Profiling abiotic factors in creek

- How does **flow rate** influence other abiotic factors such as **temperature** and **dissolved oxygen level** in a creek?
- => modelling of abiotic factors: possible?

Hypothesis

- *Lotic* water: **higher temperature** & **higher dissolved oxygen level** compared to *lentic* water

Data

Flow rate (m/s)

```
vs = [
    0.235
    0.322
    1.005
    0.790
    0.685
    0.685
    0.048
    0.048
    0.048
    0.048
    0.016
    ];
```

Temperature (ºC)

```
Ts = [
    11.2
    10.6
    10.6
    10.6
    10.6
    10.6
    10.6
    10.6
    11.5
    10.7
    10.7
    ];
```

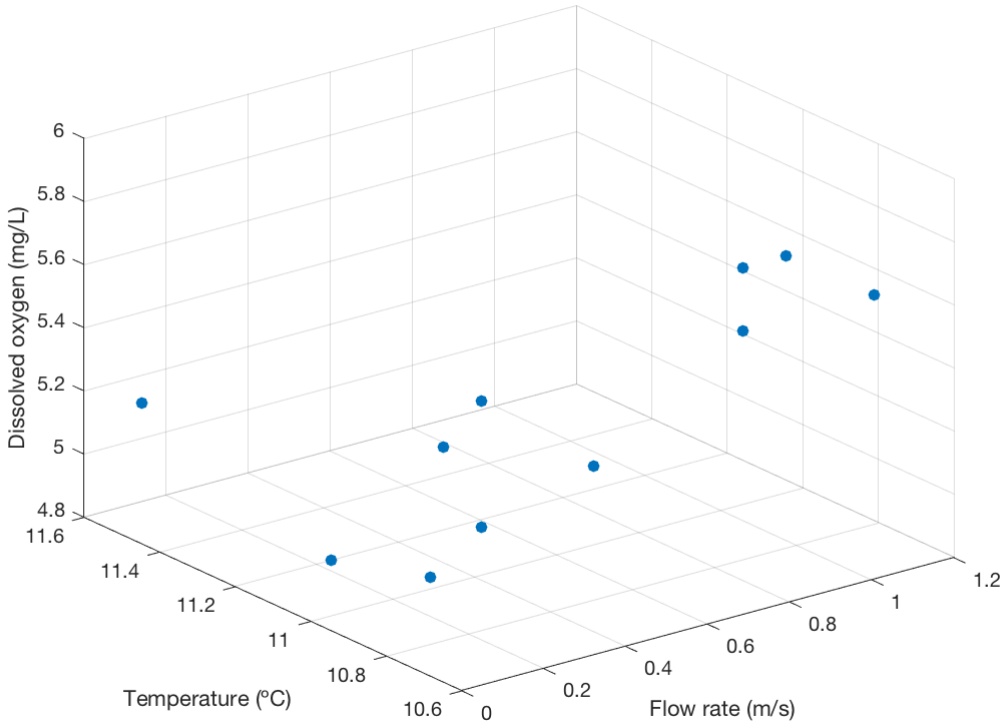
Dissolved Oxygen (mg/L)

```
DOs =[
    4.8000
    5.4000
    5.7000
    5.9000
    5.7000
    5.9000
    5.3000
    5.7000
    5.2000
```

```
    5.5000
    5.1000
    ];
```

Plots

```
scatter3(vs, Ts, DOs, 'filled')
xlabel("Flow rate (m/s)")
ylabel("Temperature (ºC)")
zlabel("Dissolved oxygen (mg/L)")
```



Conclusion

General trend: as flow rate increases, there are more oxygen dissolved in water, confirming our hypothesis; however, the data does not support the other part of the hypothesis that there is a correlation between flow rate and temperature.

Evaluation

- flow rate meter gave the same reading for 4 different locations - potential apparatus error;
- not enough data is collected to build a concrete model of the abiotic factors - this is only a snapshot trial;
- temperature affects the amount of oxygen dissolved - it is a complex system;
- dissolved oxygen level is impacted by external uncontrolled factors such as altitude, air pressure, sunshine and temperature, and the activity in the sediments as well as oxygenation from upstream

Extension

- integrate locations from which the data are collected and see if the amount of dissolved oxygen follows the Streeter-Phelps oxygen sag curge (initial deficit at jet, critical point, and convergence to saturation)

- compare the maximum value of dissolved oxygen at each temperature and pressure with the experimental data, and check if saturation is reached at any point (and whether there is any particular reason)
- collect more data points to establish a concrete model