fase3_2

May 18, 2025

[1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
from tensorflow.keras.optimizers import Adam
```

```
2025-05-18 20:33:40.130223: I external/local_xla/xla/tsl/cuda/cudart_stub.cc:32]
Could not find cuda drivers on your machine, GPU will not be used.
2025-05-18 20:33:40.233613: I external/local_xla/xla/tsl/cuda/cudart_stub.cc:32]
Could not find cuda drivers on your machine, GPU will not be used.
2025-05-18 20:33:40.316685: 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 00:00:1747614820.389666   66064 cuda_dnn.cc:8579] Unable to register cuDNN
factory: Attempting to register factory for plugin cuDNN when one has already
been registered
E0000 00:00:1747614820.411612   66064 cuda_blas.cc:1407] Unable to register
cuBLAS factory: Attempting to register factory for plugin cuBLAS when one has
already been registered
W0000 00:00:1747614820.571882   66064 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747614820.571921   66064 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747614820.571926   66064 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747614820.571929   66064 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
2025-05-18 20:33:40.614977: 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.
```

[2]:

```
# =================================
# 1. Carregar dados reais e gerados
# =================================
df_all = pd.read_csv("/home/darkcover/Documentos/Gan/Data/df_all.csv")
df_generated = pd.read_csv("/home/darkcover/Documentos/Gan/Data/df_generated.
  ↪csv")

df_real = df_all[df_all["source"] == "real"].copy()
X_real = df_real.iloc[:, :10].values.astype(np.float32)
y_real = df_real[["X", "Y"]].values.astype(np.float32)
```

[3]:

```
# =================================
# 2. Treinar rede DNN para pseudo-label
# =================================
X_train, X_val, y_train, y_val = train_test_split(X_real, y_real, test_size=0.
  ↪2, random_state=42)

model_dnn = Sequential([
    Dense(30, activation='relu', input_shape=(10,)),
    Dense(20, activation='relu'),
    Dense(2)
])
model_dnn.compile(optimizer=Adam(0.01), loss='mse')
model_dnn.fit(X_train, y_train, validation_data=(X_val, y_val), epochs=200,␣
  ↪batch_size=50, verbose=0)
```

```
/home/darkcover/.cache/pypoetry/virtualenvs/gan-oPyfrVEv-
py3.12/lib/python3.12/site-packages/keras/src/layers/core/dense.py:87:
UserWarning: Do not pass an `input_shape`/`input_dim` argument to a layer. When
using Sequential models, prefer using an `Input(shape)` object as the first
layer in the model instead.
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
2025-05-18 20:33:50.035518: 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)
```

[3]:

```
<keras.src.callbacks.history.History at 0x76326e8ba180>
```

[4]:

```
# =================================
# 3. Pseudo-label nos vetores gerados
# =================================
X_gen = df_generated.iloc[:, :10].values.astype(np.float32)
pseudo_coords = model_dnn.predict(X_gen, verbose=1)
df_generated[['X', 'Y']] = pseudo_coords
```

```
1250/1250             2s 2ms/step
```

[5]:

```
# ================================
# 4. Reproduzir Figura 4
# ================================
sample_1000 = df_generated.iloc[:1000]

plt.figure(figsize=(6.5, 6.5))
plt.scatter(sample_1000['X'], sample_1000['Y'],
            c='purple', alpha=0.6, s=15, label='Pseudo-labeled positions')
plt.xlabel("X")
plt.ylabel("Y")
plt.title("FIGURE 4. 1000 positions generated by the GAN with pseudo labels.")
plt.grid(True, linestyle='--', alpha=0.5)
plt.axis('equal')
plt.xlim(0, 20)
plt.ylim(0, 20)
plt.tight_layout()
plt.show()
```

