

EDA test

Jamie Forth

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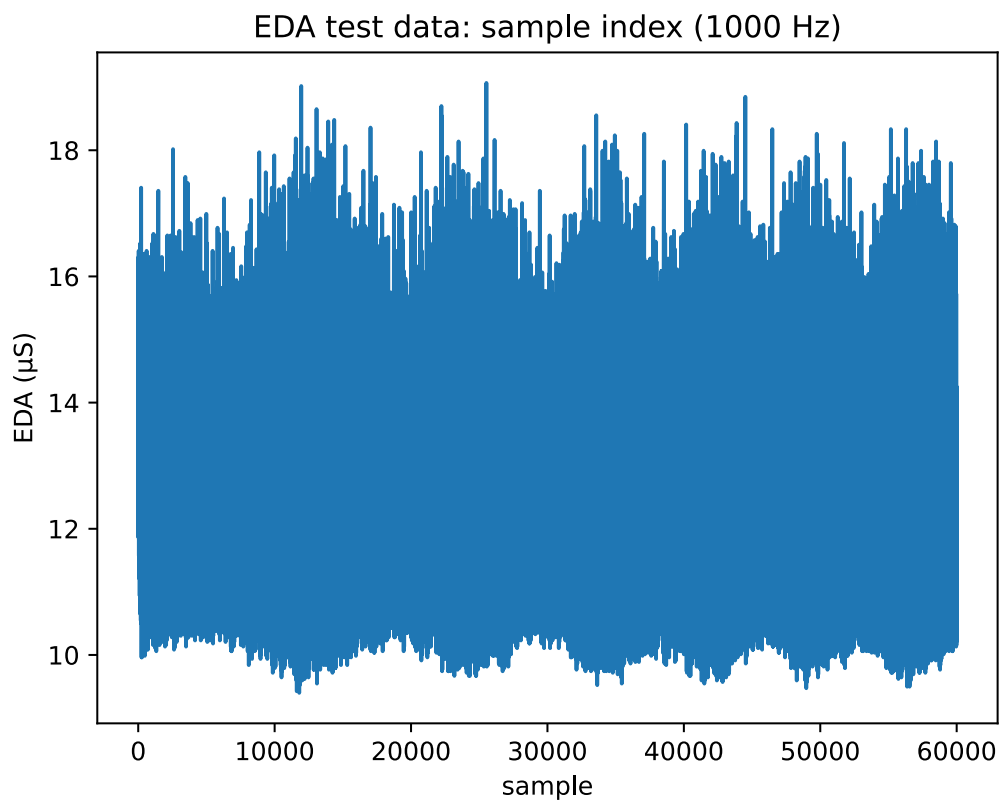
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1 Raw data

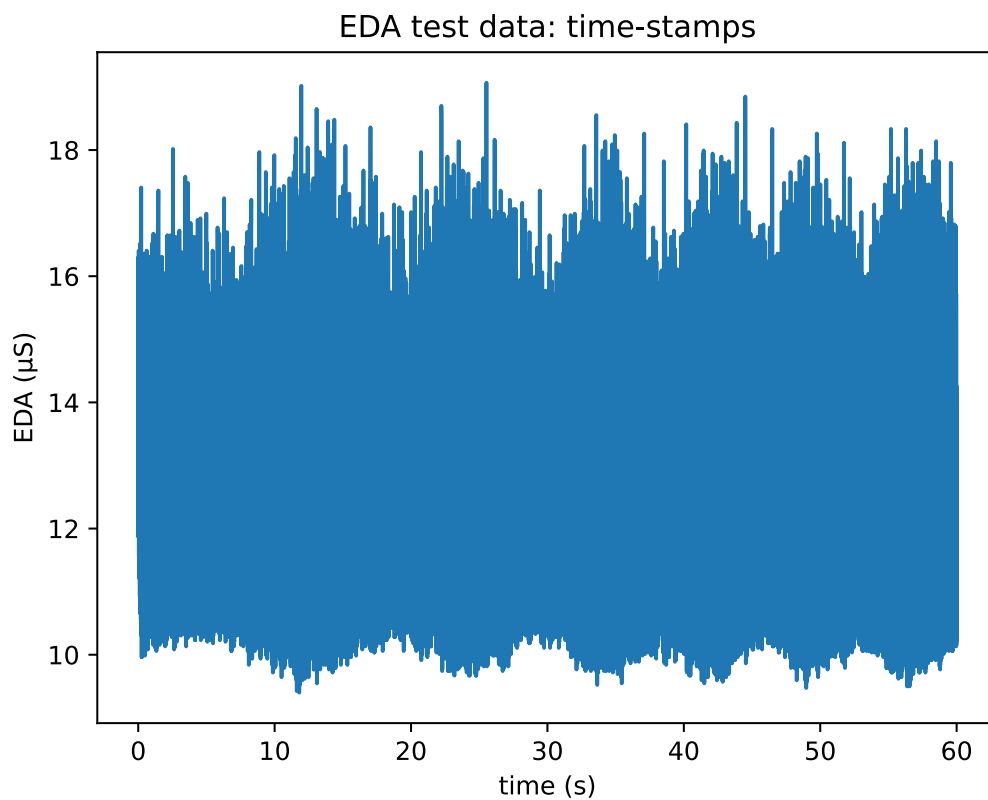
```
df = pd.read_csv(data_path, comment='#', index_col='sample')
df.head()
```

