Impact Validation Comparison Test

May 27, 2024

[28]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

# Calculate extended statistics
def calculate_statistics(data):
    return {
        'mean': np.mean(data),
        'std': np.std(data),
        'min': np.min(data),
        'max': np.max(data),
        'median': np.median(data)
    }

# Load the data
for i in range(3):

    #Test1_495_1
    if i==0:
        aspion_df = pd.read_excel('Teste1_495_1/Teste1_aspion.xlsx')
        datalogger_df = pd.read_excel('Teste1_495_1/Teste1_datalogger.xlsx')

    #Test2_888_5
    elif i==1:
        aspion_df = pd.read_excel('Teste2_888_5/Teste2_aspion.xlsx')
        datalogger_df = pd.read_excel('Teste2_888_5/Teste2_datalogger.xlsx')

    #Test3_500_9
    elif i==2:
        aspion_df = pd.read_excel('Teste3_500_9/Teste3_aspion.xlsx')
        datalogger_df = pd.read_excel('Teste3_500_9/Teste3_datalogger.xlsx')

    # Extract the time and acceleration data
    time_aspion = aspion_df.columns[1:].astype(int)
    time_datalogger = datalogger_df.columns[1:].astype(int)

    x_aspion = aspion_df.iloc[0, 1:].astype(float)
```

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    y_aspion = aspion_df.iloc[1, 1:].astype(float)
    z_aspion = aspion_df.iloc[2, 1:].astype(float)
    magnitude_aspion =␣
↪(x_aspion*x_aspion+y_aspion*y_aspion+z_aspion*z_aspion)**0.5

    x_datalogger = datalogger_df.iloc[0, 1:].astype(float)
    y_datalogger = datalogger_df.iloc[1, 1:].astype(float)
    z_datalogger = datalogger_df.iloc[2, 1:].astype(float)
    magnitude_datalogger =␣
↪(x_datalogger*x_datalogger+y_datalogger*y_datalogger+z_datalogger*z_datalogger)**0.
↪5

    # Plot the data
    plt.figure(figsize=(15, 10))

    plt.subplot(4, 1, 1)
    plt.plot(time_aspion, x_aspion, label='Aspion X-axis', marker='o')
    plt.plot(time_datalogger, x_datalogger, label='Datalogger X-axis',␣
↪linestyle='--', marker='x')
    plt.title('X-axis Impact Comparison')
    plt.xlabel('Time (ms)')
    plt.ylabel('Acceleration (g)')
