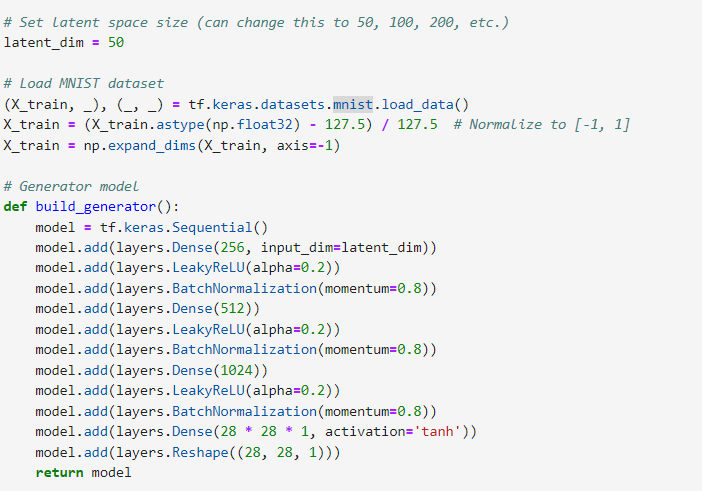
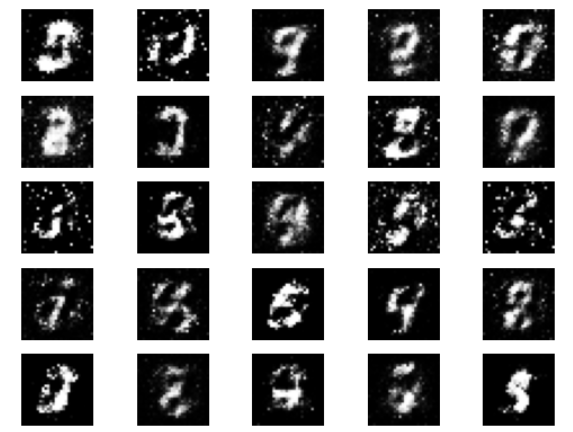
Part 1

1. Modify the latent space size: Change the noise vector size from 100 to 50 or 200. Observe how this change affects the quality and variety of generated images.



Changing the latent space size from 100 to 50 or 200 can significantly impact the quality and variety of generated images, **with a smaller size (50) potentially leading to less diversity and detail, while a larger size (200) may enhance the model's ability to capture complex patterns,** resulting in more varied and higher-quality outputs

50



100

A collage of numbers in squares

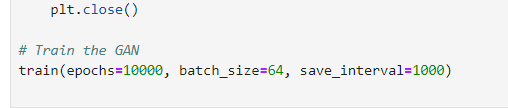
Description automatically generated

200

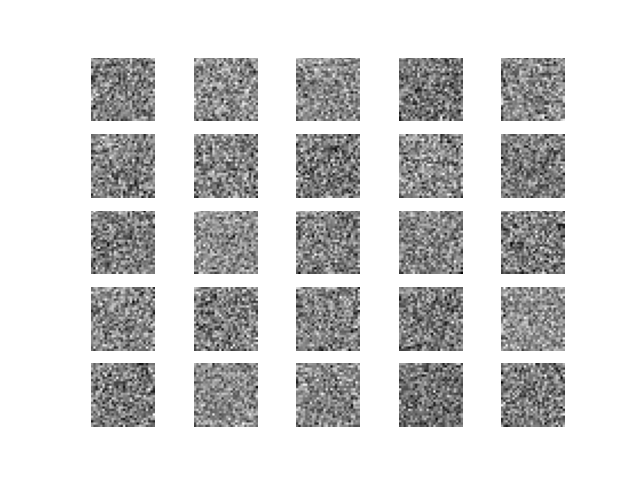
A collage of numbers in squares

Description automatically generated

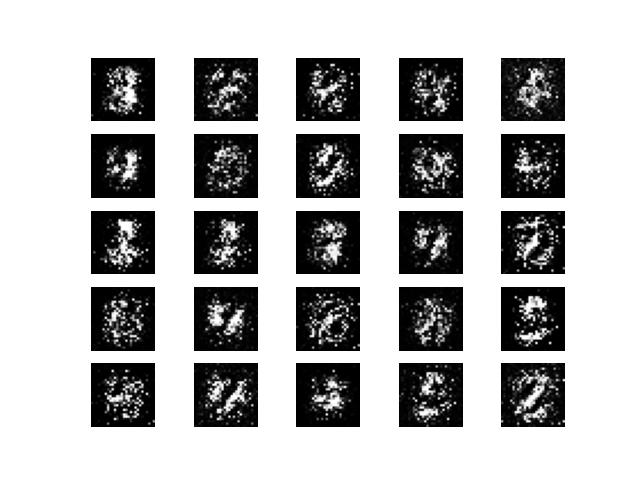
1. Train the GAN for 10,000 epochs: Save and visualize the generated images at every 1,000 epochs. Create a GIF or a slideshow to show how the quality of the generated images evolves over time.



