Datenanalyse MediaPipe und DeepMotion

1. DeepMotion Nicht Kompensiert 03

In [ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from scipy.spatial import distance
from scipy.interpolate import interp1d
from matplotlib.offsetbox import OffsetImage, AnnotationBbox
```

In [ ]:
```
df_deepM_03 = pd.read_csv('../Data/KeypointsBereinigtNichtKompensiert_03.
df_deepM_03.head(5)
```

Out[ ]:

	compensation	frame	path	x_0	
0	0	1	/Users/salomekoller/Library/CloudStorage/OneDr...	0.0000	-9
1	0	2	/Users/salomekoller/Library/CloudStorage/OneDr...	-0.2305	-9
2	0	3	/Users/salomekoller/Library/CloudStorage/OneDr...	-0.5451	-9
3	0	4	/Users/salomekoller/Library/CloudStorage/OneDr...	-0.8911	-9
4	0	5	/Users/salomekoller/Library/CloudStorage/OneDr...	-1.2253	-9

5 rows × 102 columns

1.1 Analyse Form

In [ ]:
```
print('Dimension:', df_deepM_03.shape)
print('Number of rows:', df_deepM_03.shape[0])
print('Number of columns:', df_deepM_03.shape[1])
```

```
Dimension: (937, 102)
Number of rows: 937
Number of columns: 102
```

1.2 Splitting Frames

In [ ]:
```
# Variablen initiieren
frame_count = 0
frames_until_reset = []

# Iterieren über Dataframe, um Frames mit '1' zu finden
for index, row in df_deepM_03.iterrows():
    frame_count += 1

    if row["frame"] == 1 and frame_count > 1:
        frames_until_reset.append(frame_count -1)

if frame_count > 0:
    frames_until_reset.append(frame_count)
```

```
print("Number of frames until reset for each cycle:", frames_until_reset)
```

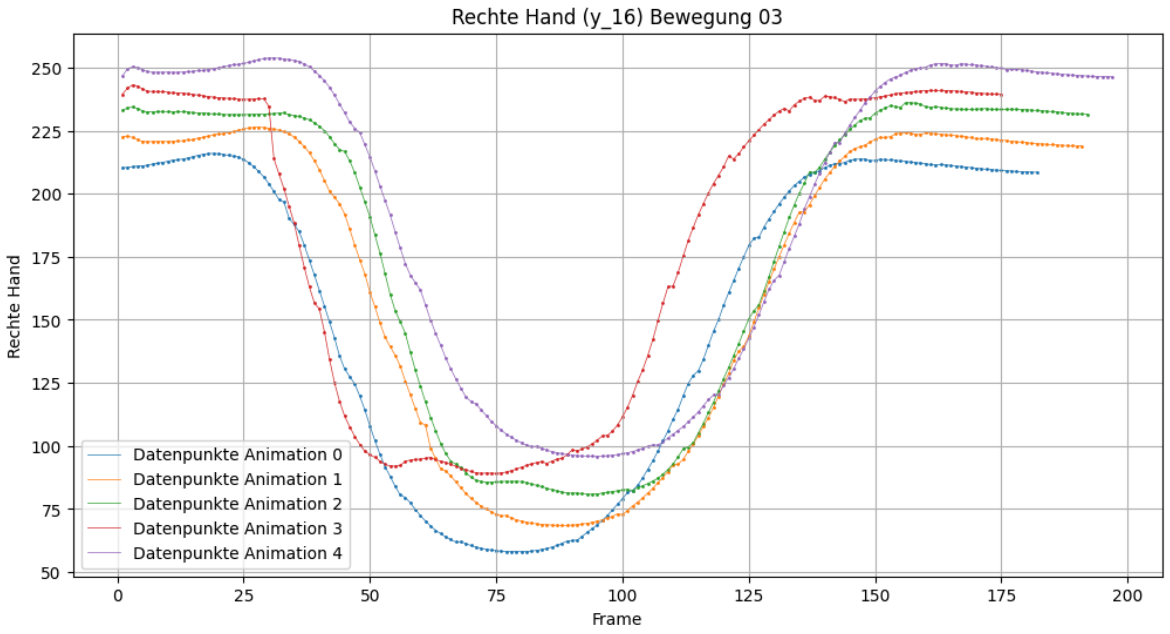
```
Number of frames until reset for each cycle: [182, 373, 565, 740, 937]
```

In [ ]:
```
# Einzelne Bewegungen werden in verschiedene Dataframes gepackt
dfs = []
start = 0
for end in frames_until_reset:
    dfs.append(df_deepM_03.iloc[start:end])
    start = end

print("Number of splits:", len(dfs))
```

```
Number of splits: 5
```

1.3 Bewegungsanalyse anhand rechter Handbewegung (Nicht Kompensiert 03)

In [ ]:
```
plt.figure(figsize=(12, 6))
for i, df in enumerate(dfs):
    plt.scatter(df["frame"], df["y_16"], marker='o', color=f'C{i}', s=1)
    plt.plot(df["frame"], df["y_16"], color=f'C{i}', linestyle='-', linew

plt.title("Rechte Hand (y_16) Bewegung 03")
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



1.3.1 Berechnung des Mean

In [ ]:
```
means03 = []
mean_values_03 = df_deepM_03[['frame', 'x_0', 'y_0', 'z_0', 'x_1', 'y_1',
                  'x_4', 'y_4', 'z_4', 'x_5', 'y_5', 'z_5', 'x_6', 'y_6'
                  'x_8', 'y_8', 'z_8', 'x_9', 'y_9', 'z_9', 'x_10', 'y_1
                  'x_12', 'y_12', 'z_12', 'x_13', 'y_13', 'z_13', 'x_14'
                  'x_16', 'y_16', 'z_16', 'x_17', 'y_17', 'z_17', 'x_18'
```

```
                    'x_20', 'y_20', 'z_20', 'x_21', 'y_21', 'z_21', 'x_22'
                    'x_24', 'y_24', 'z_24', 'x_25', 'y_25', 'z_25', 'x_26'
                    'x_28', 'y_28', 'z_28', 'x_29', 'y_29', 'z_29', 'x_30'
                    'x_32', 'y_32', 'z_32']].groupby('frame').mean()
means03.append(mean_values_03)
mean_values_03.head(5)
```

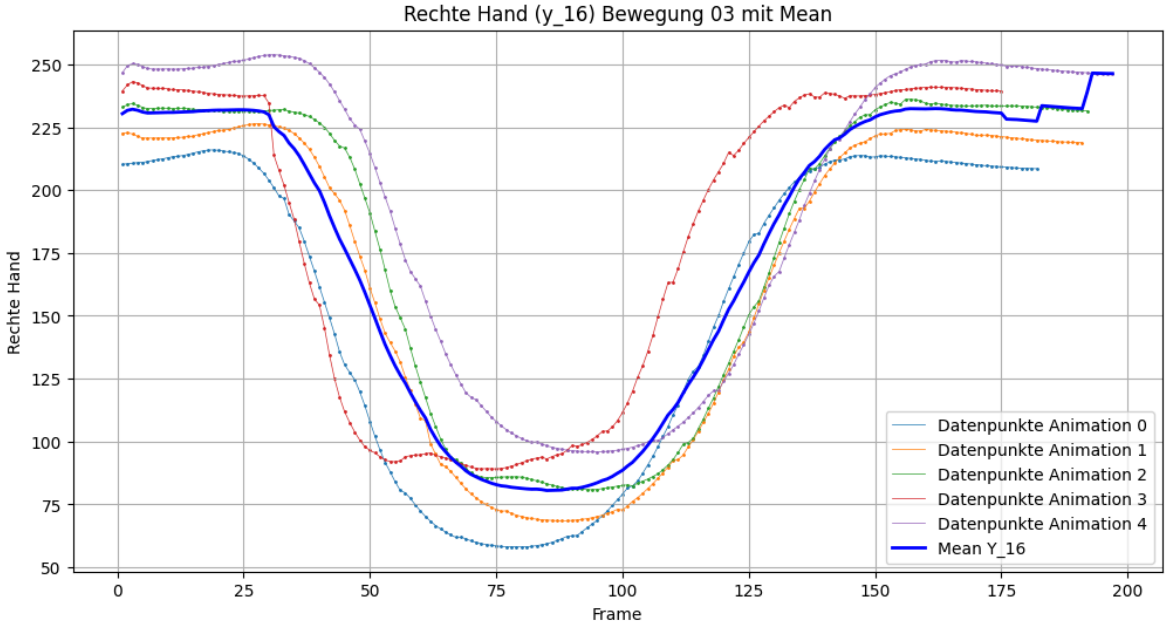
Out[ ]:

frame	x_0	y_0	z_0	x_1	y_1	z_1	x_
1	65.99356	18.27286	-171.467506	-993.7168	-312.4525	-60.97508	-993.716
2	66.85646	19.80700	-171.254204	-993.7168	-312.4525	-60.97508	-993.716
3	67.98854	20.18948	-170.908414	-993.7168	-312.4525	-60.97508	-993.716
4	68.69194	19.89282	-170.505374	-993.7168	-312.4525	-60.97508	-993.716
5	69.62770	19.35010	-170.065084	-993.7168	-312.4525	-60.97508	-993.716

5 rows × 99 columns

1.3.2 Bewegungsmuster mit Mean

In [ ]:
```
plt.figure(figsize=(12, 6))

for i, df in enumerate(dfs):
    plt.scatter(df["frame"], df["y_16"], marker='o', color=f'C{i}', s=1)
    plt.plot(df["frame"], df["y_16"], color=f'C{i}', linestyle='-', linew

plt.plot(mean_values_03.index, mean_values_03["y_16"], color='b', linesty

plt.title("Rechte Hand (y_16) Bewegung 03 mit Mean")
plt.xlabel("Frame")
plt.legend(loc='best')
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.show()
```



2. DeepMotion Kompensiert 01

In [ ]:
```
df_deepM01 = pd.read_csv('../Data/KeypointsBereinigtKompensiert_01.csv',
df_deepM01.head(5)
```

Out[ ]:

	compensation	frame		path	x_0	
0	1	1	/Users/salomekoller/Library/CloudStorage/OneDr...		0.000	-100
1	1	2	/Users/salomekoller/Library/CloudStorage/OneDr...		1.909	-100
2	1	3	/Users/salomekoller/Library/CloudStorage/OneDr...		2.832	-100
3	1	4	/Users/salomekoller/Library/CloudStorage/OneDr...		3.748	-100
4	1	5	/Users/salomekoller/Library/CloudStorage/OneDr...		5.316	-100

5 rows × 102 columns

2.1 Analyse Form

In [ ]:
```
print('Dimension:', df_deepM01.shape)
print('Number of rows:', df_deepM01.shape[0])
print('Number of columns:', df_deepM01.shape[1])
```

```
Dimension: (1096, 102)
Number of rows: 1096
Number of columns: 102
```

2.2 Splitting Frames

In [ ]:
```
# Variablen initiieren
frame_count = 0
frames_until_reset = []

# Iterieren über Dataframe, um Frames mit '1' zu finden
for index, row in df_deepM01.iterrows():
    frame_count += 1

    if row["frame"] == 1 and frame_count > 1:
        frames_until_reset.append(frame_count -1)

if frame_count > 0:
    frames_until_reset.append(frame_count)

print("Number of frames until reset for each cycle:", frames_until_reset)
```

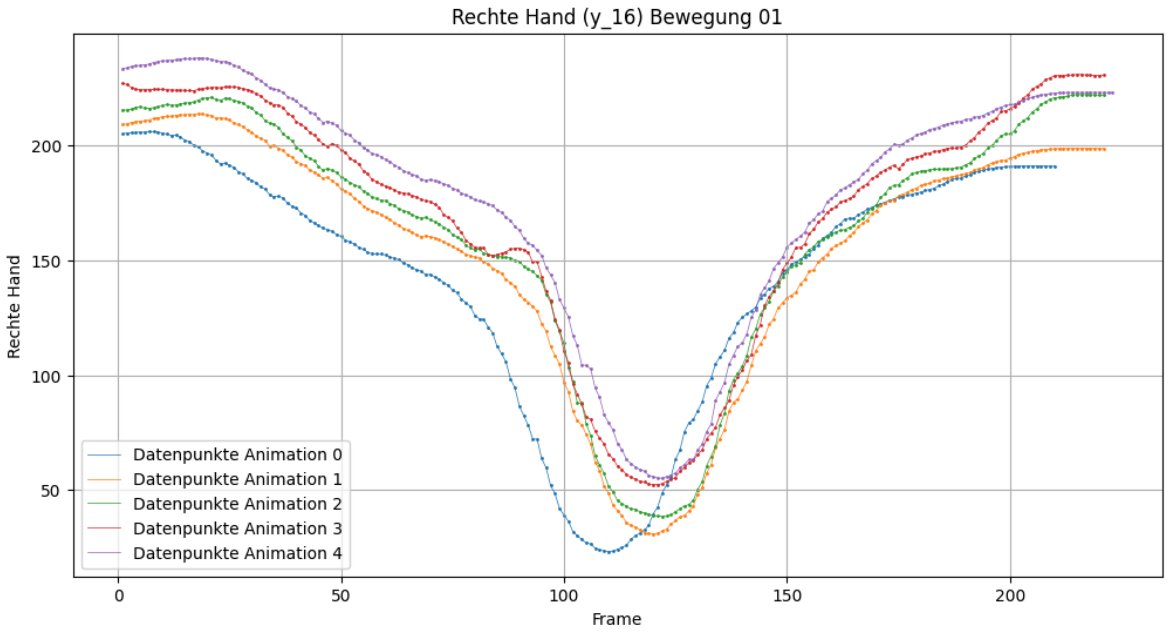
```
Number of frames until reset for each cycle: [210, 431, 652, 873, 1096]
```

In [ ]:
```
# Einzelne Bewegungen werden in verschiedene Dataframes gepackt
dfsKomp01 = []
start = 0
for end in frames_until_reset:
    dfsKomp01.append(df_deepM01.iloc[start:end])
    start = end

print("Number of splits:", len(dfsKomp01))
```

```
Number of splits: 5
```

2.3 Bewegungsanalyse anhand rechter Hand (Kompensiert 01)

In [ ]:
```
plt.figure(figsize=(12, 6))
for i, df in enumerate(dfsKomp01):
    plt.scatter(df["frame"], df["y_16"], marker='o', color=f'C{i}', s=1)
    plt.plot(df["frame"], df["y_16"], color=f'C{i}', linestyle='-', linew

plt.title("Rechte Hand (y_16) Bewegung 01")
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



2.3.1 Berechnung des Mean

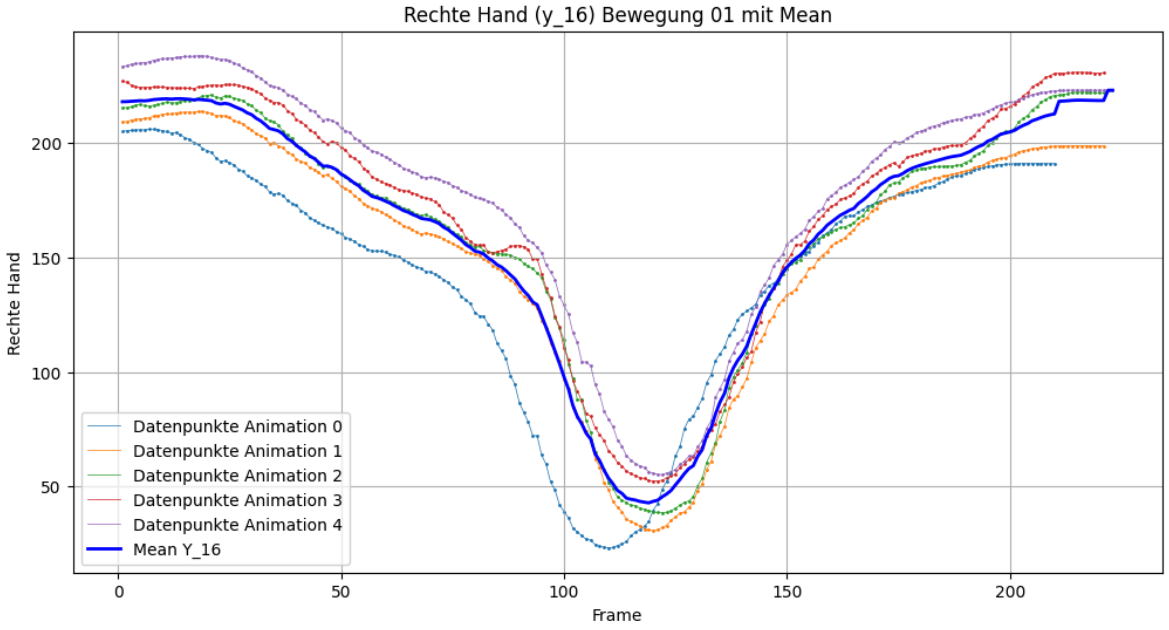
In [ ]:
```
means01 = []
mean_values_01 = df_deepM01[['frame', 'x_0', 'y_0', 'z_0', 'x_1', 'y_1',
                    'x_4', 'y_4', 'z_4', 'x_5', 'y_5', 'z_5', 'x_6', 'y_6'
                    'x_8', 'y_8', 'z_8', 'x_9', 'y_9', 'z_9', 'x_10', 'y_1
                    'x_12', 'y_12', 'z_12', 'x_13', 'y_13', 'z_13', 'x_14'
                    'x_16', 'y_16', 'z_16', 'x_17', 'y_17', 'z_17', 'x_18'
                    'x_20', 'y_20', 'z_20', 'x_21', 'y_21', 'z_21', 'x_22'
                    'x_24', 'y_24', 'z_24', 'x_25', 'y_25', 'z_25', 'x_26'
                    'x_28', 'y_28', 'z_28', 'x_29', 'y_29', 'z_29', 'x_30'
                    'x_32', 'y_32', 'z_32']].groupby('frame').mean()
means01.append(mean_values_01)

mean_values_01.head(5)
```

Out[ ]:

frame	x_0	y_0	z_0	x_1	y_1	z_1	x_2
1	42.9238	16.61496	-200.431752	-1007.957	-310.477	-48.49379	-1007.957
2	44.8634	16.47286	-202.449376	-1007.957	-310.477	-48.49379	-1007.957
3	46.3038	16.14494	-204.223192	-1007.957	-310.477	-48.49379	-1007.957
4	47.5600	15.77780	-206.149102	-1007.957	-310.477	-48.49379	-1007.957
5	49.5454	15.59410	-208.155064	-1007.957	-310.477	-48.49379	-1007.957

5 rows × 99 columns

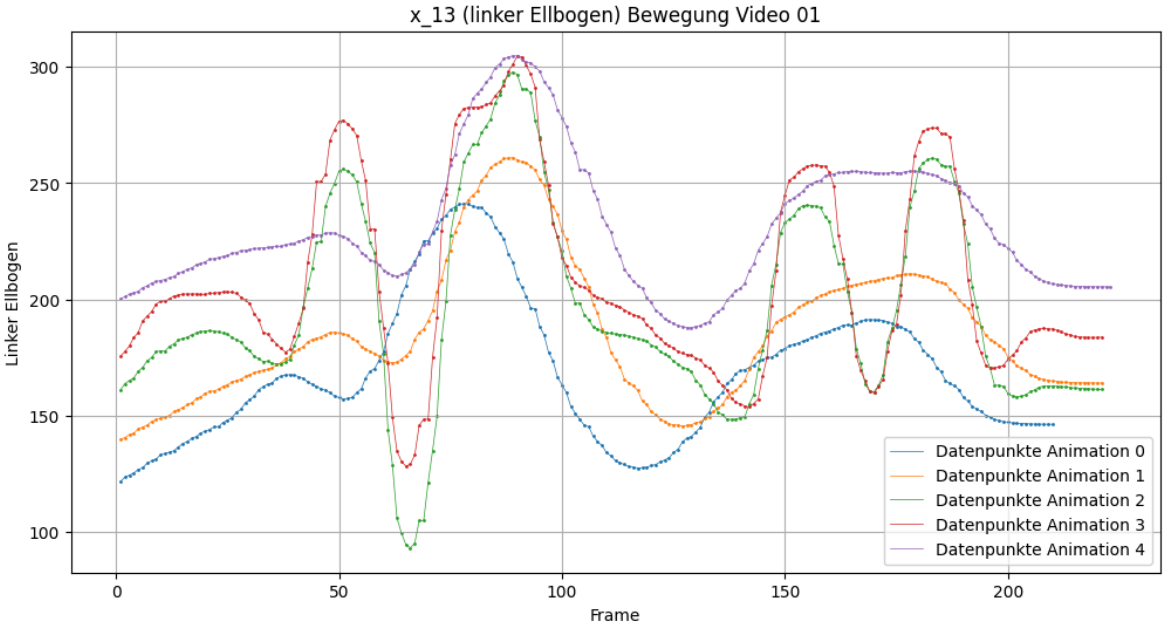
In [ ]:
```
plt.figure(figsize=(12, 6))

for i, df in enumerate(dfsKomp01):
    plt.scatter(df["frame"], df["y_16"], marker='o', color=f'C{i}', s=1)
    plt.plot(df["frame"], df["y_16"], color=f'C{i}', linestyle='-', linew

plt.plot(mean_values_01.index, mean_values_01["y_16"], color='b', linesty

plt.title("Rechte Hand (y_16) Bewegung 01 mit Mean")
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



