In [143…
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, cal
l drive.mount("/content/drive", force_remount=True).
```

In [144…
```
import numpy as np
import os
import matplotlib.pyplot as plt

import tensorflow as tf
from tensorflow.keras.utils import to_categorical, Sequence
from tensorflow.keras.models import Model
from tensorflow.keras.layers import Input, Dense, Reshape, Resizing, Conv2DT
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.layers import Flatten


from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
```

In [145…
```
images = np.load("/content/drive/MyDrive/images.npy")
labels = np.load("/content/drive/MyDrive/labels.npy")
```

In [146…
```
labels
```

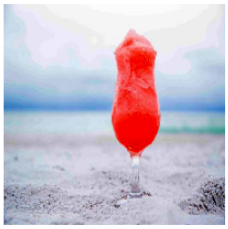
Out[146…
```
array(['drink', 'drink', 'drink', ..., 'outside', 'outside', 'outside'],
      dtype='<U7')
```

In [ ]:
```
num_images = 5
fig, axs = plt.subplots(1, num_images, figsize=(15, 15))
for i in range(num_images):
    axs[i].imshow(images[i, :, :, :])
    axs[i].axis('off')
plt.show()
```

```
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
```







In [148…
```
labels_unique = np.unique(labels)
print(f"Unique labels: {labels_unique}")
```

```
Unique labels: ['drink' 'food' 'inside' 'menu' 'outside']
```

In [149…
```
print(f"Images shape: {images.shape}")
print(f"Labels shape: {labels.shape}")
```

```
Images shape: (8390, 224, 224, 3)
Labels shape: (8390,)
```

In [150…
```
print(f"Image pixel value range: {images.min()} to {images.max()}")
print(f"Labels shape after one-hot encoding: {labels.shape}")
```

```
Image pixel value range: -1.0 to 1.0
Labels shape after one-hot encoding: (8390,)
```

In [ ]:
```
selected_class = 'menu'
class_indices = np.where(labels == selected_class)[0]
class_images = images[class_indices]

print(f"Total images for class '{selected_class}': {class_images.shape}")

num_images = 5
fig, axs = plt.subplots(1, num_images, figsize=(15, 15))
for i in range(num_images):
    axs[i].imshow(class_images[i, :, :, :])
    axs[i].axis('off')
plt.show()
```

```
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow w
ith RGB data ([0..1] for floats or [0..255] for integers).
Total images for class 'menu': (1678, 224, 224, 3)
```





In [152…
```
label_encoder = LabelEncoder()
encoded_labels = label_encoder.fit_transform(labels)
```

In [ ]:
```
num_classes = len(label_encoder.classes_)
one_hot_labels = to_categorical(encoded_labels, num_classes)

print(f"Encoded labels: {encoded_labels[:5]}")
print(f"Labels shape after one-hot encoding: {one_hot_labels.shape}")
```

```
Encoded labels: [0 0 0 0 0]
Labels shape after one-hot encoding: (8390, 5)
```

In [154…
```
target_shape = (64, 64, 3)
images = np.array([tf.image.resize(image, target_shape[:2]).numpy() for imag
```

In [155…
```
train_images, test_images, train_labels, test_labels = train_test_split(
    images, one_hot_labels, test_size=0.2, random_state=42
)
```

In [156…
```
print(f"Training set: {train_images.shape}, {train_labels.shape}")
print(f"Evaluation set: {test_images.shape}, {test_labels.shape}")
```

