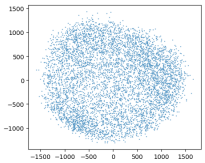
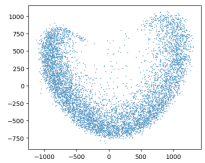
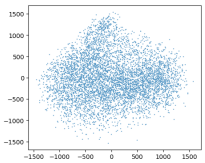
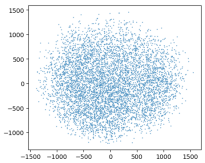
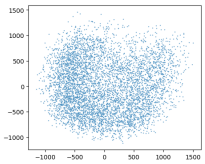
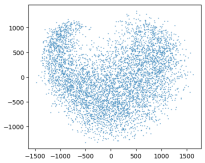
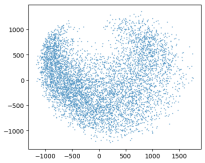
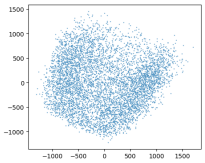
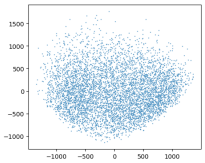
References

```
from keras.datasets import mnist
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

```
WARNING:tensorflow:From D:\Python3.11\Lib\site-packages\keras\src\losses.py:2976: The name t
