spoof_detect

May 16, 2025

[152]:
```
import numpy as np
import pandas as pd
from geopy.distance import geodesic
import matplotlib.pyplot as plt
```

[153]:
```
def generate_gps_data(n_points=100, spoof_point=70, spoof_distance=0.01):
    lat, lon = 12.9716, 77.5946  # Starting location
    gps_data = []
    for i in range(n_points):
        if i == spoof_point:
            lat += spoof_distance  # Simulate spoofing with a big jump
            lon += spoof_distance
            true_spoofed = 1
        else:
            lat += np.random.uniform(-0.001, 0.001)
            lon += np.random.uniform(-0.001, 0.001)
            true_spoofed = 0
        gps_data.append((lat, lon, true_spoofed))
    print(gps_data)
    return pd.DataFrame(gps_data, columns=["latitude", "longitude",␣
↪"true_spoofed"])
```

[154]:
```
gps_df = generate_gps_data()
```

```
[(12.972580454684794, 77.59378776174349, 0), (12.972355718516281,
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```

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77.59752015138186, 0), (12.990694276519966, 77.59677958503036, 0),
(12.990257807370277, 77.59737397940061, 0)]
```

[155]:
```
gps_df.head()
```

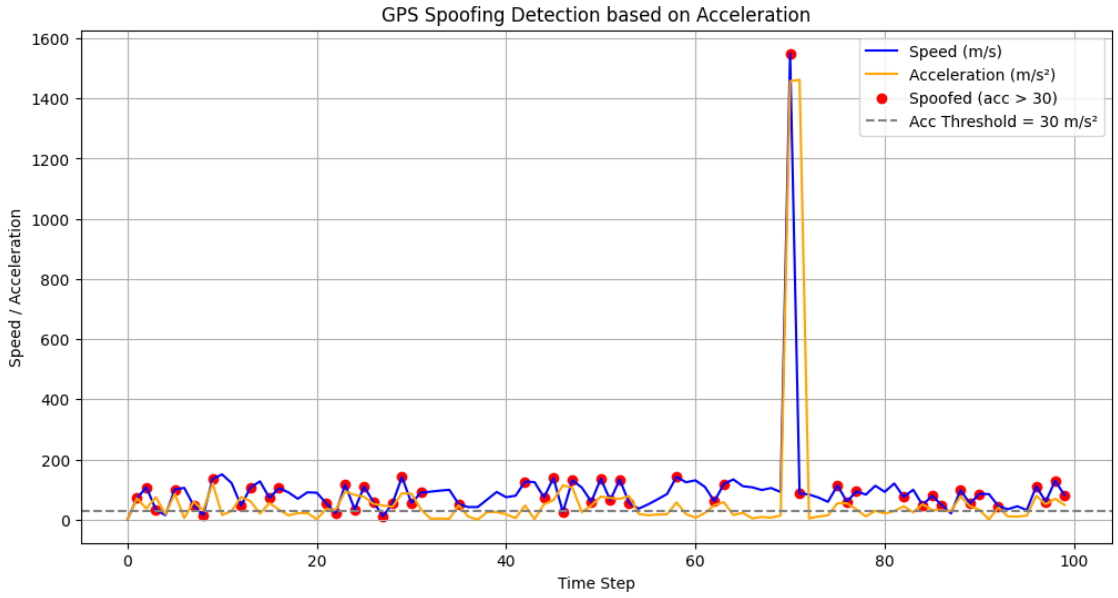
[155]:

	latitude	longitude	true_spoofed
0	12.972580	77.593788	0
1	12.972356	77.594400	0
2	12.971509	77.593911	0
3	12.971638	77.593639	0
4	12.971614	77.593508	0

[156]:
```
gps_df = compute_speed(gps_df)
gps_df = compute_acceleration(gps_df)
gps_df = detect_spoofing(gps_df, acc_threshold=30)
```

[157]:
```
plt.figure(figsize=(12, 6))
plt.plot(gps_df["speed_mps"], label="Speed (m/s)", color="blue")
plt.plot(gps_df["acceleration_mps2"], label="Acceleration (m/s²)",␣
 ↪color="orange")
plt.scatter(gps_df[gps_df["spoofed"] == 1].index,
            gps_df[gps_df["spoofed"] == 1]["speed_mps"],
            color="red", label="Spoofed (acc > 30)")

plt.axhline(30, color="gray", linestyle="--", label="Acc Threshold = 30 m/s²")
plt.xlabel("Time Step")
plt.ylabel("Speed / Acceleration")
plt.title("GPS Spoofing Detection based on Acceleration")
plt.legend()
plt.grid(True)
plt.show()
```



Effectiveness of Model

[158]:
```
from sklearn.metrics import classification_report, confusion_matrix

y_true = gps_df["true_spoofed"]
y_pred = gps_df["spoofed"]

print("Confusion Matrix:")
print(confusion_matrix(y_true, y_pred))

print("\nClassification Report:")
print(classification_report(y_true, y_pred, target_names=["Normal", "Spoofed"]))
```

```
Confusion Matrix:
[[47 52]
 [ 0  1]]

Classification Report:
              precision    recall  f1-score   support

      Normal       1.00      0.47      0.64        99
     Spoofed       0.02      1.00      0.04         1

    accuracy                           0.48       100
   macro avg       0.51      0.74      0.34       100
weighted avg       0.99      0.48      0.64       100
```