```
Training set: (6712, 64, 64, 3), (6712, 5)
Evaluation set: (1678, 64, 64, 3), (1678, 5)
```

In [157…
```
#parameters
latent_dim = 200
img_shape = (64, 64, 3)
```

In [ ]:
```
def build_generator(latent_dim, num_classes, img_shape):

    noise_input = Input(shape=(latent_dim,), name="noise_input")
    label_input = Input(shape=(num_classes,), name="label_input")

    label_dense = Dense(latent_dim, name="label_dense")(label_input)
    label_dense = BatchNormalization(momentum=0.8, name="label_batchnorm")(l
    label_dense = LeakyReLU(alpha=0.2, name="label_activation")(label_dense)

    merged_input = Concatenate(name="merged_input")([noise_input, label_dens

    x = Dense(128 * 8 * 8, activation="relu", name="dense_projection")(merge
    x = Reshape((8, 8, 128), name="reshape_layer")(x)

    x = Conv2DTranspose(128, kernel_size=3, strides=2, padding="same", name=
    x = BatchNormalization(momentum=0.8, name="batchnorm_1")(x)
```

```
    x = LeakyReLU(alpha=0.2, name="activation_1")(x)

    x = Conv2DTranspose(64, kernel_size=3, strides=2, padding="same", name="
    x = BatchNormalization(momentum=0.8, name="batchnorm_2")(x)
    x = LeakyReLU(alpha=0.2, name="activation_2")(x)

    x = Conv2DTranspose(32, kernel_size=3, strides=2, padding="same", name="
    x = BatchNormalization(momentum=0.8, name="batchnorm_3")(x)
    x = LeakyReLU(alpha=0.2, name="activation_3")(x)

    img_output = Conv2D(img_shape[2], kernel_size=3, padding="same", activat

    return Model([noise_input, label_input], img_output, name="Generator")
```

In [ ]:

```
def build_discriminator(img_shape, num_classes):

    img_input = Input(shape=(None, None, img_shape[2]), name="img_input")

    resized_img = Resizing(64, 64, name="resize_layer")(img_input)

    label_input = Input(shape=(num_classes,), name="label_input")
    label_embedding = Dense(np.prod(img_shape), name="label_dense")(label_ir
    label_embedding = Reshape(img_shape, name="label_reshape")(label_embeddi

    merged_input = Concatenate(axis=-1, name="merged_input")([resized_img, l

    x = Conv2D(64, kernel_size=3, strides=2, padding="same", name="conv2d_1"
    x = BatchNormalization(momentum=0.8, name="batchnorm_1")(x)
    x = LeakyReLU(alpha=0.2, name="activation_1")(x)

    x = Conv2D(128, kernel_size=3, strides=2, padding="same", name="conv2d_2
    x = BatchNormalization(momentum=0.8, name="batchnorm_2")(x)
    x = LeakyReLU(alpha=0.2, name="activation_2")(x)

    x = Conv2D(256, kernel_size=3, strides=2, padding="same", name="conv2d_3
    x = BatchNormalization(momentum=0.8, name="batchnorm_3")(x)
    x = LeakyReLU(alpha=0.2, name="activation_3")(x)

    x = Flatten(name="flatten")(x)
    validity = Dense(1, activation='sigmoid', name="validity_output")(x)

    return Model([img_input, label_input], validity, name="Discriminator")
```

In [160…

```
def save_generated_images(generator, epoch, save_path="generated_images"):
    os.makedirs(save_path, exist_ok=True)
    noise = np.random.normal(0, 1, (num_classes, latent_dim))
    sampled_labels = np.eye(num_classes)
    gen_imgs = generator.predict([noise, sampled_labels])
    gen_imgs = 0.5 * gen_imgs + 0.5  # Rescale to [0, 1]

    for i in range(num_classes):
        plt.imsave(f"{save_path}/epoch_{epoch}_class_{i}.png", gen_imgs[i])
```

In [161…

```
generator = build_generator(latent_dim, num_classes, img_shape)
generator.summary()
```