```

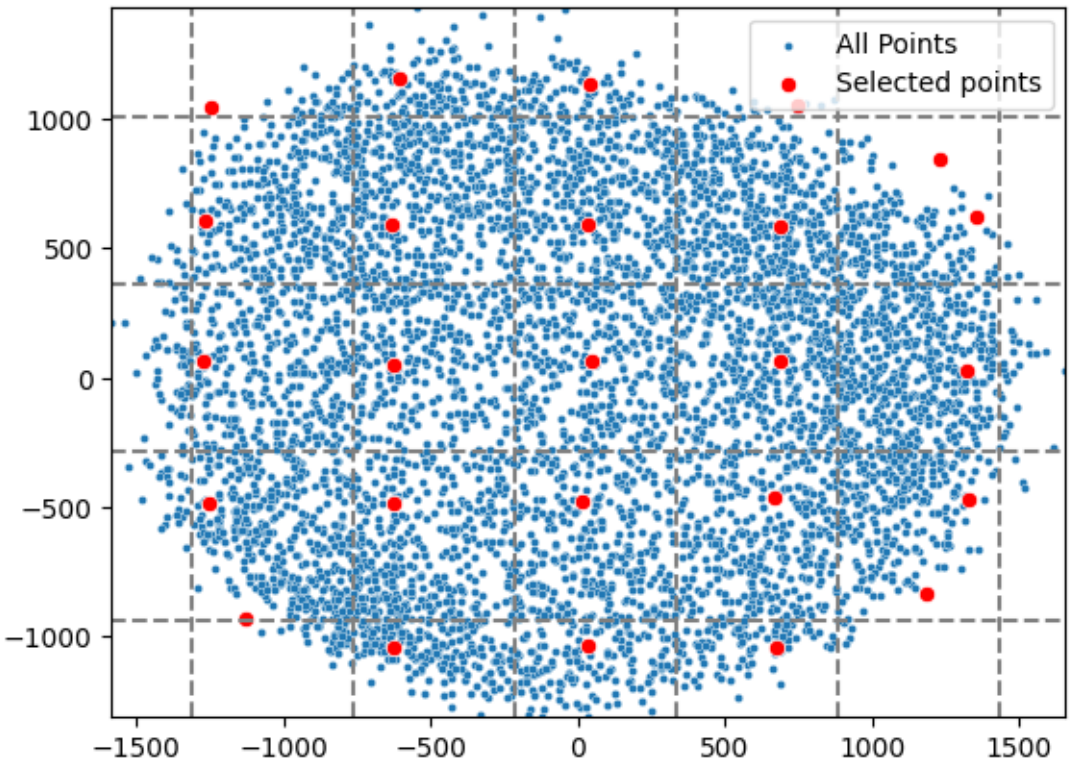
```
(X_train, y_train), (X_test, y_test) = mnist.load_data()
```

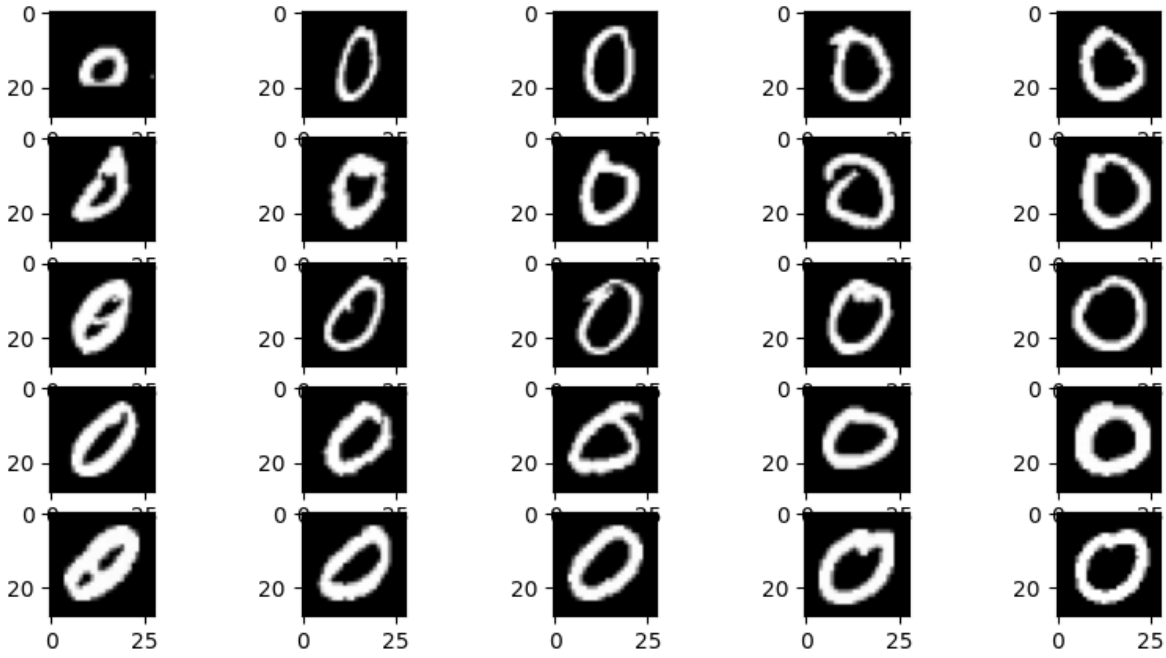
```
from sklearn.decomposition import PCA
fig,axs=plt.subplots(9,1,figsize=(5,45))
axs.ravel()
for i in range(9):
    set=sets[i]
    #print(set.shape)
    function= lambda x: x.flatten()
    flat= np.array(list(map(function,set)))
    #print(flat.shape)
    pca = PCA()
    transformed_data=pca.fit_transform(flat)