```
Ignoring fixed y limits to fulfill fixed data aspect with adjustable data
limits.
Ignoring fixed x limits to fulfill fixed data aspect with adjustable data
limits.
```

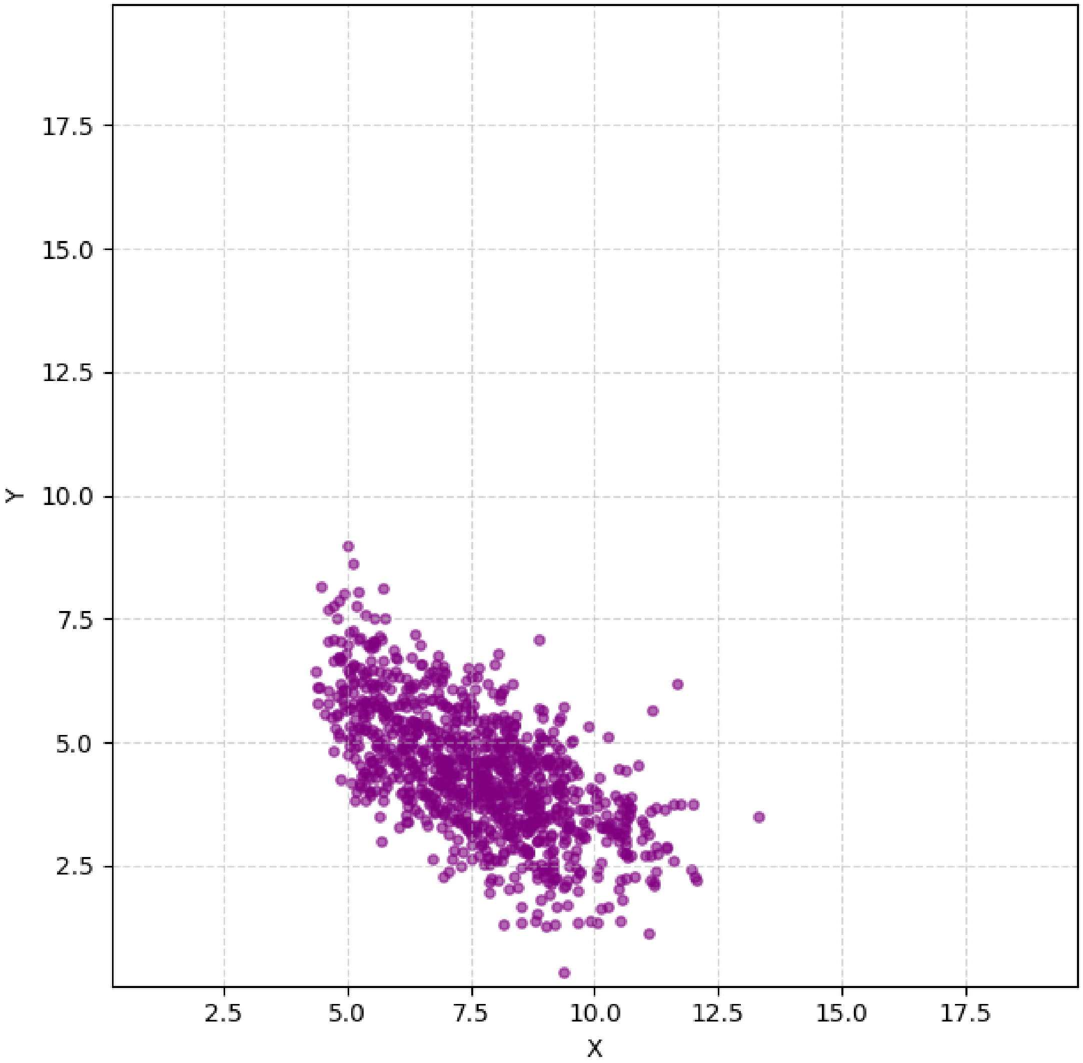
FIGURE 4. 1000 positions generated by the GAN with pseudo labels.

[6]:

```python
# ================================
# 4. Reproduzir Figura 4
# ================================

plt.figure(figsize=(6.5, 6.5))
plt.scatter(df_generated['X'], df_generated['Y'],
            c='purple', alpha=0.6, s=15, label='Pseudo-labeled positions')
plt.xlabel("X")
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plt.xlim(0, 20)
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plt.tight_layout()
plt.show()
```
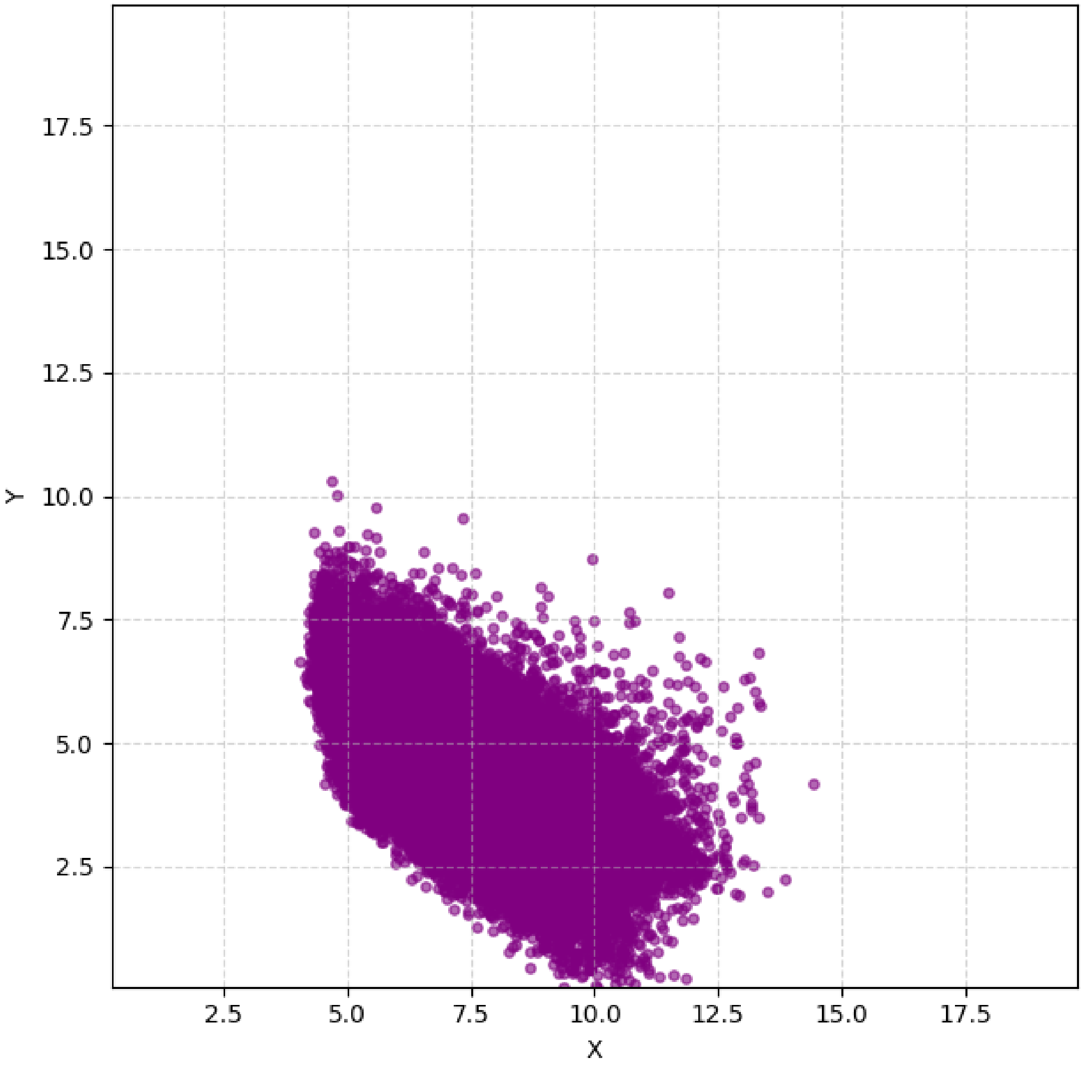