```
Model: "Generator"
__________________________________________________________________________________________
 Layer (type)                Output Shape              Param #   Connected to
==========================================================================================
 label_input (InputLayer)    [(None, 5)]               0         []

 label_dense (Dense)         (None, 200)               1200      ['label_input[0][0]']

 label_batchnorm (BatchNorm  (None, 200)               800       ['label_dense[0][0]']
 alization)

 noise_input (InputLayer)    [(None, 200)]             0         []

 label_activation (LeakyReL  (None, 200)               0         ['label_batchnorm[0][0]']
 U)

 merged_input (Concatenate)  (None, 400)               0         ['noise_input[0][0]',
                                                                  'label_activation[0][0]']

 dense_projection (Dense)    (None, 8192)              3284992   ['merged_input[0][0]']

 reshape_layer (Reshape)     (None, 8, 8, 128)         0         ['dense_projection[0][0]']

 conv2dtranspose_1 (Conv2DT  (None, 16, 16, 128)       147584    ['reshape_layer[0][0]']
 ranspose)

 batchnorm_1 (BatchNormaliz  (None, 16, 16, 128)       512       ['conv2dtranspose_1[0][0]']
 ation)

 activation_1 (LeakyReLU)    (None, 16, 16, 128)       0         ['batchnorm_1[0][0]']

 conv2dtranspose_2 (Conv2DT  (None, 32, 32, 64)        73792     ['activation_1[0][0]']
 ranspose)

 batchnorm_2 (BatchNormaliz  (None, 32, 32, 64)        256       ['conv2dtranspose_2[0][0]']
 ation)
```

```
 activation_2 (LeakyReLU)    (None, 32, 32, 64)           0         ['batchn
orm_2[0][0]']

 conv2dtranspose_3 (Conv2DT  (None, 64, 64, 32)           18464     ['activa
tion_2[0][0]']
 ranspose)

 batchnorm_3 (BatchNormaliz  (None, 64, 64, 32)           128       ['conv2d
transpose_3[0][0]']
 ation)

 activation_3 (LeakyReLU)    (None, 64, 64, 32)           0         ['batchn
orm_3[0][0]']

 img_output (Conv2D)         (None, 64, 64, 3)            867       ['activa
tion_3[0][0]']

==================================================================================
Total params: 3528595 (13.46 MB)
Trainable params: 3527747 (13.46 MB)
Non-trainable params: 848 (3.31 KB)
__________________________________________________________________________________
```

In [162…

```
discriminator = build_discriminator(img_shape, num_classes)
discriminator.summary()
```

```
Model: "Discriminator"
__________________________________________________________________________________
 Layer (type)                Output Shape                 Param #   Connecte
d to
==================================================================================
 label_input (InputLayer)    [(None, 5)]                  0         []

 img_input (InputLayer)      [(None, None, None, 3)]      0         []

 label_dense (Dense)         (None, 12288)                73728     ['label_
input[0][0]']

 resize_layer (Resizing)     (None, 64, 64, 3)            0         ['img_in
put[0][0]']

 label_reshape (Reshape)     (None, 64, 64, 3)            0         ['label_
dense[0][0]']

 merged_input (Concatenate)  (None, 64, 64, 6)            0         ['resize
_layer[0][0]',
                                                                     'label_
reshape[0][0]']
```

```
 conv2d_1 (Conv2D)           (None, 32, 32, 64)           3520      ['merged
_input[0][0]']

 batchnorm_1 (BatchNormaliz  (None, 32, 32, 64)           256       ['conv2d
_1[0][0]']
 ation)

 activation_1 (LeakyReLU)    (None, 32, 32, 64)           0         ['batchn
orm_1[0][0]']

 conv2d_2 (Conv2D)           (None, 16, 16, 128)          73856     ['activa
tion_1[0][0]']

 batchnorm_2 (BatchNormaliz  (None, 16, 16, 128)          512       ['conv2d
_2[0][0]']
 ation)

 activation_2 (LeakyReLU)    (None, 16, 16, 128)          0         ['batchn
orm_2[0][0]']

 conv2d_3 (Conv2D)           (None, 8, 8, 256)            295168    ['activa
tion_2[0][0]']

 batchnorm_3 (BatchNormaliz  (None, 8, 8, 256)            1024      ['conv2d
_3[0][0]']
 ation)

 activation_3 (LeakyReLU)    (None, 8, 8, 256)            0         ['batchn
orm_3[0][0]']

 flatten (Flatten)           (None, 16384)                0         ['activa
tion_3[0][0]']

 validity_output (Dense)     (None, 1)                    16385     ['flatte
n[0][0]']

