fase2_2

May 21, 2025

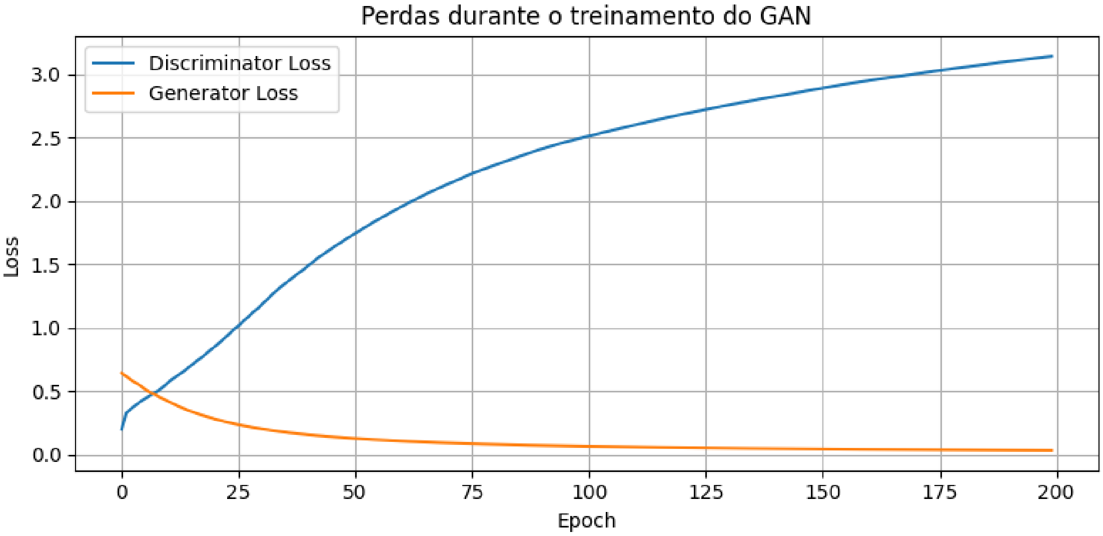
[1]:

```
#  GAN corrigido com saída linear no Generator + Reescalonamento para RSSI

import numpy as np
import pandas as pd
import tensorflow as tf
from tensorflow.keras import layers, Sequential, Input
import matplotlib.pyplot as plt

# ================================
# 1. Dados reais de entrada (X_real)
# ================================
df_real = pd.read_csv("/home/darkcover/Documentos/Gan/Data/df_simulated.csv")
X_real = df_real.iloc[:, :10].values.astype(np.float32)

n_features = X_real.shape[1]  # 10 WAPs
latent_dim = n_features       # 10

# ================================
# 2. Generator com saída linear
# ================================
def build_generator():
    model = Sequential([
    Input(shape=(latent_dim,)),
    layers.Dense(10, activation='relu'),
    layers.Dense(n_features) # saída linear
    ])
    return model

# ================================
# 3. Discriminator padrão
# ================================
def build_discriminator():
    model = Sequential([
        Input(shape=(n_features,)),
        layers.Dense(10, activation='relu'),
        layers.Dense(1, activation='sigmoid')
    ])
    return model

# ================================
# 4. Compilar modelos
# ================================
generator = build_generator()
discriminator = build_discriminator()
discriminator.compile(loss='binary_crossentropy', optimizer=tf.keras.optimizers.
 ↪Adam(0.01))

discriminator.trainable = False

gan_input = Input(shape=(latent_dim,))
gan_output = discriminator(generator(gan_input))
gan = tf.keras.Model(gan_input, gan_output)
gan.compile(loss='binary_crossentropy', optimizer=tf.keras.optimizers.Adam(0.
 ↪01))

# ================================
# 5. Loop de Treinamento GAN
# ================================
epochs = 200
batch_size = 64
half_batch = batch_size // 2
d_losses, g_losses = [], []

for epoch in range(epochs):
    idx = np.random.randint(0, X_real.shape[0], half_batch)
    real_samples = X_real[idx]
    real_labels = np.ones((half_batch, 1))

    noise = np.random.uniform(-1, 1, (half_batch, latent_dim))
    fake_samples = generator.predict(noise, verbose=0)
    fake_labels = np.zeros((half_batch, 1))

    d_loss_real = discriminator.train_on_batch(real_samples, real_labels)
    d_loss_fake = discriminator.train_on_batch(fake_samples, fake_labels)
    d_loss = 0.5 * (d_loss_real + d_loss_fake)

    noise = np.random.uniform(-1, 1, (batch_size, latent_dim))
    valid_y = np.ones((batch_size, 1))
    g_loss = gan.train_on_batch(noise, valid_y)

    d_losses.append(d_loss)
    g_losses.append(g_loss)

    if (epoch + 1) % 20 == 0:
        print(f"Epoch {epoch+1}/{epochs} | D_loss: {d_loss:.4f} | G_loss: {g_loss:.4f}")

# ================================
# 6. Plotar perdas
# ================================
plt.figure(figsize=(8, 4))
