```

import pandas as pd
csv_path = './Data/csv'
artist_train = pd.read_csv('./Data/csv/Artist/artist_train')
# lets visualize one imag
base_url = './Data/image/wikiart'
```

```
# lets start creating data
artist = './Data/csv/Artist'
genre = './Data/csv/Genre'
style = './Data/csv/Style'

data_dir = './Data/csv'
# artist_train = artist + '/artist_train'
# artist_val = artist + '/artist_val'
# artist_class = artist + '/artist_class.txt'

# genre_train = genre + '/genre_train.csv'
# genre_val = genre + '/genre_val.csv'
# genre_class = genre + '/genre_class.txt'

# style_train = style + '/style_train.csv'
# style_val = style + '/style_val.csv'
# style_class = style + '/style_class.txt'

artist_train_path = data_dir + '/artist_train.csv'
artist_val_path = data_dir + '/artist_val.csv'
artist_class_path = data_dir + '/artist_class.txt'

genre_train_path = data_dir + '/genre_train.csv'
genre_val_path = data_dir + '/genre_val.csv'
genre_class_path = data_dir + '/genre_class.txt'

style_train_path = data_dir + '/style_train.csv'
style_val_path = data_dir + '/style_val.csv'
style_class_path = data_dir + '/style_class.txt'



artist_train = pd.read_csv(data_dir + '/artist_train.csv')
artist_val = pd.read_csv(data_dir + '/artist_val.csv')
artist_class = pd.read_csv(data_dir + '/artist_class.txt')

genre_train = pd.read_csv(data_dir + '/genre_train.csv')
genre_val = pd.read_csv(data_dir + '/genre_val.csv')
genre_class = pd.read_csv(data_dir + '/genre_class.txt')

style_train = pd.read_csv(data_dir + '/style_train.csv')
style_val = pd.read_csv(data_dir + '/style_val.csv')
style_class = pd.read_csv(data_dir + '/style_class.txt')



artist_train[:4]
```

	path	class_no
0	Realism/vincent-van-gogh_pine-trees-in-the-fen...	22
1	Baroque/rembrandt_the-angel-appearing-to-the-s...	20
2	Post_Impressionism/paul-cezanne_portrait-of-th...	16
3	Impressionism/pierre-auguste-renoir_young-girl...	17

```
import os
import pandas as pd
import torch
from torch.utils.data import Dataset
from torchvision import transforms
from PIL import Image
from collections import defaultdict
import random
from tqdm import tqdm
```

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```
import matplotlib.pyplot as plt

# Define dataset class
class BalancedArtDataset(Dataset):
    def __init__(self, csv_file, img_dir, class_mapping, transform=None, images_per_class=32):
        self.data = pd.read_csv(csv_file)
        self.img_dir = img_dir
        self.class_mapping = class_mapping
        self.transform = transform
        self.images_per_class = images_per_class

        # Filter out missing images
        print("Filtering missing images...")
        self.data = self.data[self.data.iloc[:, 0].apply(lambda x: os.path.exists(os.path.join(img_dir, str(x))))]

        # Group images by class
        print("Grouping images by class...")
        self.class_images = defaultdict(list)
        for _, row in tqdm(self.data.iterrows(), total=len(self.data), desc="Processing rows"):
            self.class_images[row.iloc[1]].append(row)

        # Balance dataset with 32 images per class
        print("Balancing dataset...")
        self.final_data = []
        all_images = []
        for cls, images in tqdm(self.class_images.items(), total=len(self.class_images), desc="Processing classes"):
            if len(images) >= images_per_class:
                selected_images = random.sample(images, images_per_class)
            else:
                selected_images = images[:]
                all_images.extend(images)  # Store extra images for filling
            self.final_data.extend(selected_images)

        # Fill missing slots with extra images
        print("Filling missing slots...")
        needed_images = images_per_class * len(self.class_images) - len(self.final_data)
        if needed_images > 0:
            self.final_data.extend(random.sample(all_images, min(needed_images, len(all_images))))

        # Shuffle dataset
        print("Shuffling dataset...")
        random.shuffle(self.final_data)

        # Count images per class
        self.class_counts = defaultdict(int)
        for row in self.final_data:
            self.class_counts[row.iloc[1]] += 1

    def __len__(self):
        return len(self.final_data)

    def __getitem__(self, idx):
        row = self.final_data[idx]
        img_path = os.path.join(self.img_dir, str(row.iloc[0]))
        label = row.iloc[1]
        image = Image.open(img_path).convert("RGB")

        if self.transform:
            image = self.transform(image)

        return image, label

    def visualize_class_distribution(self):
        plt.figure(figsize=(12, 6))
        plt.bar(self.class_counts.keys(), self.class_counts.values(), color='skyblue')
        plt.xlabel("Class")
        plt.ylabel("Number of Images")
        plt.title("Class Distribution in Balanced Dataset")
        plt.xticks(rotation=45)
        plt.show()