==================================================================================
Total params: 464449 (1.77 MB)
Trainable params: 463553 (1.77 MB)
Non-trainable params: 896 (3.50 KB)
__________________________________________________________________________________
```

In [163…
```
discriminator.compile(loss='binary_crossentropy', optimizer=Adam(0.0002, 0.5
```

In [164…
```
discriminator.trainable = False
```

In [ ]:
```
# Generator inputs
noise_input = Input(shape=(latent_dim,), name="noise_input")
label_input = Input(shape=(num_classes,), name="label_input")
validity = discriminator([generated_img, label_input])
```

In [166…
```
cgan = Model([noise_input, label_input], validity, name="cGAN")
cgan.compile(loss='binary_crossentropy', optimizer=Adam(0.0002, 0.5))
```

In [167…
```
# Training parameters
epochs = 5000
batch_size = 8
save_interval = 5000
```

In [ ]:
```
valid = np.ones((batch_size, 1))
fake = np.zeros((batch_size, 1))
```

In [169…
```
discriminator_losses = []
generator_losses = []
discriminator_accuracies = []
```

In [ ]:
```
import numpy as np
import matplotlib.pyplot as plt
from tensorflow.keras.utils import to_categorical

def display_images_per_label(generator, latent_dim, num_classes, epoch=None)

    # Generate one image per class
    for label in range(num_classes):
        noise = np.random.normal(0, 1, (1, latent_dim))
        one_hot_label = to_categorical([label], num_classes)

        gen_img = generator.predict([noise, one_hot_label])[0]

        gen_img = (gen_img + 1) / 2.0

        plt.figure(figsize=(2, 2))
        plt.imshow(gen_img)
        plt.axis('off')
        label_name = f"label_{label}" if epoch is None else f"label_{label}_
        plt.title(f"Class {label}")
        plt.show()

    print(f"Displayed images for all labels.")

for epoch in range(epochs):

    #  Train Discriminator
    idx = np.random.randint(0, train_images.shape[0], batch_size)
    real_imgs, real_labels = train_images[idx], train_labels[idx]

    noise = np.random.normal(0, 1, (batch_size, latent_dim))
    sampled_labels = np.random.randint(0, num_classes, size=batch_size)
    one_hot_labels = to_categorical(sampled_labels, num_classes)
    gen_imgs = generator.predict([noise, one_hot_labels])

    d_loss_real = discriminator.train_on_batch([real_imgs, real_labels], val
    d_loss_fake = discriminator.train_on_batch([gen_imgs, one_hot_labels], f
```

```
    d_loss = 0.5 * np.add(d_loss_real, d_loss_fake)

    #  Train Generator
    noise = np.random.normal(0, 1, (batch_size, latent_dim))
    sampled_labels = np.random.randint(0, num_classes, size=batch_size)
    one_hot_labels = to_categorical(sampled_labels, num_classes)

    g_loss = cgan.train_on_batch([noise, one_hot_labels], valid)
    g_loss_scalar = g_loss[0] if isinstance(g_loss, (list, tuple)) else g_lo

    discriminator_losses.append(d_loss[0])
    generator_losses.append(g_loss_scalar)
    discriminator_accuracies.append(d_loss[1])

    if epoch % 100 == 0:
        print(f"Epoch {epoch}/{epochs}")
        print(f"[D loss: {d_loss[0]:.4f}, acc.: {d_loss[1] * 100:.2f}%] [G l

    if epoch % 1000 == 0:
        display_images_per_label(generator, latent_dim, num_classes, epoch=e

display_images_per_label(generator, latent_dim, num_classes)

generator.save('generator_model.h5')
```

```
1/1 [==============================] - 0s 183ms/step
Epoch 0/5000
[D loss: 1.6570, acc.: 6.25%] [G loss: 0.6787]
1/1 [==============================] - 0s 31ms/step
```