sample	eda	time_stamp
0	12.3779	0
1	12.1338	5.3259e-05
2	11.9873	6.6749e-05
3	11.8652	0.0116976
4	11.9141	0.0117544

```
ax = df['eda'].plot()
ax.set_ylabel('EDA ( $\mu$ S)')
ax.set_title('EDA test data: sample index (1000 Hz)')
plt.show()
```



```
ax = df.set_index('time_stamp')['eda'].plot()  
ax.set_xlabel('time (s)')  
ax.set_ylabel('EDA (μS)')  
ax.set_title('EDA test data: time-stamps')  
plt.show()
```



2 Pre-processing

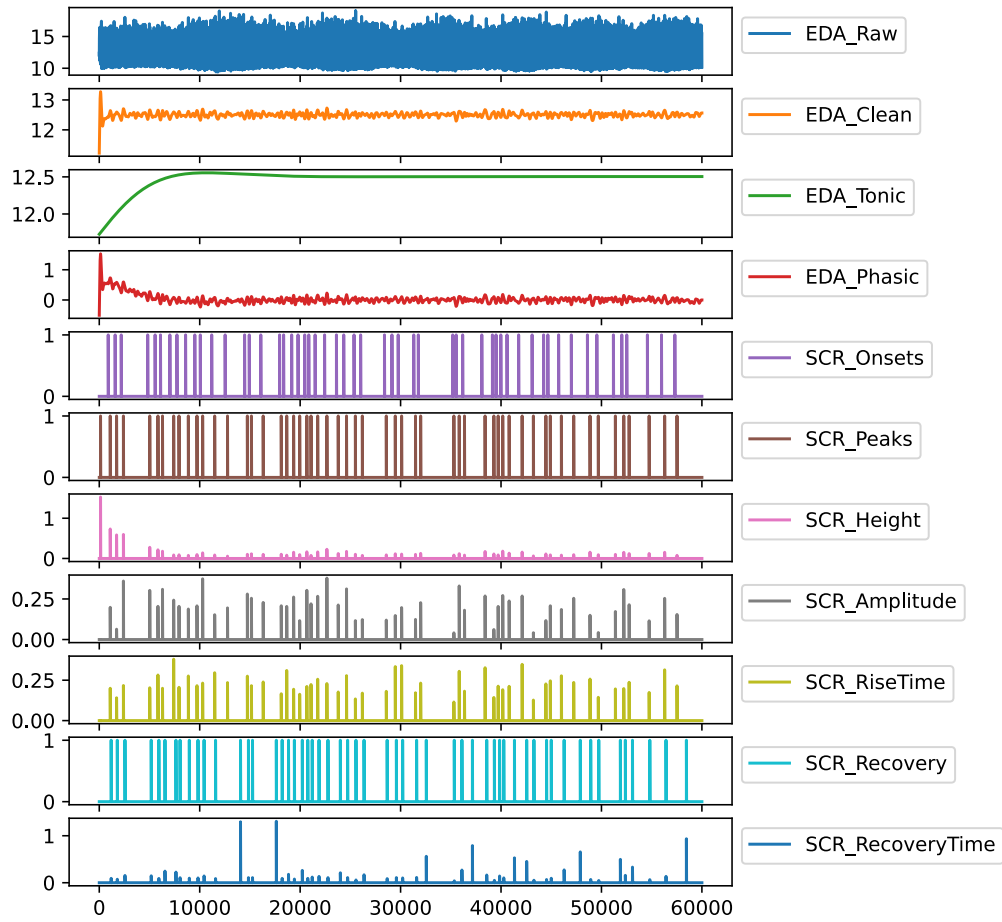
```
fs = 1000
data, info = nk.bio_process(eda=df['eda'], sampling_rate=1000)
pd.concat([data.head(10), data.tail(10)]).style.format(precision=2)
```