    def visualize_samples(self, num_samples=10):
        fig, axes = plt.subplots(1, num_samples, figsize=(40, 20))
        for i in range(num_samples):
            image, label = self.__getitem__(random.randint(0, len(self) - 1))
            image = image.permute(1, 2, 0).numpy()  # Convert to (H, W, C)
            image = (image * 0.5) + 0.5  # Unnormalize
```

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```
            axes[i].imshow(image)
            axes[i].set_title(f"Class: {label} {artist_class['class_name'][label]}")
            axes[i].axis("off")
        plt.show()

    # Function to compare artist and genre relationships



# Define transformations
transform = transforms.Compose([
    transforms.Resize((224, 224)),
    transforms.ToTensor(),
    transforms.Normalize(mean=[0.5, 0.5, 0.5], std=[0.5, 0.5, 0.5])
])

# Create balanced artist dataset
print("Creating balanced artist dataset...")
artist_balanced_dataset = BalancedArtDataset(artist_train_path, "./Data/image/wikiart", artist_class_path, transform=transform, images_

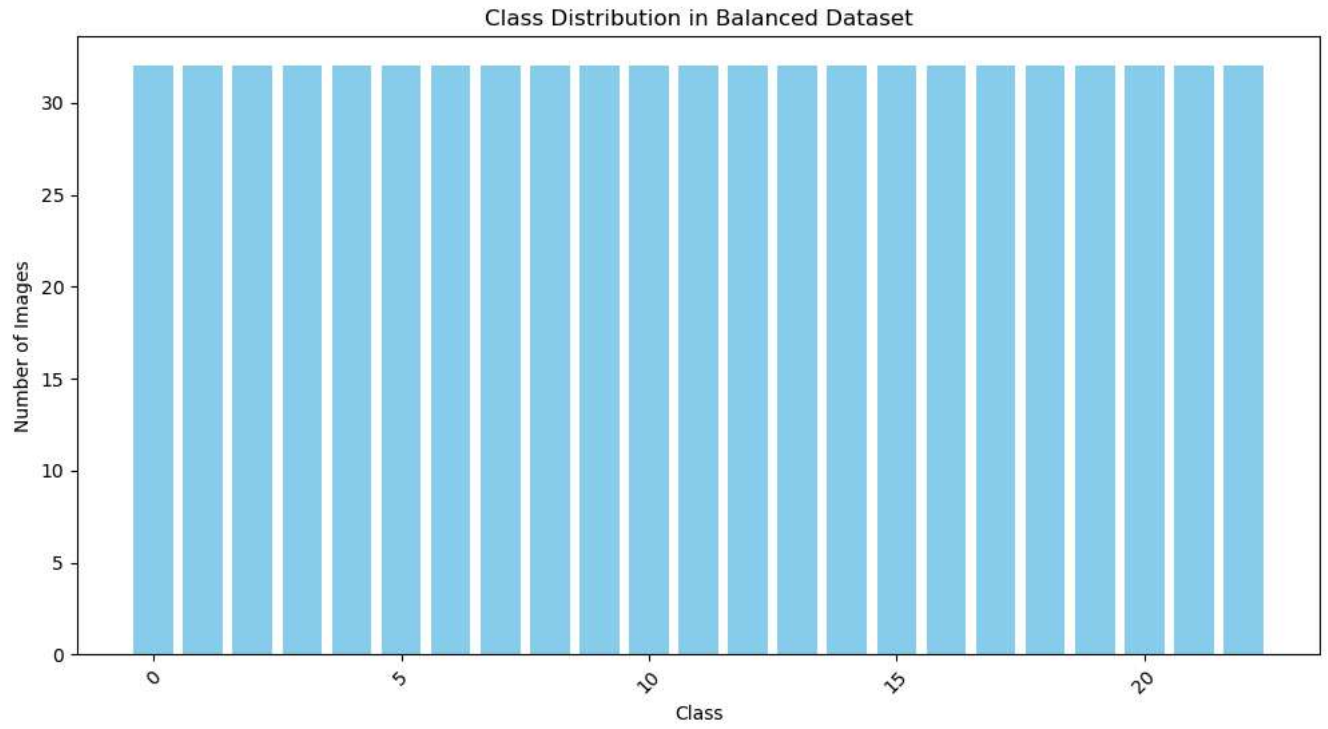
# Check dataset length
print("Artist balanced dataset size:", len(artist_balanced_dataset))

# Visualize class distribution
artist_balanced_dataset.visualize_class_distribution()

# Visualize sample images
artist_balanced_dataset.visualize_samples(num_samples=10)