    plt.legend()

    plt.subplot(4, 1, 2)
    plt.plot(time_aspion, y_aspion, label='Aspion Y-axis', marker='o')
    plt.plot(time_datalogger, y_datalogger, label='Datalogger Y-axis',␣
↪linestyle='--', marker='x')
    plt.title('Y-axis Impact Comparison')
    plt.xlabel('Time (ms)')
    plt.ylabel('Acceleration (g)')
    plt.legend()

    plt.subplot(4, 1, 3)
    plt.plot(time_aspion, z_aspion, label='Aspion Z-axis', marker='o')
    plt.plot(time_datalogger, z_datalogger, label='Datalogger Z-axis',␣
↪linestyle='--', marker='x')
    plt.title('Z-axis Impact Comparison')
    plt.xlabel('Time (ms)')
    plt.ylabel('Acceleration (g)')
    plt.legend()

    plt.subplot(4, 1, 4)
    plt.plot(time_aspion, magnitude_aspion, label='Aspion Z-axis', marker='o')
    plt.plot(time_datalogger, magnitude_datalogger, label='Datalogger Z-axis',␣
↪linestyle='--', marker='x')
```

```
plt.title('All-axis magnitude Impact Comparison')
plt.xlabel('Time (ms)')
plt.ylabel('Acceleration (g)')
plt.legend()

plt.tight_layout()
plt.show()

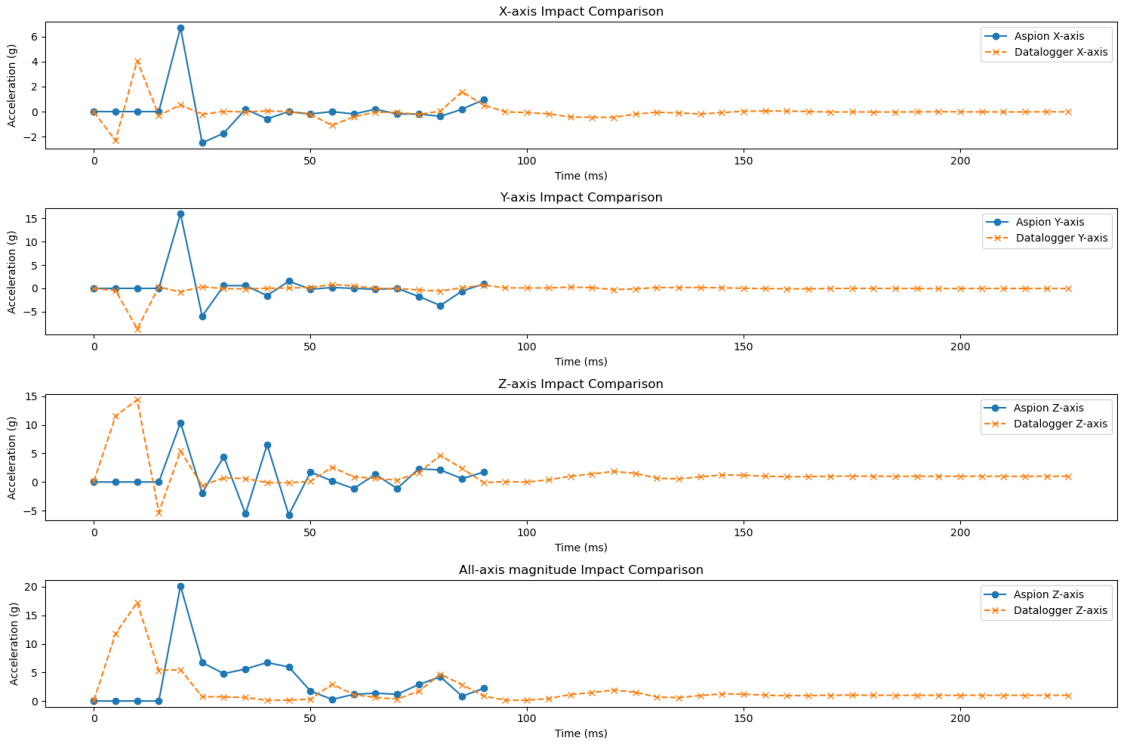

aspion_stats = {
    'X': calculate_statistics(x_aspion),
    'Y': calculate_statistics(y_aspion),
    'Z': calculate_statistics(z_aspion),
    'magnitude': calculate_statistics(magnitude_aspion)
}

datalogger_stats = {
    'X': calculate_statistics(x_datalogger),
    'Y': calculate_statistics(y_datalogger),
    'Z': calculate_statistics(z_datalogger),
    'magnitude': calculate_statistics(magnitude_datalogger)
}

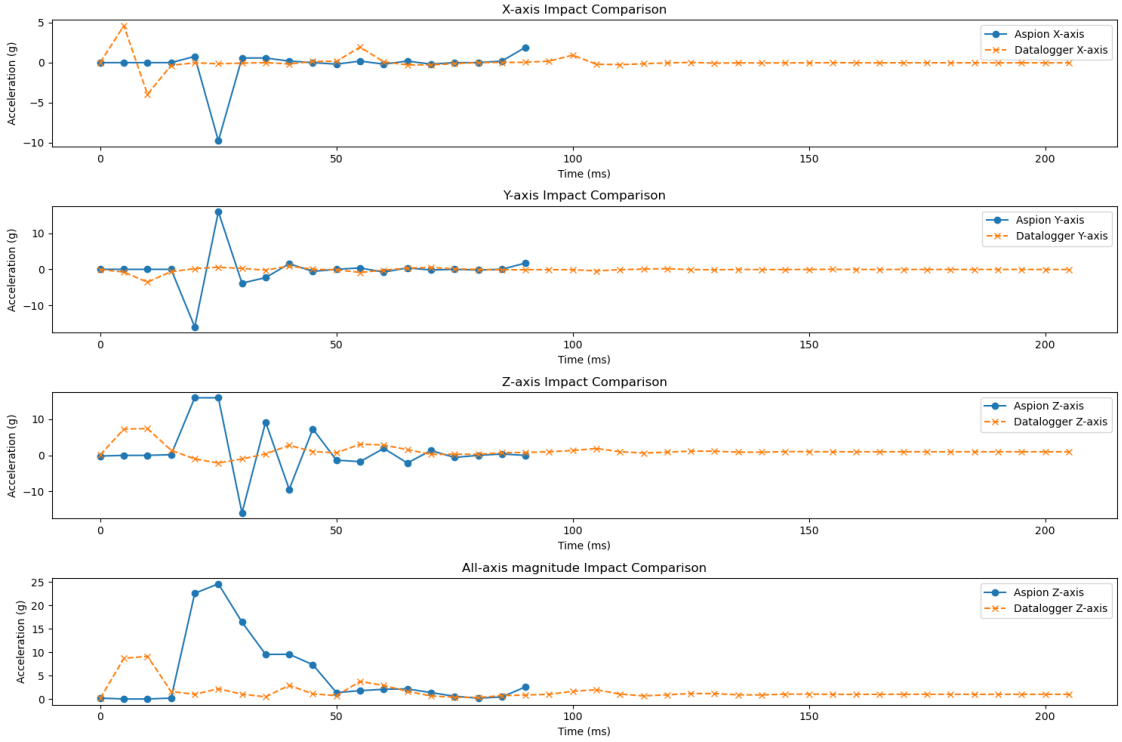


# Create a DataFrame for display
stats_df = pd.DataFrame({
    'Aspion X': aspion_stats['X'],
    'Datalogger X': datalogger_stats['X'],
    'Aspion Y': aspion_stats['Y'],
    'Datalogger Y': datalogger_stats['Y'],
    'Aspion Z': aspion_stats['Z'],
    'Datalogger Z': datalogger_stats['Z'],
    'Aspion Magnitude': aspion_stats['magnitude'],
    'Datalogger Magnitude': datalogger_stats['magnitude']
}).T

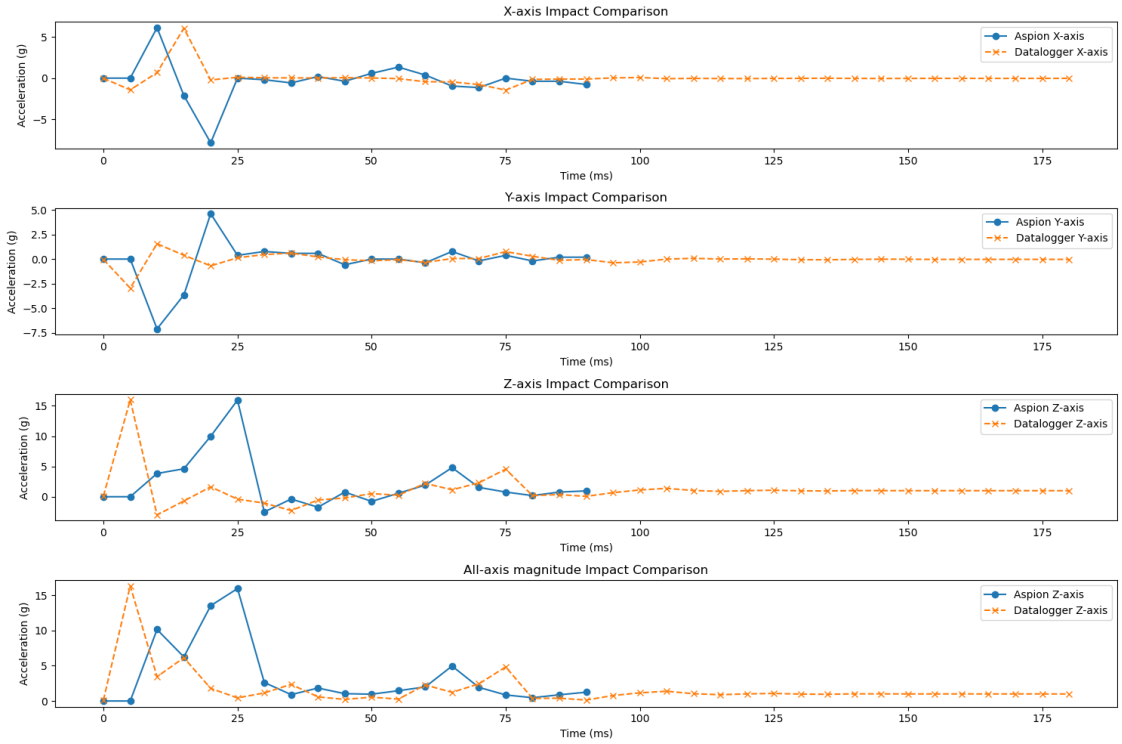
display(stats_df)
```