    sns.scatterplot(x=transformed_data[:,0],y=transformed_data[:,1],ax=axs[i],s=2)
```

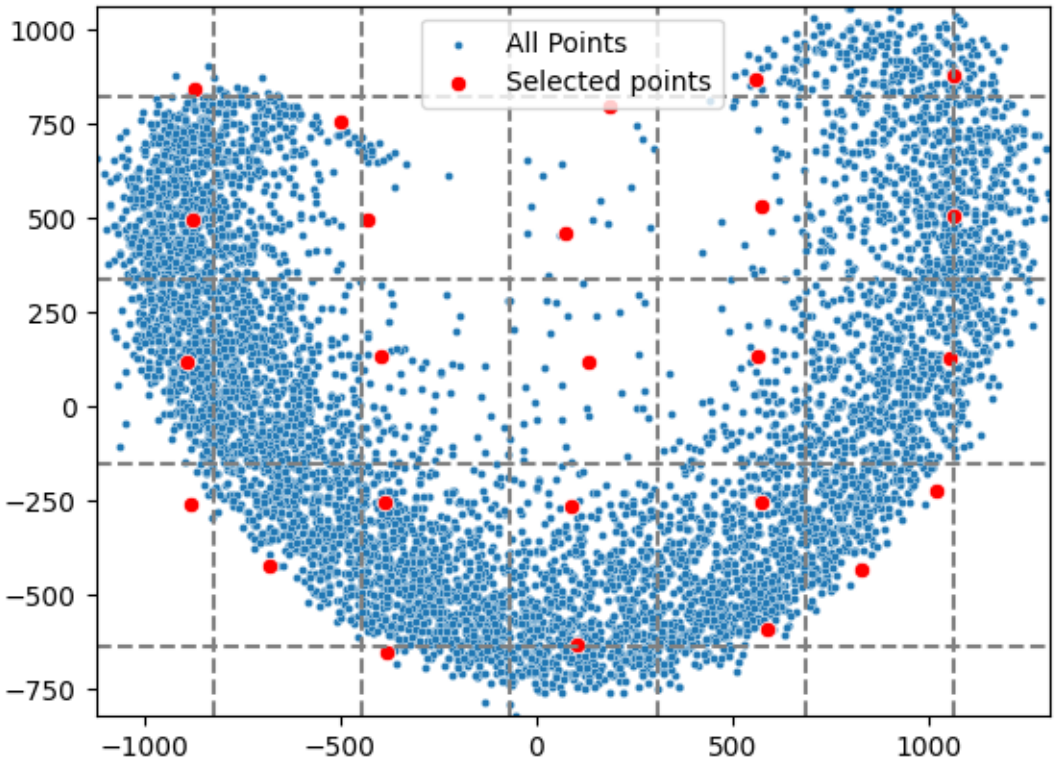











```
for set in sets:

    function= lambda x: x.flatten()

    flat= np.array(list(map(function,set)))
    pca = PCA(n_components=2)
    transformed_data=pca.fit_transform(flat)
    x = transformed_data[:,0] #PC1
    y = transformed_data[:,1] #PC2



    # Assuming `points` is a 2D numpy array where each row is a point

    # Create a 5x5 grid
    x_grid = np.linspace(x.min(), x.max(), 6)
    y_grid = np.linspace(y.min(), y.max(), 6)