```
1/1 [==============================] - 0s 31ms/step
```

```
1/1 [==============================] - 0s 32ms/step
```

Class 2

```
1/1 [==============================] - 0s 32ms/step
```

Class 3

```
1/1 [==============================] - 0s 31ms/step
```

Class 4

```
Displayed images for all labels.
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 38ms/step
1/1 [==============================] - 0s 36ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 38ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 35ms/step
1/1 [==============================] - 0s 39ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 32ms/step
1/1 [==============================] - 0s 31ms/step
```

```
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 32ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 40ms/step
1/1 [==============================] - 0s 31ms/step
1/1 [==============================] - 0s 32ms/step
1/1 [==============================] - 0s 32ms/step
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1/1 [==============================] - 0s 37ms/step
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1/1 [==============================] - 0s 36ms/step
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1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 44ms/step
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 43ms/step
1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 43ms/step
```

```
1/1 [==============================] - 0s 46ms/step
1/1 [==============================] - 0s 43ms/step
1/1 [==============================] - 0s 44ms/step
1/1 [==============================] - 0s 40ms/step
1/1 [==============================] - 0s 43ms/step
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1/1 [==============================] - 0s 42ms/step
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1/1 [==============================] - 0s 46ms/step
1/1 [==============================] - 0s 45ms/step
1/1 [==============================] - 0s 51ms/step
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 39ms/step
1/1 [==============================] - 0s 44ms/step
Epoch 100/5000
[D loss: 0.0013, acc.: 100.00%] [G loss: 0.0009]
1/1 [==============================] - 0s 43ms/step
1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 43ms/step
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 46ms/step
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1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 46ms/step
1/1 [==============================] - 0s 42ms/step
```

```
1/1 [==============================] - 0s 43ms/step
1/1 [==============================] - 0s 46ms/step
1/1 [==============================] - 0s 45ms/step
1/1 [==============================] - 0s 43ms/step
1/1 [==============================] - 0s 40ms/step
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1/1 [==============================] - 0s 50ms/step
1/1 [==============================] - 0s 47ms/step
1/1 [==============================] - 0s 40ms/step
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 49ms/step
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Epoch 200/5000
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Epoch 300/5000
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Epoch 400/5000
[D loss: 0.0001, acc.: 100.00%] [G loss: 0.0002]
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Epoch 500/5000
[D loss: 0.0002, acc.: 100.00%] [G loss: 0.0000]
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Epoch 600/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 40ms/step
1/1 [==============================] - 0s 33ms/step
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1/1 [==============================] - 0s 37ms/step
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1/1 [==============================] - 0s 35ms/step
Epoch 700/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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1/1 [==============================] - 0s 37ms/step
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1/1 [==============================] - 0s 45ms/step
1/1 [==============================] - 0s 37ms/step
1/1 [==============================] - 0s 37ms/step
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Epoch 800/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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1/1 [==============================] - 0s 37ms/step
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```
1/1 [==============================] - 0s 33ms/step
Epoch 900/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
1/1 [==============================] - 0s 42ms/step
1/1 [==============================] - 0s 34ms/step
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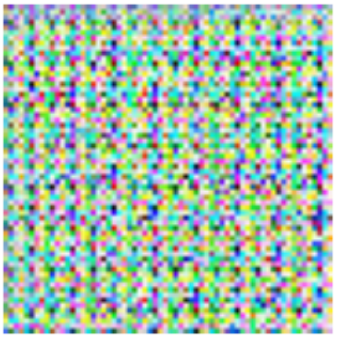
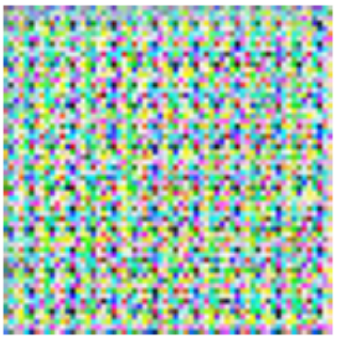
1/1 [==============================] - 0s 35ms/step
1/1 [==============================] - 0s 44ms/step
1/1 [==============================] - 0s 39ms/step
Epoch 1000/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
1/1 [==============================] - 0s 31ms/step
```

Class 0



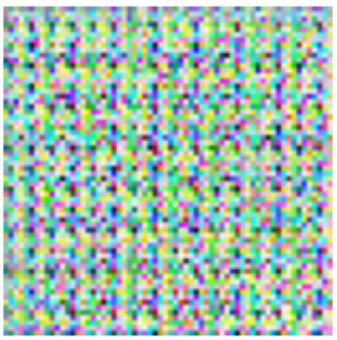
```
1/1 [==============================] - 0s 31ms/step
```

Class 1



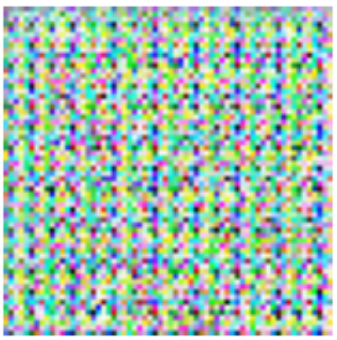
```
1/1 [==============================] - 0s 29ms/step
```

Class 2



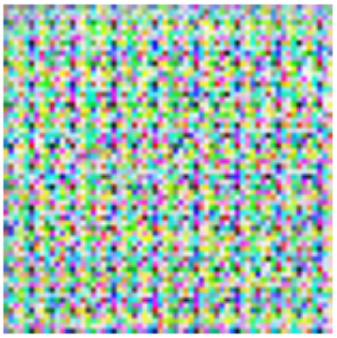
```
1/1 [==============================] - 0s 30ms/step
```

Class 3



