Parameter Tuning

Outline

What are Hyper Parameters?

Search space

Grid Search

Randomized search

What are parameters?

parameters

From the greek word
hyper: over, above

Parameters that are above?
Yes! The parameters that define the structure of our classifiers :-)

For example, to create a SVM classifier in SciKit:

```
classifier = svm.SVC( )
```

← Default parameters

In reality we have these knobs we can turn to change the structure of the classifier before learning:

```
classifier = svm.SVC(C=1, kernel='rbf', gamma='auto')
```

HYPER parameters

So many choices
So little time!

Don’t dispair yet!

HYPER parameter tuning can be automated!

General Hyper Parameter tuning algorithm

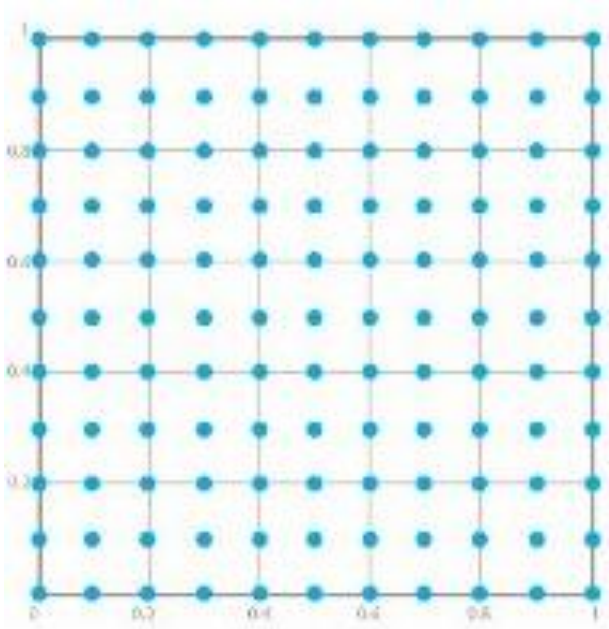
1. Select values
2. Instantiate classifier with selected values
3. Train Classifier on training data (taking the classifier on a test run)
4. Score Classifier using cross validation on the training data
5. Repeat until end of parameter space

Result: Select classifier with the best score on the validation metric

Parameter Search Space

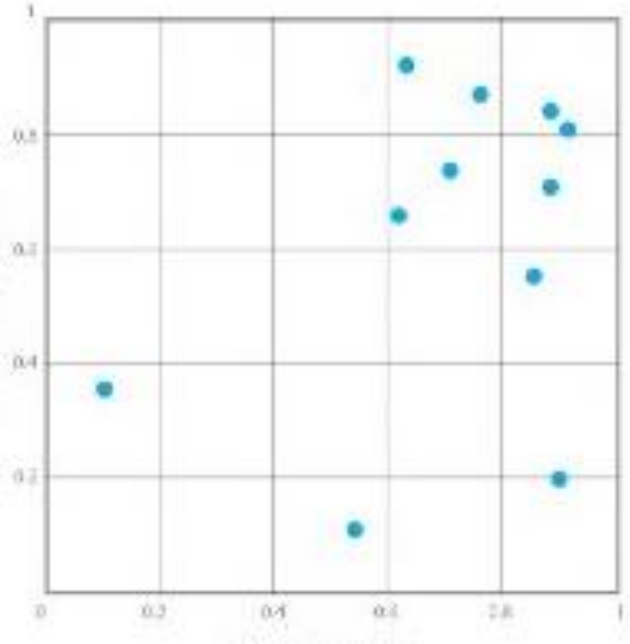
Defines the region of parameters we want to test