2.4 Bewegungsanalyse linker Ellbogen (Kompensiert 01)

In [ ]:
```
plt.figure(figsize=(12, 6))
for i, df in enumerate(dfsKomp01):
    plt.scatter(df["frame"], df["x_13"], marker='o', color=f'C{i}', s=1)
    plt.plot(df["frame"], df["x_13"], color=f'C{i}', linestyle='-', linew

plt.title("x_13 (linker Ellbogen) Bewegung Video 01")
plt.xlabel("Frame")
```

```
plt.ylabel("Linker Ellbogen")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



3. DeepMotion Kompensiert 02

In [ ]:
```
df_deepM02 = pd.read_csv('../Data/KeypointsBereinigtKompensiert_02.csv',
df_deepM02.head(5)
```

Out[ ]:

	compensation	frame		path	x_0	
0	1	1	/Users/salomekoller/Library/CloudStorage/OneDr...		0.000	-10
1	1	2	/Users/salomekoller/Library/CloudStorage/OneDr...		5.366	-10
2	1	3	/Users/salomekoller/Library/CloudStorage/OneDr...		8.136	-10
3	1	4	/Users/salomekoller/Library/CloudStorage/OneDr...		13.775	-10
4	1	5	/Users/salomekoller/Library/CloudStorage/OneDr...		15.967	-10

5 rows × 102 columns

3.1 Analyse Form

In [ ]:
```
print('Dimension:', df_deepM02.shape)
print('Number of rows:', df_deepM02.shape[0])
print('Number of columns:', df_deepM02.shape[1])
```

```
Dimension: (1715, 102)
Number of rows: 1715
Number of columns: 102
```

3.2 Splitting Frames

In [ ]:
```
# Variablen initiieren
frame_count = 0
```

```
frames_until_reset = []

# Iterieren über Dataframe, um Frames mit '1' zu finden
for index, row in df_deepM02.iterrows():
    frame_count += 1

    if row["frame"] == 1 and frame_count > 1:
        frames_until_reset.append(frame_count -1)

if frame_count > 0:
    frames_until_reset.append(frame_count)

print("Number of frames until reset for each cycle:", frames_until_reset)
```

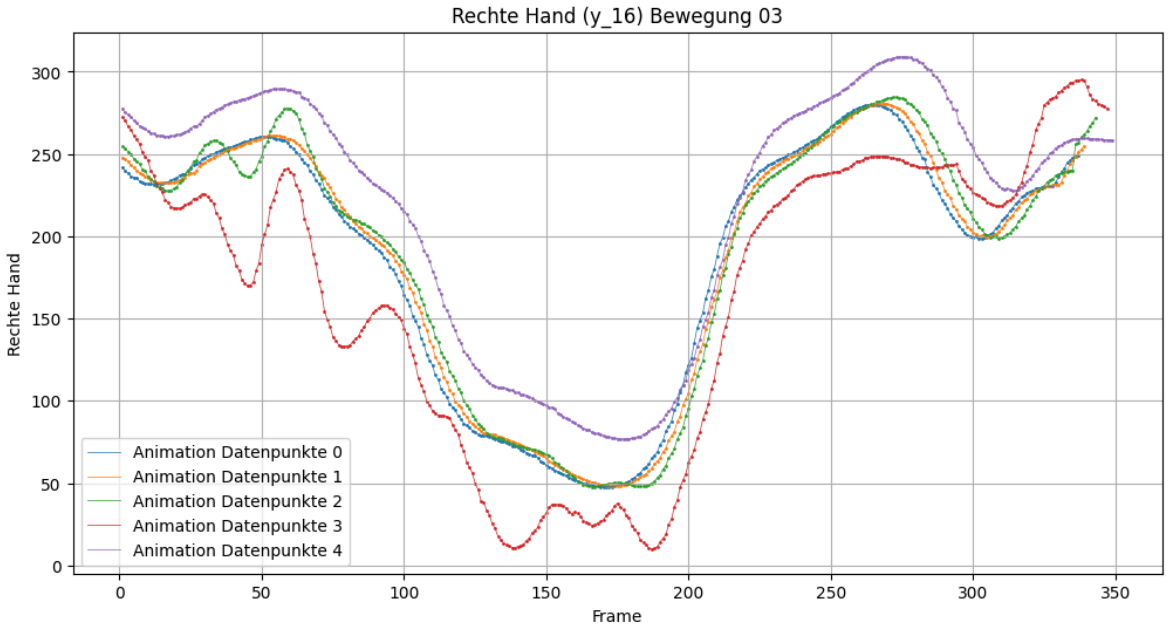
```
Number of frames until reset for each cycle: [337, 676, 1019, 1366, 1715]
```

In [ ]:
```
# Einzelne Bewegungen werden in verschiedene Dataframes gepackt
dfsKomp02 = []
start = 0
for end in frames_until_reset:
    dfsKomp02.append(df_deepM02.iloc[start:end])
    start = end

print("Number of splits:", len(dfsKomp02))
```

```
Number of splits: 5
```

3.3 Bewegungsanalyse anhand rechter Handbewegung (Kompensiert 02)

In [ ]:
```
plt.figure(figsize=(12, 6))

for i, df in enumerate(dfsKomp02):

    plt.scatter(df["frame"], df["y_16"], marker='o', color=f'C{i}', s=1)
    plt.plot(df["frame"], df["y_16"], color=f'C{i}', linestyle='-', linew

plt.title("Rechte Hand (y_16) Bewegung 03")
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



3.3.1 Berechnung des Mean

In [ ]:
```
means02 = []
mean_values_02 = df_deepM02[['frame', 'x_0', 'y_0', 'z_0', 'x_1', 'y_1',
                    'x_4', 'y_4', 'z_4', 'x_5', 'y_5', 'z_5', 'x_6', 'y_6'
                    'x_8', 'y_8', 'z_8', 'x_9', 'y_9', 'z_9', 'x_10', 'y_1
                    'x_12', 'y_12', 'z_12', 'x_13', 'y_13', 'z_13', 'x_14'
                    'x_16', 'y_16', 'z_16', 'x_17', 'y_17', 'z_17', 'x_18'
                    'x_20', 'y_20', 'z_20', 'x_21', 'y_21', 'z_21', 'x_22'
                    'x_24', 'y_24', 'z_24', 'x_25', 'y_25', 'z_25', 'x_26'
                    'x_28', 'y_28', 'z_28', 'x_29', 'y_29', 'z_29', 'x_30'
                    'x_32', 'y_32', 'z_32']].groupby('frame').mean()
means02.append(mean_values_02)

mean_values_02.head(5)
```

Out[ ]:

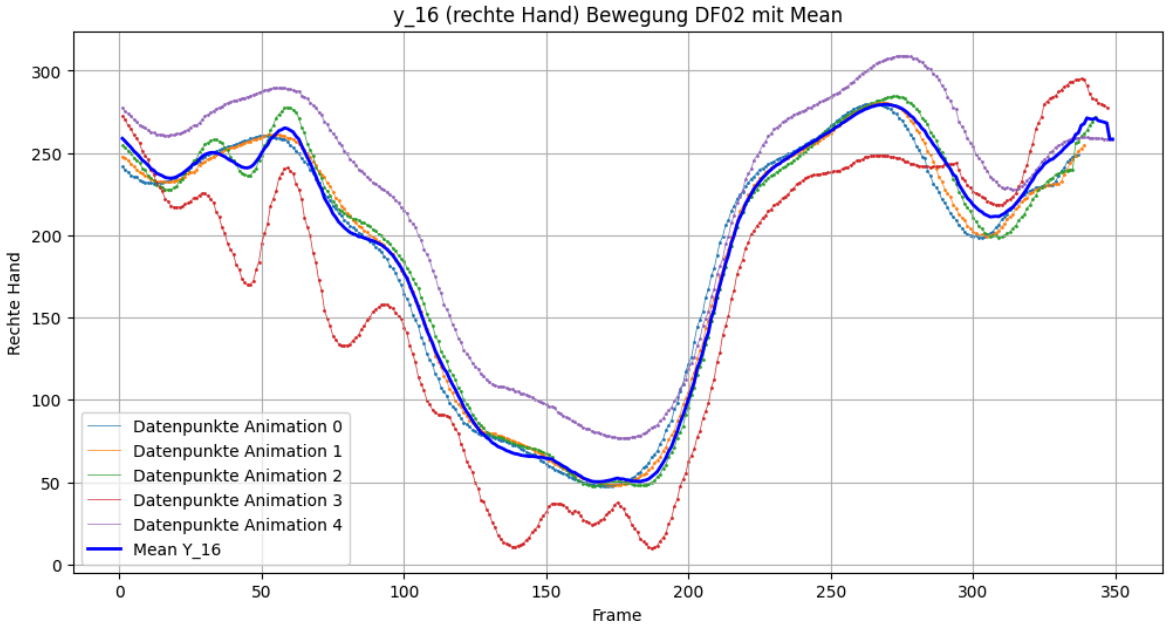
frame	x_0	y_0	z_0	x_1	y_1	z_1	x_
1	-80.50884	8.62712	-102.583294	-1045.738	-307.2164	-53.49067	-1045.7
2	-77.81076	8.94612	-98.155338	-1045.738	-307.2164	-53.49067	-1045.7
3	-75.21866	9.22386	-93.563912	-1045.738	-307.2164	-53.49067	-1045.7
4	-72.21568	9.81578	-88.551916	-1045.738	-307.2164	-53.49067	-1045.7
5	-69.32478	10.38222	-82.843140	-1045.738	-307.2164	-53.49067	-1045.7

5 rows × 99 columns

3.3.2 Bewegungsmuster mit Mean

In [ ]:
```
plt.figure(figsize=(12, 6))

for i, df in enumerate(dfsKomp02):

    plt.scatter(df["frame"], df["y_16"], marker='o', color=f'C{i}', s=1)
```

```
    plt.plot(df["frame"], df["y_16"], color=f'C{i}', linestyle='-', linew

plt.plot(mean_values_02.index, mean_values_02["y_16"], color='b', linesty

plt.title("y_16 (rechte Hand) Bewegung DF02 mit Mean" )
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



4. MediaPipe

In [ ]:
```
df_MediaP = pd.read_csv('../Data/samples.csv', sep=',', encoding='utf-8')
df_MediaP.head(5)
```

Out[ ]:

	path	frame	compensation	x_0	
0	bachelorarbeiten/nils/data/videos/samples/drin...	1	False	0.00000	0.0
1	bachelorarbeiten/nils/data/videos/samples/drin...	2	False	-0.08766	0.
2	bachelorarbeiten/nils/data/videos/samples/drin...	3	False	-0.81886	0.9
3	bachelorarbeiten/nils/data/videos/samples/drin...	4	False	-1.46955	1.4
4	bachelorarbeiten/nils/data/videos/samples/drin...	5	False	-2.07000	1.4

5 rows × 102 columns

4.1 Analyse form

In [ ]:
```
print('Dimension:', df_MediaP.shape)
print('Number of rows:', df_MediaP.shape[0])
print('Number of columns:', df_MediaP.shape[1])
```

```
Dimension: (623, 102)
Number of rows: 623
Number of columns: 102
```

4.2 Splitting Frames

In [ ]:
```python
# Variablen initiieren
frame_count = 0
frames_until_reset = []

# Iterieren über Dataframe, um Frames mit '1' zu finden
for index, row in df_MediaP.iterrows():
    frame_count += 1

    if row["frame"] == 1 and frame_count > 1:
        frames_until_reset.append(frame_count -1)

if frame_count > 0:
    frames_until_reset.append(frame_count)

print("Number of frames until reset for each cycle:", frames_until_reset)
```

```
Number of frames until reset for each cycle: [172, 471, 623]
```

In [ ]:
```python
# DataFrame entsprechend splitten
df_MediaP1 = df_MediaP.iloc[:frames_until_reset[0]]
df_MediaP2 = df_MediaP.iloc[frames_until_reset[0]:frames_until_reset[1]]
df_MediaP3 = df_MediaP.iloc[frames_until_reset[1]:]
```

In [ ]:
```python
df_MediaP1.head(5)
```

Out[ ]:

	path	frame	compensation	x_0	
0	bachelorarbeiten/nils/data/videos/samples/drin...	1	False	0.00000	0.0
1	bachelorarbeiten/nils/data/videos/samples/drin...	2	False	-0.08766	0.
2	bachelorarbeiten/nils/data/videos/samples/drin...	3	False	-0.81886	0.9
3	bachelorarbeiten/nils/data/videos/samples/drin...	4	False	-1.46955	1.4
4	bachelorarbeiten/nils/data/videos/samples/drin...	5	False	-2.07000	1.4

5 rows × 102 columns

4.3.1 Vergleich Länge Mediapipe Frame zu DeepMotion Frame 01

In [ ]:
```python
print('Dimension MediaPipe02:', df_MediaP1.shape)

for i, df in enumerate(dfsKomp01):
    print(f"DataFrame {i+1} Shape:", df.shape)
```

```
Dimension MediaPipe02: (172, 102)
DataFrame 1 Shape: (210, 102)
DataFrame 2 Shape: (221, 102)
DataFrame 3 Shape: (221, 102)
DataFrame 4 Shape: (221, 102)
DataFrame 5 Shape: (223, 102)
```

In [ ]:
```
df_MediaP2.head(5)
```

Out[ ]:

	path	frame	compensation	x_0
172	bachelorarbeiten/nils/data/videos/samples/03_t...	1	False	0.00000
173	bachelorarbeiten/nils/data/videos/samples/03_t...	2	False	0.13657
174	bachelorarbeiten/nils/data/videos/samples/03_t...	3	False	0.19873
175	bachelorarbeiten/nils/data/videos/samples/03_t...	4	False	1.98133
176	bachelorarbeiten/nils/data/videos/samples/03_t...	5	False	3.43781

5 rows × 102 columns

4.3.2 Vergleich Länge Mediapipe Frame zu DeepMotion Frame 02

In [ ]:
```
print('Dimension MediaPipe02:', df_MediaP2.shape)

for i, df in enumerate(dfsKomp02):
    print(f"DataFrame {i+1} Shape:", df.shape)
```

```
Dimension MediaPipe02: (299, 102)
DataFrame 1 Shape: (337, 102)
DataFrame 2 Shape: (339, 102)
DataFrame 3 Shape: (343, 102)
DataFrame 4 Shape: (347, 102)
DataFrame 5 Shape: (349, 102)
```

In [ ]:
```
df_MediaP3.head(5)
```

Out[ ]:

	path	frame	compensation	x_0
471	bachelorarbeiten/nils/data/videos/samples/drin...	1	False	0.0000
472	bachelorarbeiten/nils/data/videos/samples/drin...	2	False	-0.6283
473	bachelorarbeiten/nils/data/videos/samples/drin...	3	False	-0.7909
474	bachelorarbeiten/nils/data/videos/samples/drin...	4	False	-1.8517
475	bachelorarbeiten/nils/data/videos/samples/drin...	5	False	-1.7632

5 rows × 102 columns

4.3.3 Vergleich Länge Mediapipe Frame zu DeepMotion Frame 03

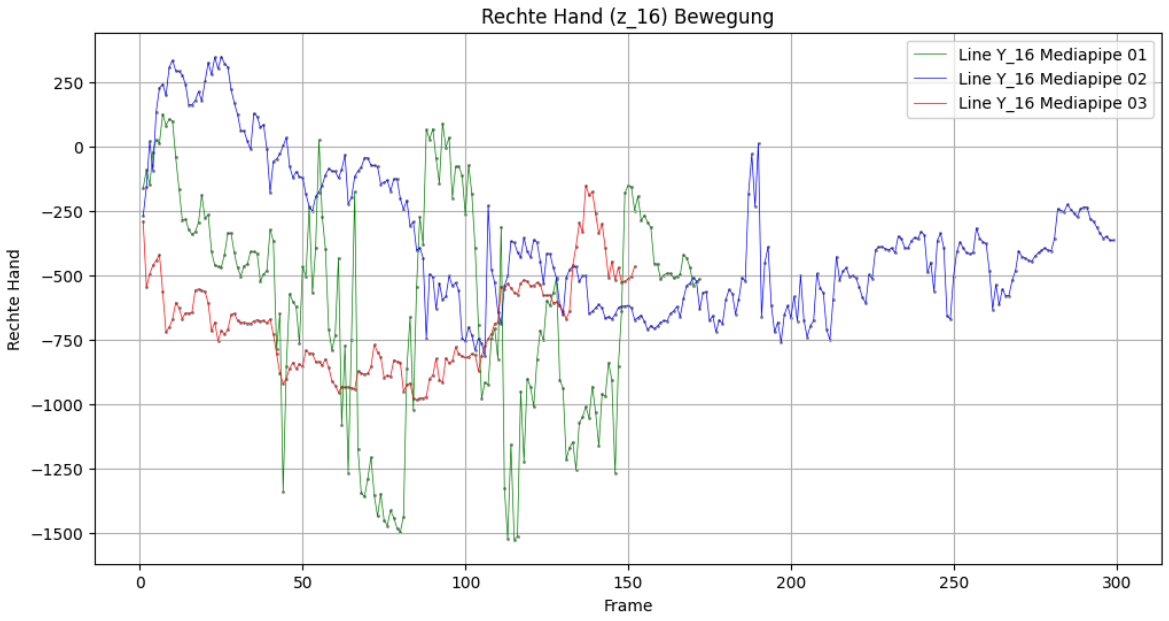
In [ ]:
```
print('Dimension MediaPipe03:', df_MediaP3.shape)
```