```

```
Creating balanced artist dataset...
Filtering missing images...
Grouping images by class...
Processing rows: 100%|| 13344/13344 [00:02<00:00, 6538.13it/s]
Balancing dataset...
Processing classes: 100%|| 23/23 [00:00<00:00, 11122.91it/s]
Filling missing slots...
Shuffling dataset...
Artist balanced dataset size: 736
```



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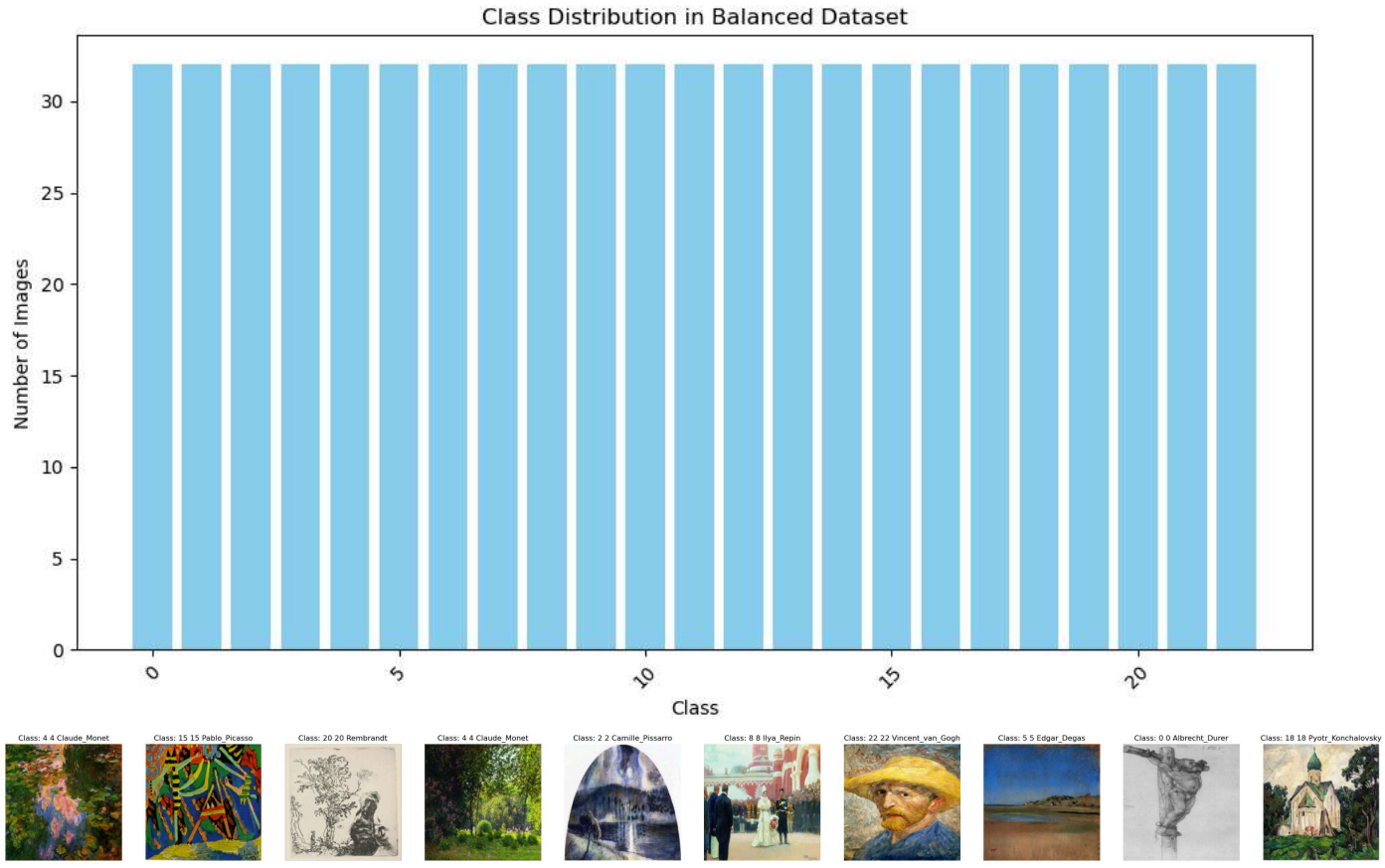
```
artist_class['class_name'][0]
```

```
'0 Albrecht_Durer'
```

```
# Visualize class distribution
artist_balanced_dataset.visualize_class_distribution()

# Visualize sample images
artist_balanced_dataset.visualize_samples(num_samples=10)
```




```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Visualize artist-genre relationship
def visualize_artist_genre_relationship(artist_csv, genre_csv):
    # Load datasets
    artist_data = pd.read_csv(artist_csv)
    genre_data = pd.read_csv(genre_csv)

    # Merge datasets on image path
    merged_data = artist_data.merge(genre_data, on="path")

    # Extract artist and genre relationships
    artist_genre_counts = merged_data.groupby(["class_no_x", "class_no_y"]).size().unstack(fill_value=0)

    # Plot heatmap
    plt.figure(figsize=(12, 8))
    sns.heatmap(artist_genre_counts, cmap="Blues", annot=True, fmt="d")
    plt.xlabel("Genre")
    plt.ylabel("Artist")
    plt.title("Artist-Genre Relationship")
    plt.xticks(rotation=45, ha="right")
    plt.yticks(rotation=0)
    plt.show()

# File paths
df_artist_path = artist_train_path  # Replace with actual artist CSV path
```

