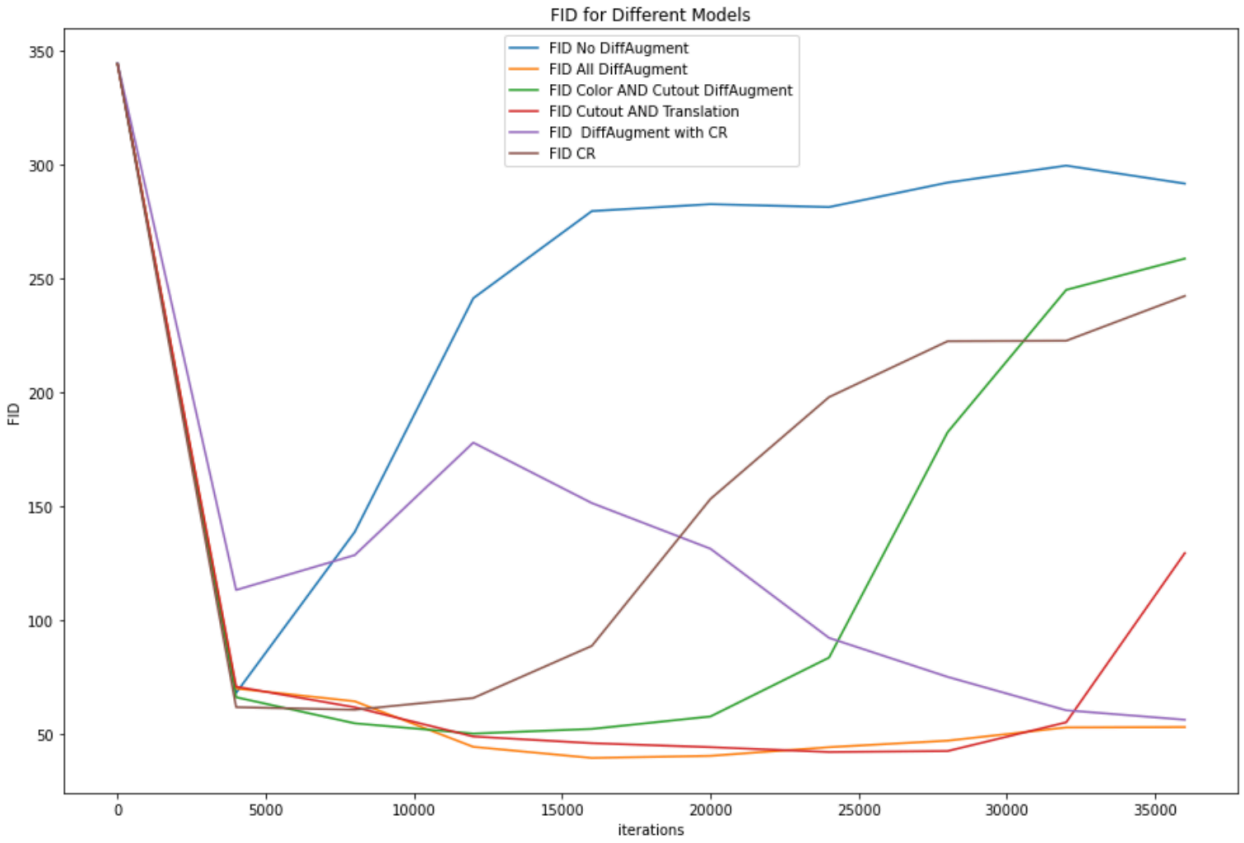


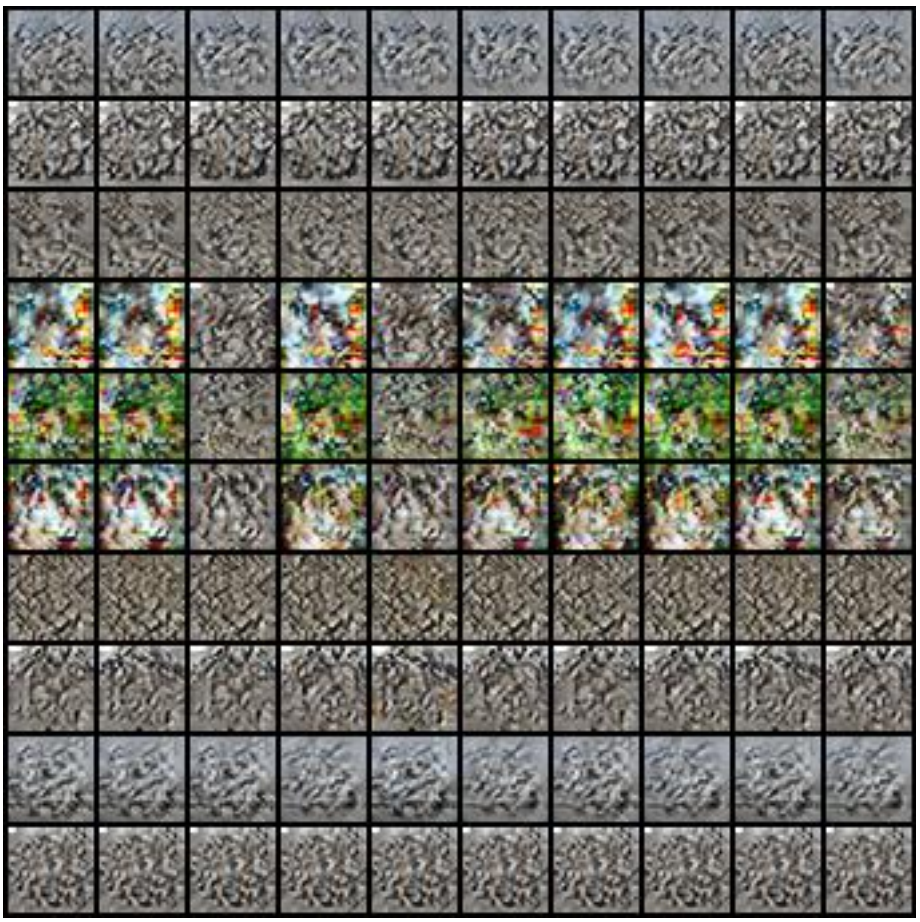
Fig. 3

Problem 5:

As shown below I presented different visualization for epoch number 38000 for each model. The generated images by the NoDiffAugment model collapsed. The generated images have no meaning.

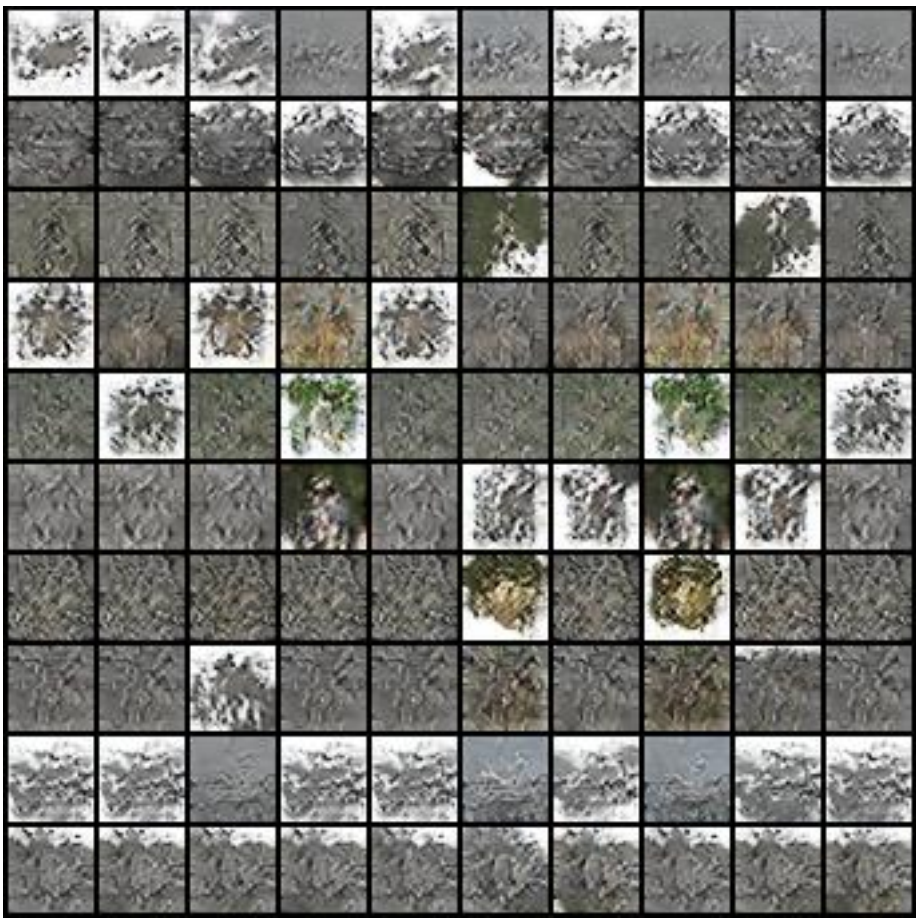
On the other hand, applying all the types of DiffAugment give better result overall. Also, using CR with DiffAugment generates good images. However, applying only two DiffAugment (Cutout and Color, Cutout and Translation) seems to generate meaningful images in the early epochs but then it eventually collapsed.