    # Store the selected points
    selected_points = []

    # Loop over the grid and find the closest point to the center of each cell
    closest_point_indices=[]
    for j in range(5):
        for i in range(5):
            x_center = (x_grid[i] + x_grid[i+1]) / 2
            y_center = (y_grid[j] + y_grid[j+1]) / 2
            distances = np.sqrt((x - x_center)**2 + (y - y_center)**2)
            closest_point_index = np.argmin(distances)
            closest_point_indices.append(closest_point_index)
            selected_points.append(transformed_data[closest_point_index])

    # Convert the list to a numpy array
    selected_points = np.array(selected_points)
    for i in range(6):
        plt.axhline(x_grid[i],ls='--',c='gray')
        plt.axvline(y_grid[i],ls='--',c='gray')

    # Plot all points
    sns.scatterplot(x=x,y=y,s=10,label="All Points")
```

```
# Plot the selected points
sns.scatterplot(x=selected_points[:, 0],y= selected_points[:, 1], color='red', label='
plt.xlim(x.min(),x.max())
plt.ylim(y.min(),y.max())
fig,axs=plt.subplots(5,5,figsize=(10,5))
axs=axs.ravel()
selected=set[closest_point_indices,:,:]
for i in range(25):
    axs[i].imshow(selected[i],cmap='gray')

plt.show()
```



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Selected points
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750
500
250
0
−250
−500
−750
−1000
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0
500
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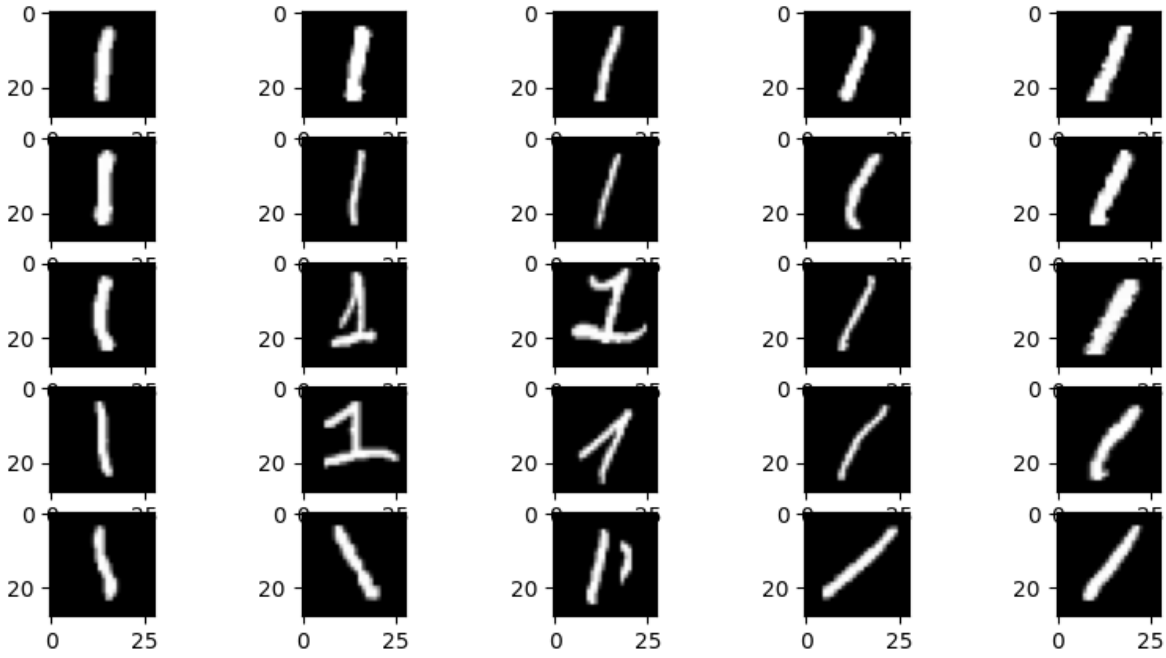

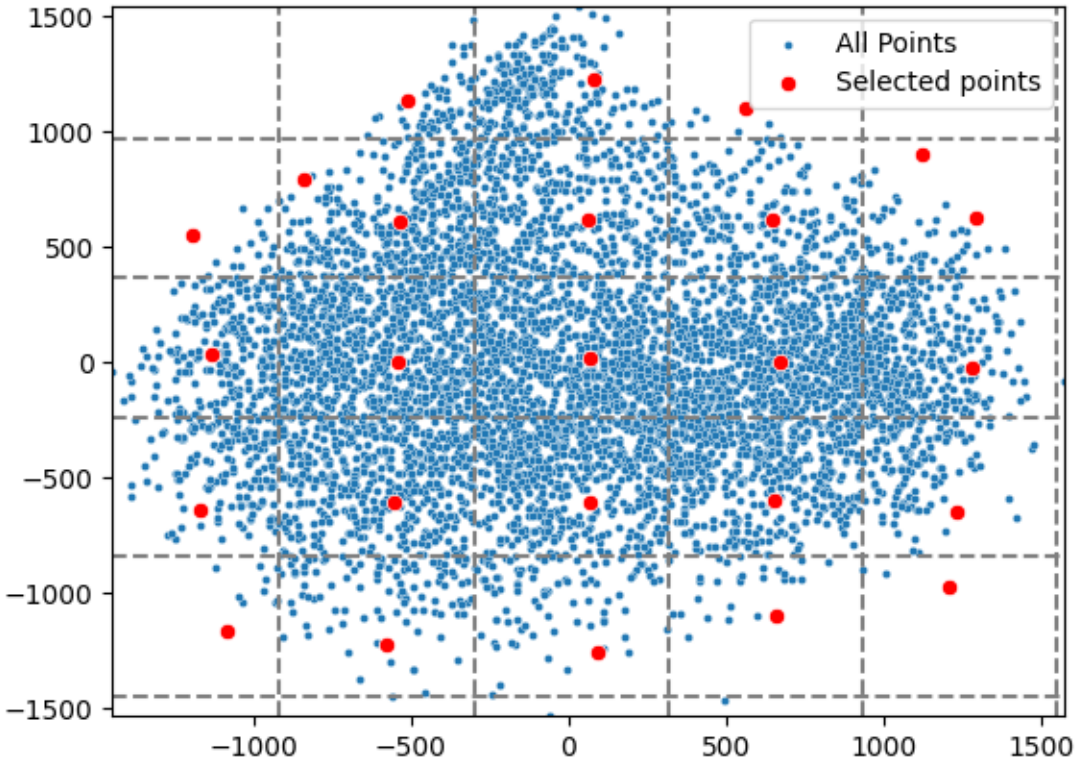