```
for i, df in enumerate(dfs):
    print(f"DataFrame {i+1} Shape:", df.shape)
```

```
Dimension MediaPipe03: (152, 102)
DataFrame 1 Shape: (182, 102)
DataFrame 2 Shape: (191, 102)
DataFrame 3 Shape: (192, 102)
DataFrame 4 Shape: (175, 102)
DataFrame 5 Shape: (197, 102)
```

4.4 Rechter Arm (z_16) Bewegung Mediapipe

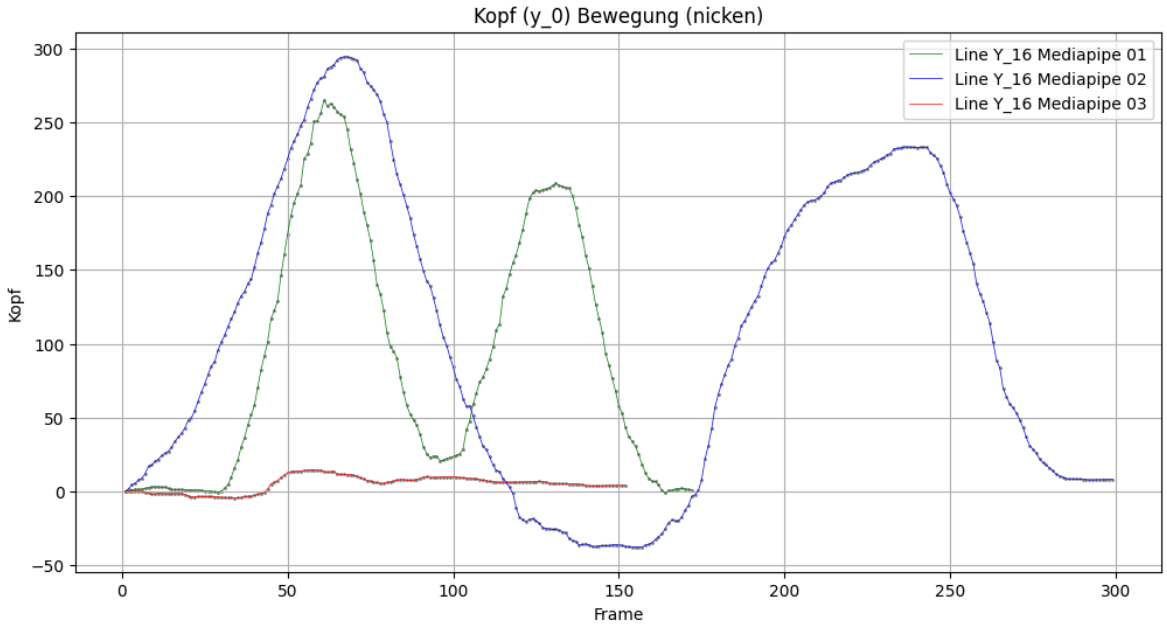
In [ ]:
```
plt.figure(figsize=(12, 6))

plt.scatter(df_MediaP1["frame"], df_MediaP1["z_16"], marker='o', color='g
plt.plot(df_MediaP1["frame"], df_MediaP1["z_16"], color='green', linestyl

plt.scatter(df_MediaP2["frame"], df_MediaP2["z_16"], marker='o', color='g
plt.plot(df_MediaP2["frame"], df_MediaP2["z_16"], color='blue', linestyle

plt.scatter(df_MediaP3["frame"], df_MediaP3["z_16"], marker='o', color='g
plt.plot(df_MediaP3["frame"], df_MediaP3["z_16"], color='red', linestyle=


plt.title("Rechte Hand (z_16) Bewegung")
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')

plt.show()
```



4.5 Kopfbewegung (z_0) Mediapipe

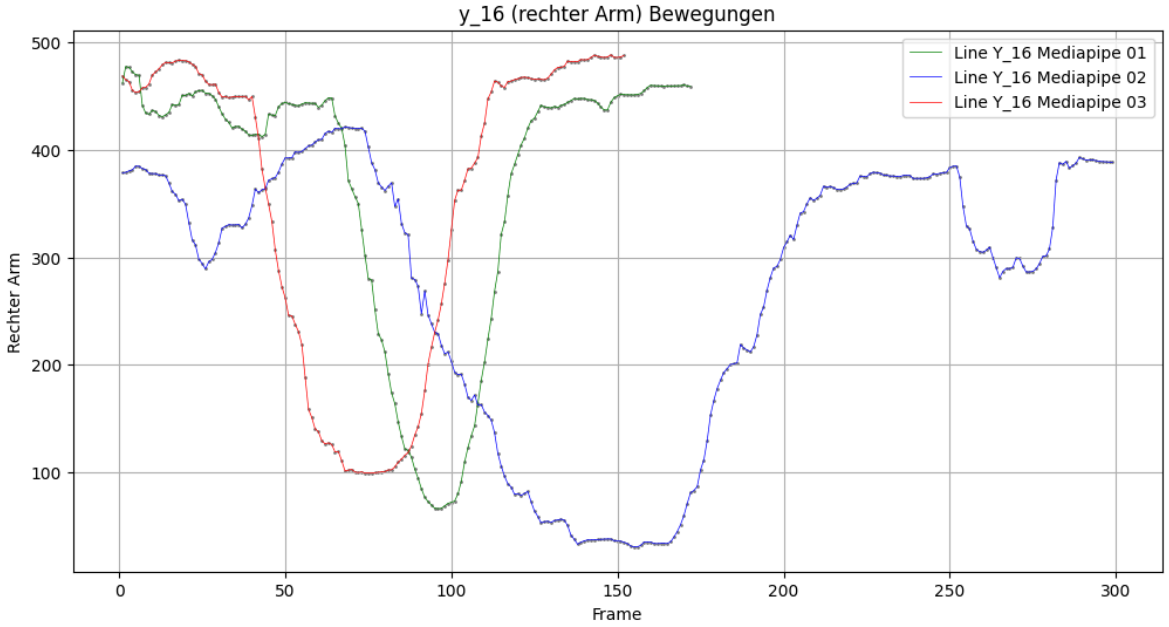
In [ ]:
```
plt.figure(figsize=(12, 6))

plt.scatter(df_MediaP1["frame"], df_MediaP1["y_0"], marker='o', color='gr
plt.plot(df_MediaP1["frame"], df_MediaP1["y_0"], color='green', linestyle
```

```
plt.scatter(df_MediaP2["frame"], df_MediaP2["y_0"], marker='o', color='gr
plt.plot(df_MediaP2["frame"], df_MediaP2["y_0"], color='blue', linestyle=

plt.scatter(df_MediaP3["frame"], df_MediaP3["y_0"], marker='o', color='gr
plt.plot(df_MediaP3["frame"], df_MediaP3["y_0"], color='red', linestyle='


plt.title("Kopf (y_0) Bewegung (nicken)")
plt.xlabel("Frame")
plt.ylabel("Kopf")
plt.grid(True)
# Move the legend outside of the plot
plt.legend(loc='best')

plt.show()
```



4.6 Bewegungsanalyse anhand rechter Handbewegung

In [ ]:
```
plt.figure(figsize=(12, 6))

plt.scatter(df_MediaP1["frame"], df_MediaP1["y_16"], marker='o', color='g
plt.plot(df_MediaP1["frame"], df_MediaP1["y_16"], color='green', linestyl

plt.scatter(df_MediaP2["frame"], df_MediaP2["y_16"], marker='o', color='g
plt.plot(df_MediaP2["frame"], df_MediaP2["y_16"], color='blue', linestyle

plt.scatter(df_MediaP3["frame"], df_MediaP3["y_16"], marker='o', color='g
plt.plot(df_MediaP3["frame"], df_MediaP3["y_16"], color='red', linestyle=


plt.title("y_16 (rechter Arm) Bewegungen")
plt.xlabel("Frame")
plt.ylabel("Rechter Arm")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



4.6.1 Berechnung des Mean

In [ ]:
```
meansMP = []
df_MediaP12 = pd.concat([df_MediaP1, df_MediaP2])

mean_values_MP = df_MediaP12[['frame', 'x_0', 'y_0', 'z_0', 'x_1', 'y_1',
                    'x_4', 'y_4', 'z_4', 'x_5', 'y_5', 'z_5', 'x_6', 'y_6'
                    'x_8', 'y_8', 'z_8', 'x_9', 'y_9', 'z_9', 'x_10', 'y_1
                    'x_12', 'y_12', 'z_12', 'x_13', 'y_13', 'z_13', 'x_14'
                    'x_16', 'y_16', 'z_16', 'x_17', 'y_17', 'z_17', 'x_18'
                    'x_20', 'y_20', 'z_20', 'x_21', 'y_21', 'z_21', 'x_22'
                    'x_24', 'y_24', 'z_24', 'x_25', 'y_25', 'z_25', 'x_26'
                    'x_28', 'y_28', 'z_28', 'x_29', 'y_29', 'z_29', 'x_30'
                    'x_32', 'y_32', 'z_32']].groupby('frame').mean()
meansMP.append(mean_values_MP)

mean_values_MP.head(5)
```

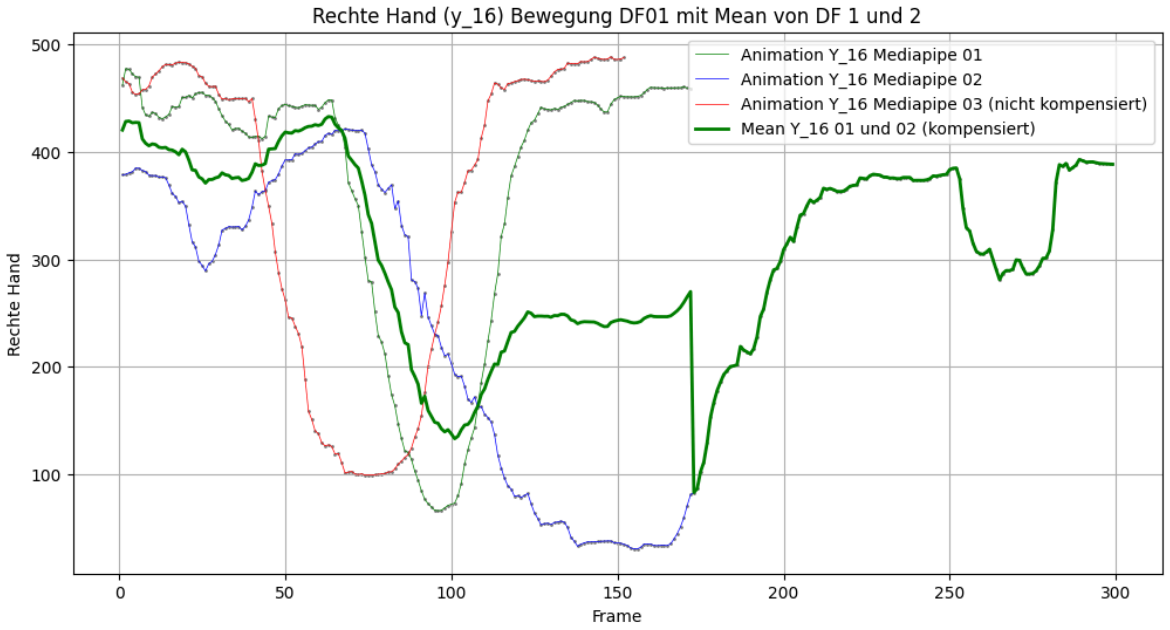
Out[ ]:

frame	x_0	y_0	z_0	x_1	y_1	z_1	
1	0.000000	0.000000	0.000000	19.160885	-26.792770	61.691245	29.9
2	0.024455	1.189490	31.137870	19.269535	-26.128870	99.299155	29.92
3	-0.310065	2.638355	55.155305	18.940485	-24.881945	122.820275	29.4
4	0.255890	3.420960	150.906590	19.777185	-24.170795	216.327370	30.18
5	0.683905	4.665790	185.844140	20.488755	-22.907115	249.370338	30.9

5 rows × 99 columns

In [ ]:
```
plt.figure(figsize=(12, 6))

plt.scatter(df_MediaP1["frame"], df_MediaP1["y_16"], marker='o', color='g
plt.plot(df_MediaP1["frame"], df_MediaP1["y_16"], color='green', linestyl

plt.scatter(df_MediaP2["frame"], df_MediaP2["y_16"], marker='o', color='g
```

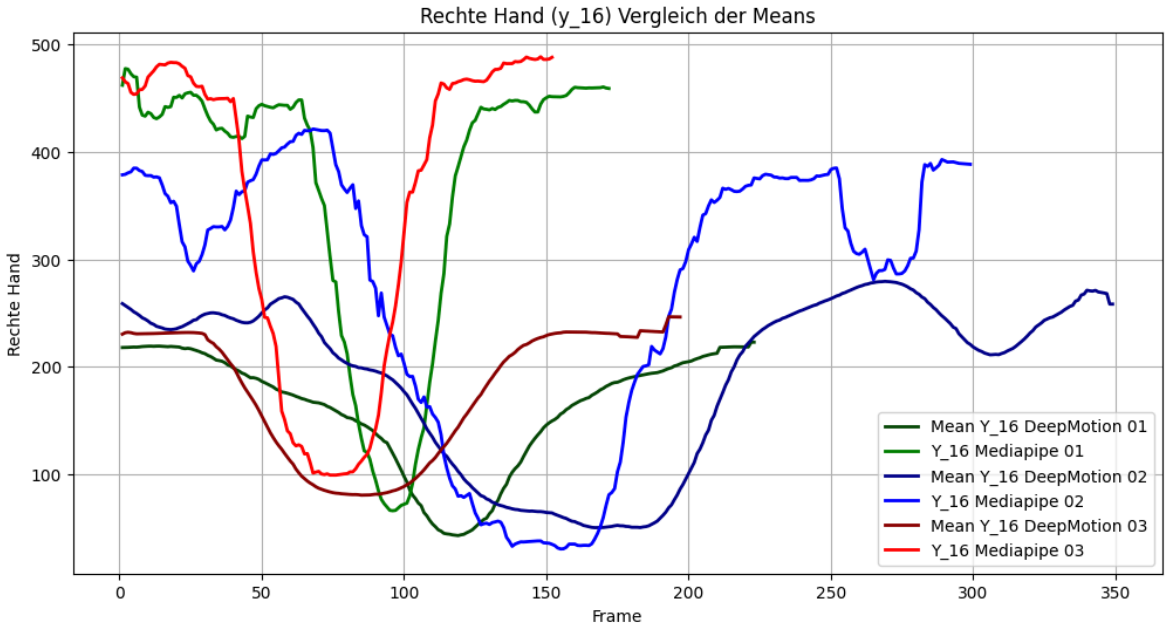
```
plt.plot(df_MediaP2["frame"], df_MediaP2["y_16"], color='blue', linestyle

plt.scatter(df_MediaP3["frame"], df_MediaP3["y_16"], marker='o', color='g
plt.plot(df_MediaP3["frame"], df_MediaP3["y_16"], color='red', linestyle=

plt.plot(mean_values_MP.index, mean_values_MP["y_16"], color='green', lin

plt.title("Rechte Hand (y_16) Bewegung DF01 mit Mean von DF 1 und 2")
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



Berechnung Euclidean Distances

1. Analyse der Mean Werte

In [ ]:
```
plt.figure(figsize=(12, 6))

plt.plot(mean_values_01.index, mean_values_01["y_16"], color='#054907', l
plt.plot(df_MediaP1["frame"], df_MediaP1["y_16"], color='green', linestyl

plt.plot(mean_values_02.index, mean_values_02["y_16"], color='darkblue',
plt.plot(df_MediaP2["frame"], df_MediaP2["y_16"], color='blue', linestyle

plt.plot(mean_values_03.index, mean_values_03["y_16"], color='darkred', l
plt.plot(df_MediaP3["frame"], df_MediaP3["y_16"], color='red', linestyle=

plt.title("Rechte Hand (y_16) Vergleich der Means")
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



In [ ]:
```
difference_in_mean_01 = df_MediaP1['y_16'].mean() - mean_values_01['y_16'
difference_in_mean_02 = df_MediaP2['y_16'].mean() - mean_values_02['y_16'
difference_in_mean_03 = df_MediaP3['y_16'].mean() - mean_values_03['y_16'

difference_in_mean_01_per = difference_in_mean_01 / df_MediaP1['y_16'].me
difference_in_mean_02_per = difference_in_mean_02 / df_MediaP2['y_16'].me
difference_in_mean_03_per = difference_in_mean_03 / df_MediaP3['y_16'].me

print(f"Mean Value in DeepMotion 01: {mean_values_01['y_16'].mean()}")
print(f"Mean Value in MediaPipe 01: {df_MediaP1['y_16'].mean()}")
print(f"Difference in Mean: {difference_in_mean_01}")
print(f"Difference in Mean in Percentage: {difference_in_mean_01_per}")
print("")
print(f"Mean Value in DeepMotion 02: {mean_values_02['y_16'].mean()}")
print(f"Mean Value in MediaPipe 02: {df_MediaP2['y_16'].mean()}")
print(f"Difference in Mean: {difference_in_mean_02}")
print(f"Difference in Mean in Percentage: {difference_in_mean_02_per}")
print("")
print(f"Mean Value in DeepMotion 03: {mean_values_03['y_16'].mean()}")
print(f"Mean Value in MediaPipe 03: {df_MediaP3['y_16'].mean()}")
print(f"Difference in Mean: {difference_in_mean_03}")
print(f"Difference in Mean in Percentage: {difference_in_mean_03_per}")
```

```
Mean Value in DeepMotion 01: 162.18050183856505
Mean Value in MediaPipe 01: 367.5381621511628
Difference in Mean: 205.35766031259774
Difference in Mean in Percentage: 55.87383337573999

Mean Value in DeepMotion 02: 191.1468976599809
Mean Value in MediaPipe 02: 271.1325231438127
Difference in Mean: 79.9856254838318
Difference in Mean in Percentage: 29.500564726204477

Mean Value in DeepMotion 03: 176.7090342639594
Mean Value in MediaPipe 03: 351.3075072368421
Difference in Mean: 174.59847297288272
Difference in Mean in Percentage: 49.6996134088228
```

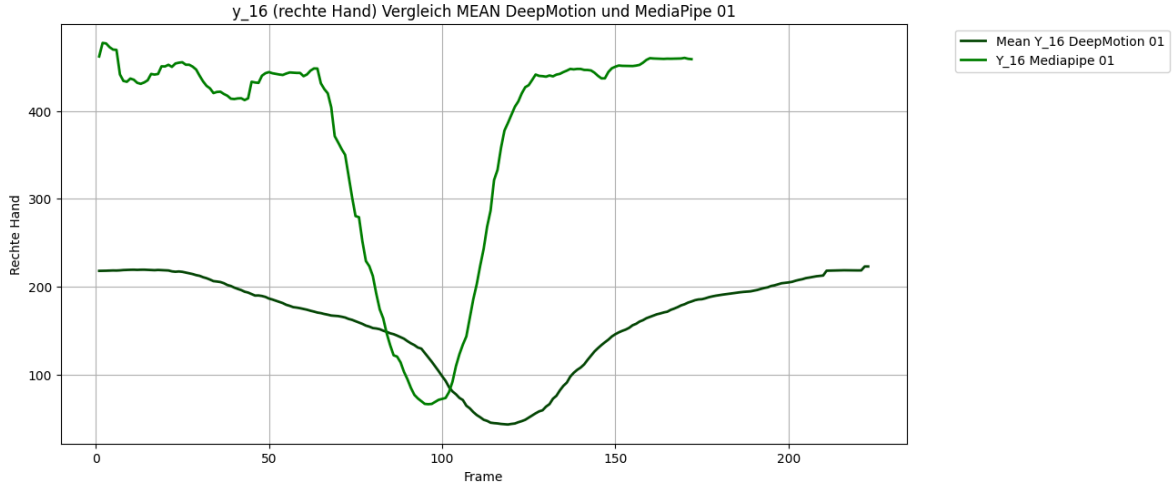
2. Vergleich Werte MediaPipe und DeepMotion

Werte von 1 Original MediaPipe Frame werden zum dazugehörigen Animationsclip DeepMotion verglichen

Es wird der Y-Wert der rechten Hand (y_16) analsiert.

