fase3_2

May 21, 2025

[1]:

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

```
2025-05-20 21:15:15.834157: 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 21:15:15.843819: 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 21:15:15.873844: 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 00:00:1747790115.930517  149871 cuda_dnn.cc:8579] Unable to register cuDNN
factory: Attempting to register factory for plugin cuDNN when one has already
been registered
E0000 00:00:1747790115.945139  149871 cuda_blas.cc:1407] Unable to register
cuBLAS factory: Attempting to register factory for plugin cuBLAS when one has
already been registered
W0000 00:00:1747790115.985897  149871 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747790115.985934  149871 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747790115.985939  149871 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
W0000 00:00:1747790115.985942  149871 computation_placer.cc:177] computation
placer already registered. Please check linkage and avoid linking the same
target more than once.
2025-05-20 21:15:15.997960: 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=250,␣
 ↪batch_size=100, 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)
2025-05-20 21:15:20.032553: 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 0x737b93493140>
```

[4]:

```
model_dnn.save("/home/darkcover/Documentos/Gan/Models/pseudo_label_dnn.h5")
print("  Modelo de pseudo-label salvo")
```

```
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')`.

 Modelo de pseudo-label salvo
```

[5]:

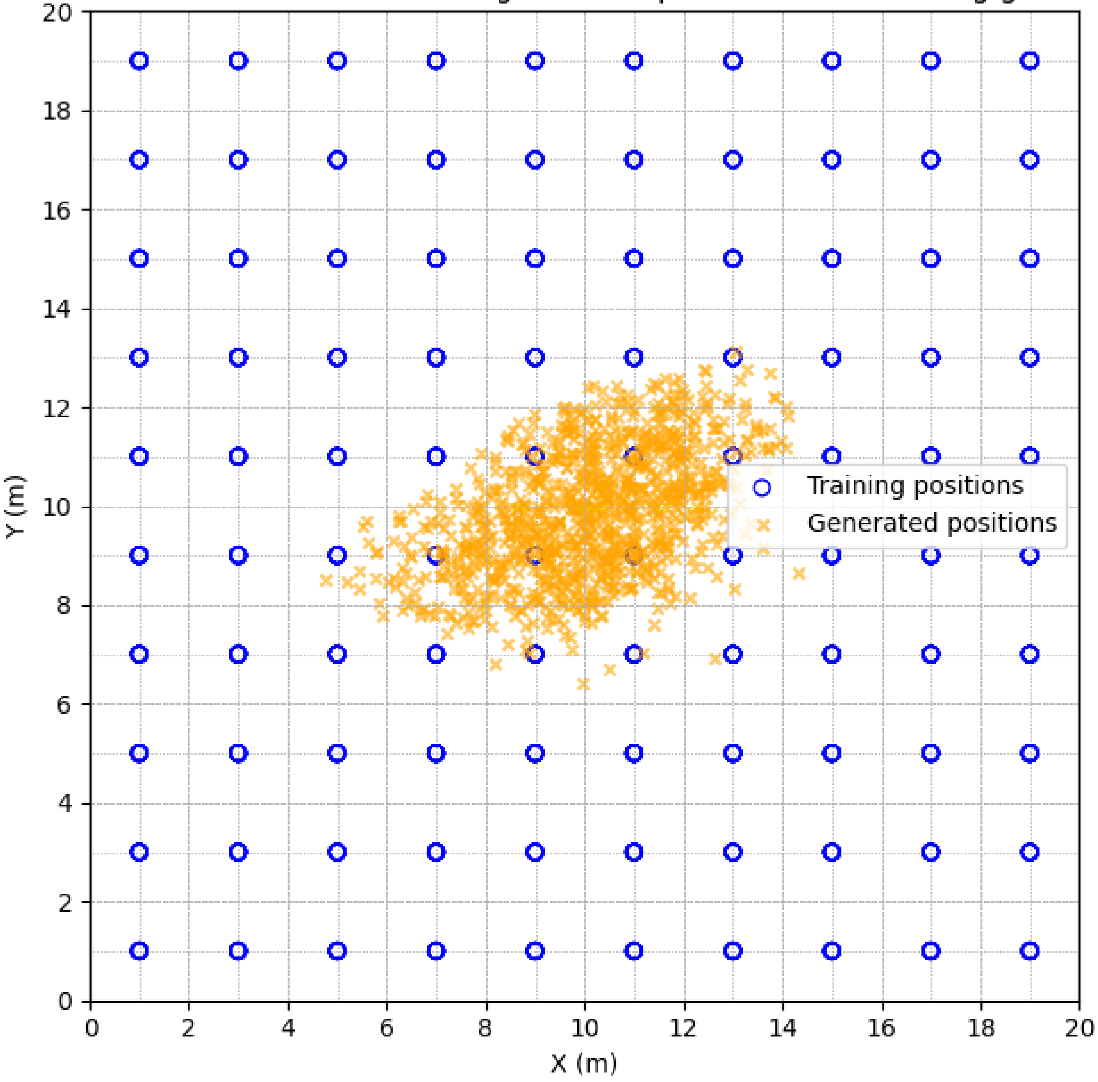
```
# ================================
# 3. Pseudo-label nos vetores gerados
# ================================
X_gen = df_generated.iloc[:, :10].values.astype(np.float32)
pseudo_coords = model_dnn.predict(X_gen, verbose=1)
df_generated[['X', 'Y']] = pseudo_coords
```