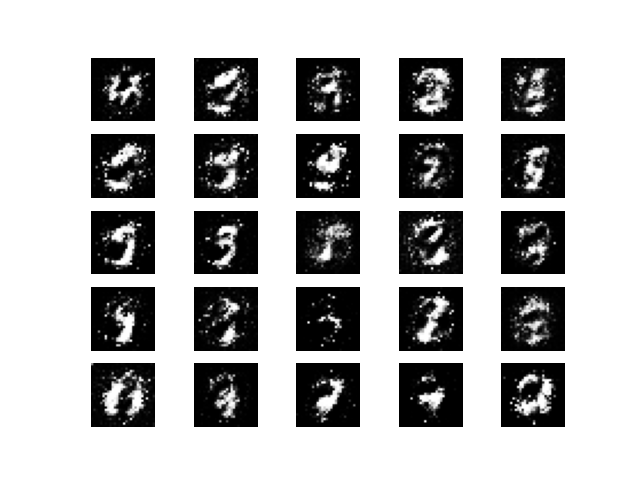
Epoch -0



Epoch -1000



Epoch -2000

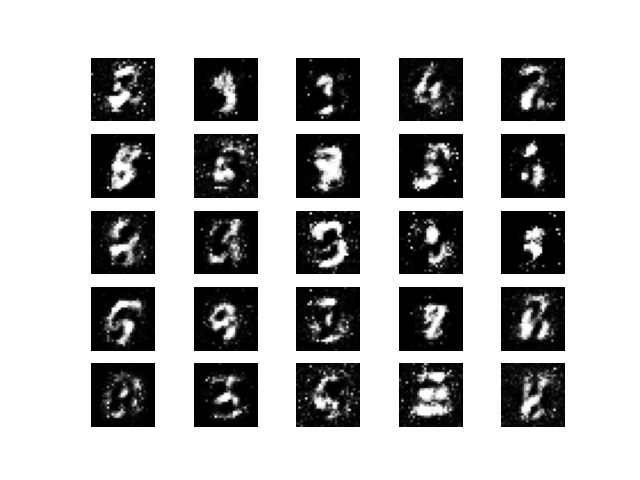


Epoch - 3000

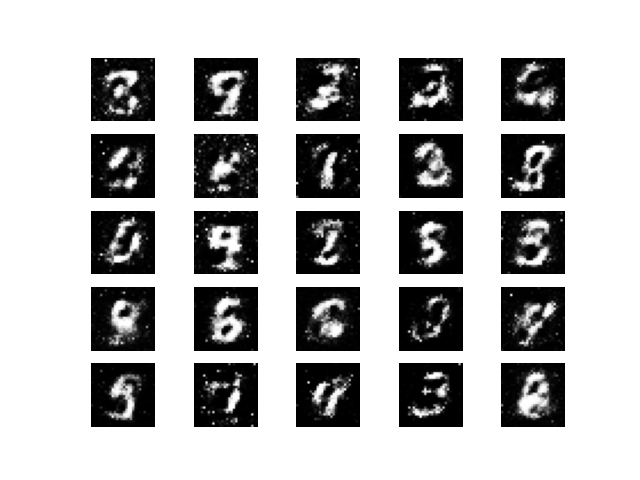
A group of numbers in squares

Description automatically generated

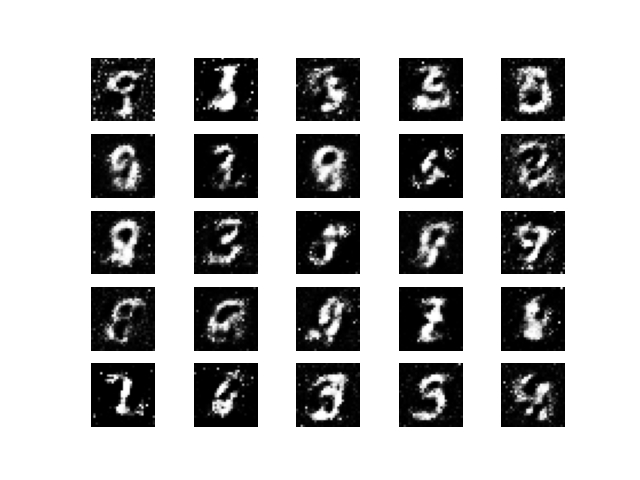
Epoch – 4000



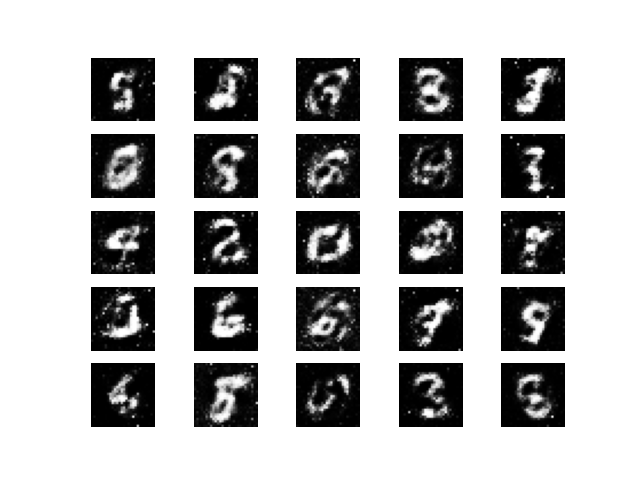
Epoch – 5000



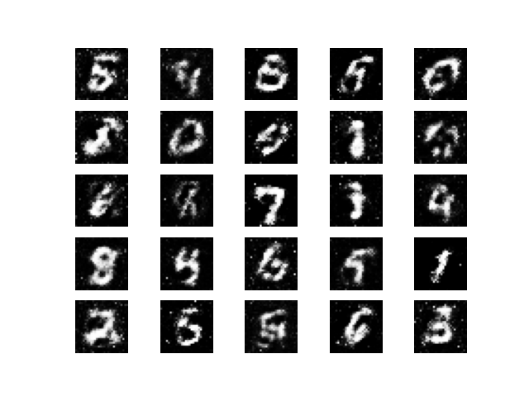
Epoch – 6000



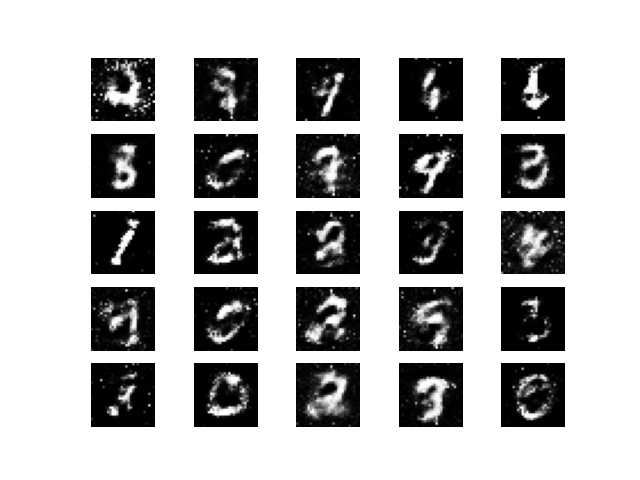
Epoch – 7000



Epoch – 8000



Epoch - 9000



A group of squares with a white background

Description automatically generated

1. Change the optimizer from Adam to RMSprop or SGD for both the generator and discriminator. Observe the impact on training performance and image quality.