2.1 Kompensiert 01

In [ ]:
```
plt.figure(figsize=(12, 6))

plt.plot(mean_values_01.index, mean_values_01["y_16"], color='#054907', l
plt.plot(df_MediaP1["frame"], df_MediaP1["y_16"], color='green', linestyl

plt.title("y_16 (rechte Hand) Vergleich MEAN DeepMotion und MediaPipe 01"
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(bbox_to_anchor=(1.05, 1), loc='upper left')
plt.show()
```



In [ ]:
```
df_deepM01.head(5)
```

Out[ ]:

	compensation	frame	path	x_0	
0	1	1	/Users/salomekoller/Library/CloudStorage/OneDr...	0.000	-100
1	1	2	/Users/salomekoller/Library/CloudStorage/OneDr...	1.909	-100
2	1	3	/Users/salomekoller/Library/CloudStorage/OneDr...	2.832	-100
3	1	4	/Users/salomekoller/Library/CloudStorage/OneDr...	3.748	-100
4	1	5	/Users/salomekoller/Library/CloudStorage/OneDr...	5.316	-100

5 rows × 102 columns

2.1.1 Euclidean Distances

In [ ]:
```
# Definition von Kolonnen
columns = ['frame', 'x_0', 'y_0', 'z_0', 'x_11', 'y_11', 'z_11',
           'x_12', 'y_12', 'z_12', 'x_13', 'y_13', 'z_13', 'x_14', 'y_14'
           'x_16', 'y_16', 'z_16', 'x_17', 'y_17', 'z_17', 'x_18', 'y_18'
           'x_20', 'y_20', 'z_20', 'x_21', 'y_21', 'z_21', 'x_22', 'y_22'
```

```
            'x_24', 'y_24', 'z_24', 'x_25', 'y_25', 'z_25', 'x_26', 'y_26'
            'x_28', 'y_28', 'z_28', 'x_31', 'y_31', 'z_31', 'x_32', 'y_32'

# Kalkulieren von euclidean Distance
euclidean_distances_01 = {}

for frame in df_MediaP1["frame"]:
    euclidean_distances_01[frame] = []
    for col in columns[1:]:
        point_1 = (frame, mean_values_01[col].loc[frame])
        point_2 = (frame, df_MediaP1[col][df_MediaP1['frame'] == frame].v
        euclidean_distance_01 = distance.euclidean(point_1, point_2)
        euclidean_distances_01[frame].append(euclidean_distance_01)

euclidean_df_01 = pd.DataFrame.from_dict(euclidean_distances_01, orient='
euclidean_df_01.head(5)
```

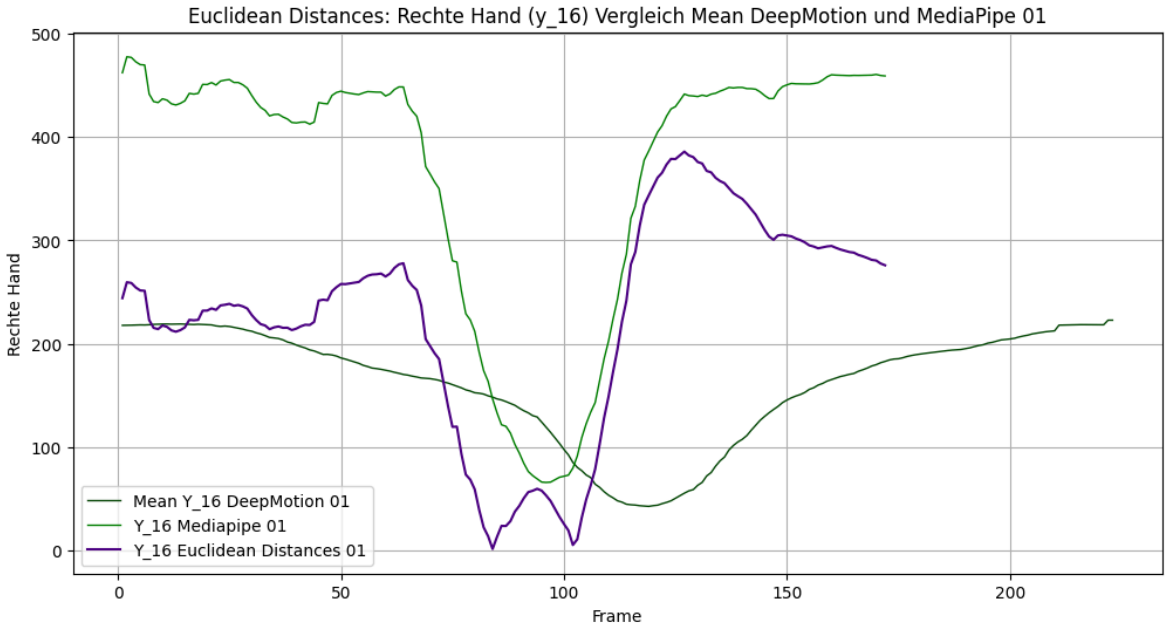
Out[ ]:

	x_0	y_0	z_0	x_11	y_11	z_11	x_12	
1	42.92380	16.61496	200.431752	69.3176	90.13566	758.638164	168.83520	7
2	44.95106	15.95476	263.983176	69.9716	89.87085	831.607521	171.16664	7
3	47.12266	15.15391	347.277852	70.6990	91.24217	862.063893	173.41177	7
4	49.02955	14.35974	555.240142	69.6152	91.58547	1001.308958	175.43172	8
5	51.61540	14.09434	658.537104	70.5362	92.12765	1103.323308	177.55982	8

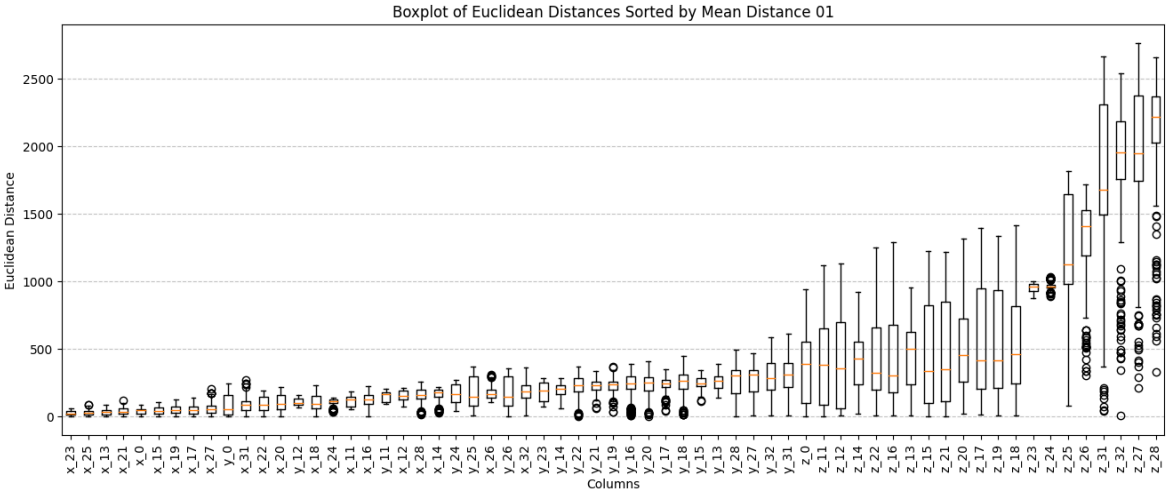
5 rows × 63 columns

In [ ]:

```
plt.figure(figsize=(12, 6))

plt.plot(mean_values_01.index, mean_values_01["y_16"], color='#054907', l
plt.plot(df_MediaP1["frame"], df_MediaP1["y_16"], color='green', linestyl

plt.plot(euclidean_df_01.index, euclidean_df_01["y_16"], color='indigo',

plt.title("Euclidean Distances: Rechte Hand (y_16) Vergleich Mean DeepMot
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



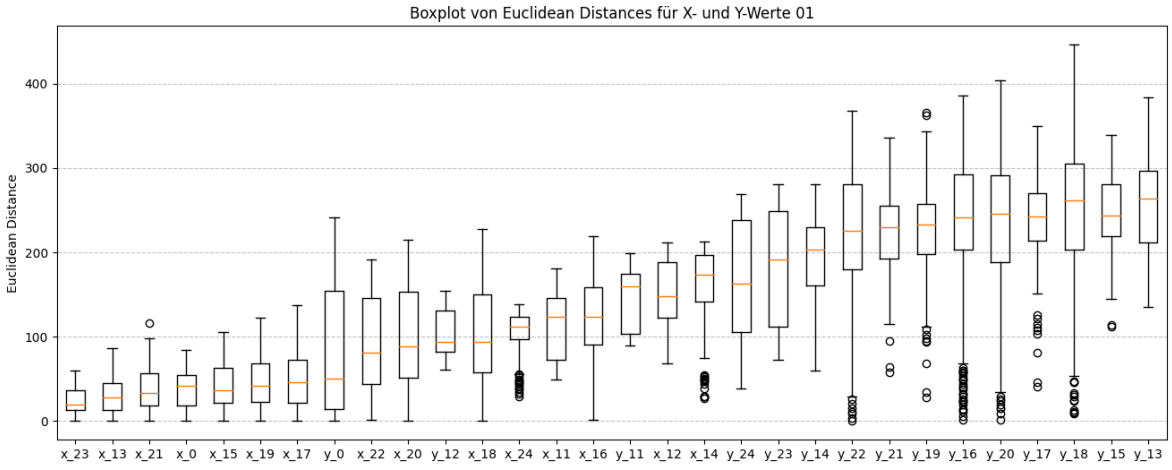
In [ ]:
```
mean_distances = euclidean_df_01.mean()
sorted_df = euclidean_df_01[mean_distances.sort_values().index]

plt.figure(figsize=(16, 6))
plt.boxplot(sorted_df.values)
plt.xticks(range(1, len(sorted_df.columns) + 1), sorted_df.columns, rotat
plt.title('Boxplot of Euclidean Distances Sorted by Mean Distance 01')
plt.xlabel('Columns')
plt.ylabel('Euclidean Distance')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



2.1.1.1 Ohne Z Werte

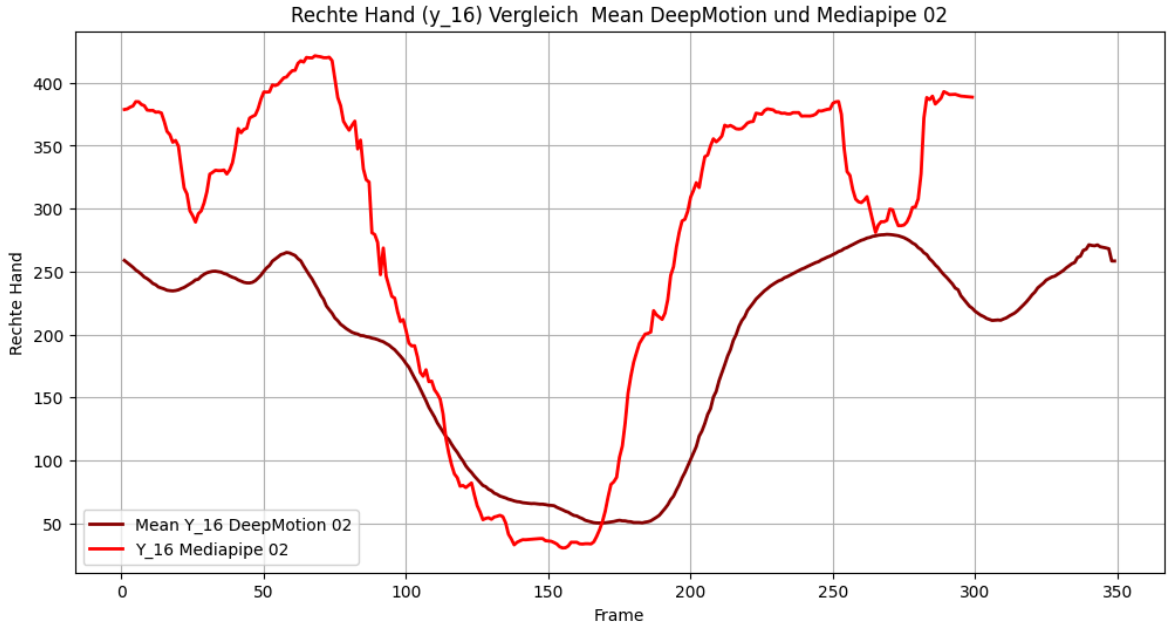
In [ ]:
```
# Definition von Kolonnen
selected_columns = ['x_0', 'x_11', 'x_12', 'x_13', 'x_14', 'x_15', 'x_16'
                    'x_18', 'x_19', 'x_20', 'x_21', 'x_22', 'x_23', 'x_24
                    'y_11', 'y_12', 'y_13', 'y_14', 'y_15', 'y_16', 'y_17
                    'y_18', 'y_19', 'y_20', 'y_21', 'y_22', 'y_23', 'y_24

mean_distances = euclidean_df_01[selected_columns].mean()
sorted_df = euclidean_df_01[mean_distances.sort_values().index]

plt.figure(figsize=(16, 6))
```

```
plt.boxplot(sorted_df.values)
plt.xticks(range(1, len(sorted_df.columns) + 1), sorted_df.columns)
plt.title('Boxplot von Euclidean Distances für X- und Y-Werte 01')
plt.ylabel('Euclidean Distance')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



2.2 Kompensiert 02

In [ ]:
```
plt.figure(figsize=(12, 6))

plt.plot(mean_values_02.index, mean_values_02["y_16"], color='darkred', l
plt.plot(df_MediaP2["frame"], df_MediaP2["y_16"], color='red', linestyle=

plt.title("Rechte Hand (y_16) Vergleich  Mean DeepMotion und Mediapipe 02
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend( loc='best')
plt.show()
```



2.2.1 Euclidean Distances

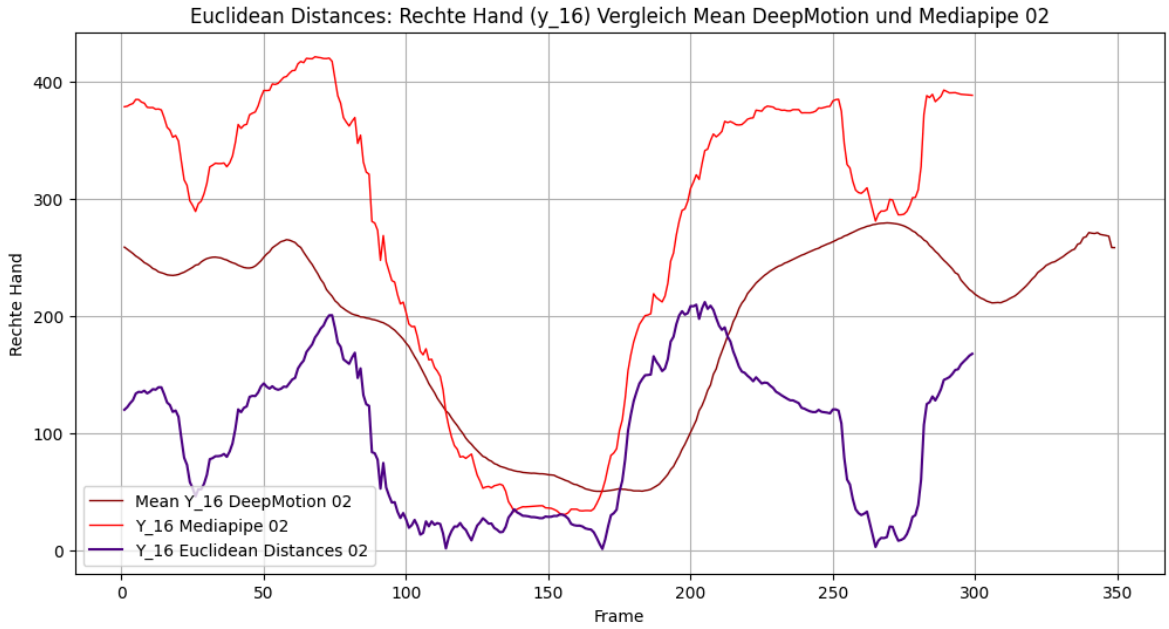
In [ ]:
```
# Definition von Kolonnen
columns = ['frame', 'x_0', 'y_0', 'z_0', 'x_11', 'y_11', 'z_11',
           'x_12', 'y_12', 'z_12', 'x_13', 'y_13', 'z_13', 'x_14', 'y_14'
           'x_16', 'y_16', 'z_16', 'x_17', 'y_17', 'z_17', 'x_18', 'y_18'
           'x_20', 'y_20', 'z_20', 'x_21', 'y_21', 'z_21', 'x_22', 'y_22'
           'x_24', 'y_24', 'z_24', 'x_25', 'y_25', 'z_25', 'x_26', 'y_26'
           'x_28', 'y_28', 'z_28', 'x_31', 'y_31', 'z_31', 'x_32', 'y_32'