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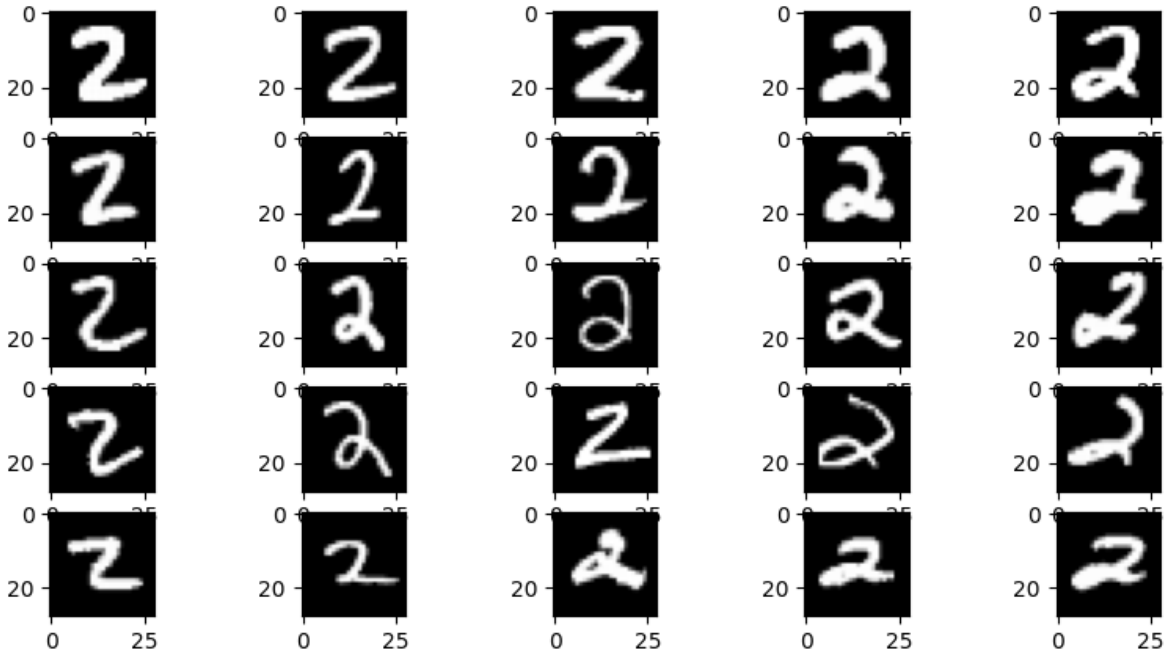

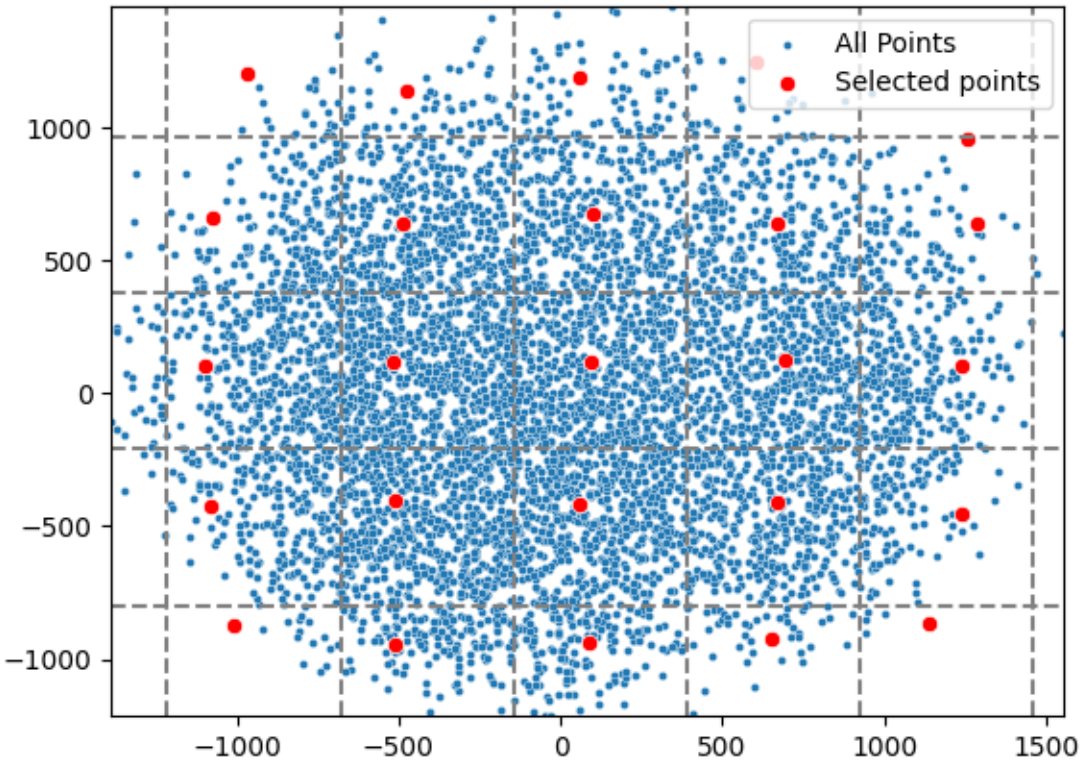
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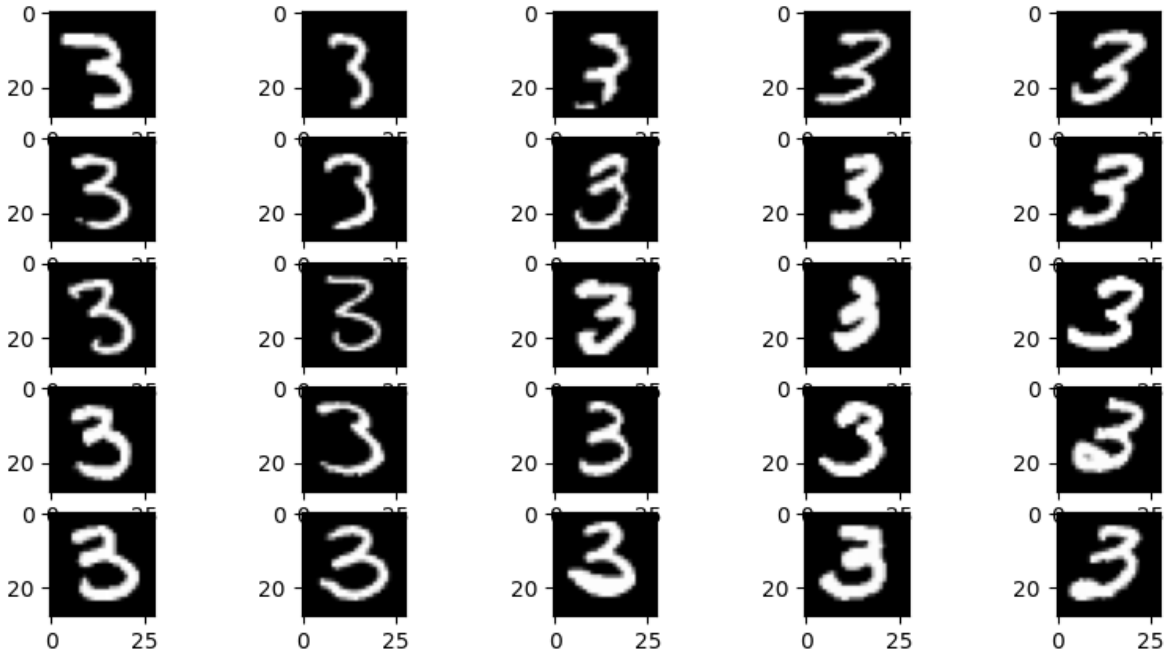

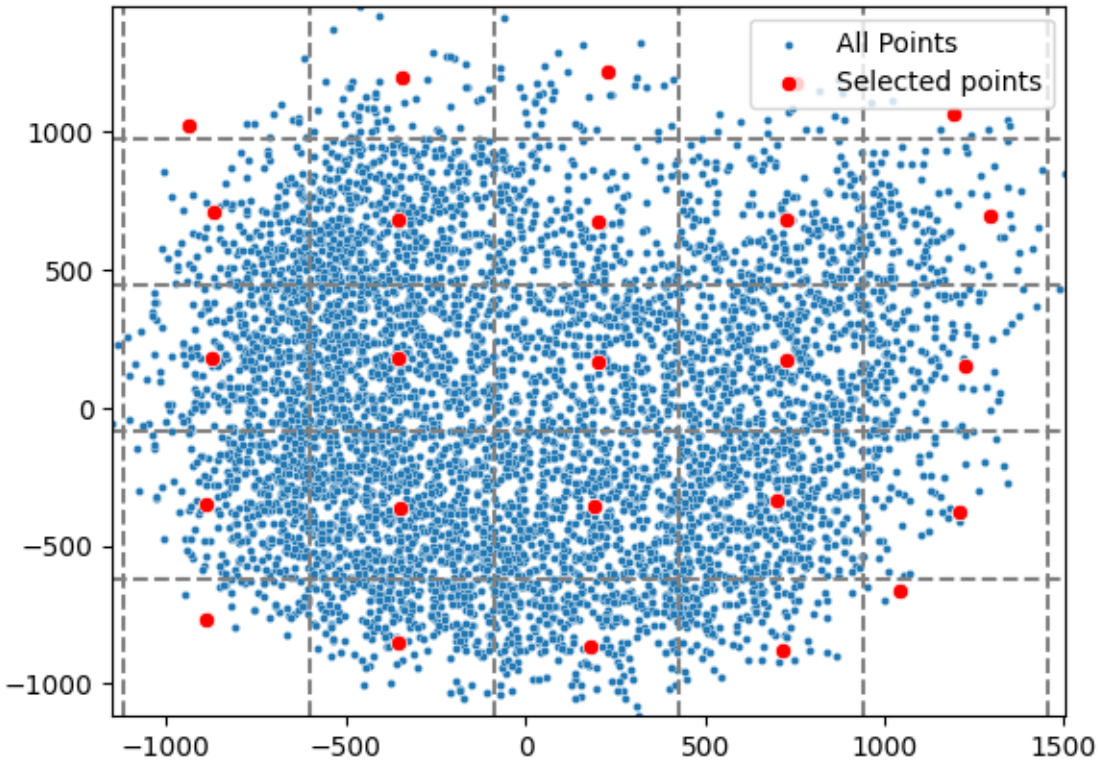
All Points
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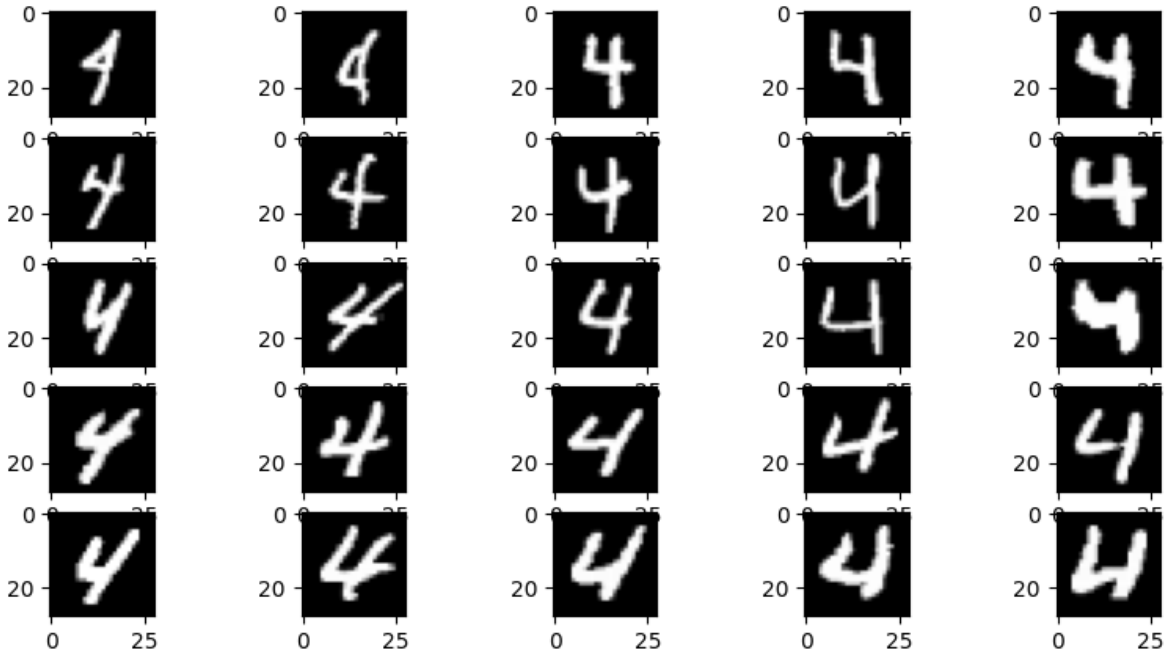

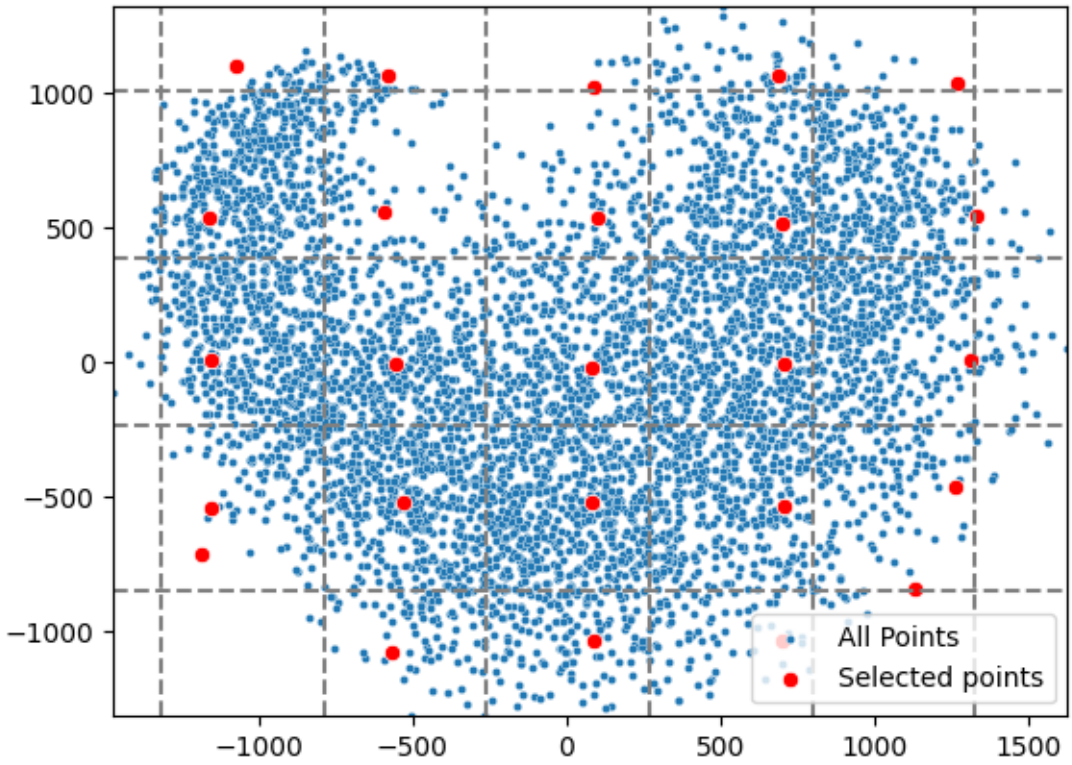
All Points
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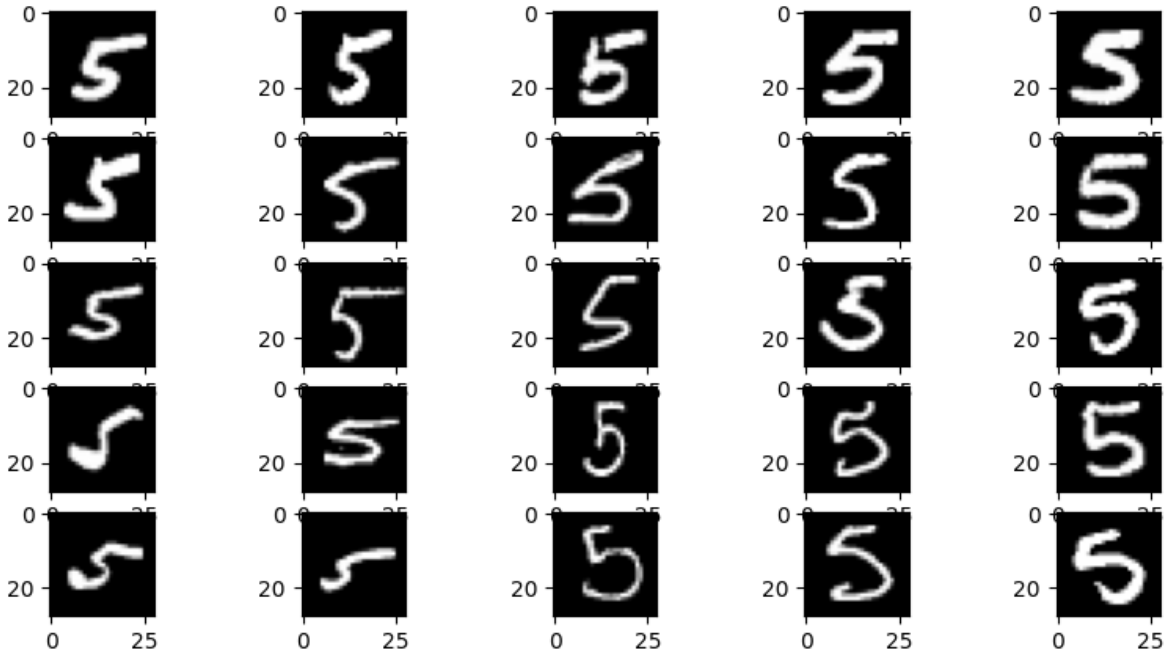

