

# Homework 2

Please turn in your work through blackboard.  
Only correctly formatted PDFs will be accepted.

This assignment will be submitted in a report format. While no specific format of the report is provided, please ensure your report has the following:

- Objective (what are you trying to convey to the reader)
- Introduction and background
- Clear figures that express the objective you are trying to solve
- Conclusion
- Appendix (This will include your code.)

This assignment is graded on its ability to clearly express the ideas at hand. Consider this to be a professional report where you are trying to convey to a client the challenges associated with their “system”. Keep is short (less than 3 pages) and use quality figures.

## 1 Gradient Decent Algorithm

Using the population and life satisfaction index provided with the assignment, develop a gradient descent algorithm that seeks to optimize the parameters  $\theta_1$  and  $\theta_2$  from our linear model:

$$\text{life\_satisfaction\_model} = \theta_1 + \theta_2 \times \text{GDP\_model}$$

Your final result, in the  $\text{GDP} \times \text{life\_satisfaction\_model}$  space should look like figure 1. This solution was obtained using a closed-form solution, implemented in SK-Learn. The purpose of this assignment is to explore the use of gradient descent for model updating. In the course of your assignment, please provide insight into how you developed your processes and tuned your parameters. For example, a plot of the performance space that highlights the path your algorithm took to the global minimum may helpful; or you may wish to provide a plot that demonstrates how model changes with each successive step; or both. Be sure to discuss data filtering that was performed along with any feature scaling.

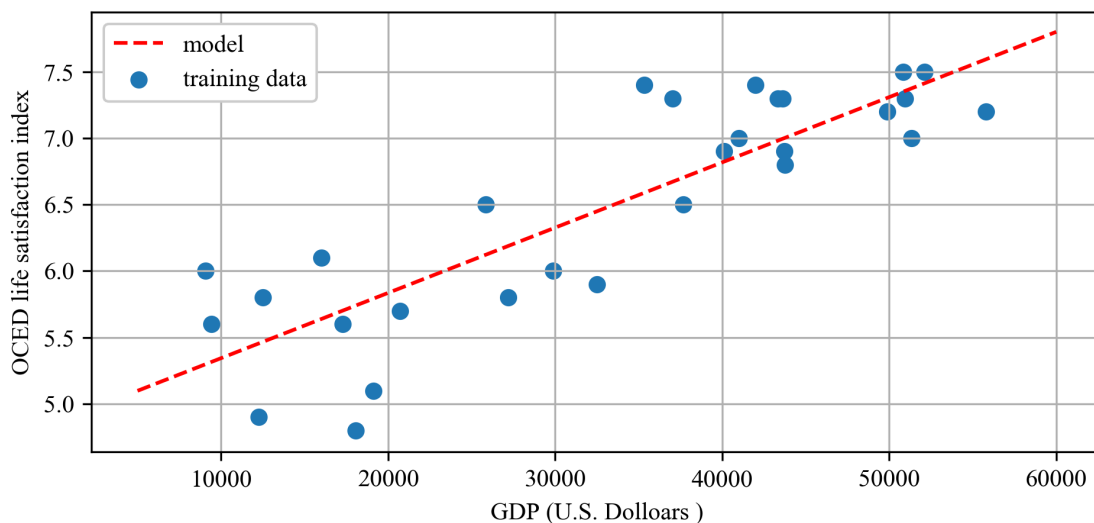


Figure 1: Linear model for the OCED life satisfaction index obtained by SK-Learn using the closed form solution.