# Kalkulieren von euclidean Distance
euclidean_distances_02 = {}

for frame in df_MediaP2["frame"]:
    euclidean_distances_02[frame] = []
    for col in columns[1:]:
        point_1 = (frame, mean_values_02[col].loc[frame])
        point_2 = (frame, df_MediaP2[col][df_MediaP2['frame'] == frame].v
        euclidean_distance_02 = distance.euclidean(point_1, point_2)
        euclidean_distances_02[frame].append(euclidean_distance_02)

euclidean_df_02 = pd.DataFrame.from_dict(euclidean_distances_02, orient='
euclidean_df_02.head(5)
```

Out[ ]:

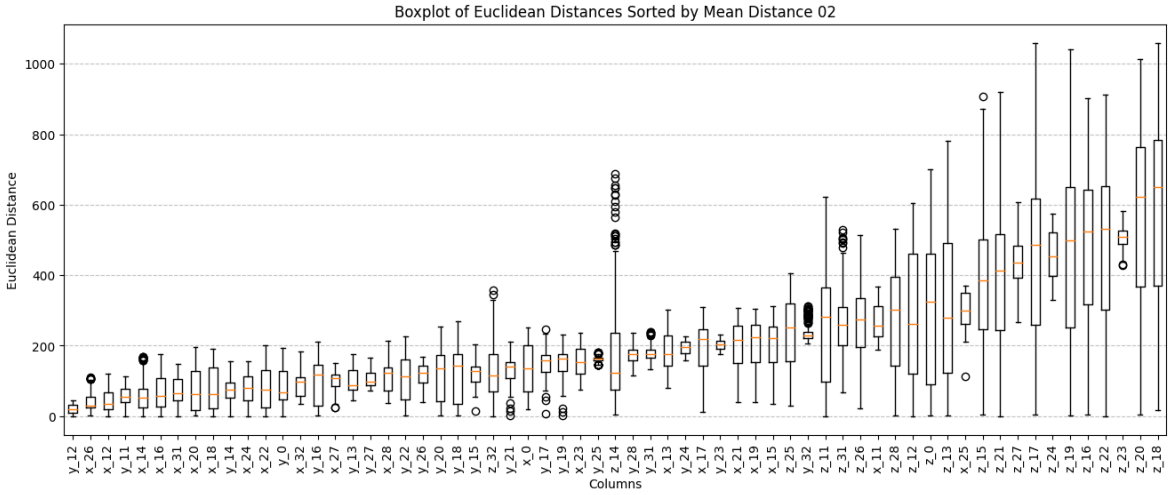
	x_0	y_0	z_0	x_11	y_11	z_11	x_12	
1	80.50884	8.62712	102.583294	204.19991	75.73850	612.477154	33.43345	3
2	77.94733	7.08524	98.897278	202.00413	75.67390	621.639808	34.80006	3
3	75.41739	4.93818	60.819862	199.83341	74.17957	609.463960	36.16155	3
4	74.19701	4.39192	41.274056	197.32713	72.01682	591.316945	37.25993	4
5	72.76259	2.55040	4.149380	195.28057	69.82888	569.920596	37.51685	4

5 rows × 63 columns

In [ ]:
```
plt.figure(figsize=(12, 6))

plt.plot(mean_values_02.index, mean_values_02["y_16"], color='darkred', l
plt.plot(df_MediaP2["frame"], df_MediaP2["y_16"], color='red', linestyle=

plt.plot(euclidean_df_02.index, euclidean_df_02["y_16"], color='indigo',

plt.title("Euclidean Distances: Rechte Hand (y_16) Vergleich Mean DeepMot
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend( loc='best')
plt.show()
```



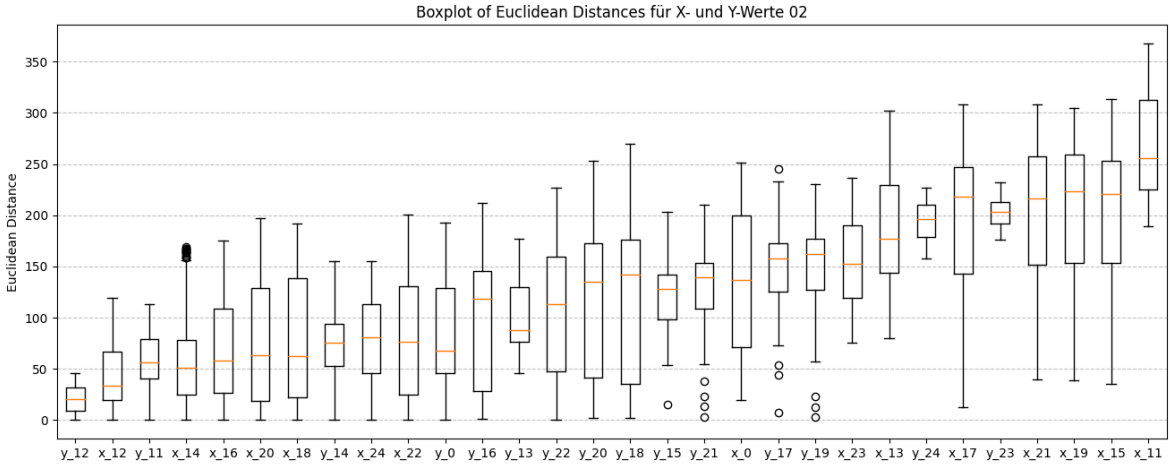
In [ ]:
```
mean_distances = euclidean_df_02.mean()
sorted_df = euclidean_df_02[mean_distances.sort_values().index]

plt.figure(figsize=(16, 6))
plt.boxplot(sorted_df.values)
plt.xticks(range(1, len(sorted_df.columns) + 1), sorted_df.columns, rotat
plt.title('Boxplot of Euclidean Distances Sorted by Mean Distance 02')
plt.xlabel('Columns')
plt.ylabel('Euclidean Distance')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



2.2.1.1 Ohne Z Werte

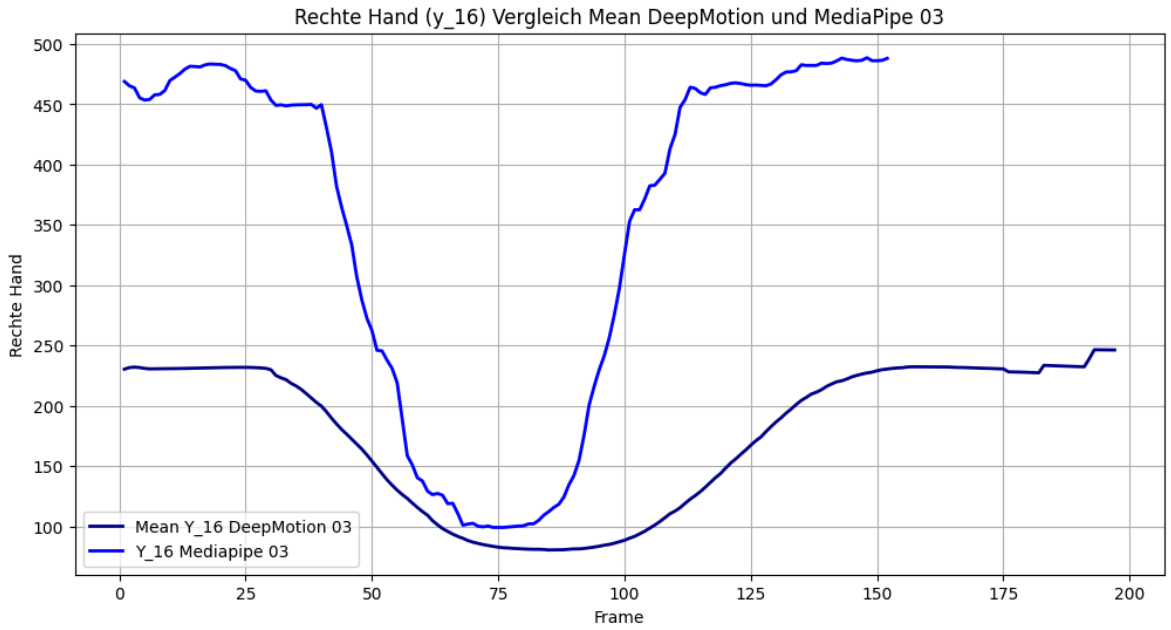
In [ ]:
```
# Definition von Kolonnen
selected_columns = ['x_0', 'x_11', 'x_12', 'x_13',
                    'x_14', 'x_15', 'x_16', 'x_17',
                    'x_18', 'x_19', 'x_20', 'x_21',
                    'x_22', 'x_23', 'x_24', 'y_0',
                    'y_11', 'y_12', 'y_13',
                    'y_14', 'y_15', 'y_16', 'y_17',
                    'y_18', 'y_19', 'y_20', 'y_21',
                    'y_22', 'y_23', 'y_24']
```

```
mean_distances = euclidean_df_02[selected_columns].mean()
sorted_df = euclidean_df_02[mean_distances.sort_values().index]

plt.figure(figsize=(16, 6))
plt.boxplot(sorted_df.values)
plt.xticks(range(1, len(sorted_df.columns) + 1), sorted_df.columns)
plt.title('Boxplot of Euclidean Distances für X- und Y-Werte 02')
plt.ylabel('Euclidean Distance')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



2.3 Nicht Kompensiert 03

In [ ]:
```
plt.figure(figsize=(12, 6))

plt.plot(mean_values_03.index, mean_values_03["y_16"], color='darkblue',
plt.plot(df_MediaP3["frame"], df_MediaP3["y_16"], color='blue', linestyle

plt.title("Rechte Hand (y_16) Vergleich Mean DeepMotion und MediaPipe 03"
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



2.3.1 Euclidean Distances

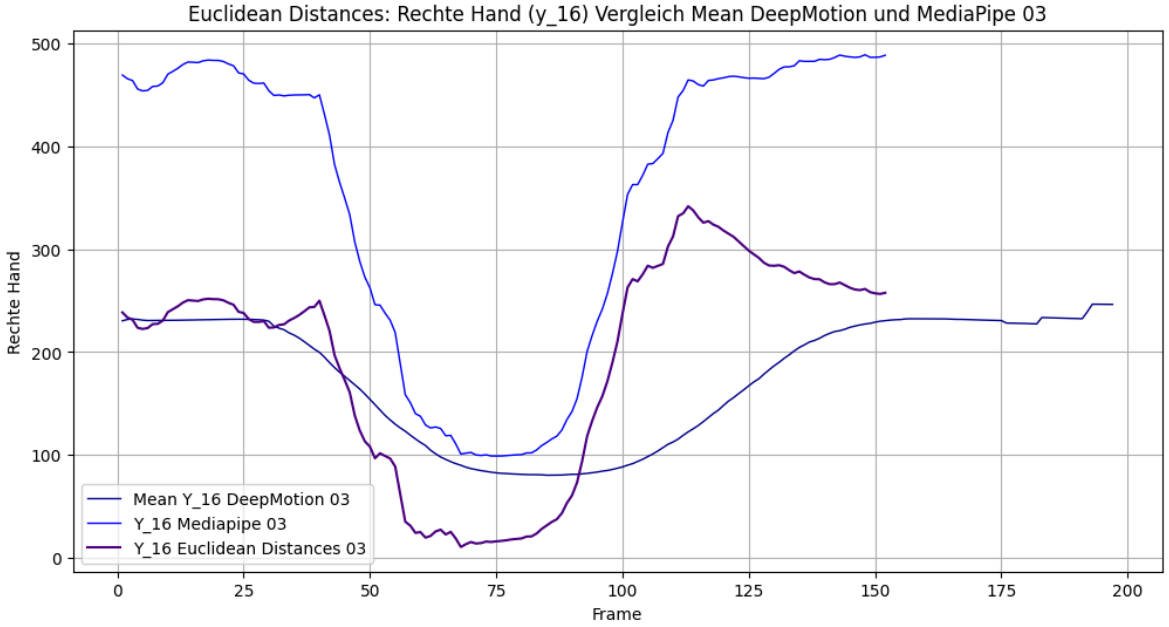
In [ ]:
```
# Definition von Kolonnen
columns = ['frame', 'x_0', 'y_0', 'z_0', 'x_11', 'y_11', 'z_11',
           'x_12', 'y_12', 'z_12', 'x_13', 'y_13', 'z_13', 'x_14', 'y_14'
           'x_16', 'y_16', 'z_16', 'x_17', 'y_17', 'z_17', 'x_18', 'y_18'
           'x_20', 'y_20', 'z_20', 'x_21', 'y_21', 'z_21', 'x_22', 'y_22'
           'x_24', 'y_24', 'z_24', 'x_25', 'y_25', 'z_25', 'x_26', 'y_26'
           'x_28', 'y_28', 'z_28', 'x_31', 'y_31', 'z_31', 'x_32', 'y_32'

# Kalkulieren von euclidean Distance
euclidean_distances_03 = {}

for frame in df_MediaP3["frame"]:
    euclidean_distances_03[frame] = []
    for col in columns[1:]:
        point_1 = (frame, mean_values_03[col].loc[frame])
        point_2 = (frame, df_MediaP3[col][df_MediaP3['frame'] == frame].v
        euclidean_distance_03 = distance.euclidean(point_1, point_2)
        euclidean_distances_03[frame].append(euclidean_distance_03)

euclidean_df_03 = pd.DataFrame.from_dict(euclidean_distances_03, orient='
euclidean_df_03.head(5)
```

Out[ ]:

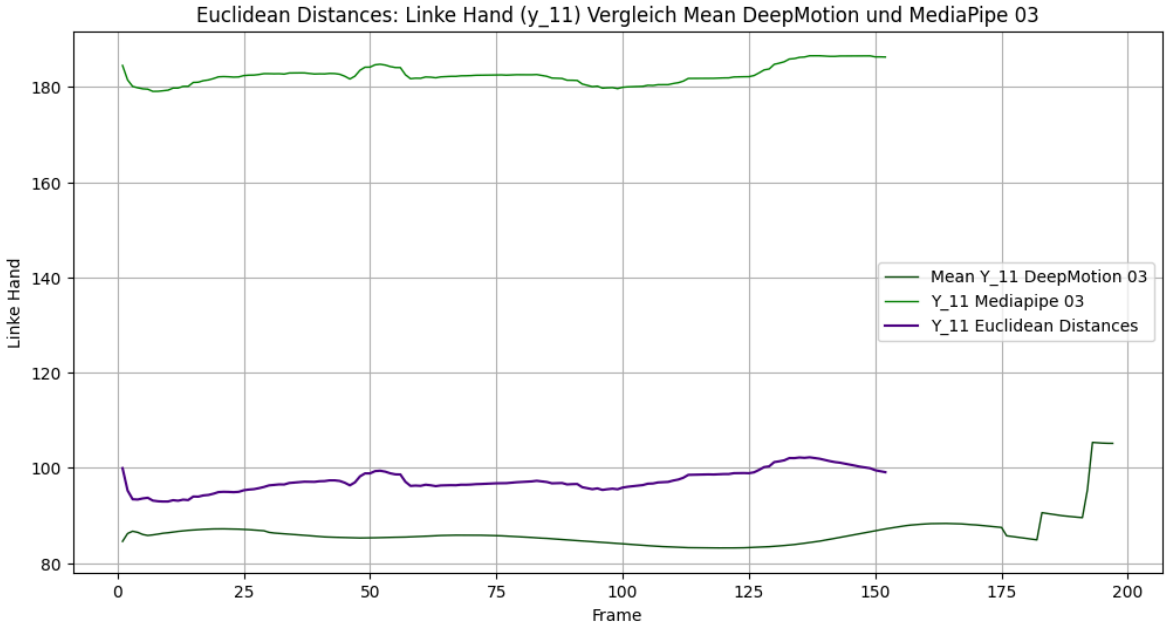
	x_0	y_0	z_0	x_11	y_11	z_11	x_12	
1	65.99356	18.27286	171.467506	49.6439	99.93474	668.763334	205.30202	7
2	67.48476	19.79484	130.008146	48.9014	95.24961	431.186842	206.08323	75
3	68.77944	20.10476	121.484736	48.5285	93.40679	434.953544	207.17242	78
4	70.54364	19.92736	2.222716	49.3687	93.34960	490.740326	208.43588	80
5	71.39090	19.31311	24.813634	49.5948	93.57797	519.740428	209.44843	83

