Lab 2 – Design of Experiments

Short course on Statistical modelling for optimization

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The first half of this lab session is dedicated to designing the best possible DoE. In the second one, we will run the actual experiments.

1 Design of experiments

The aim of this section is to define a DoE of 40 points over $(0,1)^4$ that shows good space filling properties and good projection properties. Some useful functions (such as `discrepancy`, `minimax`, `maximin`, `IMSE`) are provided in the file `lab2.py`. The file `SobolSequence.py` will also be of particular interest to generate low discrepancy sequences.

Q1. Write a function that implements a Latin Hypercube Design. The function should take as parameters the number of points n and the dimension d. It should return a np.array with shape (n, d).

Q2. Write a function that returns a Centroidal Voronoi Tesselation. You may use a k-means or a McQueen algorithm. The inputs and outputs should be as in Q1.

Q3. Generate various DoE using the functions you just wrote (you may also consider `SobolSequence`).

Q4. Choose your favourite DoE using the various space filling criteria. Do not forget to test the projections on some variables. Justify your choice in the report.

2 Running the experiments

Step 1. Convert your DoE on $(0,1)^4$ to the hyper-rectangle you defined during the last lab session.

Step 2. Save your design on a file.

Step 3. Run the experiments on the simulator.