```
Ignoring fixed y limits to fulfill fixed data aspect with adjustable data
limits.
Ignoring fixed x limits to fulfill fixed data aspect with adjustable data
limits.
```

FIGURE 4. 1000 positions generated by the GAN with pseudo labels.

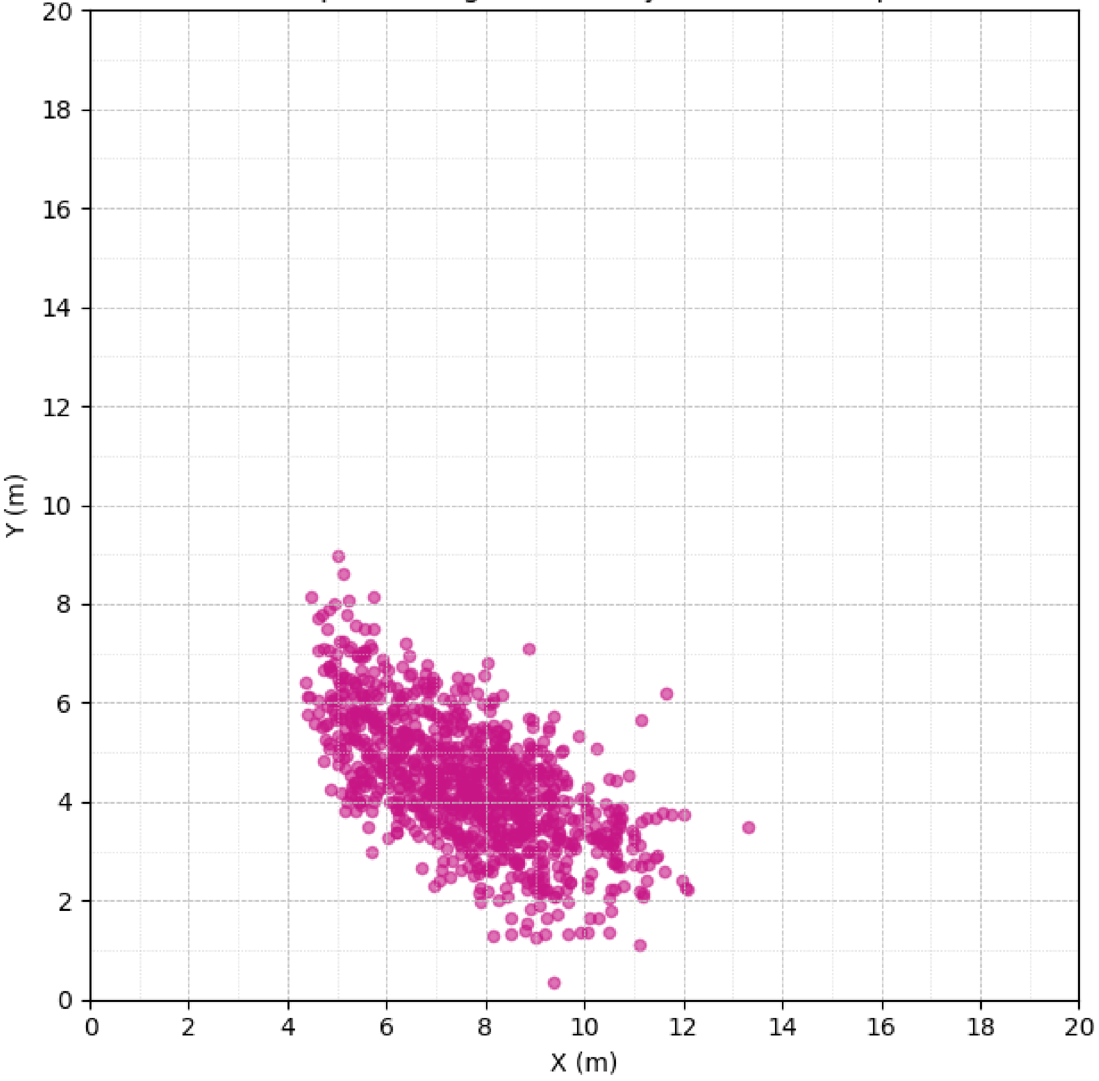


[8]:

```
# ================================
# 4. Reproduzir Figura 4 (ajustada)
# ================================
```

```python
sample_1000 = df_generated.iloc[:1000]

plt.figure(figsize=(6.5, 6.5))

