Running Workout Statistics and Graphs

```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import time

# plt.style.use('bmh')

start = time.perf_counter()
```

```python
df = pd.read_csv('HeartWatch-Workouts-20230718-to-20230818.csv')
```

```python
df = df.drop(['ISO', 'from', 'to', 'rpe', 'Load', 'bpm-lo', 'bpm-90%+-%', '90%+-mins',
              'bpm-80-90%-%', '80-90%-mins','bpm-70-80%-%', '70-80%-mins','bpm-60-70%-%',
              '60-70%-mins','bpm-50-60%-%', '50-60%-mins'], axis=1)

df['Duration'] = pd.to_timedelta(df['Duration'])
df['/km'] = pd.to_timedelta(df['/km'])

# Drop Run w/ Bear
df = df.drop(19)

# df.head()
```

```python
dfRun = df[df['Type'] == 'Running']
dfBike = df[df['Type'] == 'Cycling']
dfOther = df[~df['Type'].isin(['Running', 'Cycling'])]

# print(dfRun.info())
# print(dfBike.info())
# print(dfOther.head())
```

```
dfRun.tail()
```

	Date	Duration	Type	bpm-Avg.	bpm-%	bpm-hi	Cals	Cals/h	km	kn
17	Friday, Aug 11	0 days 00:39:03	Running	148.2	77.4	161.0	434.2	667.1	5.14	7.9
20	Tuesday, Aug 15	0 days 01:08:11	Running	151.3	79.0	177.0	792.8	697.6	9.22	8.
23	Thursday, Aug 17	0 days 00:41:24	Running	157.9	82.4	189.0	498.9	723.0	6.12	8.9
24	Friday, Aug 18	0 days 00:49:30	Running	139.7	72.9	162.0	550.8	667.5	6.64	8.0
25	Friday, Aug 18	0 days 00:49:51	Running	148.9	77.7	170.0	591.6	712.0	7.09	8.

```
# Pace Calculation
# Calculate the total seconds of Duration column
total_seconds = dfRun['Duration'].dt.total_seconds()

# Average Pace from M/S
mps = dfRun['km'].sum()*1000 / total_seconds.sum()
kph = mps * 3.6
mpk = 60 / kph

integer_part = int(mpk)
decimal_part = mpk - integer_part

# Convert decimal part to minutes by dividing by 60
decimal_minutes = round(decimal_part * 60,0)
```

```