plt.plot(d_losses, label="Discriminator Loss")
plt.plot(g_losses, label="Generator Loss")
plt.xlabel("Epoch")
plt.ylabel("Loss")
plt.title("Perdas durante o treinamento do GAN")
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.show()
```

```
2025-05-20 21:03:18.379451: I external/local_xla/xla/tsl/cuda/cudart_stub.cc:32]
Could not find cuda drivers on your machine, GPU will not be used.
2025-05-20 21:03:18.385696: I external/local_xla/xla/tsl/cuda/cudart_stub.cc:32]
Could not find cuda drivers on your machine, GPU will not be used.
2025-05-20 21:03:18.402863: E
external/local_xla/xla/stream_executor/cuda/cuda_fft.cc:467] Unable to register
cuFFT factory: Attempting to register factory for plugin cuFFT when one has
already been registered
WARNING: All log messages before absl::InitializeLog() is called are written to
STDERR
E0000 00:00:1747789398.432446  102281 cuda_dnn.cc:8579] Unable to register cuDNN
factory: Attempting to register factory for plugin cuDNN when one has already
been registered
E0000 00:00:1747789398.446940  102281 cuda_blas.cc:1407] Unable to register
cuBLAS factory: Attempting to register factory for plugin cuBLAS when one has
already been registered
W0000 00:00:1747789398.470848  102281 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747789398.470871  102281 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747789398.470874  102281 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747789398.470877  102281 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
2025-05-20 21:03:18.477444: I tensorflow/core/platform/cpu_feature_guard.cc:210]
This TensorFlow binary is optimized to use available CPU instructions in
performance-critical operations.
```

```
To enable the following instructions: AVX2 FMA, in other operations, rebuild
TensorFlow with the appropriate compiler flags.
2025-05-20 21:03:23.713049: E
external/local_xla/xla/stream_executor/cuda/cuda_platform.cc:51] failed call to
cuInit: INTERNAL: CUDA error: Failed call to cuInit: UNKNOWN ERROR (303)
/home/darkcover/.cache/pypoetry/virtualenvs/gan-oPyfrVEv-
py3.12/lib/python3.12/site-packages/keras/src/backend/tensorflow/trainer.py:82:
UserWarning: The model does not have any trainable weights.
  warnings.warn("The model does not have any trainable weights.")
```

```
Epoch 20/200 | D_loss: 0.8259 | G_loss: 0.2914
Epoch 40/200 | D_loss: 1.4632 | G_loss: 0.1608
Epoch 60/200 | D_loss: 1.9388 | G_loss: 0.1090
Epoch 80/200 | D_loss: 2.2720 | G_loss: 0.0824
Epoch 100/200 | D_loss: 2.5044 | G_loss: 0.0663
Epoch 120/200 | D_loss: 2.6769 | G_loss: 0.0554
Epoch 140/200 | D_loss: 2.8194 | G_loss: 0.0477
Epoch 160/200 | D_loss: 2.9456 | G_loss: 0.0418
Epoch 180/200 | D_loss: 3.0506 | G_loss: 0.0373
Epoch 200/200 | D_loss: 3.1421 | G_loss: 0.0336
```