5 rows × 63 columns

In [ ]:
```
plt.figure(figsize=(12, 6))

plt.plot(mean_values_03.index, mean_values_03["y_16"], color='darkblue',
plt.plot(df_MediaP3["frame"], df_MediaP3["y_16"], color='blue', linestyle

plt.plot(euclidean_df_03.index, euclidean_df_03["y_16"], color='indigo',

plt.title("Euclidean Distances: Rechte Hand (y_16) Vergleich Mean DeepMot
plt.xlabel("Frame")
plt.ylabel("Rechte Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```

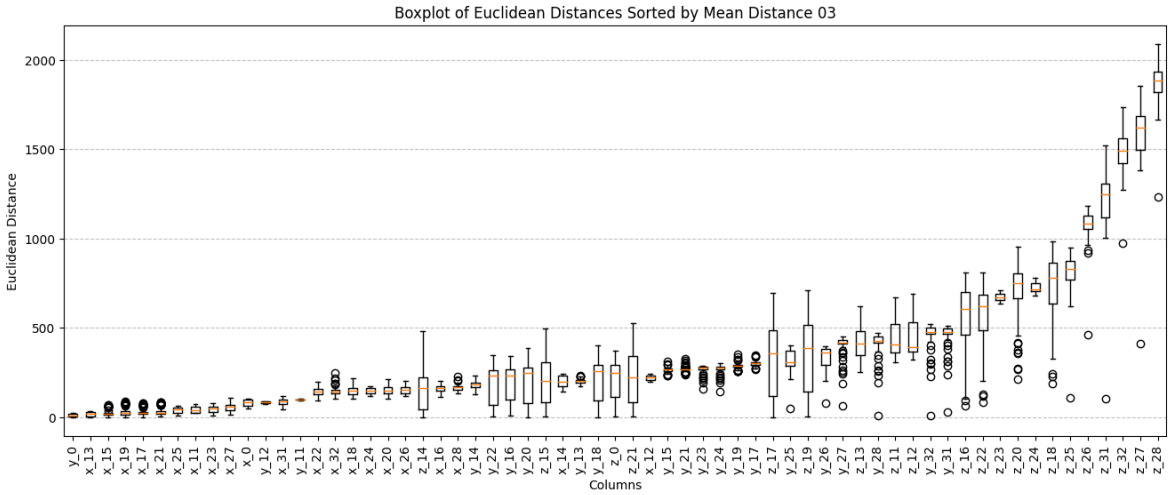


In [ ]:
```
plt.figure(figsize=(12, 6))

plt.plot(mean_values_03.index, mean_values_03["y_11"], color='#054907', l
plt.plot(df_MediaP3["frame"], df_MediaP3["y_11"], color='green', linestyl

plt.plot(euclidean_df_03.index, euclidean_df_03["y_11"], color='indigo',

plt.title("Euclidean Distances: Linke Hand (y_11) Vergleich Mean DeepMoti
plt.xlabel("Frame")
plt.ylabel("Linke Hand")
plt.grid(True)
plt.legend(loc='best')
plt.show()
```



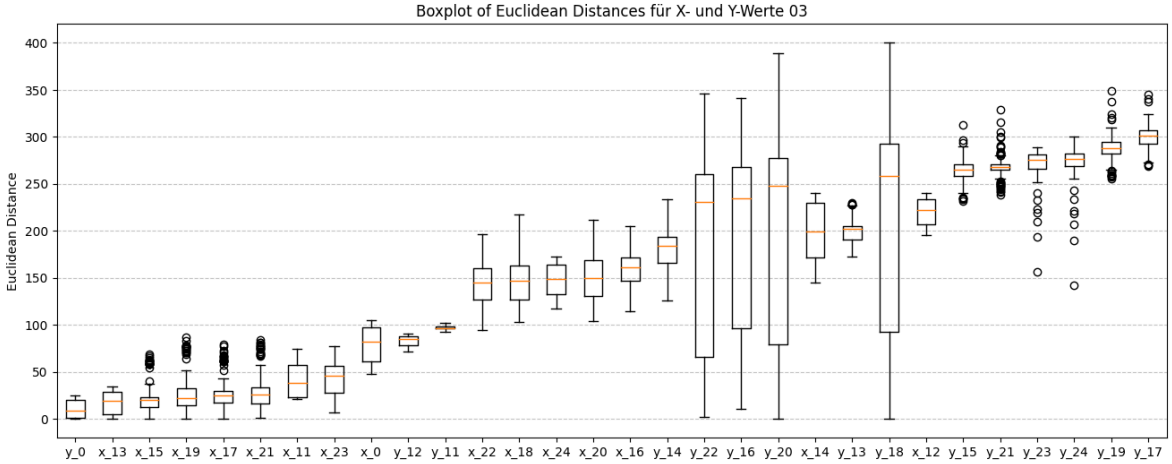
In [ ]:
```
mean_distances = euclidean_df_03.mean()
sorted_df = euclidean_df_03[mean_distances.sort_values().index]

plt.figure(figsize=(16, 6))
plt.boxplot(sorted_df.values)
plt.xticks(range(1, len(sorted_df.columns) + 1), sorted_df.columns, rotat
```

```
plt.title('Boxplot of Euclidean Distances Sorted by Mean Distance 03')
plt.xlabel('Columns')
plt.ylabel('Euclidean Distance')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



2.3.1.1 Ohne Z Werte

In [ ]:
```
# Definition von Kolonnen
selected_columns = ['x_0', 'x_11', 'x_12', 'x_13',
                    'x_14', 'x_15', 'x_16', 'x_17',
                    'x_18', 'x_19', 'x_20', 'x_21',
                    'x_22', 'x_23', 'x_24', 'y_0',
                    'y_11', 'y_12', 'y_13',
                    'y_14', 'y_15', 'y_16', 'y_17',
                    'y_18', 'y_19', 'y_20', 'y_21',
                    'y_22', 'y_23', 'y_24']

mean_distances = euclidean_df_03[selected_columns].mean()
sorted_df = euclidean_df_03[mean_distances.sort_values().index]

plt.figure(figsize=(16, 6))
plt.boxplot(sorted_df.values)
plt.xticks(range(1, len(sorted_df.columns) + 1), sorted_df.columns)
plt.title('Boxplot of Euclidean Distances für X- und Y-Werte 03')
plt.ylabel('Euclidean Distance')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```

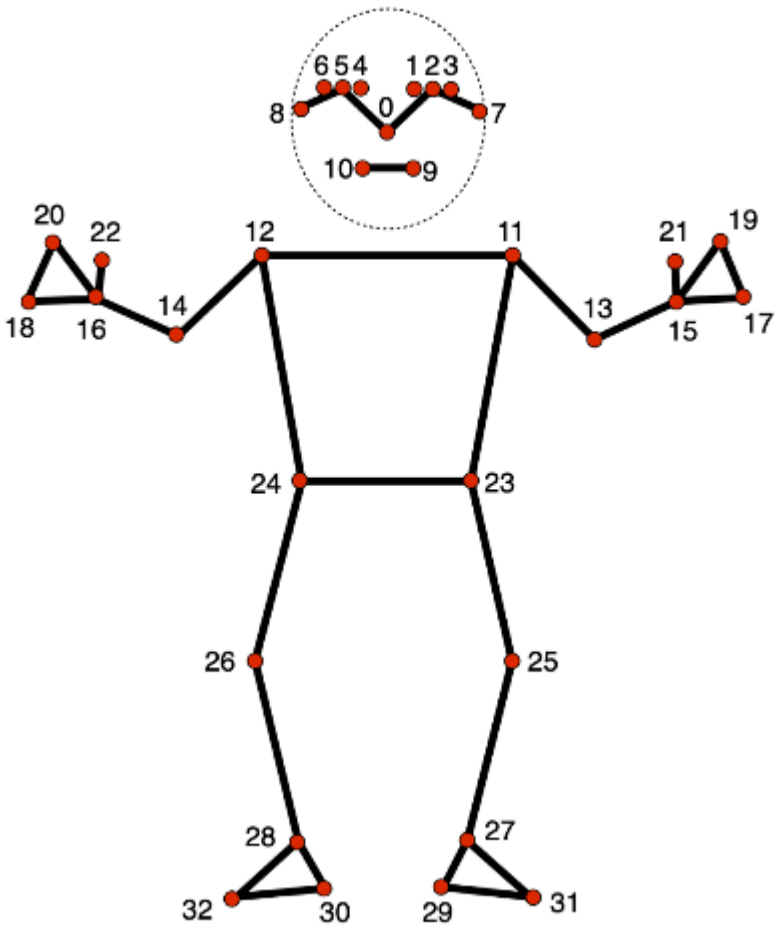


Erkenntnisse

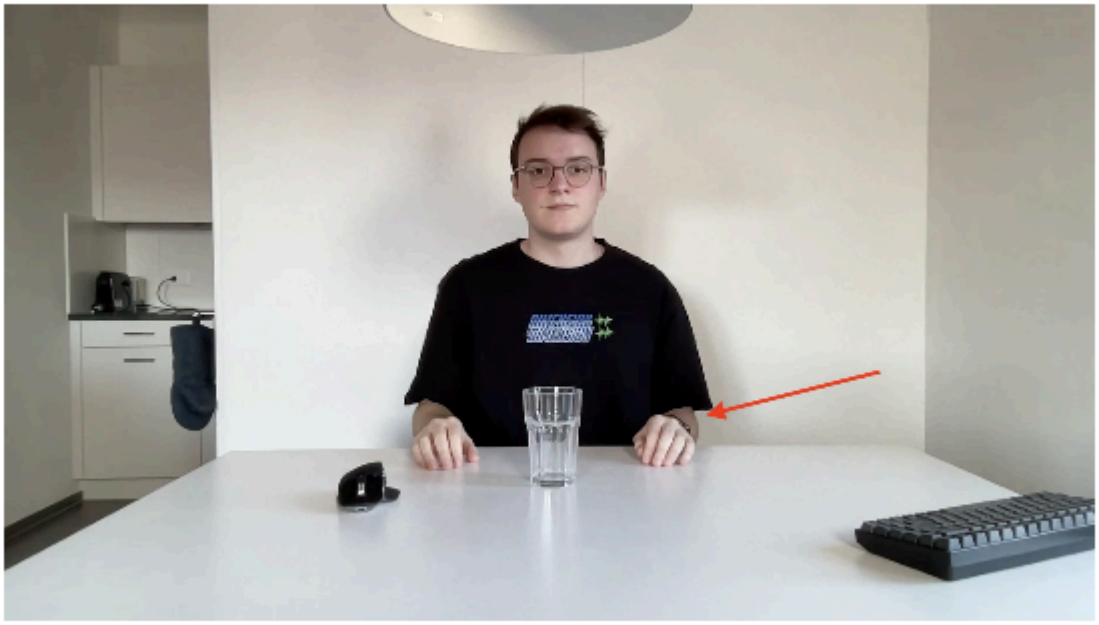
- Trinkarm ist viel ungenauer, als der ruhende Arm
- Videoaufnahmen: Arm ist wegen Shirt nicht ersichtlich
- Videoaufnahmen: Beine in Sitzposition können irritieren durch Tisch
- Z Werte können nicht verwendet werden für Analyse Performance
- Nicht Kompensierte Bewegung hat viel kleinere Ranges von Differenzen weil Bewegung sehr klar ist

3. Vergleich ganzer Oberkörper

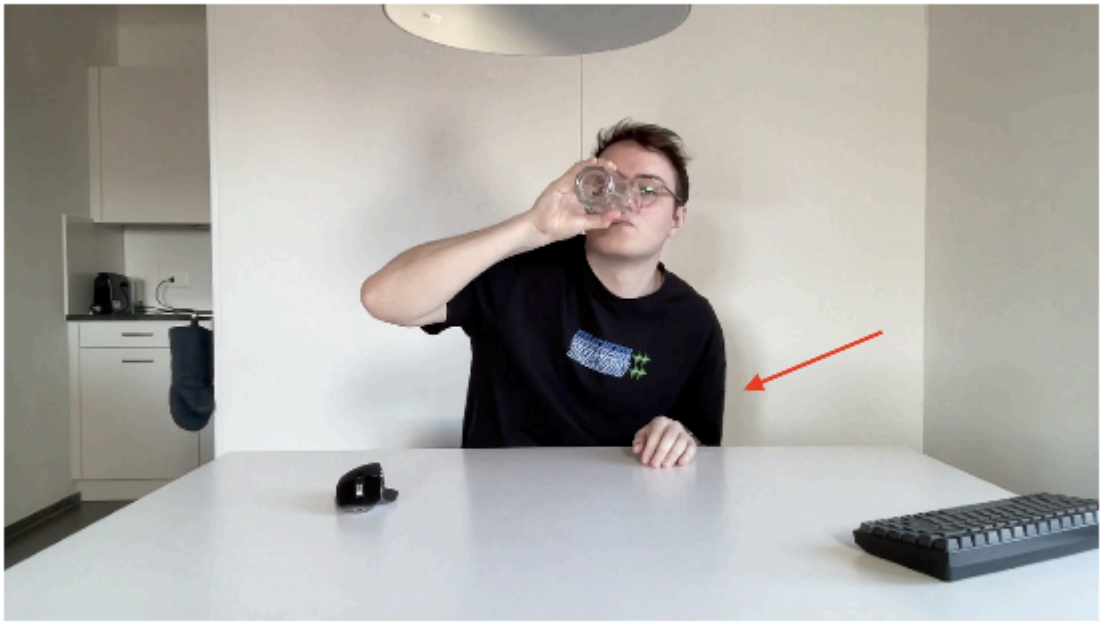
In [ ]:
```
img = plt.imread('Pictures/landmark.png')
im = OffsetImage(img, zoom=0.2)
ab = AnnotationBbox(im, (0.5, 0.5), frameon=False)
plt.gca().add_artist(ab)
plt.axis('off')
plt.show()
```



In [ ]:
```
img = plt.imread('Pictures/ausgangsposition.jpg')
im = OffsetImage(img, zoom=0.2)
ab = AnnotationBbox(im, (0.5, 0.5), frameon=False)
plt.gca().add_artist(ab)
plt.axis('off')
plt.show()
```

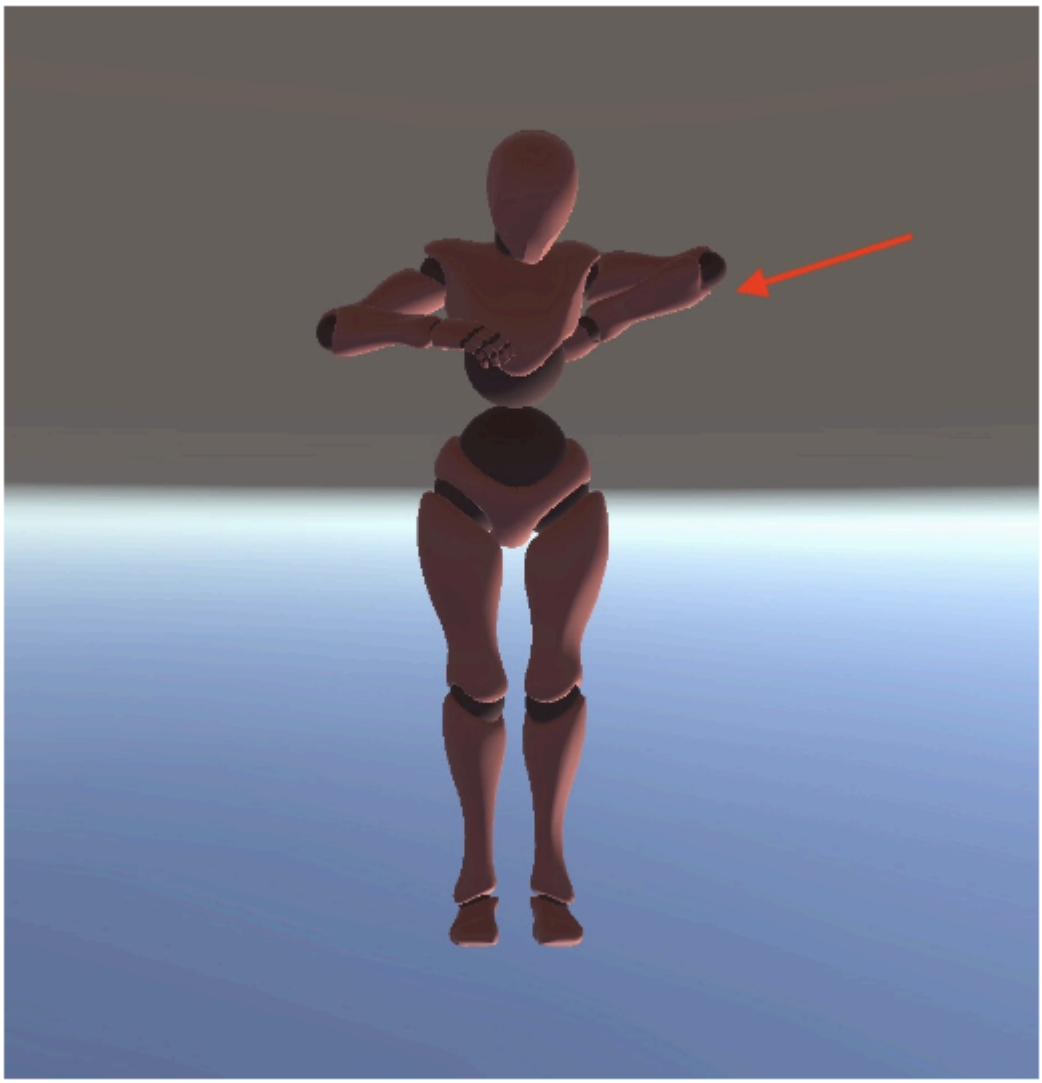


In [ ]:
```
img = plt.imread('Pictures/bewegung.jpg')
im = OffsetImage(img, zoom=0.2)
ab = AnnotationBbox(im, (0.5, 0.5), frameon=False)
plt.gca().add_artist(ab)

plt.axis('off')
plt.show()
```



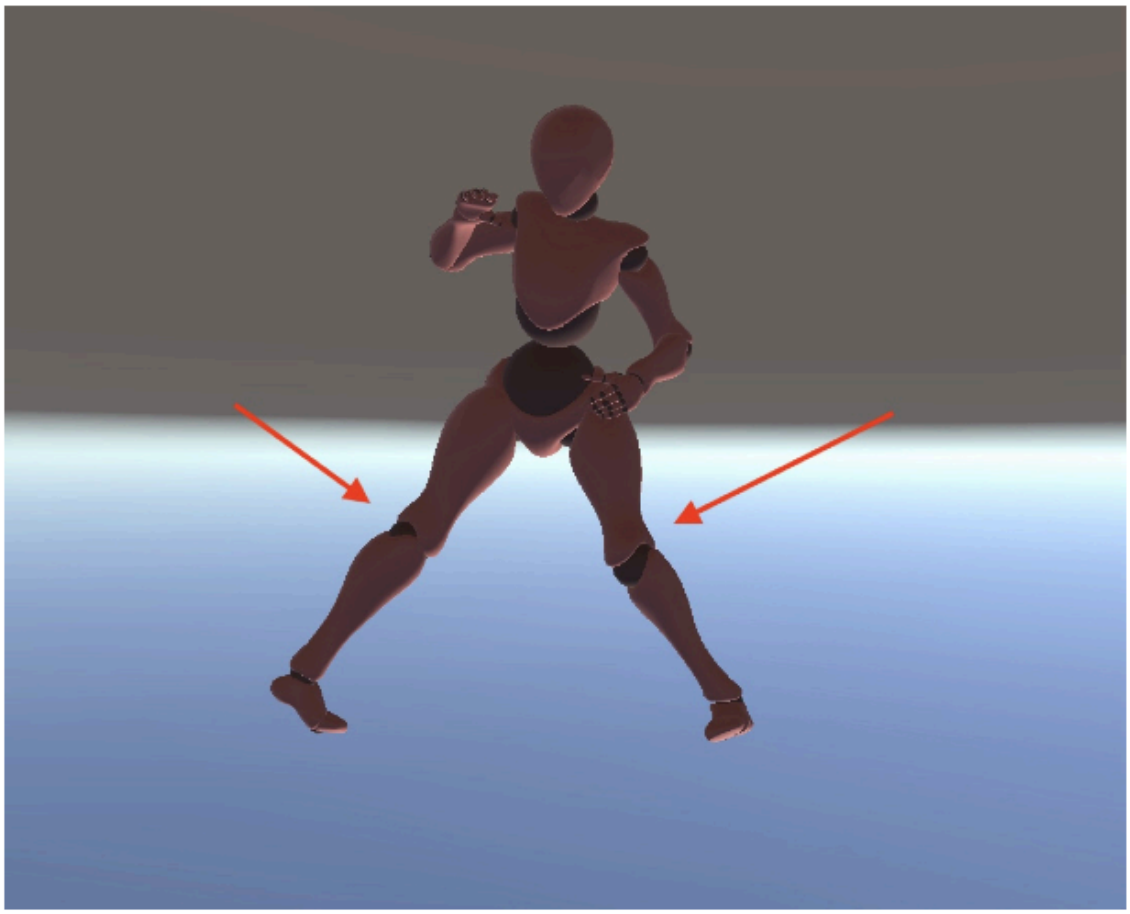
In [ ]:
```
img = plt.imread('Pictures/komp_1.jpg')
im = OffsetImage(img, zoom=0.4)
ab = AnnotationBbox(im, (0.5, 0.5), frameon=False)
plt.gca().add_artist(ab)
```