# Weighted HR
dfRunWght = dfRun

# Convert the time delta to decimal hours and create a new column
dfRunWght["Duration"] = dfRunWght["Duration"].apply(lambda x: x.total_seconds() / 3600)
dfRunWght['Weighted HR'] = dfRunWght['Duration'] * dfRunWght['bpm-Avg.']
```

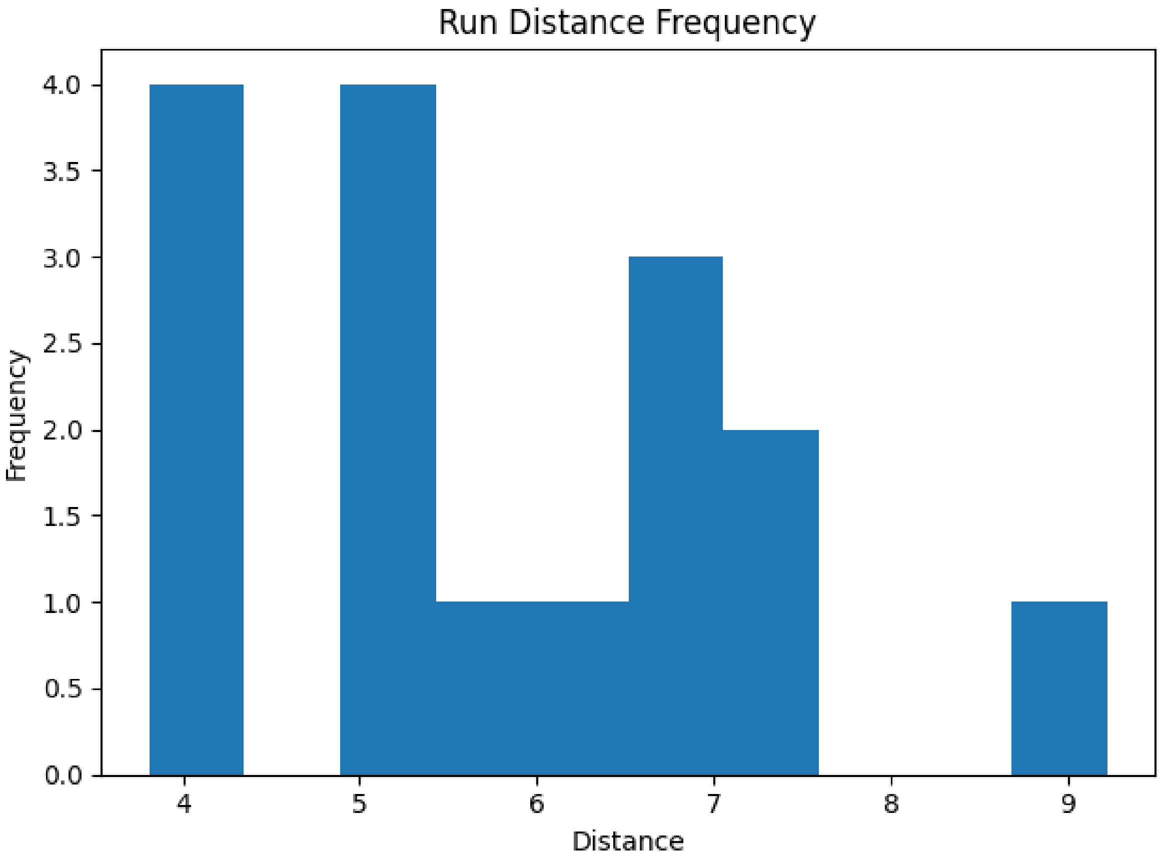
```
/var/folders/y_/8cmvsg791ys9qqbzj_yxrlj40000gn/T/ipykernel_14278/2394796668.py:5: SettingWit
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guid
  dfRunWght["Duration"] = dfRunWght["Duration"].apply(lambda x: x.total_seconds() / 3600)
/var/folders/y_/8cmvsg791ys9qqbzj_yxrlj40000gn/T/ipykernel_14278/2394796668.py:6: SettingWit
A value is trying to be set on a copy of a slice from a DataFrame.
```

```
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide
  dfRunWght['Weighted HR'] = dfRunWght['Duration'] * dfRunWght['bpm-Avg.']
```

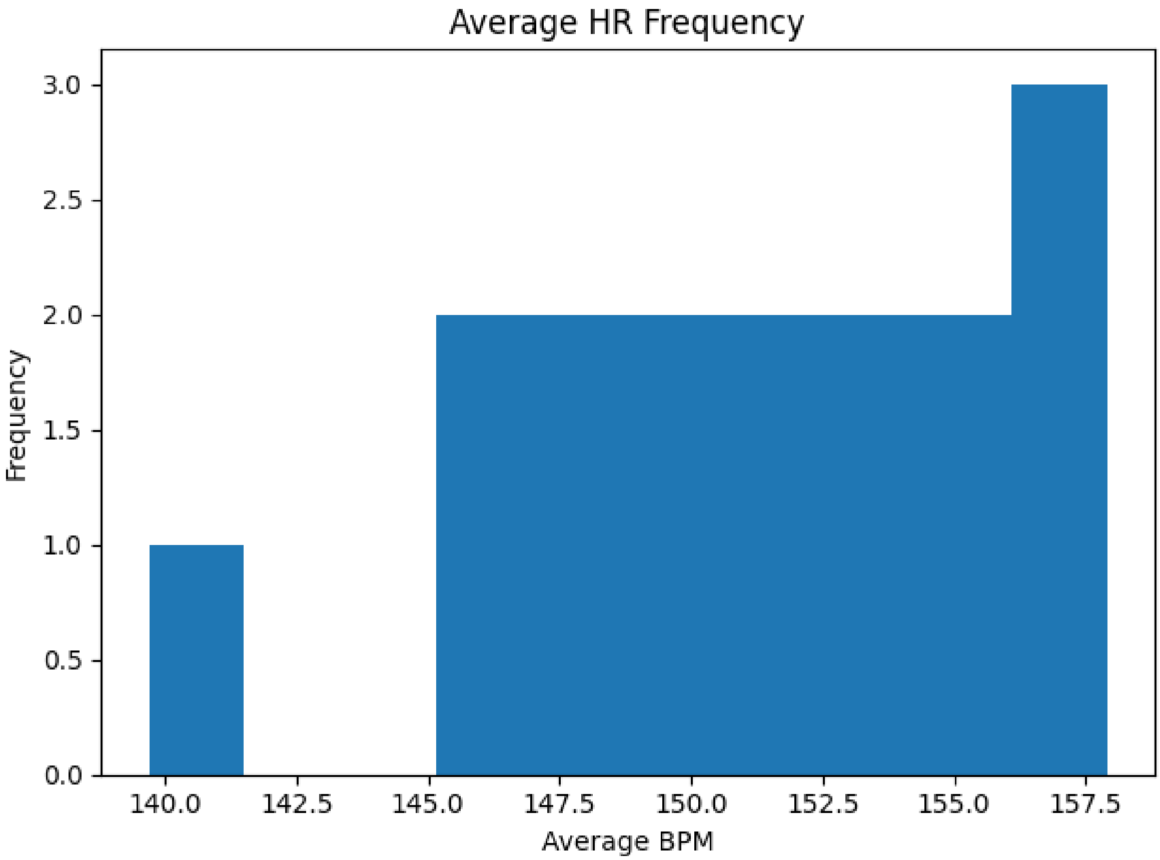
```
# Average Duration, Distance, Average HR, Average Max HR Average Calories
avg_dist = round(dfRun['km'].mean(),2)
avg_hr = round(dfRun['bpm-Avg.'].mean(),2)
avg_wght_hr = round(dfRunWght['Weighted HR'].sum() / dfRunWght['Duration'].sum(),2)
avg_maxhr = round(dfRun['bpm-hi'].mean(),2)
avg_cals = round(dfRun['Cals'].mean(),2)
avg_dur = dfRun['Duration'].mean()

# Count Runs
num_runs = dfRun['km'].count()
ovr_5k = dfRun[dfRun['km'] >=5].count()['km']
povr_5k = round(ovr_5k / num_runs *100,2)
ovr_10k = dfRun[dfRun['km'] >=10].count()['km']
povr_10k = round(ovr_10k / num_runs *100,2)

# Maximums
max_dur = dfRun['Duration'].max()
max_dist = dfRun['km'].max()
max_avghr = dfRun['bpm-Avg.'].max()
max_maxhr = dfRun['bpm-hi'].max()
max_cals = dfRun['Cals'].max()

# Totals
tot_dist = round(dfRun['km'].sum(),2)
tot_dur = dfRun['Duration'].sum()
tot_cals = round(dfRun['Cals'].sum(),2)

