Linear Regression homework assignment with hands-on activities

The following problems will help you understand how to perform linear regression analysis. You will learn how to process training data as well make a prediction for a linear relationship. Before starting with the assignment make sure you go over the accompanying lecture and hands-on tutorial. For the assignments below, you will work with the *Linear Regression in materials science – Young's Modulus* notebook in the following tool: https://nanohub.org/tools/youngsmod.

Problem 1. Understanding units. The learning module example fit a linear function to the stress-strain curve up to 0.05% strain. Based on your understanding of stress, strain, and the equation from the linear regression, what is Young's modulus?

Problem 2. Strain range. Explore how the Young's modulus depends on the maximum stress used in the fit. How much does the Young's modulus change if you reduce the range by a factor of two? What level of strain marks the end of the linear region?

Problem 3. Yield Stress. Calculate the Yield stress with the 0.2% offset method using the predicted Young's modulus for 0.05% strain. Note that you will have to enter the Young's modulus in the notebook. Use the same units as in your stress-strain data (e.g. if stress is given in MPa and strain is given in percent your input should be the value in MPa/100). Please show the value in the cell below, the plot showing the yield stress calculation generated by the tool, and report the yield stress obrained.

```
# The 0.2% offset line can be defined as y = E(x - 0.2)/100
#    where E is the young's modulus (in the units of stress), x is the strain in %, and the factor of 100
#    is to account for the fact that strain is given in %

# Below enter the Young's modulus of your material (obtained above) - in the units of stress
E = XXX
```