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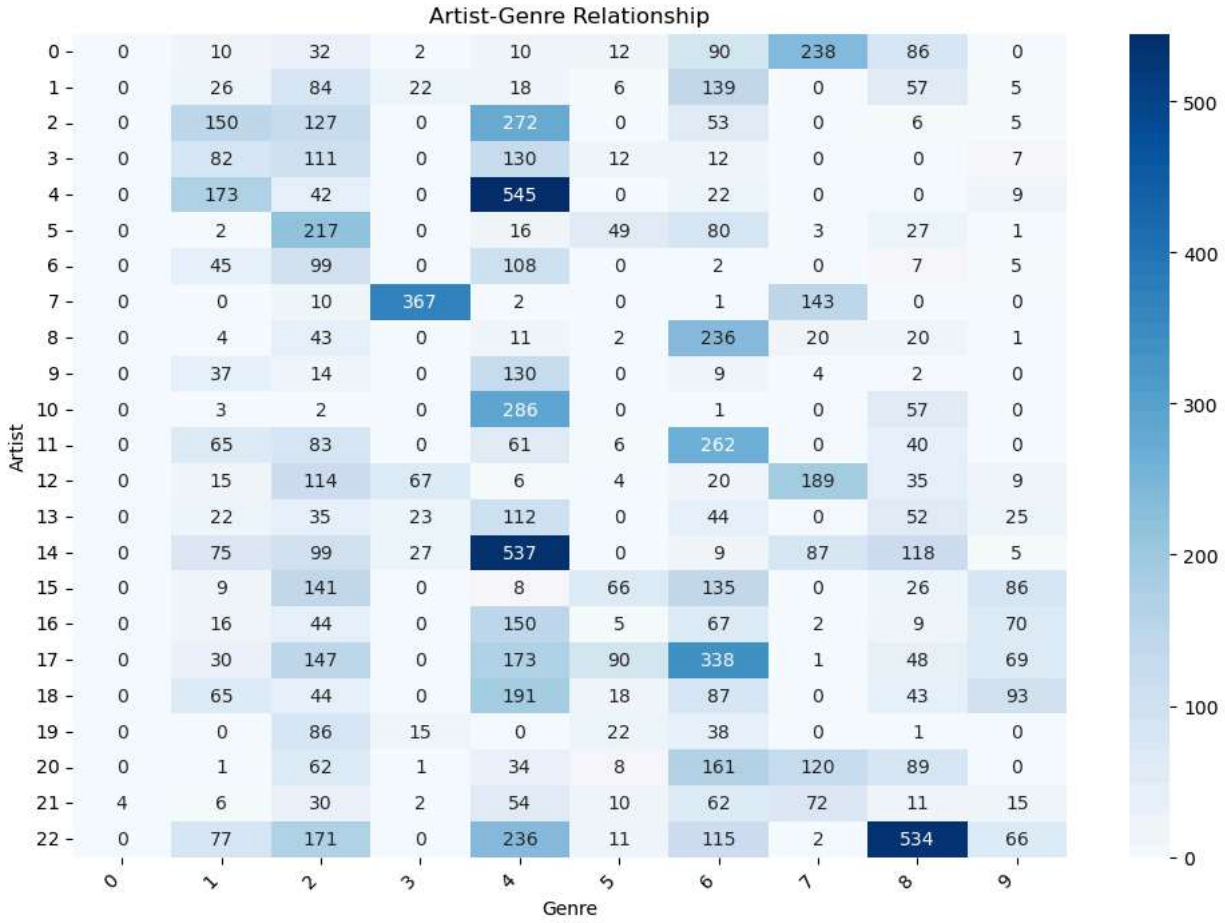
```
df_genre_path = genre_train_path    # Replace with actual genre CSV path

# Run visualization
visualize_artist_genre_relationship(df_artist_path, df_genre_path)