# Durations to Time Format
avg_dur_h = int(avg_dur)
max_dur_h = int(max_dur)
tot_dur_h = int(tot_dur)

avg_dur_m_dec = (avg_dur - avg_dur_h)*60
max_dur_m_dec = (max_dur - max_dur_h)*60
tot_dur_m_dec = (tot_dur - tot_dur_h)*60
```

```
avg_dur_m = int(avg_dur_m_dec)
max_dur_m = int(max_dur_m_dec)
tot_dur_m = int(tot_dur_m_dec)

avg_dur_s = int((avg_dur_m_dec - avg_dur_m)*60)
max_dur_s = int((max_dur_m_dec - max_dur_m)*60)
tot_dur_s = int((tot_dur_m_dec - tot_dur_m)*60)

avg_dur_f = str(avg_dur_h) + ':' + str(avg_dur_m) + ':' + str(avg_dur_s)
max_dur_f = str(max_dur_h) + ':' + str(max_dur_m) + ':' + str(max_dur_s)
tot_dur_f = str(tot_dur_h) + ':' + str(tot_dur_m) + ':' + str(tot_dur_s)
```

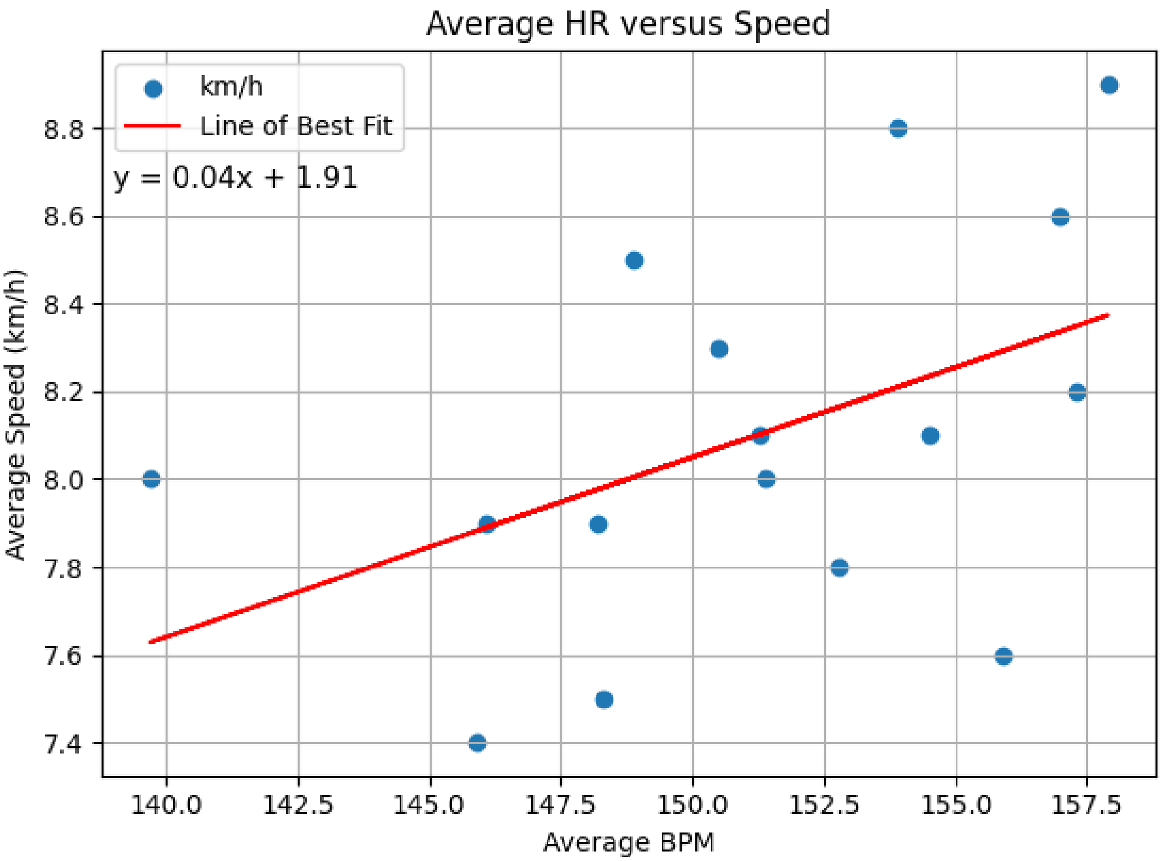
```
plt.hist(dfRun['km'])
plt.title('Run Distance Frequency')
plt.xlabel('Distance')
plt.ylabel('Frequency')
# plt.xticks(rotation=45)
plt.tight_layout()
plt.savefig('Graphs/Distance Frequency.png', dpi=300)
plt.show()
```



```
plt.hist(dfRun['bpm-Avg.'])
plt.title('Average HR Frequency')
plt.xlabel('Average BPM')
plt.ylabel('Frequency')
# plt.xticks(rotation=45)
plt.tight_layout()
plt.savefig('Graphs/HR Frequency.png', dpi=300)
plt.show()
```



```
# Line of Best Fit
# Fit a linear regression line to the data
degree = 1
coefficients = np.polyfit(dfRun['bpm-Avg.'], dfRun['km/h'], degree)
slope = coefficients[0]
intercept = coefficients[1]
# Calculate the predicted y-values using the line equation
predicted_y = slope * dfRun['bpm-Avg.'] + intercept
equation = f'y = {slope:.2f}x + {intercept:.2f}'

# Plot
plt.scatter('bpm-Avg.', 'km/h', data=dfRun)
plt.plot(dfRun['bpm-Avg.'], predicted_y, color='red', label='Line of Best Fit')
plt.xlabel('Average BPM')
plt.ylabel('Average Speed (km/h)')