```
plt.axis('off')
plt.show()
```

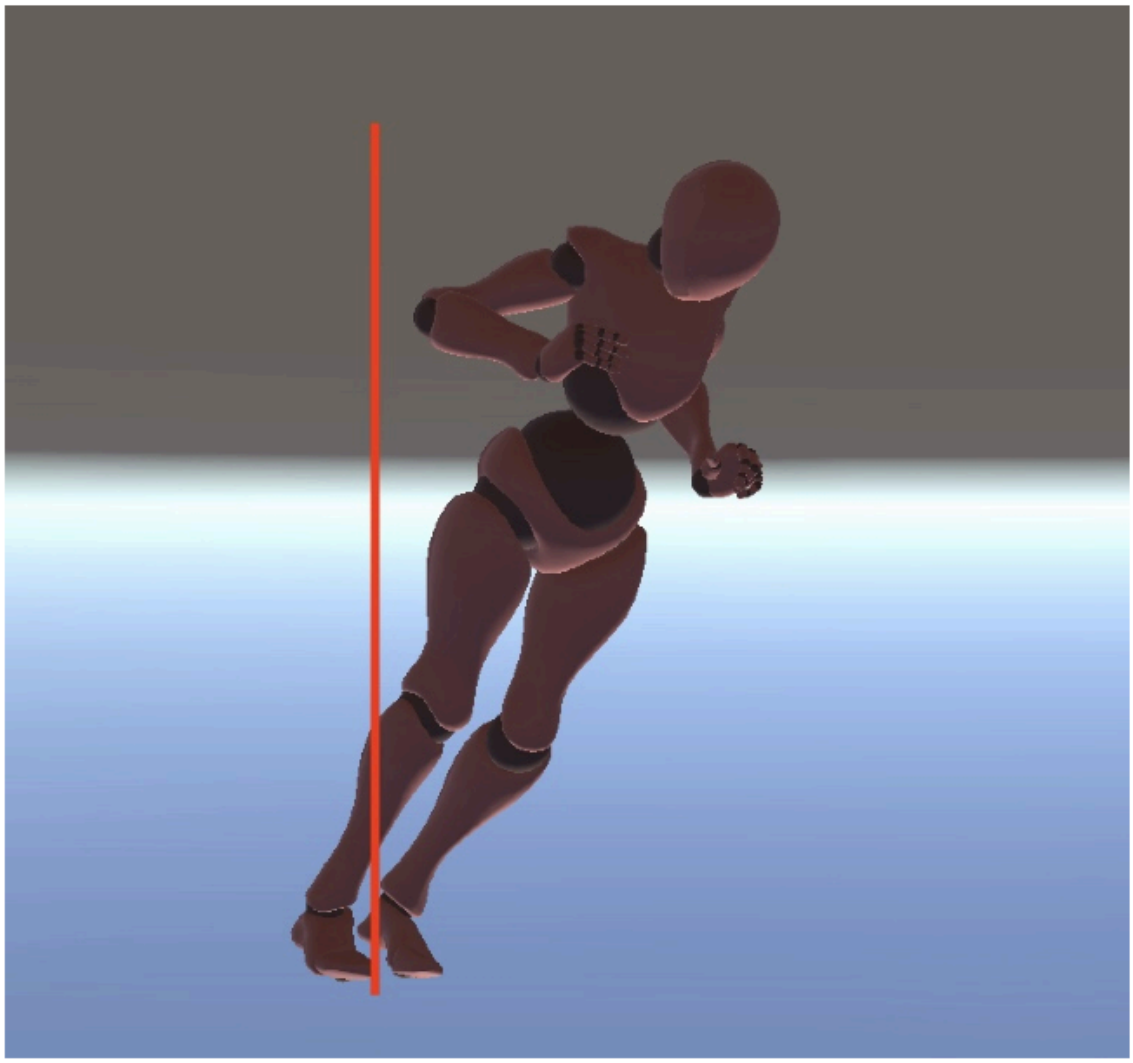


In [ ]:
```
img = plt.imread('Pictures/komp2.jpg')
im = OffsetImage(img, zoom=0.2)
ab = AnnotationBbox(im, (0.5, 0.5), frameon=False)
plt.gca().add_artist(ab)

plt.axis('off')
plt.show()
```

In [ ]:
```
img = plt.imread('Pictures/x_2.jpg')
im = OffsetImage(img, zoom=0.4)
ab = AnnotationBbox(im, (0.5, 0.5), frameon=False)
plt.gca().add_artist(ab)

plt.axis('off')
plt.show()
```



In [ ]:
```
img = plt.imread('Pictures/x_3.jpg')
im = OffsetImage(img, zoom=0.6)
ab = AnnotationBbox(im, (0.5, 0.5), frameon=False)
plt.gca().add_artist(ab)

plt.axis('off')
plt.show()
```



4. Difference in Mean Upper Body

- Jeglich die Oberarm Keypoints werden verglichen

4.1 Kompensation 01

In [ ]:
```
selected_columns = ['x_0', 'y_0', 'z_0', 'x_11', 'y_11', 'z_11',
                    'x_12', 'y_12', 'z_12', 'x_13', 'y_13', 'z_13',
                    'x_14', 'y_14', 'z_14', 'x_15', 'y_15', 'z_15',
                    'x_16', 'y_16', 'z_16', 'x_17', 'y_17', 'z_17',
                    'x_18', 'y_18', 'z_18', 'x_19', 'y_19', 'z_19',
                    'x_20', 'y_20', 'z_20', 'x_21', 'y_21', 'z_21',
                    'x_22', 'y_22', 'z_22', 'x_23', 'y_23', 'z_23',
                    'x_24', 'y_24', 'z_24']
```

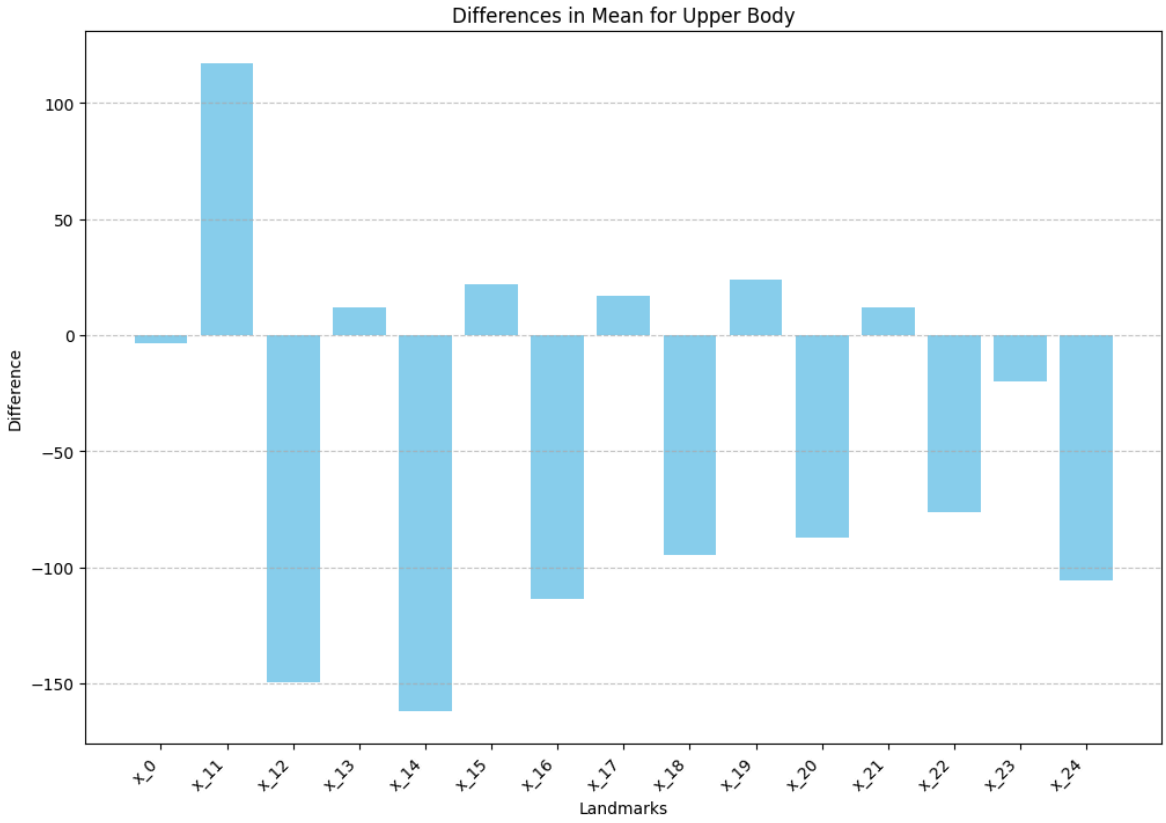
```
difference_in_mean_upper_body_01 = df_MediaP1[selected_columns].mean() -
print(f"Mean Value in DeepMotion 01: {difference_in_mean_upper_body_01}")
```

```
Mean Value in DeepMotion 01: x_0      -3.319083
y_0      73.683774
z_0    -210.642338
x_11    116.795024
y_11    146.385612
z_11    374.395101
x_12   -149.673985
y_12    104.762081
z_12    374.873850
x_13     11.958495
y_13    257.475238
z_13    353.311798
x_14   -162.232370
y_14    183.706348
z_14    133.704332
x_15     21.795657
y_15    245.967297
z_15    -91.969699
x_16   -113.446733
y_16    205.357660
z_16   -389.343679
x_17     16.749902
y_17    238.363306
z_17   -211.062132
x_18    -94.916984
y_18    212.191708
z_18   -524.594197
x_19     23.633374
y_19    226.420394
z_19   -202.265748
x_20    -87.188510
y_20    200.584724
z_20   -479.274081
x_21     11.851888
y_21    223.093311
z_21    -99.649882
x_22    -76.151072
y_22    188.579113
z_22   -382.626055
x_23    -19.884797
y_23    183.582298
z_23    957.603535
x_24   -105.803264
y_24    164.761015
z_24    970.039118
dtype: float64
```

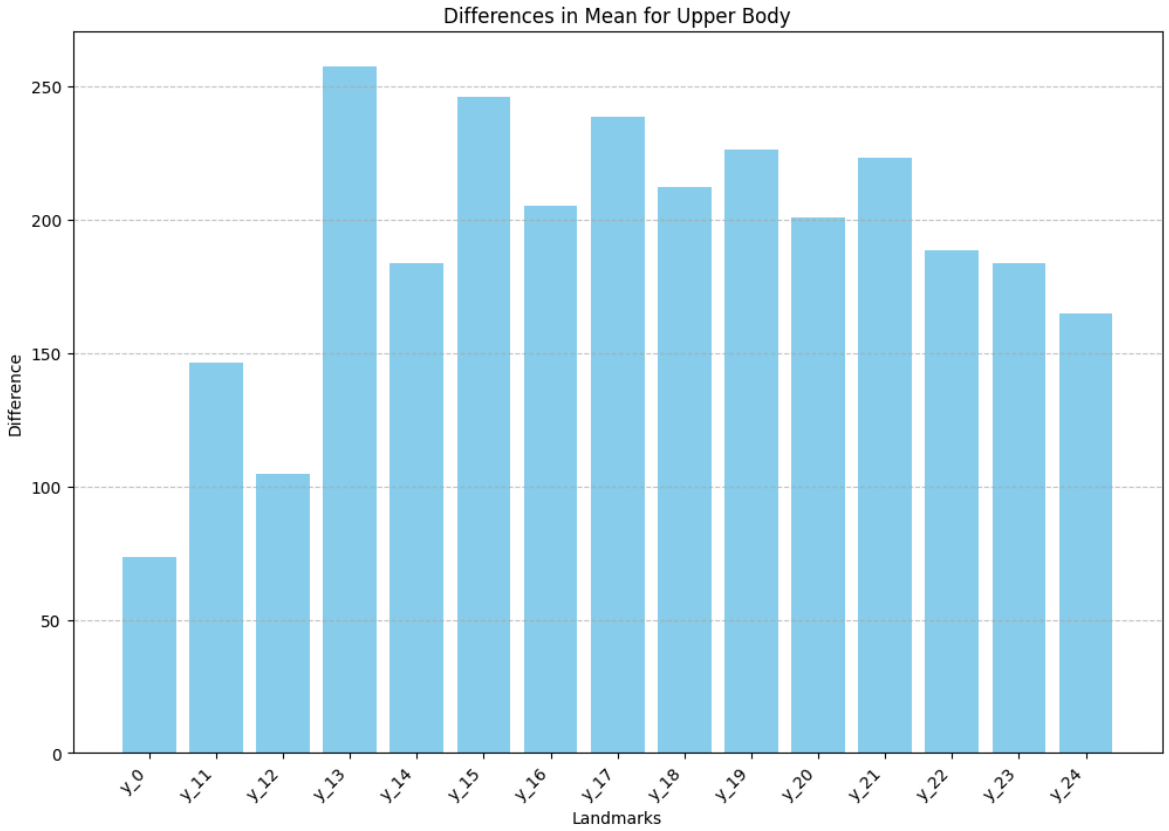
In [ ]:
```
selected_columns_X = ['x_0', 'x_11', 'x_12', 'x_13',
                      'x_14', 'x_15', 'x_16', 'x_17',
                      'x_18', 'x_19', 'x_20', 'x_21',
                      'x_22', 'x_23', 'x_24']

selected_columns_Y = ['y_0', 'y_11', 'y_12', 'y_13',
                      'y_14', 'y_15', 'y_16', 'y_17',
                      'y_18', 'y_19', 'y_20', 'y_21',
                      'y_22', 'y_23', 'y_24']
```

```
selected_columns_Z = ['z_0', 'z_11', 'z_12', 'z_13',
                      'z_14', 'z_15', 'z_16', 'z_17',
                      'z_18', 'z_19', 'z_20', 'z_21',
                      'z_22', 'z_23', 'z_24']

difference_in_mean_upper_body_01_X = difference_in_mean_upper_body_01[sel
difference_in_mean_upper_body_01_Y = difference_in_mean_upper_body_01[sel
difference_in_mean_upper_body_01_Z = difference_in_mean_upper_body_01[sel
```

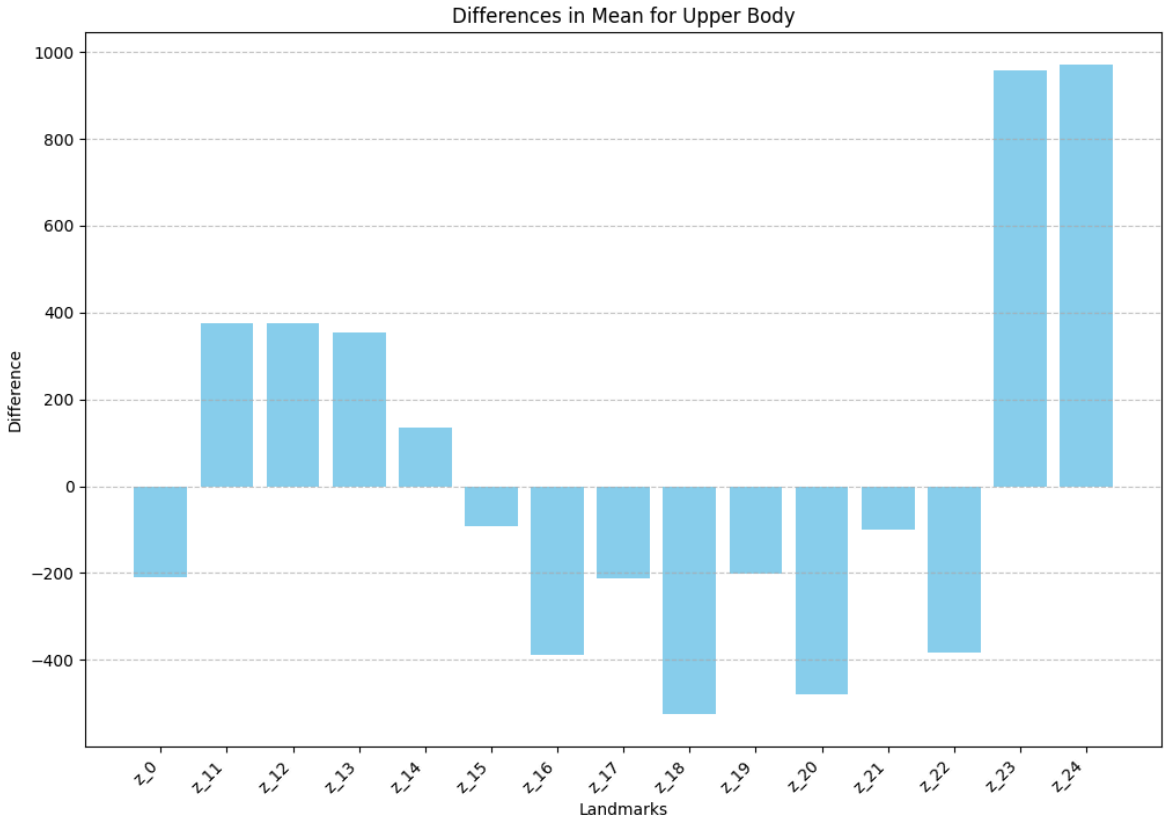
In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_01_X.index, difference_in_mean_uppe
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_01_Y.index, difference_in_mean_uppe
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_01_Z.index, difference_in_mean_uppe
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



4.2 Kompensation 02

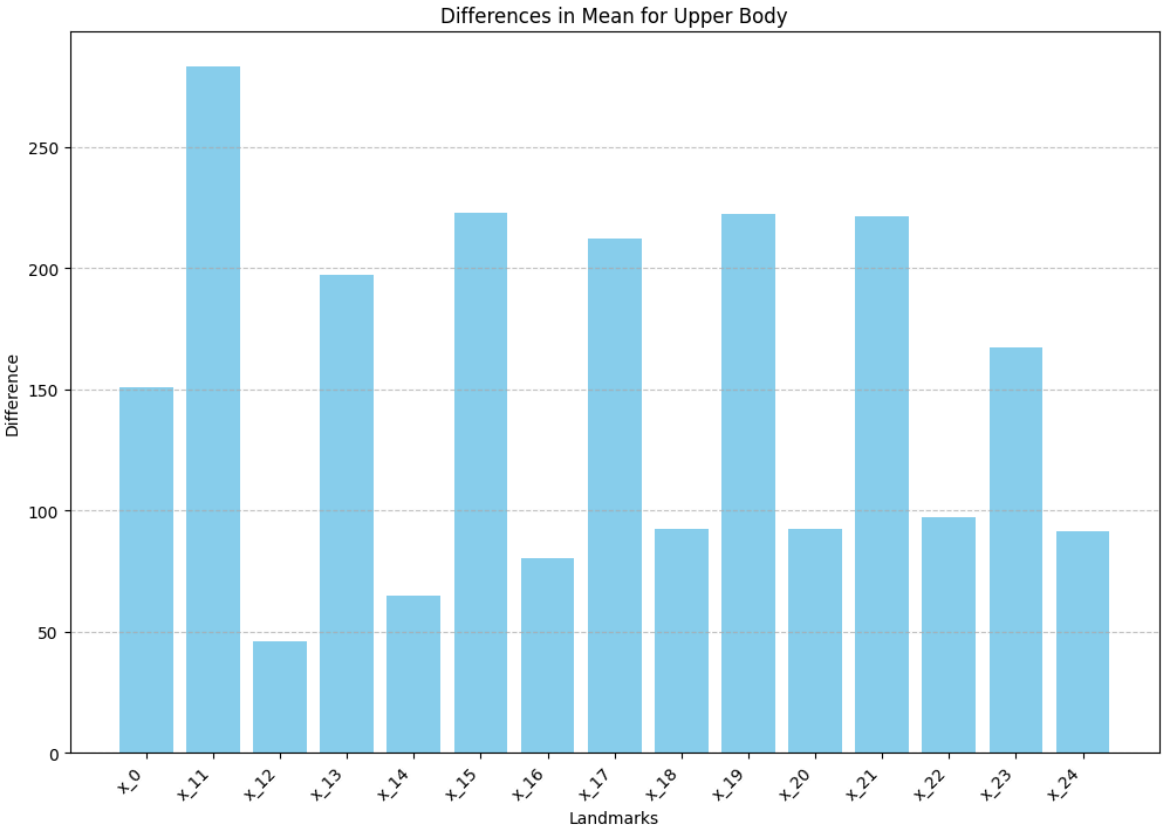
In [ ]:
```
difference_in_mean_upper_body_02 = df_MediaP2[selected_columns].mean() -
print(f"Mean Value in DeepMotion 02: {difference_in_mean_upper_body_02}")
```