```




```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Visualize artist-genre relationship
def visualize_artist_genre_relationship(artist_csv, genre_csv, artist_class_txt, genre_class_txt):
    # Load datasets
    artist_data = pd.read_csv(artist_csv)
    genre_data = pd.read_csv(genre_csv)

    # Load artist and genre class data from text files and assign index as class_no
    artist_classes = pd.read_csv(artist_class_txt, header=None, names=["artist_name"])
    genre_classes = pd.read_csv(genre_class_txt, header=None, names=["genre_name"])

    # Assign class_no starting from 0
    artist_classes.reset_index(inplace=True)
    genre_classes.reset_index(inplace=True)

    # Rename index column to class_no
    artist_classes.rename(columns={"index": "class_no"}, inplace=True)
    genre_classes.rename(columns={"index": "class_no"}, inplace=True)

    # Merge datasets on image path
    merged_data = artist_data.merge(genre_data, on="path")

    # Convert class_no_x and class_no_y to integers
    merged_data["class_no_x"] = merged_data["class_no_x"].astype(int)
    merged_data["class_no_y"] = merged_data["class_no_y"].astype(int)

    # Merge to replace class_no with actual names
    merged_data = merged_data.merge(artist_classes, left_on="class_no_x", right_on="cl
    merged_data = merged_data.merge(genre_classes, left_on="class_no_y", right_on="class_
```

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```
    # Drop unnecessary columns to prevent conflicts
    merged_data.drop(columns=["class_no", "class_no_artist", "class_no_genre"], errors="ignore", inplace=True)

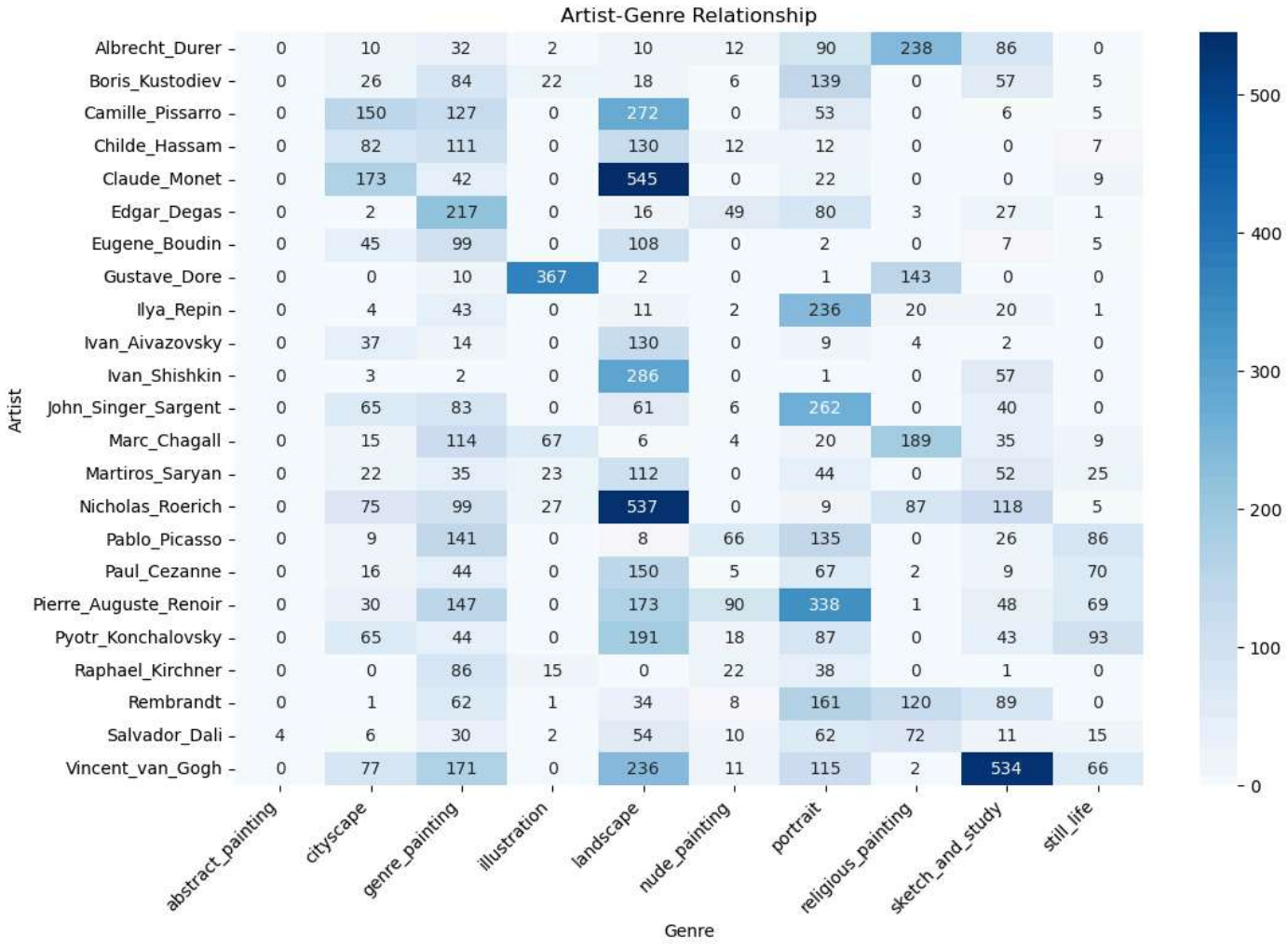
    # Extract artist and genre relationships
    artist_genre_counts = merged_data.groupby(["artist_name", "genre_name"]).size().unstack(fill_value=0)