```
1/1 [==============================] - 0s 29ms/step
```

Class 4



```
Displayed images for all labels.
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 40ms/step
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1/1 [==============================] - 0s 33ms/step
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Epoch 1100/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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Epoch 1300/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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Epoch 1400/5000
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Epoch 1500/5000
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Epoch 1600/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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Epoch 1700/5000
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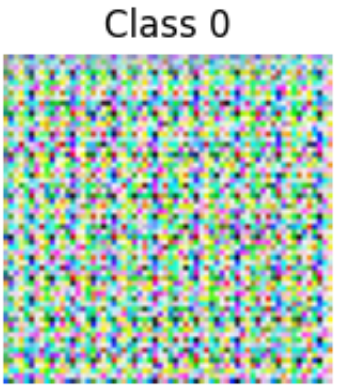
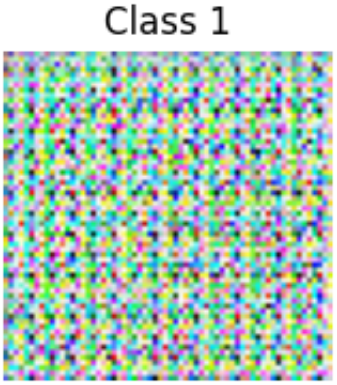
Epoch 2000/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
1/1 [==============================] - 0s 29ms/step
```

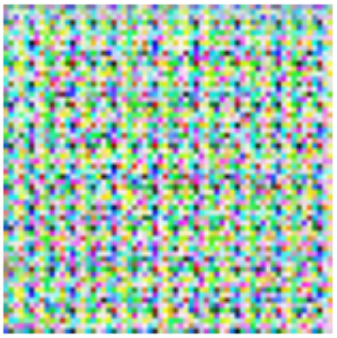



```
1/1 [==============================] - 0s 30ms/step
```



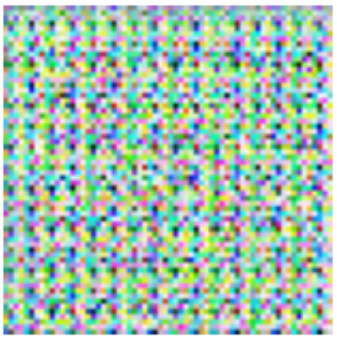