```
Mean Value in DeepMotion 02: x_0     150.901215
y_0      45.595955
z_0    -227.528791
x_11    283.252751
y_11     61.692810
z_11    285.009399
x_12     46.207360
y_12     15.589027
z_12    262.641740
x_13    197.326623
y_13    102.834697
z_13    315.100115
x_14     65.072355
y_14     74.540943
z_14    132.690039
x_15    222.777897
y_15    126.753305
z_15   -184.942157
x_16     80.540867
y_16     79.985625
z_16   -418.256537
x_17    212.372087
y_17    155.749507
z_17   -296.386476
x_18     92.287134
y_18    103.080864
z_18   -534.293733
x_19    222.254899
y_19    158.058629
z_19   -341.451427
x_20     92.491910
y_20     99.587247
z_20   -536.114006
x_21    221.153078
y_21    136.507000
z_21   -220.009200
x_22     97.359988
y_22     83.443998
z_22   -434.171967
x_23    167.449638
y_23    204.225627
z_23    529.435083
x_24     91.554630
y_24    196.521203
z_24    480.946851
dtype: float64
```

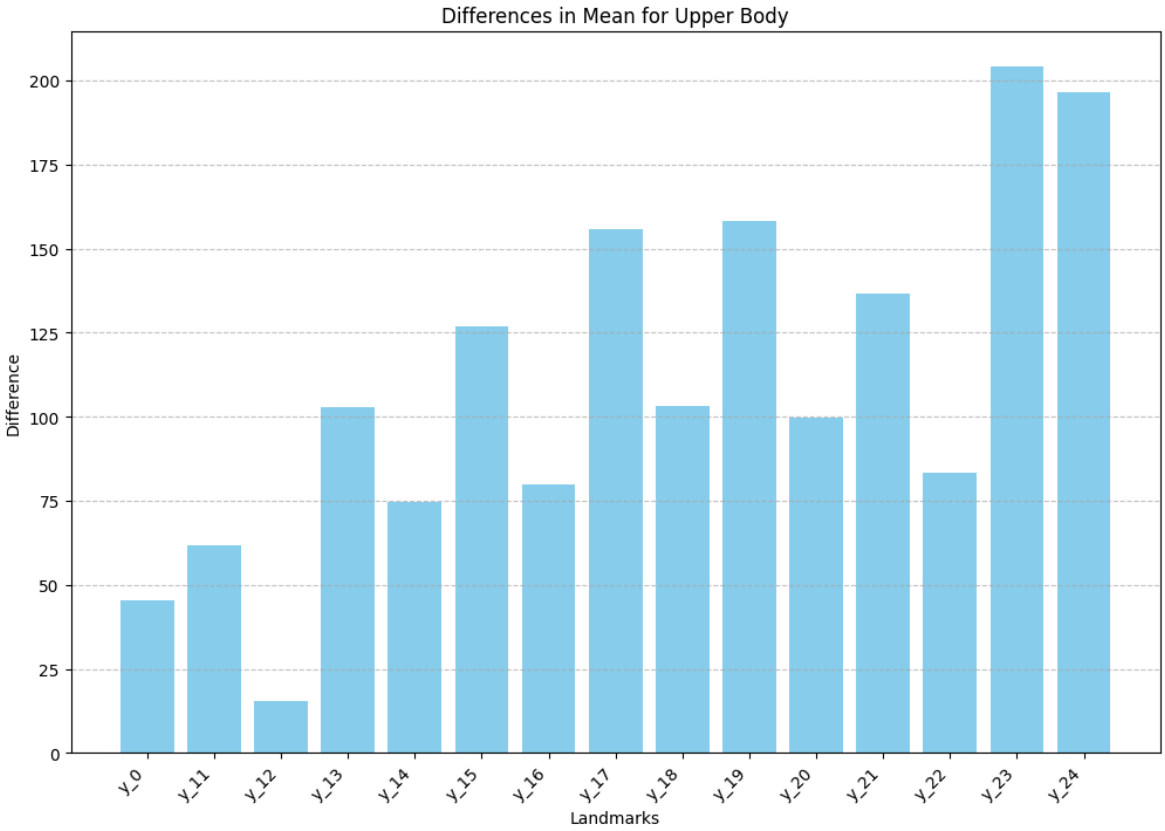
In [ ]:
```
difference_in_mean_upper_body_02_X = difference_in_mean_upper_body_02[sel
difference_in_mean_upper_body_02_Y = difference_in_mean_upper_body_02[sel
difference_in_mean_upper_body_02_Z = difference_in_mean_upper_body_02[sel
```

In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_02_X.index, difference_in_mean_uppe
```

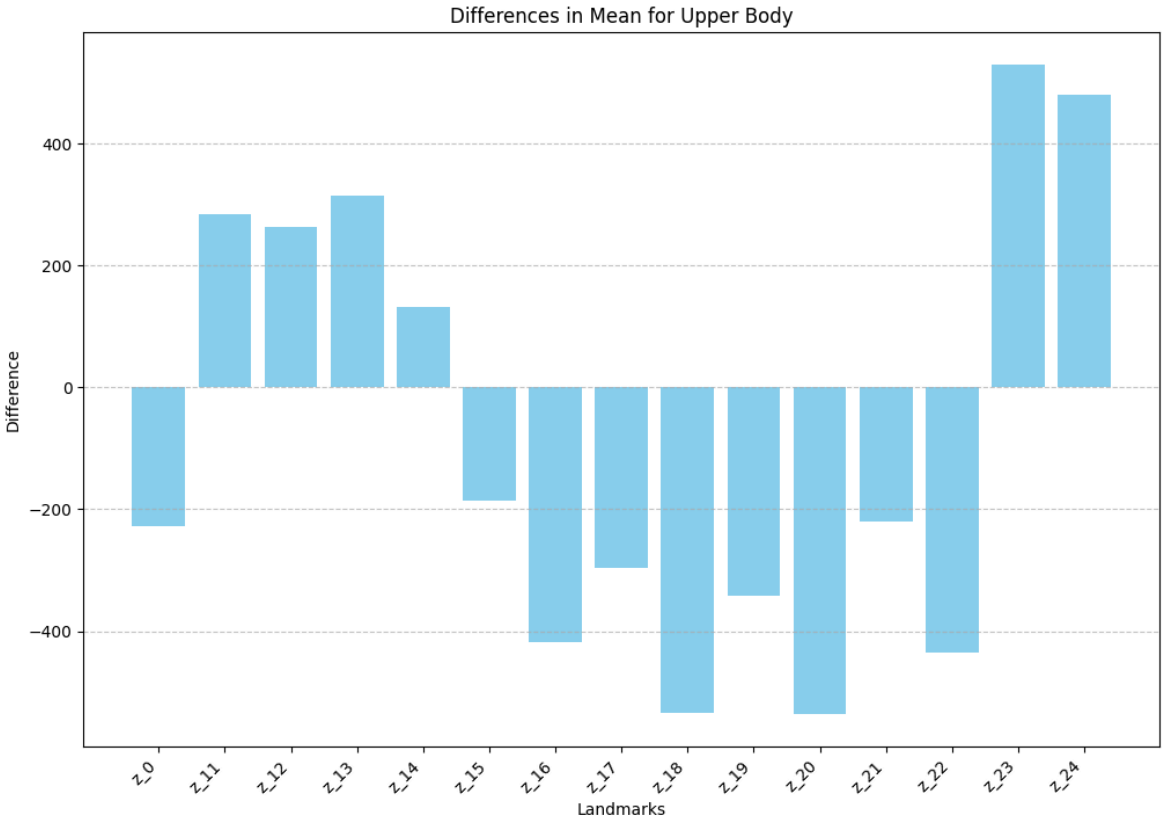
```
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_02_Y.index, difference_in_mean_uppe
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_02_Z.index, difference_in_mean_uppe
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



4.3 Nicht Kompensiert 03

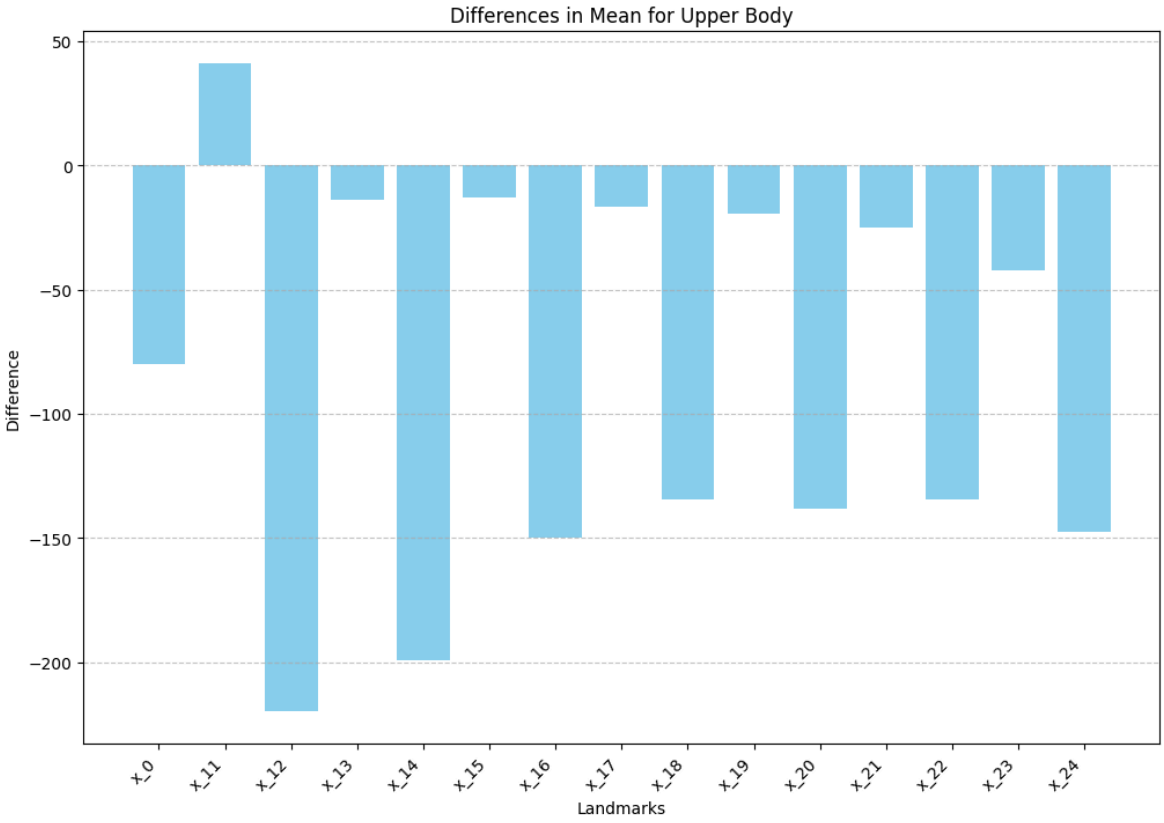
In [ ]:
```
difference_in_mean_upper_body_03 = df_MediaP3[selected_columns].mean() -
print(f"Mean Value in DeepMotion 03: {difference_in_mean_upper_body_03}")
```

```
Mean Value in DeepMotion 03: x_0     -79.727432
y_0     -12.878601
z_0    -215.486841
x_11     40.958609
y_11     96.163076
z_11    421.896135
x_12   -219.902243
y_12     81.928650
z_12    427.840876
x_13    -13.864860
y_13    199.769663
z_13    411.117255
x_14   -198.952793
y_14    176.548532
z_14    145.939174
x_15    -12.935756
y_15    265.261322
z_15   -157.637703
x_16   -149.607376
y_16    174.598473
z_16   -581.207535
x_17    -16.636216
y_17    298.852667
z_17   -310.012186
x_18   -134.422691
y_18    188.485895
z_18   -749.404108
x_19    -19.505289
y_19    286.740996
z_19   -335.861554
x_20   -138.045069
y_20    176.511838
z_20   -732.746303
x_21    -25.007999
y_21    268.128056
z_21   -187.053607
x_22   -134.235969
y_22    157.867234
z_22   -592.268149
x_23    -42.196064
y_23    270.904955
z_23    667.807884
x_24   -147.509207
y_24    273.400205
z_24    721.503507
dtype: float64
```

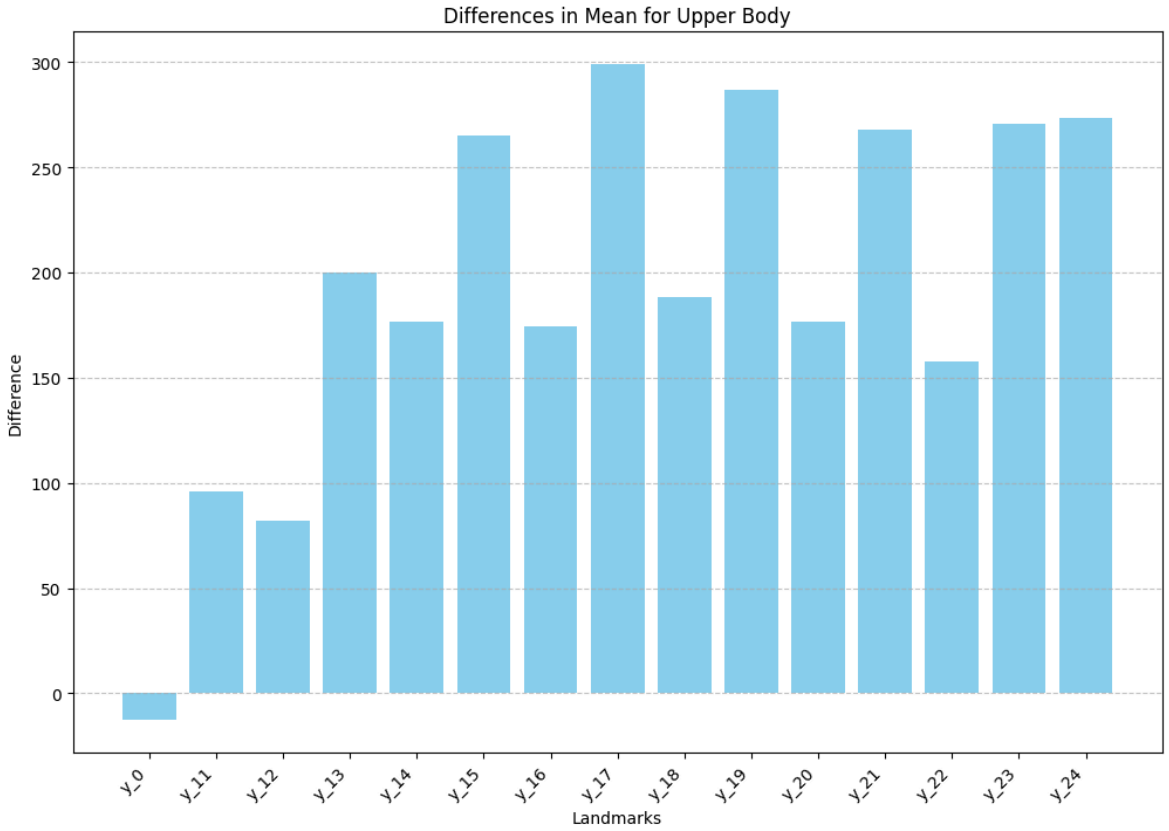
In [ ]:
```
difference_in_mean_upper_body_03_X = difference_in_mean_upper_body_03[sel
difference_in_mean_upper_body_03_Y = difference_in_mean_upper_body_03[sel
difference_in_mean_upper_body_03_Z = difference_in_mean_upper_body_03[sel
```

In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_03_X.index, difference_in_mean_uppe
```

```
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_03_Y.index, difference_in_mean_uppe
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```



In [ ]:
```
plt.figure(figsize=(12, 8))
plt.bar(difference_in_mean_upper_body_03_Z.index, difference_in_mean_uppe
plt.title('Differences in Mean for Upper Body')
plt.xlabel('Landmarks')
plt.ylabel('Difference')
plt.xticks(rotation=45, ha='right')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.show()
```