
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 Tessellation. You may use a k-means or a McQueen algorithm. The inputs and outputs should be as in Q1.

2 Running the experiments

Q3. Generate various DoE with $n = 30$ points in dimension $d = 4$ using the functions you just wrote (you may also consider `SobolSequence`).

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

Q5. Save your best design in a file (csv for example).

Q6. Run the experiments with the simulator and save the outputs in a file.