```
1/1 [==============================] - 0s 29ms/step
```

Class 2



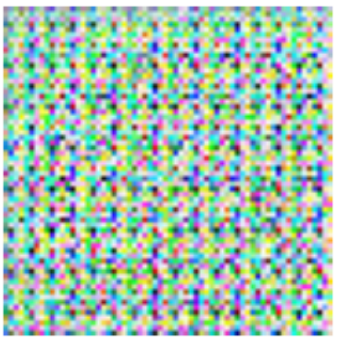
```
1/1 [==============================] - 0s 29ms/step
```

Class 3



```
1/1 [==============================] - 0s 29ms/step
```

Class 4



```
Displayed images for all labels.
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Epoch 2200/5000
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Epoch 2500/5000
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Epoch 2600/5000
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1/1 [==============================] - 0s 33ms/step
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1/1 [==============================] - 0s 37ms/step
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1/1 [==============================] - 0s 41ms/step
Epoch 2700/5000
[D loss: 0.0001, acc.: 100.00%] [G loss: 0.0000]
1/1 [==============================] - 0s 40ms/step
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1/1 [==============================] - 0s 42ms/step
Epoch 2800/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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1/1 [==============================] - 0s 41ms/step
```

```
Epoch 2900/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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1/1 [==============================] - 0s 38ms/step
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1/1 [==============================] - 0s 36ms/step
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1/1 [==============================] - 0s 37ms/step
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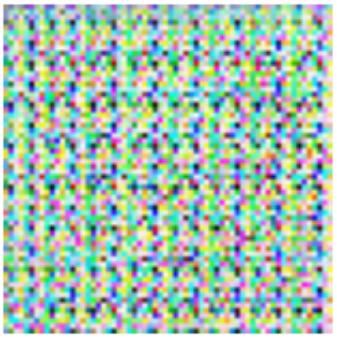
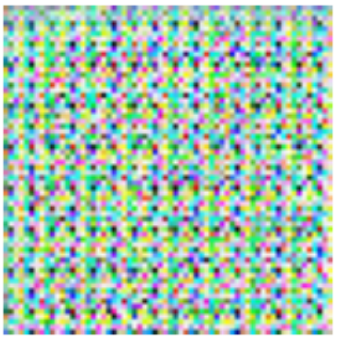
1/1 [==============================] - 0s 41ms/step
1/1 [==============================] - 0s 36ms/step
1/1 [==============================] - 0s 35ms/step
1/1 [==============================] - 0s 42ms/step
Epoch 3000/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
1/1 [==============================] - 0s 30ms/step
```

Class 0



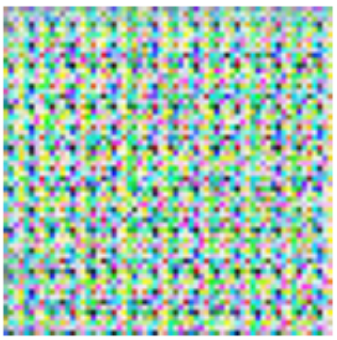
```
1/1 [==============================] - 0s 31ms/step
```

Class 1



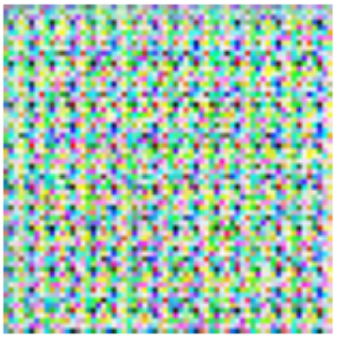
```
1/1 [==============================] - 0s 34ms/step
```

Class 2



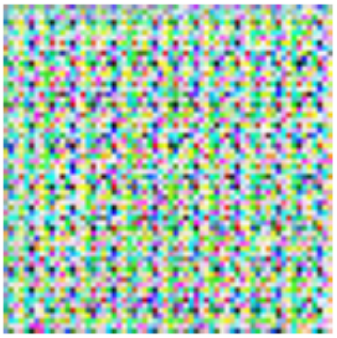
```
1/1 [==============================] - 0s 32ms/step
```

Class 3