    # Plot heatmap
    plt.figure(figsize=(12, 8))
    sns.heatmap(artist_genre_counts, cmap="Blues", annot=True, fmt="d")
    plt.xlabel("Genre")
    plt.ylabel("Artist")
    plt.title("Artist-Genre Relationship")
    plt.xticks(rotation=45, ha="right")
    plt.yticks(rotation=0)
    plt.show()

# File paths
df_artist_path = artist_train_path  # Replace with actual artist CSV path
df_genre_path = genre_train_path    # Replace with actual genre CSV path
df_artist_class_txt = artist_class_path  # Artist class text file (each line is a name)
df_genre_class_txt = genre_class_path    # Genre class text file (each line is a name)

# Run visualization
visualize_artist_genre_relationship(df_artist_path, df_genre_path, df_artist_class_txt, df_genre_class_txt)

```




```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Visualize artist-style relationship
def visualize_artist_style_relationship(artist_csv, style_csv, artist_class_txt, style_
    # Load datasets
```

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```
    artist_data = pd.read_csv(artist_csv)
    style_data = pd.read_csv(style_csv)

    # Load artist and style class data from text files and assign index as class_no
    artist_classes = pd.read_csv(artist_class_txt, header=None, names=["artist_name"])
    style_classes = pd.read_csv(style_class_txt, header=None, names=["style_name"])

    # Assign class_no starting from 0
    artist_classes.reset_index(inplace=True)
    style_classes.reset_index(inplace=True)

    # Rename index column to class_no
    artist_classes.rename(columns={"index": "class_no"}, inplace=True)
    style_classes.rename(columns={"index": "class_no"}, inplace=True)

    # Merge datasets on image path
    merged_data = artist_data.merge(style_data, on="path")

    # Convert class_no_x and class_no_y to integers
    merged_data["class_no_x"] = merged_data["class_no_x"].astype(int)
    merged_data["class_no_y"] = merged_data["class_no_y"].astype(int)

    # Merge to replace class_no with actual names
    merged_data = merged_data.merge(artist_classes, left_on="class_no_x", right_on="class_no", how="left", suffixes=("", "_artist"))
    merged_data = merged_data.merge(style_classes, left_on="class_no_y", right_on="class_no", how="left", suffixes=("", "_style"))

    # Drop unnecessary columns to prevent conflicts
    merged_data.drop(columns=["class_no", "class_no_artist", "class_no_style"], errors="ignore", inplace=True)

    # Extract artist and style relationships
    artist_style_counts = merged_data.groupby(["artist_name", "style_name"]).size().unstack(fill_value=0)

    # Plot heatmap
    plt.figure(figsize=(12, 8))
    sns.heatmap(artist_style_counts, cmap="Oranges", annot=True, fmt="d")
    plt.xlabel("Style")
    plt.ylabel("Artist")
    plt.title("Artist-Style Relationship")
    plt.xticks(rotation=45, ha="right")
    plt.yticks(rotation=0)
    plt.show()

# File paths
df_artist_path = artist_train_path  # Replace with actual artist CSV path
df_style_path = style_train_path    # Replace with actual style CSV path
df_artist_class_txt = artist_class_path  # Artist class text file (each line is a name)
df_style_class_txt = style_class_path    # Style class text file (each line is a name)

# Run visualization
visualize_artist_style_relationship(df_artist_path, df_style_path, df_artist_class_txt, df_style_class_txt)