NoDiffAugment

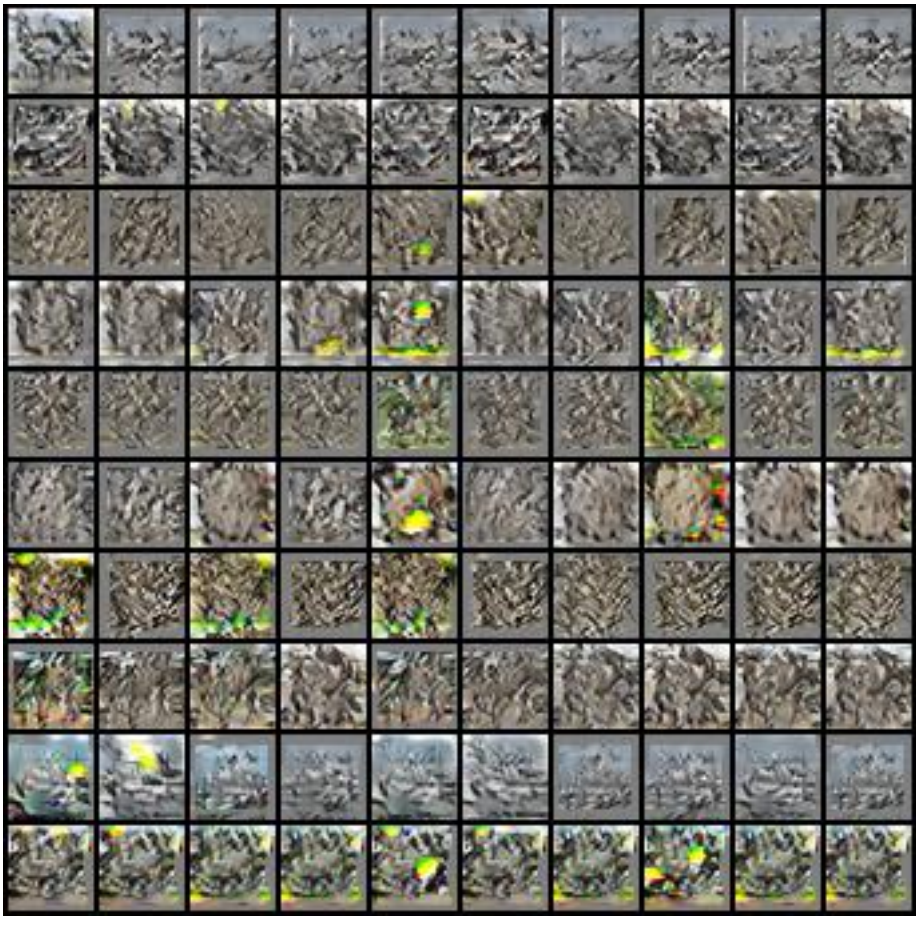


All DiffAugment

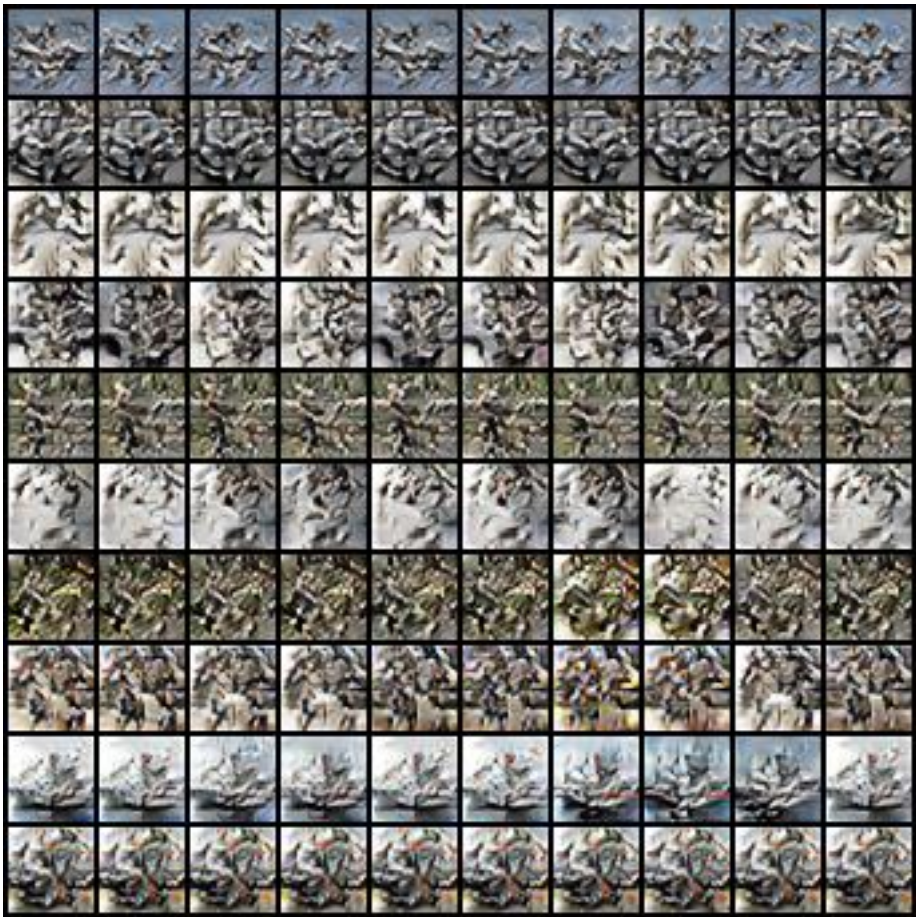
Color AND CutOut



CutOut AND Translation



CR Only



CR with DiffAugment