**TASK 3 - BAYESIAN OPTIMIZATION**

The first step of this task was fitting the two functions f and v with two Gaussian Process regressors. As suggested in the problem description, a Matern kernel was used, and all the values provided were set accordingly.

In the function next\_recommendation() we define the points at which we have to sample at each iteration. At the beginning, the first value is randomly taken from the domain of the parameters [0,5], but from the second iteration on, it is chosen as the result of the optimization defined in optimize\_acquisition\_function(). Two different activation functions were tested in order to achieve the final result, namely the UCB and the EI. In the end, the best results were obtained with the UCB, by setting the beta value to 2. To account for the constraint on v, a penalty term was added to the cost function each time the inequality was not respected.

For the EI, in order to consider the constraint on v(x), I computed the expected constrained improvement, which multiplies the normal EI value by the complementary cumulative distribution of the posterior v(x), such as Pr[v(x) > 1.2].

At each iteration, the points that are computed from the optimization step, together with the predictions f(x) and v(x), are added in their respective dataset, and each time the two GP regressors are fitted over their new updated dataset. The final value is chosen from the dataset to be the one maximizing the predictions of the GP\_f and for which the inequality v(x) > 1.2 is satisfied.