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

[6]:

```
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
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.

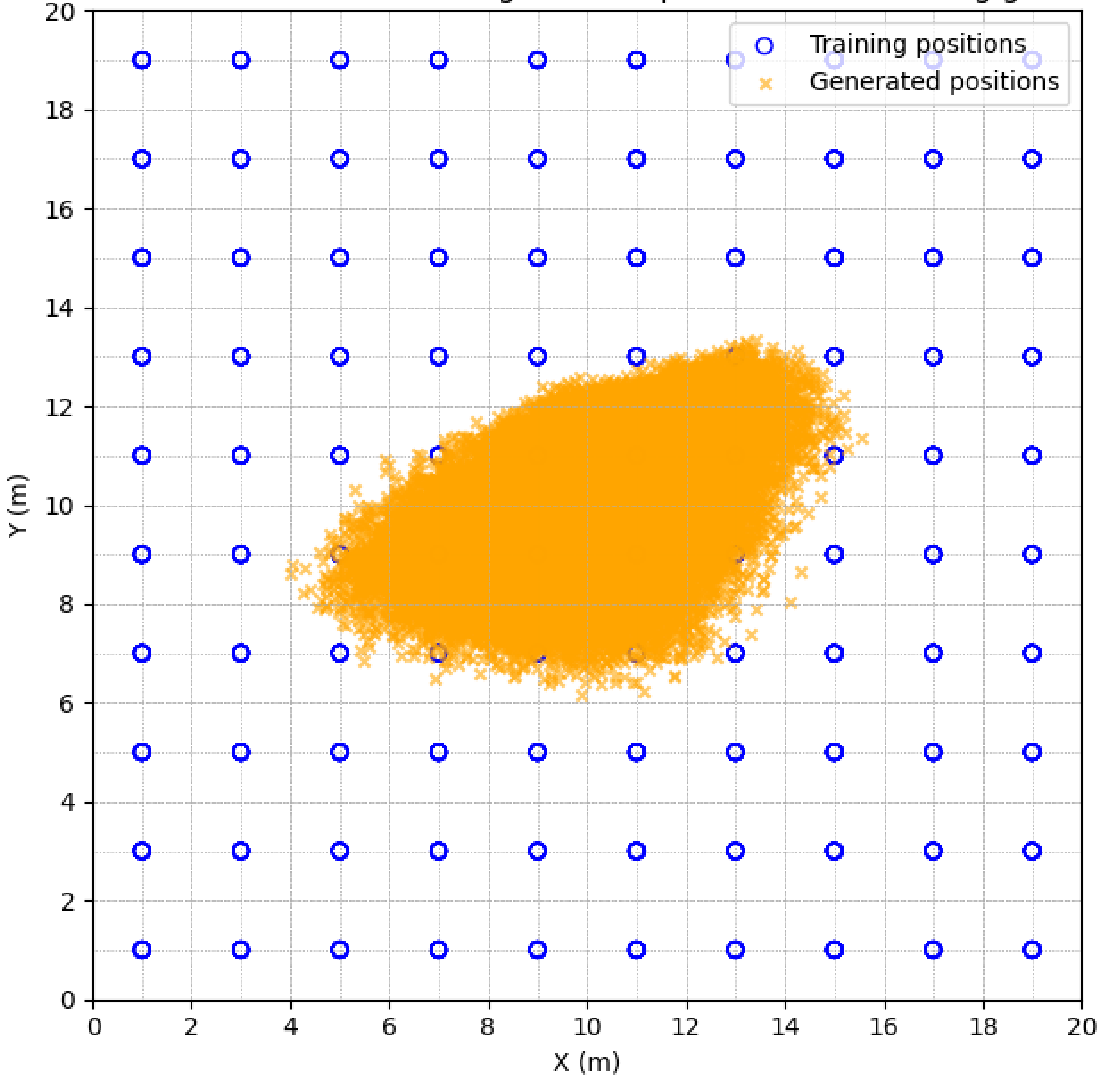


[7]:

```
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")
```

```python
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.



[9]:
```python
import pandas as pd
import numpy as np
import tensorflow as tf

# 1) Carrega as amostras geradas
df_generated = pd.read_csv('/home/darkcover/Documentos/Gan/Data/df_generated.csv')
wap_columns = [c for c in df_generated.columns if c.startswith('WAP')]

X_gen = df_generated[wap_columns].values.astype(np.float32)

# 2) Carrega o modelo regressor treinado nos dados reais
#    (ex: treinado em X_real,y_real na própria Fase 3)
model = tf.keras.models.load_model(
    '/home/darkcover/Documentos/Gan/Models/pseudo_label_dnn.h5',
    compile=False
)

# 3) Prediz as coordenadas
pred_coords = model.predict(X_gen, verbose=0)

# 4) Anexa as colunas de pseudo-rótulo
df_generated['LONGITUDE'] = pred_coords[:,0]
df_generated['LATITUDE']  = pred_coords[:,1]

# 5) Salva de volta para uso na Fase 4
df_generated.to_csv('/home/darkcover/Documentos/Gan/Data/df_generated_pseudo.
 ↪csv', index=False)
```

```
[10]: df_generated.describe()
```

```
[10]:              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

                 LONGITUDE      LATITUDE
       count  40000.000000  40000.000000
       mean      10.037706      9.903981
       std        1.724494      1.243719
       min        3.990654      6.160164
       25%        8.866894      8.976322
       50%       10.104205      9.870904
       75%       11.266562     10.831815
```

```
max        15.545594     13.339489
```

[11]:
```
df_generated.head()
```

[11]:
```
   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  LONGITUDE   LATITUDE
0     -71  12.596934   9.377690
1     -72  11.546078   8.916157
2     -73  10.771829   9.959242
3     -61  11.109782  10.355710
4     -70   7.718573   8.156986
```