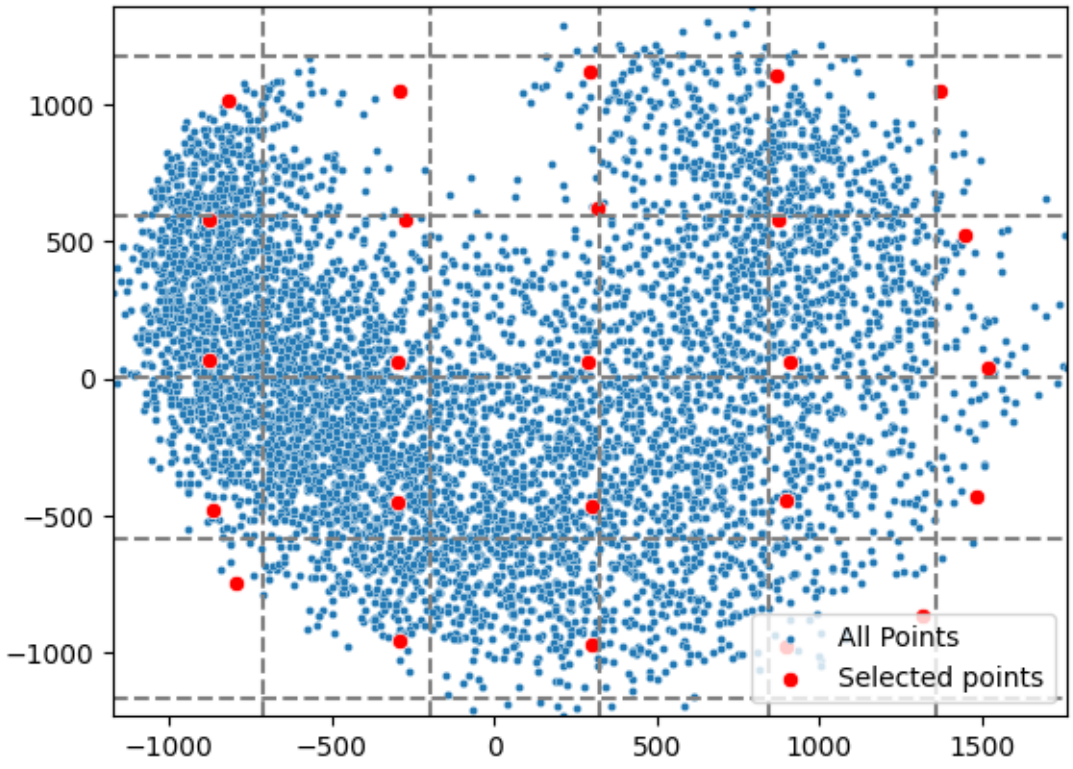
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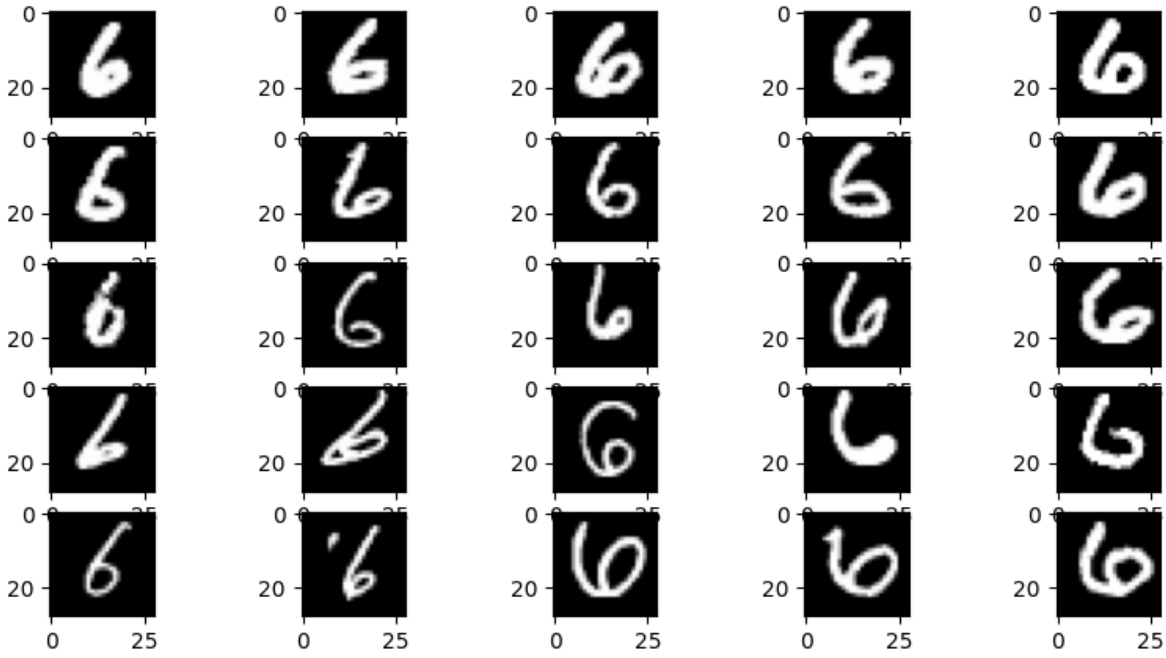
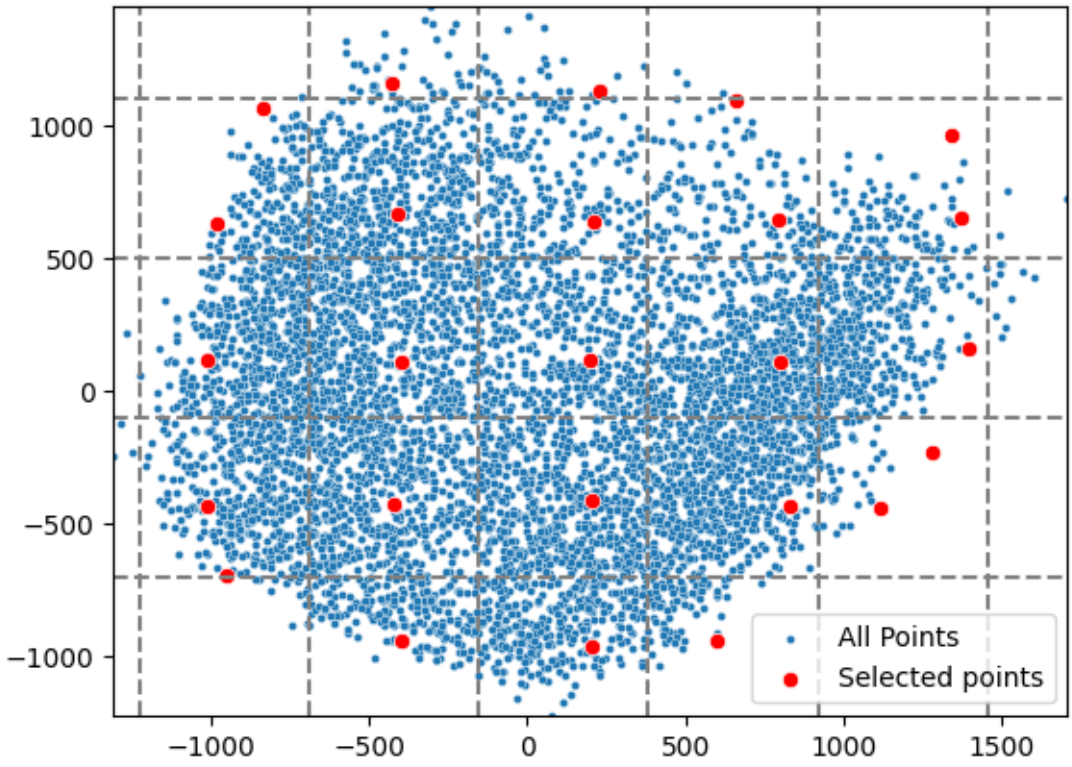
All Points
Selected points

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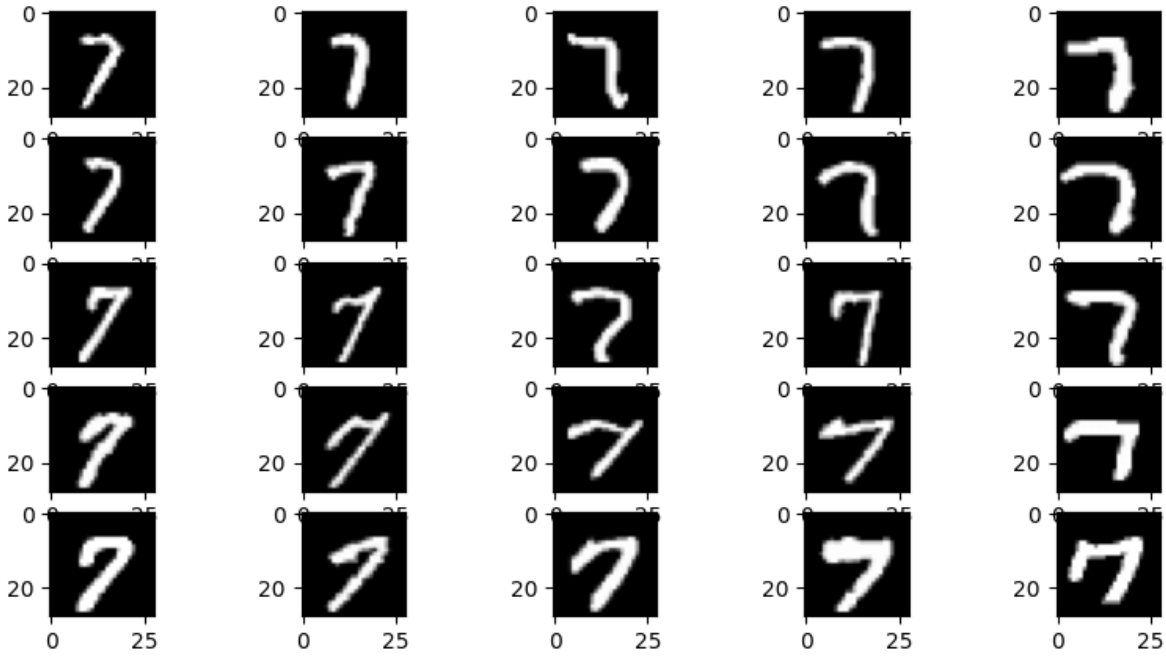

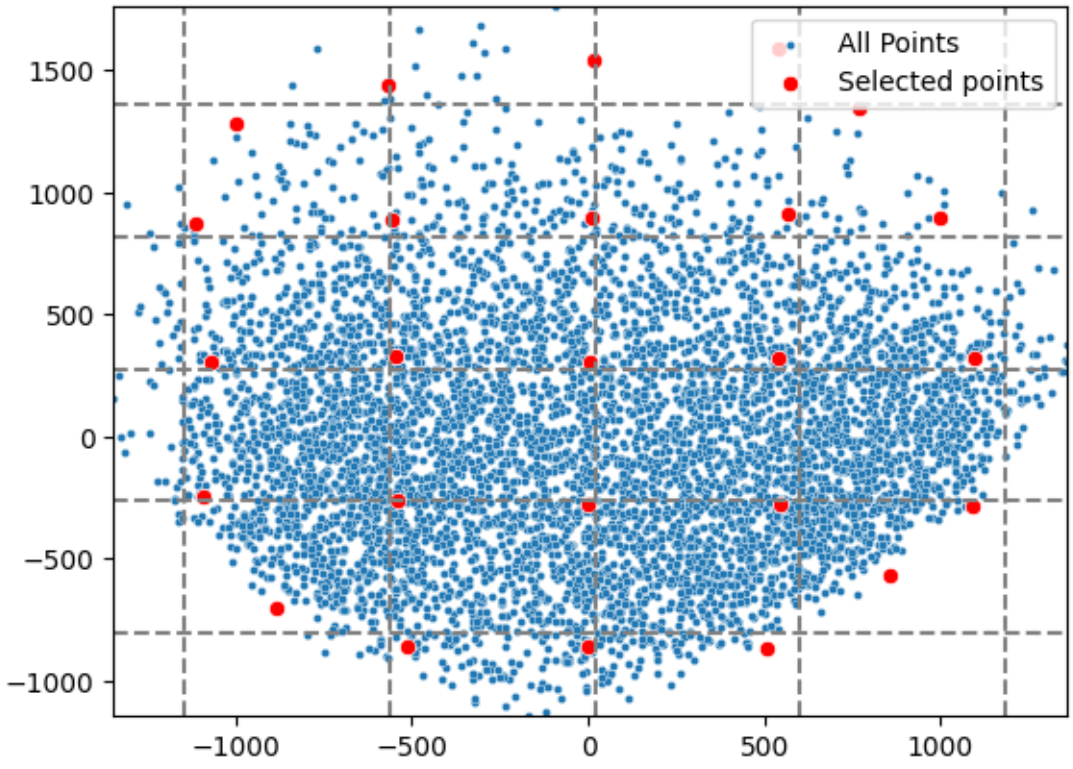
All Points
Selected points
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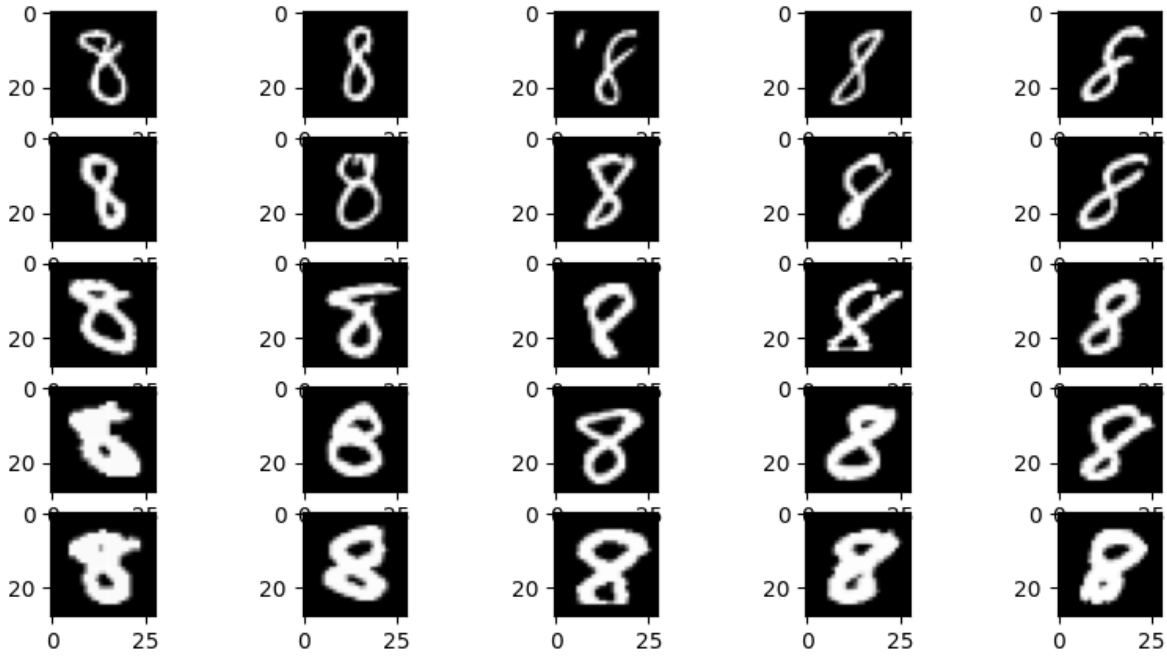
−500
0
500
1000



Websites:

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