	mean	std	min	max	median
Aspion X	0.121053	1.713384	-2.500000	6.720000	0.000000
Datalogger X	-0.012361	0.772736	-2.313500	4.075200	-0.028300
Aspion Y	0.313684	4.043931	-5.950000	15.940000	0.000000
Datalogger Y	-0.159646	1.293331	-8.648900	0.819800	-0.013200
Aspion Z	0.828947	3.591570	-5.760000	10.370000	0.190000
Datalogger Z	1.420030	2.843392	-5.320800	14.376000	0.994400
Aspion Magnitude	3.466291	4.579681	0.000000	20.168760	1.750743
Datalogger Magnitude	1.828406	3.008947	0.106128	17.264996	1.000836



	mean	std	min	max	median
Aspion X	-0.302632	2.286215	-9.790000	1.920000	0.000000
Datalogger X	0.040571	1.002649	-3.959500	4.623500	-0.025900
Aspion Y	-0.202105	5.301844	-15.940000	15.940000	0.000000
Datalogger Y	-0.121655	0.615820	-3.556600	0.905800	-0.034950
Aspion Z	1.101579	7.186672	-15.940000	15.940000	0.000000
Datalogger Z	1.212302	1.631538	-2.109900	7.411600	0.995600
Aspion Magnitude	5.411021	7.553234	0.000000	24.576641	1.781404
Datalogger Magnitude	1.534409	1.782742	0.132587	9.124629	1.000962



	mean	std	min	max	median
Aspion X	-0.323158	2.384816	-7.870000	6.140000	-0.190000
Datalogger X	0.036349	1.073402	-1.451700	6.076700	-0.030300
Aspion Y	-0.191579	2.140583	-7.100000	4.610000	0.000000
Datalogger Y	-0.025559	0.604767	-2.960900	1.560100	-0.026400
Aspion Z	2.173158	4.243280	-2.500000	15.940000	0.770000
Datalogger Z	1.060400	2.772875	-3.003400	15.999500	0.995100
Aspion Magnitude	3.526533	4.549965	0.000000	15.944529	1.460137
Datalogger Magnitude	1.710927	2.721383	0.107989	16.333860	1.002793