plt.title('Average HR versus Speed')
plt.text(0.01, 0.81, equation, fontsize=11, transform=plt.gca().transAxes)
plt.grid(True)
plt.legend()
plt.tight_layout()
plt.savefig('Graphs/SpeedvsHR.png', dpi=300)
plt.show()
```



```
print(f'Runs: {num_runs}')
print(f'Runs over 5k(%): {ovr_5k} ({povr_5k}%)')
print(f'Runs over 10k(%): {ovr_10k} ({povr_10k}%)')


print('----------------------------')
print(f'Average Duration: {avg_dur_f}')
print(f'Average Distance: {avg_dist}')
```

```python
print(f"Average Pace: {integer_part}:{decimal_minutes}")
print(f'Average Weighted HR: {avg_wght_hr}')
print(f'Average HR: {avg_hr}')
print(f'Average Max HR: {avg_maxhr}')
print(f'Average Calories: {avg_cals}')

print('----------------------------')
print(f'Max Duration: {max_dur_f}')
print(f'Max Distance: {max_dist}')
print(f'Max Average HR: {max_avghr}')
print(f'Max Max HR: {max_maxhr}')
print(f'Max Calories: {max_cals}')

print('----------------------------')
print(f'Total Duration: {tot_dur_f}')
print(f'Total Distance: {tot_dist}')
print(f'Total Calories Burn: {tot_cals}')

print('----------------------------')
print(f'Runtime: {round(time.perf_counter() - start,2)}s')
```

```
Runs: 16
Runs over 5k(%): 12 (75.0%)
Runs over 10k(%): 0 (0.0%)
----------------------------
Average Duration: 0:43:5
Average Distance: 5.81
Average Pace: 7:25.0
Average Weighted HR: 150.6
Average HR: 151.23
Average Max HR: 169.06
Average Calories: 475.62
----------------------------
Max Duration: 1:8:11
Max Distance: 9.22
Max Average HR: 157.9
Max Max HR: 189.0
Max Calories: 792.8
----------------------------
Total Duration: 11:29:34
Total Distance: 92.96
Total Calories Burn: 7609.9
```

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Runtime: 0.83s
```