A white background with black text

Description automatically generated

**We had the best result From rmsprop**

Adam

A collage of images of various shapes

Description automatically generatedA group of squares with a white background

Description automatically generated

A number in squares with numbers in black squares

Description automatically generated with medium confidenceRmsprop

A group of squares with a white background

Description automatically generated

Sgd

A group of squares with white dots

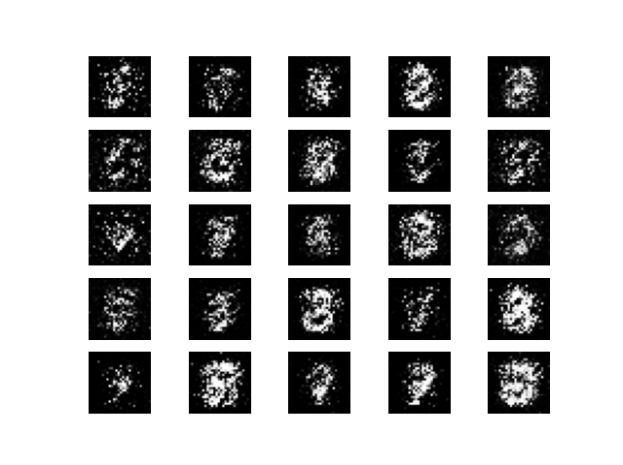
Description automatically generatedA group of squares with a white background