# Dispersão simples dos pseudo-rótulos
plt.scatter(sample_1000['X'], sample_1000['Y'],
            c='mediumvioletred', s=20, alpha=0.6)

# Desenhar fundo quadriculado
for x in range(0, 21):
    plt.axvline(x, color='lightgray', linestyle=':', linewidth=0.5)
for y in range(0, 21):
    plt.axhline(y, color='lightgray', linestyle=':', linewidth=0.5)


# Estilo compatível com o artigo
plt.xlabel("X (m)")
plt.ylabel("Y (m)")
plt.title("FIGURE 4. 1000 positions generated by the GAN with pseudo labels.")
plt.xlim(0, 20)
plt.ylim(0, 20)
plt.xticks(np.arange(0, 21, 2))
plt.yticks(np.arange(0, 21, 2))
plt.grid(True, linestyle='--', linewidth=0.5)
plt.gca().set_aspect('equal', adjustable='box')
plt.tight_layout()
plt.show()
```

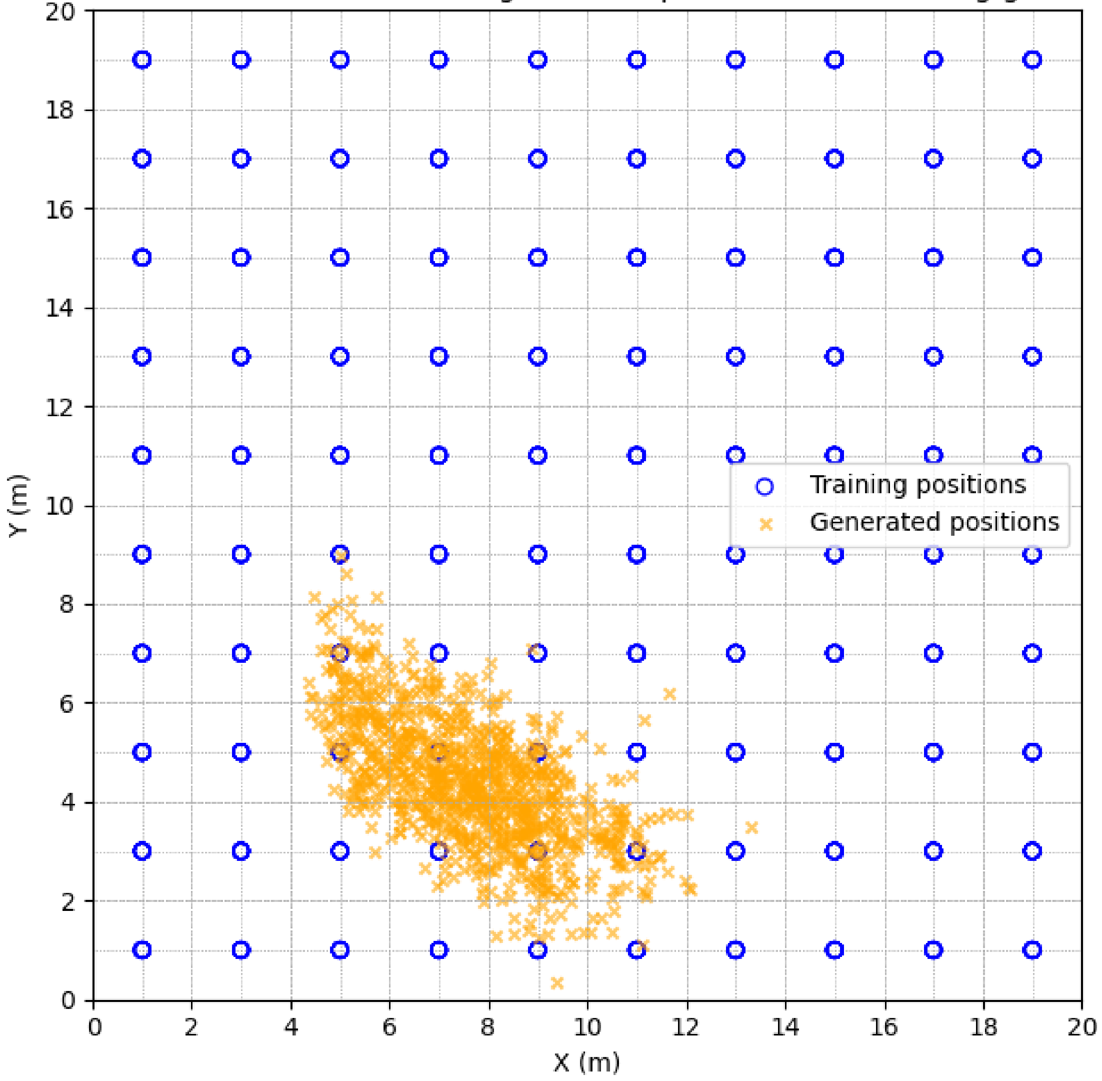
FIGURE 4. 1000 positions generated by the GAN with pseudo labels.



[13]:
```python
import matplotlib.pyplot as plt
import numpy as np