```

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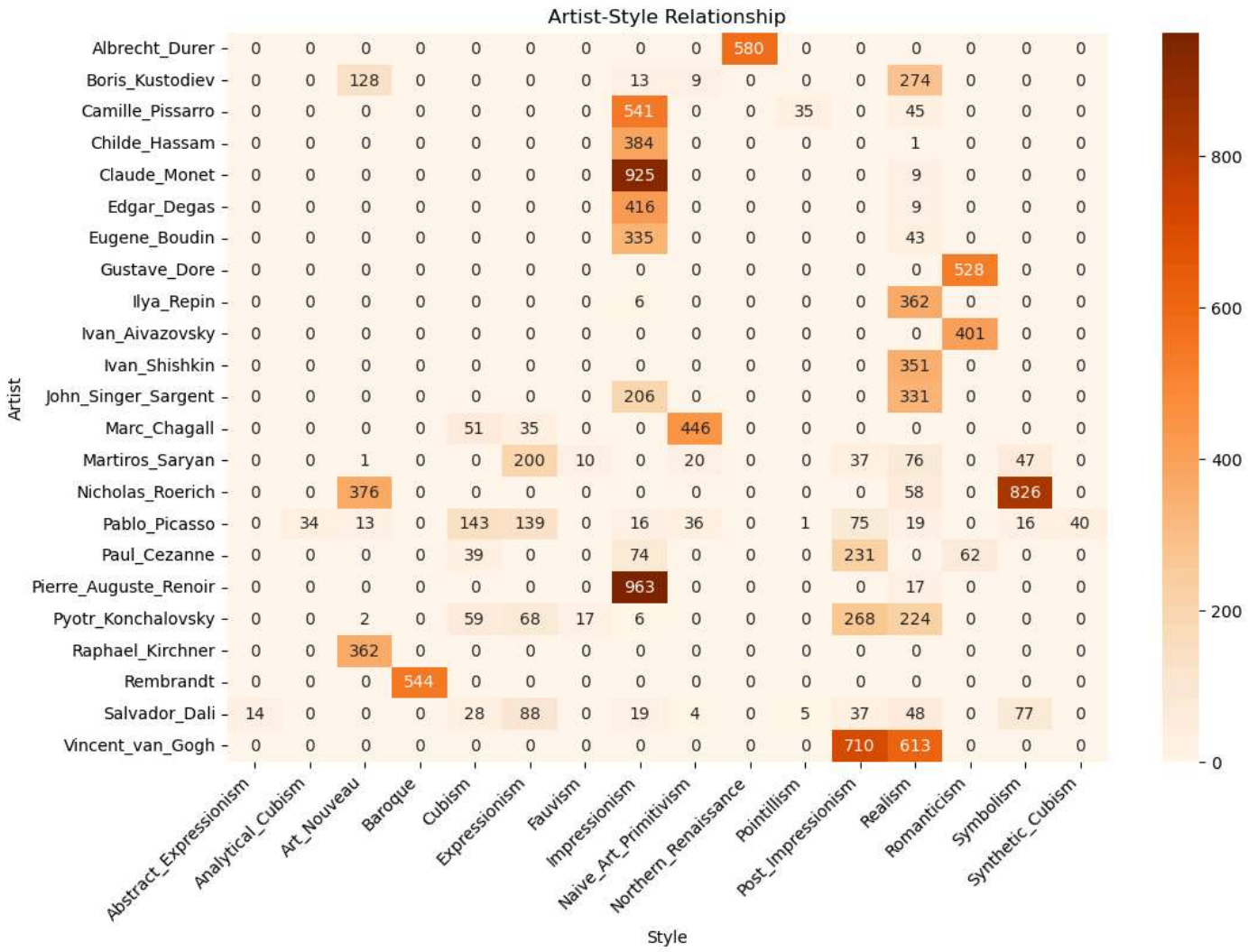


```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Visualize style-genre relationship
def visualize_style_genre_relationship(style_csv, genre_csv, style_class_txt, genre_class_txt):
    # Load datasets
    style_data = pd.read_csv(style_csv)
    genre_data = pd.read_csv(genre_csv)

    # Load style and genre class data from text files and assign index as class_no
    style_classes = pd.read_csv(style_class_txt, header=None, names=["style_name"])
    genre_classes = pd.read_csv(genre_class_txt, header=None, names=["genre_name"])

    # Assign class_no starting from 0
    style_classes.reset_index(inplace=True)
    genre_classes.reset_index(inplace=True)

    # Rename index column to class_no
    style_classes.rename(columns={"index": "class_no"}, inplace=True)
    genre_classes.rename(columns={"index": "class_no"}, inplace=True)

    # Merge datasets on image path
    merged_data = style_data.merge(genre_data, on="path")

    # Convert class_no_x and class_no_y to integers
    merged_data["class_no_x"] = merged_data["class_no_x"].astype(int)
    merged_data["class_no_y"] = merged_data["class_no_y"].astype(int)

    # Merge to replace class_no with actual names
    merged_data = merged_data.merge(style_classes, left_on="class_no_x", right_on="cla
    merged_data = merged_data.merge(genre_classes, left_on="class_no_y", right_on="class_
```

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```
    # Drop unnecessary columns to prevent conflicts
    merged_data.drop(columns=["class_no", "class_no_style", "class_no_genre"], errors="ignore", inplace=True)

