Exploring Streaming Sensor Data

By the end of this activity, you will be able to:

1. View semi-structured data streaming in real-time from a weather station
2. Create plots of streaming weather station data

Step 1. Open a terminal shell and activate your virtual environment. Open your local terminal shell and go to your *big-data-2/* directory. Activate your virtual environment using the command that corresponds to your operating system (adjust the command if you named your virtual environment differently).

Windows:

```
.\big-data-2-env\Scripts\Activate
```

macOS:

```
source big-data-2-env/bin/activate
```

Step 2. Go to sensor directory. With you virtual environment activated go to your *sensor* directory.

```
PS C:\Users\                    \Desktop\coursera\big-data-2\sensor>
```

Run *ls* to see the sensor data files and scripts:

```
    Directory: C:\Users\                    \Desktop\coursera\big-data-2\sensor


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
-a----        12/11/2023   2:33 PM            944 plot-data.py
-a----         4/12/2024   4:07 PM            236 stream-data.py
-a----        12/13/2023   2:14 PM           1586 stream-plot-data.py
-a----         4/19/2016   3:30 PM        6119195 wx-data.txt
-a----         3/14/2016   2:59 PM           1018 wxt-520-format.txt
```

Step 3. View streaming weather station data. Run *stream-data.py* to see streaming data from the weather station:

```
python3 ./stream-data.py
```

```
0: 1712964518   0R1,Dn=181D,Dm=189D,Dx=194D,Sn=4.6M,Sm=5.2M,Sx=5.7M
1: 1712964519   0R1,Dn=181D,Dm=188D,Dx=194D,Sn=4.6M,Sm=5.2M,Sx=5.6M
2: 1712964520   0R1,Dn=181D,Dm=188D,Dx=194D,Sn=4.6M,Sm=5.2M,Sx=5.6M
3: 1712964521   0R1,Dn=181D,Dm=187D,Dx=194D,Sn=4.8M,Sm=5.2M,Sx=5.6M
4: 1712964522   0R1,Dn=183D,Dm=188D,Dx=194D,Sn=4.6M,Sm=5.2M,Sx=5.6M
5: 1712964523   0R1,Dn=183D,Dm=189D,Dx=194D,Sn=4.6M,Sm=5.2M,Sx=5.6M
6: 1712964524   0R1,Dn=183D,Dm=188D,Dx=194D,Sn=4.5M,Sm=5.2M,Sx=5.6M
7: 1712964524   0R2,Ta=10.7C,Ua=82.3P,Pa=915.4H
```

The measurements are appearing as they are produced by the weather station. By looking at the timestamp, we can see that they arrive about every second. Additionally, different measurement types are produced at different frequencies. For example *R1* is measured every second, but *R2* is less frequent.

The script will run for 1 minute. You can either wait until it finishes, or stop it by typing *Ctrl+C*.

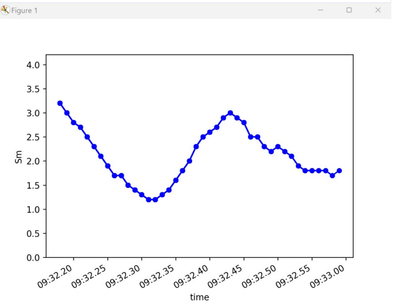
Step 4. View key for measurements. Run *more wxt-520-format.txt* to see the key for the measurement fields.

```
more wxt-520-format.txt
```

```
Sn      Wind speed minimum m/s, km/h, mph, knots #,M, K, S, N
Sm      Wind speed average m/s, km/h, mph, knots #,M, K, S, N
Sx      Wind speed maximum m/s, km/h, mph, knots #,M, K, S, N
Dn      Wind direction minimum deg #, D
Dm      Wind direction average deg #, D
Dx      Wind direction maximum deg #, D
Pa      Air pressure hPa, Pa, bar, mmHg, inHg #, H, P, B, M, I
Ta      Air temperature °C, °F #, C, F
Tp      Internal temperature °C, °F #, C, F
Ua      Relative humidity %RH #, P
Rc      Rain accumulation mm, in #, M, I
Rd      Rain duration s #, S
Ri      Rain intensity mm/h, in/h #, M, I
Rp      Rain peak intensity mm/h, in/h #, M, I
Hc      Hail accumulation hits/cm2, hits/in2, hits #, M, I, H
Hd      Hail duration s #, S
Hi      Hail intensity hits/cm2h, hits/in2h, hits/ h #, M, I, H
Hp      Hail peak intensity hits/cm2h, hits/in2h, hits/ h #, M, I, H
Th      Heating temperature °C, °F #, C, F
Vh      Heating voltage V #, N, V, W, F2
Vs      Supply voltage V V
Vr      3.5 V ref. voltage V V
```

Step 5. Create plot of streaming data. We can plot the streaming data by running *stream-plot-data.py*:

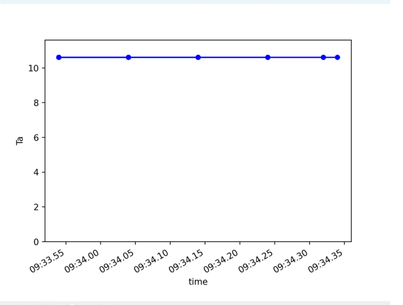
```
python3 ./stream-plot-data.py Sm
```



This show a plot of the average wind speed (*Sm*), and it updated every time a new measurement is produced. Notice that the plot is updated every second. To stop the streaming, type *Ctrl+C* on your terminal, and close the plot.y pa

We can create plots for other measurements by specifying the measurement in the last argument to *stream-plot-data.py*. For example, we can plot air temperature (*Ta*) by running:

```
python3 ./stream-plot-data.py Ta
```



This plot is updated less frequently than the first plot since air temperature measurements are produced less frequently.

Step 6. Deactivate your virtual environment. Run *deactivate* to deactivate the virtual environment.

```
deactivate
```

Mark as completed