# Carregar os dados reais de treino (centralizados)
df_train = pd.read_csv("/home/darkcover/Documentos/Gan/Data/df_simulated.csv")

sample_1000 = df_generated.iloc[:1000]

# Criar gráfico
plt.figure(figsize=(6.5, 6.5))

# Treinamento: círculos vazados azuis
```

```python
plt.scatter(df_train['X'], df_train['Y'],
            facecolors='none', edgecolors='blue', s=40, label='Training positions')

# Gerados: preenchidos em roxo
plt.scatter(sample_1000['X'], sample_1000['Y'],
            c='orange', marker='x', s=20, alpha=0.6, label='Generated positions')
# Sublinhas tracejadas de 1 em 1 metro (por cima dos pontos)
for x in np.arange(0, 21, 1):
    plt.axvline(x, color='gray', linestyle=':', linewidth=0.5, zorder=0)

for y in np.arange(0, 21, 1):
    plt.axhline(y, color='gray', linestyle=':', linewidth=0.5, zorder=0)

# Configurações visuais
plt.xlabel("X (m)")
plt.ylabel("Y (m)")
plt.title("FIGURE 4. Pseudo-labeled generated positions over training grid.")
plt.xticks(np.arange(0, 21, 2))
plt.yticks(np.arange(0, 21, 2))
plt.xlim(0, 20)
plt.ylim(0, 20)
plt.grid(True, linestyle='--', linewidth=0.5)
plt.gca().set_aspect('equal', adjustable='box')
plt.legend()
plt.tight_layout()
plt.show()
```

FIGURE 4. Pseudo-labeled generated positions over training grid.

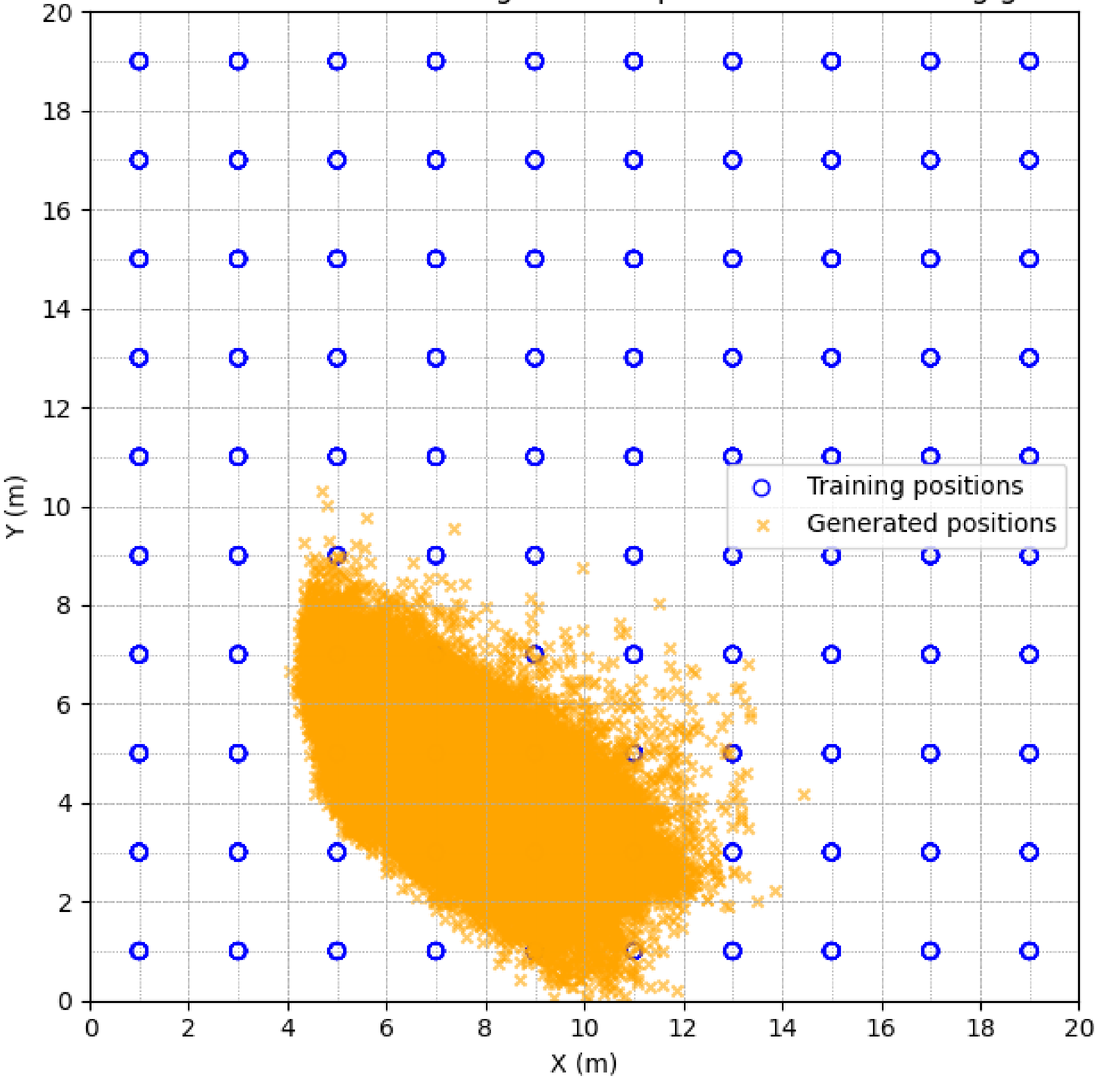


[14]:

```