Grid Search



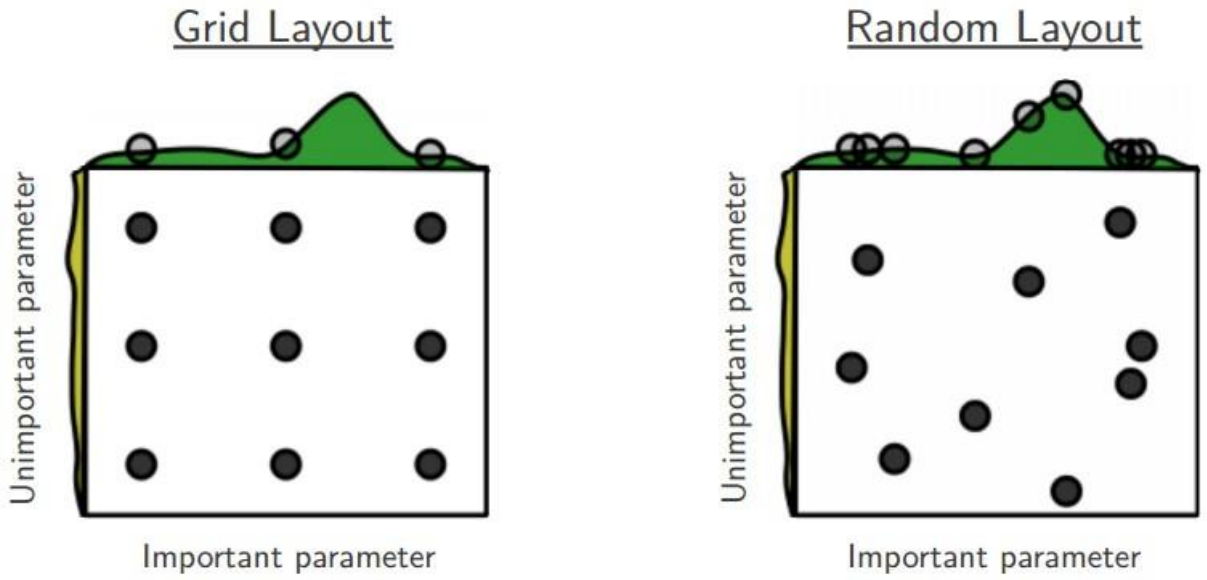
Searches the space linearly from start to end

Random Search (or how I find my keys)



Searches the space randomly

Grid vs Random Search

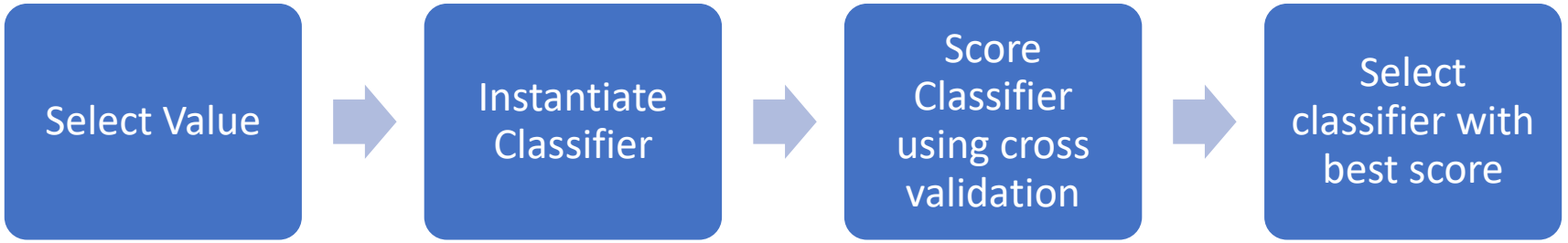


"Our analysis of the hyper-parameter response surface (Ψ) suggests that random experiments are more efficient because not all hyperparameters are equally important to tune. Grid search experiments allocate too many trials to the exploration of dimensions that do not matter and suffer from poor coverage in dimensions that are important. Compared with the grid search experiments of Larochelle et al. (2007), random search found better models in most cases and required less computational time." (Bergstra and Bengio, 2012)

Classifier Validation/Scoring

Since the tuning is done on the training set, we need some way to test run the classifier

A popular method is using cross validation on the training set



Conclusion:

The Classifier

Space of parameters to search in

A way to choose the next

parameter to test

A model validation method

Some way to score the

parameters

Goal: Finding the best hyperparameters for the problem

Happy HYPER parameter tuning