[2]:

```
# Salvar Generator e Discriminator
generator.save("/home/darkcover/Documentos/Gan/Models/Modelsgenerator.h5")
discriminator.save("/home/darkcover/Documentos/Gan/Models/Modelsdiscriminator.
  ↪h5")
print("  Generator e Discriminator salvos em models/")
```

```
WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or
`keras.saving.save_model(model)`. This file format is considered legacy. We
recommend using instead the native Keras format, e.g.
```

```
`model.save('my_model.keras')` or `keras.saving.save_model(model,
'my_model.keras')`.
WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or
`keras.saving.save_model(model)`. This file format is considered legacy. We
recommend using instead the native Keras format, e.g.
`model.save('my_model.keras')` or `keras.saving.save_model(model,
'my_model.keras')`.
```

```
 Generator e Discriminator salvos em models/
```

[3]:

```python
# ======= Geração de 10 blocos de 4.000 (mais diversidade) =======
generated_all = []
min_val, max_val = -5, 6  # baseado na saída bruta

for _ in range(10):
    noise = np.random.uniform(-1, 1, size=(4000, latent_dim))
    raw = generator.predict(noise, verbose=0)
    scaled = (raw - min_val) / (max_val - min_val)
    clipped = scaled * 70 - 110
    generated_all.append(clipped)

generated_rssi = np.vstack(generated_all)
columns = [f'WAP{str(i+1).zfill(3)}' for i in range(n_features)]
df_generated = pd.DataFrame(generated_rssi, columns=columns)
df_generated = df_generated.clip(-110, -40).astype(int)
df_generated.to_csv("/home/darkcover/Documentos/Gan/Data/df_generated.csv",␣
 ↪index=False)
print("  df_generated.csv salvo com sucesso com 40.000 amostras mais diversas")
```

```
 df_generated.csv salvo com sucesso com 40.000 amostras mais diversas
```

[4]:

```python
df_generated.describe()
```

[4]:

```
             WAP001         WAP002         WAP003         WAP004         WAP005  \
count  40000.000000   40000.000000   40000.000000   40000.000000   40000.000000
mean     -52.131000     -97.930100     -60.247600     -89.294925     -63.500625
std        4.353879       5.075836       4.681441       4.961357       3.109902
min      -64.000000    -110.000000     -71.000000    -110.000000     -72.000000
25%      -55.000000    -101.000000     -64.000000     -93.000000     -66.000000
50%      -53.000000     -98.000000     -61.000000     -89.000000     -64.000000
75%      -49.000000     -94.000000     -57.000000     -86.000000     -62.000000
max      -40.000000     -82.000000     -40.000000     -78.000000     -46.000000

             WAP006         WAP007         WAP008         WAP009         WAP010
count  40000.000000   40000.000000   40000.000000   40000.000000   40000.000000
mean     -94.420700     -70.493825     -97.648175     -93.546025     -67.002625
std        5.060805       2.509307       5.459940       3.898392       4.002002
min     -110.000000     -79.000000    -110.000000    -110.000000     -78.000000
```

```
25%     -98.000000    -72.000000  -101.000000   -96.000000   -70.000000
50%     -94.000000    -71.000000   -97.000000   -93.000000   -67.000000
75%     -91.000000    -69.000000   -93.000000   -91.000000   -64.000000
max     -80.000000    -60.000000   -85.000000   -82.000000   -50.000000
```

```
[5]: df_generated.head()
```

```
[5]:    WAP001  WAP002  WAP003  WAP004  WAP005  WAP006  WAP007  WAP008  WAP009  \
     0     -54     -94     -60     -97     -60    -100     -71     -96     -97
     1     -53     -95     -58     -96     -64     -94     -70     -94     -93
     2     -56     -94     -58     -95     -64     -93     -73     -96     -91
     3     -44    -104     -63     -92     -61    -100     -69    -101     -97
     4     -54    -101     -60     -87     -66    -101     -71     -91     -91

        WAP010
     0     -71
     1     -72
     2     -73
     3     -61
     4     -70
```

```
[6]: df_generated.to_csv("/home/darkcover/Documentos/Gan/Data/df_generated.csv",␣
      ↪index=False)
     print("  df_generated.csv salvo com sucesso com RSSI reescalonado")
```

```
  df_generated.csv salvo com sucesso com RSSI reescalonado
```