Description automatically generated

1. Experiment with different batch sizes. What impact different batch sizes have on

**For epoch 1000 we had best result for batch size 16,32**

16



32

A collage of images of a brain

Description automatically generated

64

A collage of images of a brain

Description automatically generated

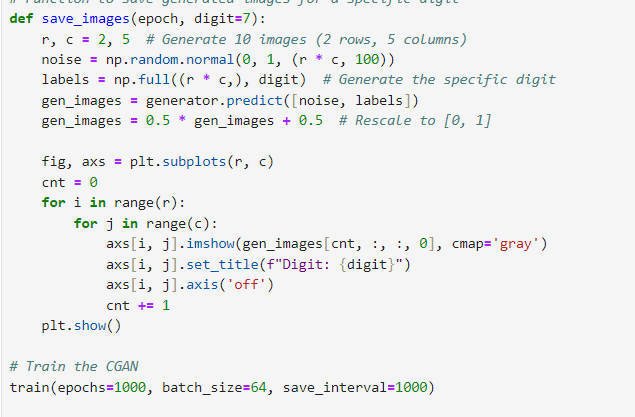
128

A group of white squares

Description automatically generated

Part 2

1. Modify the CGAN to generate images for specific digits (e.g., generate only '7' or '9').



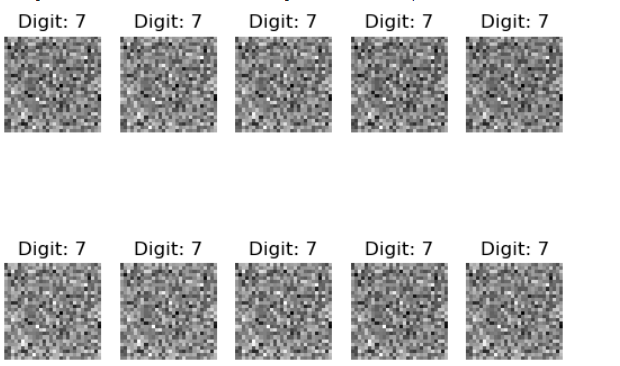
1. Implement label smoothing by replacing real labels of 1 with random values between 0.9 and 1 during training. Analyze how label smoothing affects the training process and the quality of generated images.

**label smoothing helps in creating models that are better generalized by moderating their prediction confidence, which in turn improves the quality and reliability of the generated outputs over the course of training epochs.**

A screenshot of a computer code

Description automatically generated

epoch 0



epoch 1000

A collage of images of numbers

Description automatically generated

epoch 2000

A screenshot of a number

Description automatically generated

epoch 3000

A collage of images of numbers and symbols

Description automatically generated

epoch 4000

A screenshot of a computer screen

Description automatically generated

epoch 5000

A screenshot of a computer

Description automatically generated

epoch 6000

A screenshot of a computer

Description automatically generated

epoch 7000

A collage of numbers and symbols

Description automatically generated

epoch 8000

A number in black squares

Description automatically generated with medium confidence

epoch 9000

A collage of numbers

Description automatically generated

1. Create noise vectors corresponding to two different digits (e.g., '3' and '8'). Perform **interpolation** between the two noise vectors and visualize how the generated images morph from one digit to the other.

**As training progresses, the generated images become clearer and more distinguishable as individual digits.**

**The interpolation shows the capability of the generative model to not only generate realistic digits but also transition smoothly between two different classes.**

**The effectiveness and quality of interpolation depend heavily on the training progress and the learned latent space of the model.**

epoch 0

A group of squares with numbers

Description automatically generated

epoch 2000

A collage of images of numbers

Description automatically generated

epoch 4000

A screenshot of a computer

Description automatically generated

epoch 6000

A number of numbers in different sizes

Description automatically generated with medium confidence

epoch 8000

A screenshot of a computer

Description automatically generated