	EDA_Raw	EDA_Clean	EDA_Tonic	EDA_Phasic	SCR_Onsets	SCR_Peaks	SCR_Height	SCR_Amplitude	SCR_RiseTime	SCR_Recovery	SCR_RecoveryTime
0	12.38	11.22	11.73	-0.51	0	0	0.00	0.00	0.00	0	0.00
1	12.13	11.25	11.73	-0.48	0	0	0.00	0.00	0.00	0	0.00
2	11.99	11.28	11.73	-0.45	0	0	0.00	0.00	0.00	0	0.00
3	11.87	11.31	11.73	-0.42	0	0	0.00	0.00	0.00	0	0.00
4	11.91	11.34	11.73	-0.39	0	0	0.00	0.00	0.00	0	0.00
5	11.94	11.37	11.73	-0.36	0	0	0.00	0.00	0.00	0	0.00
6	11.96	11.39	11.73	-0.33	0	0	0.00	0.00	0.00	0	0.00
7	12.16	11.42	11.73	-0.31	0	0	0.00	0.00	0.00	0	0.00
8	12.35	11.45	11.73	-0.28	0	0	0.00	0.00	0.00	0	0.00
9	12.50	11.48	11.73	-0.25	0	0	0.00	0.00	0.00	0	0.00
59992	13.87	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
59993	13.35	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
59994	12.82	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
59995	12.23	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
59996	11.69	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
59997	11.23	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
59998	10.82	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
59999	10.50	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
60000	10.28	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00
60001	10.18	12.56	12.50	0.00	0	0	0.00	0.00	0.00	0	0.00

```

axes = data.plot(subplots=True, figsize=(6, 8))
for ax in axes:
    ax.legend(bbox_to_anchor=(1, 1), loc=2)
plt.show()

```



3 Epochs

In a real experiment markers would be recorded alongside the sensor values. Here's will make fake markers at ten-second intervals just to demonstrate the concept of epochs.

```

markers = np.zeros_like(df['eda'])
marked_samples = np.arange(0, fs * 60, fs * 10)
markers[marked_samples] = 1
df['marker'] = markers
df.head()

```

sample	eda	time_stamp	marker
0	12.3779	0	1
1	12.1338	5.3259e-05	0
2	11.9873	6.6749e-05	0
3	11.8652	0.0116976	0
4	11.9141	0.0117544	0

```

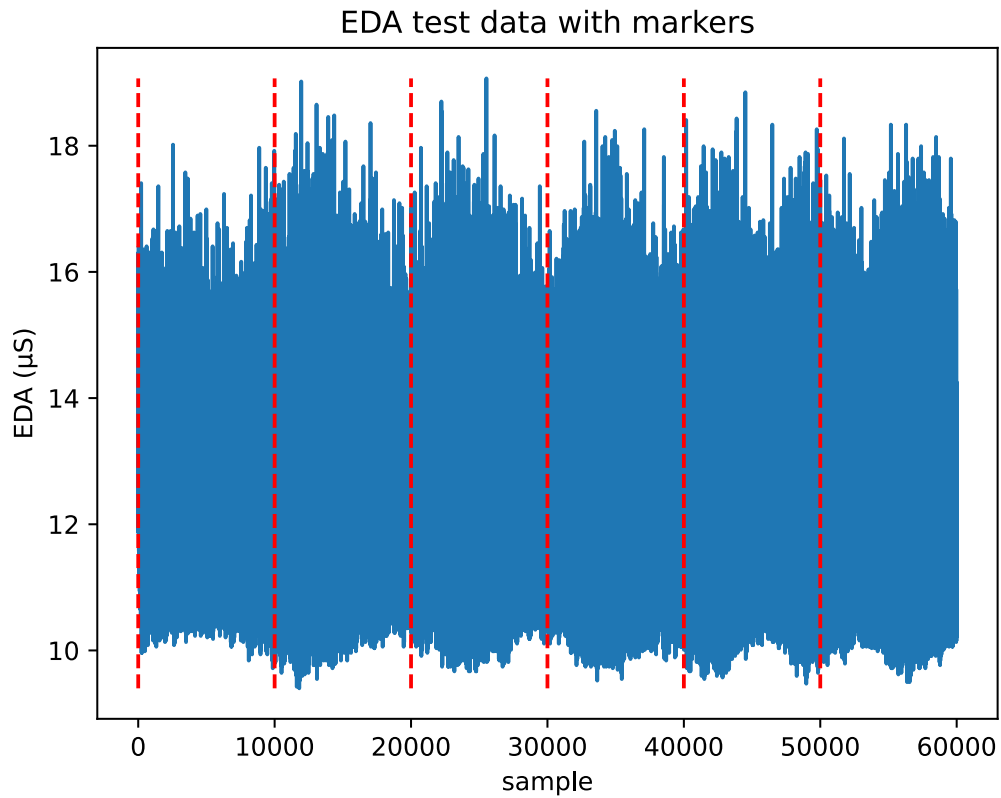
ax = df['eda'].plot()
ax.vlines(
    df.loc[df['marker'] == 1].index,

