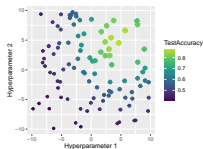


Introduction to Machine Learning

Hyperparameter Tuning Basic Techniques

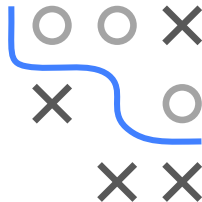


Learning goals

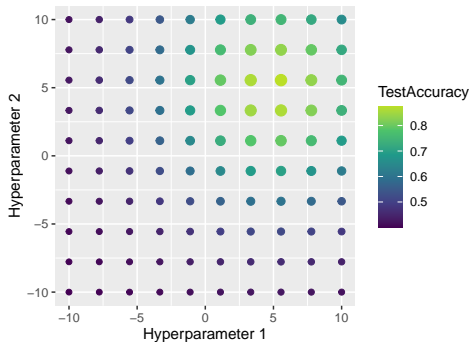
- Understand the idea of grid search
- Understand the idea of random search
- Be able to discuss advantages and disadvantages of the two methods

GRID SEARCH

- Simple technique which is still quite popular, tries all HP combinations on a multi-dimensional discretized grid
- For each hyperparameter a finite set of candidates is predefined
- Then, we simply search all possible combinations in arbitrary order



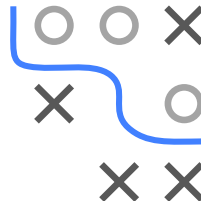
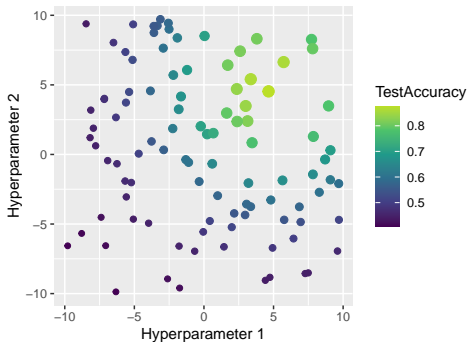
Grid search over 10x10 points



RANDOM SEARCH

- Small variation of grid search
- Uniformly sample from the region-of-interest

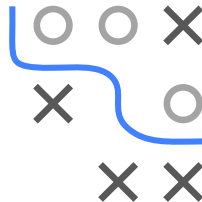
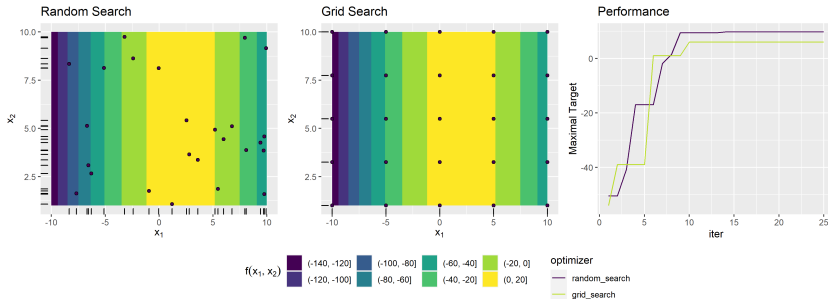
Random search over 100 points



RANDOM SEARCH VS. GRID SEARCH

We consider a maximization problem on the function

$f(x_1, x_2) = g(x_1) + h(x_2) \approx \dot{g}(x_1)$, i.e. in order to maximize the target, x_1 should be the parameter to focus on.



⇒ In this setting, random search is more superior as we get a better coverage for the parameter x_1 in comparison with grid search, where we only discover 5 distinct values for x_1 .

TUNING EXAMPLE

Tuning random forest with grid search/random search and 5CV on the sonar data set for AUC:

Hyperparameter	Type	Min	Max
num.trees	integer	3	500
mtry	integer	5	50
min.node.size	integer	10	100