import matplotlib.pyplot as plt
import numpy as np

# Carregar os dados reais de treino (centralizados)
df_train = pd.read_csv("/home/darkcover/Documentos/Gan/Data/df_simulated.csv")

sample_1000 = df_generated

# Criar gráfico
plt.figure(figsize=(6.5, 6.5))

# Treinamento: círculos vazados azuis
```

```
plt.scatter(df_train['X'], df_train['Y'],
            facecolors='none', edgecolors='blue', s=40, label='Training positions')

# Gerados: preenchidos em roxo
plt.scatter(sample_1000['X'], sample_1000['Y'],
            c='orange', marker='x', s=20, alpha=0.6, label='Generated positions')
# Sublinhas tracejadas de 1 em 1 metro (por cima dos pontos)
for x in np.arange(0, 21, 1):
    plt.axvline(x, color='gray', linestyle=':', linewidth=0.5, zorder=0)

for y in np.arange(0, 21, 1):
    plt.axhline(y, color='gray', linestyle=':', linewidth=0.5, zorder=0)

# Configurações visuais
plt.xlabel("X (m)")
plt.ylabel("Y (m)")
plt.title("FIGURE 4. Pseudo-labeled generated positions over training grid.")
plt.xticks(np.arange(0, 21, 2))
plt.yticks(np.arange(0, 21, 2))
plt.xlim(0, 20)
plt.ylim(0, 20)
plt.grid(True, linestyle='--', linewidth=0.5)
plt.gca().set_aspect('equal', adjustable='box')
plt.legend()
plt.tight_layout()
plt.show()
```

FIGURE 4. Pseudo-labeled generated positions over training grid.


Y (m)
X (m)
Training positions
Generated positions