```

```

ymin=df['eda'].min(),
ymax=df['eda'].max(),
color='red',
linestyle='--')
ax.set_ylabel('EDA (μS)')
ax.set_title('EDA test data with markers')
plt.show()

```



```

events = df[df['marker'] == 1].index
epochs = nk.epochs_create(data, events, sampling_rate=fs, epochs_start=0,
    ↳ epochs_end=5)
pd.concat([epochs['1'].head(10),
    ↳ epochs['1'].tail(10)]).style.format(precision=2)

```

	EDA_Raw	EDA_Clean	EDA_Tonic	EDA_Phasic	SCR_Onsets	SCR_Peaks	SCR_Height	SCR_Amplitude	SCR_RiseTime	SCR_Recovery	SCR_RecoveryTime	Index	Label
0.000000	12.38	11.22	11.73	-0.51	0	0	0.00	0.00	0.00	0	0.00	0	1
0.001000	12.13	11.25	11.73	-0.48	0	0	0.00	0.00	0.00	0	0.00	1	1
0.002000	11.99	11.28	11.73	-0.45	0	0	0.00	0.00	0.00	0	0.00	2	1
0.003001	11.87	11.31	11.73	-0.42	0	0	0.00	0.00	0.00	0	0.00	3	1
0.004001	11.91	11.34	11.73	-0.39	0	0	0.00	0.00	0.00	0	0.00	4	1
0.005001	11.94	11.37	11.73	-0.36	0	0	0.00	0.00	0.00	0	0.00	5	1
0.006001	11.96	11.39	11.73	-0.33	0	0	0.00	0.00	0.00	0	0.00	6	1
0.007001	12.16	11.42	11.73	-0.31	0	0	0.00	0.00	0.00	0	0.00	7	1
0.008002	12.35	11.45	11.73	-0.28	0	0	0.00	0.00	0.00	0	0.00	8	1
0.009002	12.50	11.48	11.73	-0.25	0	0	0.00	0.00	0.00	0	0.00	9	1
4.990998	16.33	12.64	12.39	0.26	0	0	0.00	0.00	0.00	0	0.00	4990	1
4.991998	16.63	12.65	12.39	0.26	0	0	0.00	0.00	0.00	0	0.00	4991	1
4.992999	16.99	12.65	12.39	0.26	0	0	0.00	0.00	0.00	0	0.00	4992	1
4.993999	16.87	12.65	12.39	0.26	0	0	0.00	0.00	0.00	0	0.00	4993	1
4.994999	16.41	12.65	12.39	0.26	0	0	0.00	0.00	0.00	0	0.00	4994	1
4.995999	15.67	12.65	12.39	0.26	0	0	0.00	0.00	0.00	0	0.00	4995	1
4.996999	14.84	12.65	12.39	0.26	0	0	0.00	0.00	0.00	0	0.00	4996	1
4.998000	13.99	12.65	12.39	0.26	0	0	0.00	0.00	0.00	0	0.00	4997	1
4.999000	13.23	12.65	12.39	0.27	0	0	0.00	0.00	0.00	0	0.00	4998	1
5.000000	12.50	12.65	12.39	0.27	0	0	0.00	0.00	0.00	0	0.00	4999	1

```

fig, axes = plt.subplots(len(epochs), figsize=(6, 8), sharey=True)
for (epoch, epoch_data), i in zip(epochs.items(), range(len(epochs))):
    epoch_data[['EDA_Tonic', 'EDA_Phasic']].plot(
        ax=axes[i],
        title=f'Epoch {epoch}',
    )
    axes[i].set_ylabel('EDA')
axes[-1].set_xlabel('time (s)')
for ax in axes:
    ax.legend(bbox_to_anchor=(1, 1), loc=2)

fig.subplots_adjust(hspace=0.6)
plt.show()

```