```
1/1 [==============================] - 0s 34ms/step
```

Class 4



```
Displayed images for all labels.
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 35ms/step
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Epoch 3100/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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Epoch 3300/5000
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Epoch 3500/5000
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1/1 [==============================] - 0s 34ms/step
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1/1 [==============================] - 0s 43ms/step
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1/1 [==============================] - 0s 36ms/step
1/1 [==============================] - 0s 38ms/step
1/1 [==============================] - 0s 39ms/step
1/1 [==============================] - 0s 33ms/step
Epoch 3700/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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1/1 [==============================] - 0s 34ms/step
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1/1 [==============================] - 0s 34ms/step
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1/1 [==============================] - 0s 41ms/step
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1/1 [==============================] - 0s 39ms/step
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Epoch 3800/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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Epoch 3900/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
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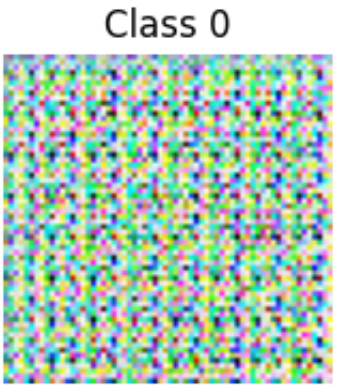
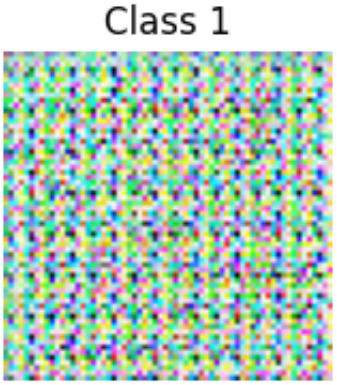
1/1 [==============================] - 0s 35ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 38ms/step
Epoch 4000/5000
[D loss: 0.0000, acc.: 100.00%] [G loss: 0.0000]
1/1 [==============================] - 0s 29ms/step
```

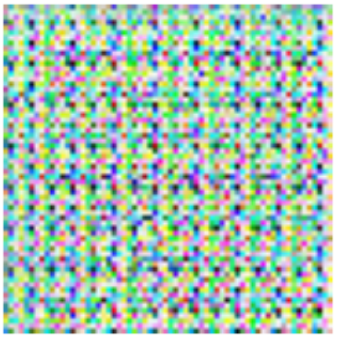



```
1/1 [==============================] - 0s 29ms/step
```



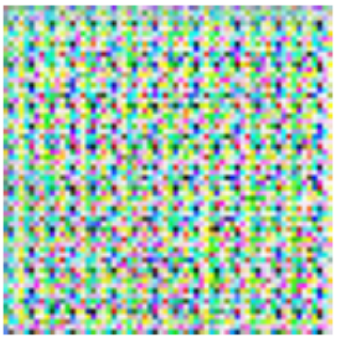

```
1/1 [==============================] - 0s 30ms/step
```

Class 2



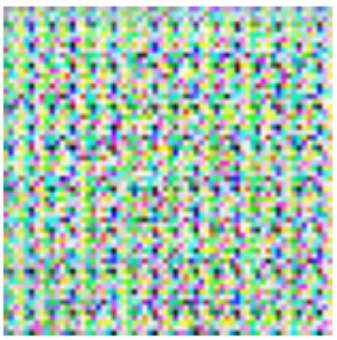
```
1/1 [==============================] - 0s 29ms/step
```

Class 3



```
1/1 [==============================] - 0s 29ms/step
```

Class 4



```
Displayed images for all labels.
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 34ms/step
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1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 39ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - ETA: 0s
```