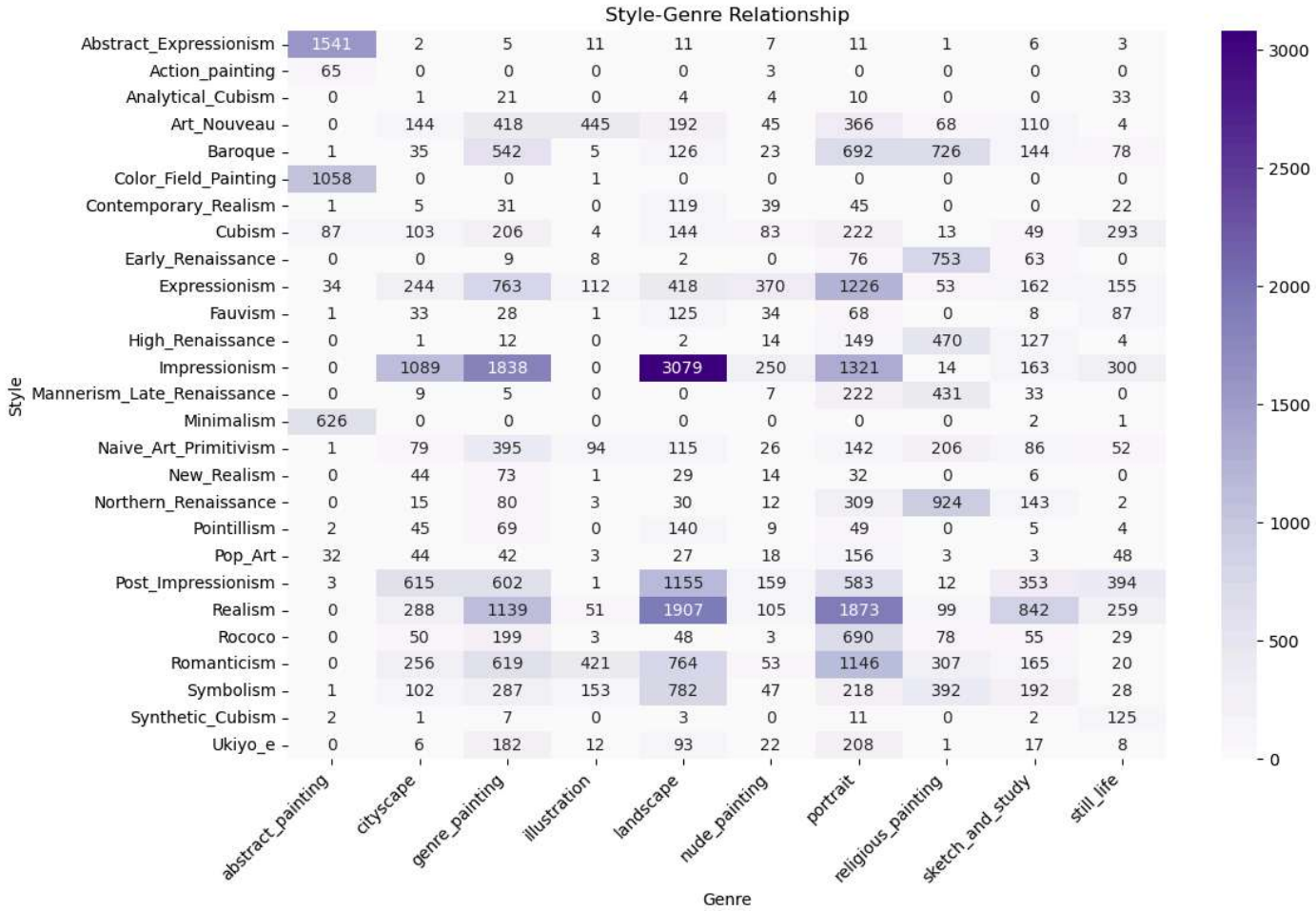
    # Extract style and genre relationships
    style_genre_counts = merged_data.groupby(["style_name", "genre_name"]).size().unstack(fill_value=0)

    # Plot heatmap
    plt.figure(figsize=(12, 8))
    sns.heatmap(style_genre_counts, cmap="Purples", annot=True, fmt="d")
    plt.xlabel("Genre")
    plt.ylabel("Style")
    plt.title("Style-Genre Relationship")
    plt.xticks(rotation=45, ha="right")
    plt.yticks(rotation=0)
    plt.show()

# File paths
df_style_path = style_train_path  # Replace with actual style CSV path
df_genre_path = genre_train_path  # Replace with actual genre CSV path
df_style_class_txt = style_class_path  # Style class text file (each line is a name)
df_genre_class_txt = genre_class_path  # Genre class text file (each line is a name)

# Run visualization
visualize_style_genre_relationship(df_style_path, df_genre_path, df_style_class_txt, df_genre_class_txt)

```




```
1
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