

# Hyperparameter Optimization using Hyperopt

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# About me

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## Yassine

- Data Scientist @ Qucit
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# Outline

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1. Hyperparameters in Machine Learning
2. How to Choose Hyperparameters?
3. Live-coding Example

# 1. Hyperparameters in Machine Learning

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# What are hyperparameters ?

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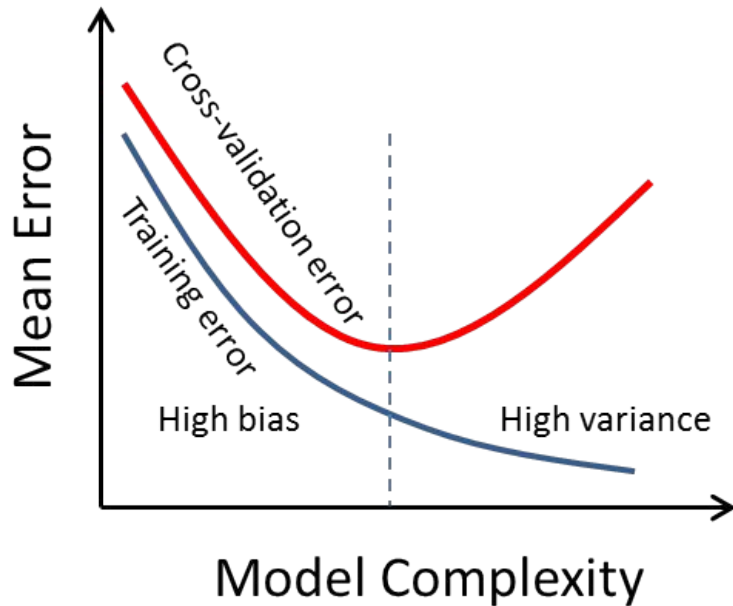
## Parameters:

Rent =  $a_1$  × surface +  
 $a_2$  × distance to city center +  
...

## Hyperparameters:

$$\text{RMSE}_{\text{LASSO}} = \text{RMSE} + \alpha \times (|a_1| + \dots)$$

# The impact of hyperparameters



## 2. How to choose hyperparameters ?

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# How to choose the points?

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## Independently

- Grid search
- Random search

## Sequential Model Based Optimization (SMBO)

- Tree-structured Parzen Estimators (TPE)
- Gaussian Processes (GP)

## 4. Live-coding Example

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Thanks for your attention.  
Question time



# References

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- <https://papers.nips.cc/paper/4443-algorithms-for-hyper-parameter-optimization.pdf>
- [https://conference.scipy.org/proceedings/scipy2013/pdfs/bergstra\\_hyperopt.pdf](https://conference.scipy.org/proceedings/scipy2013/pdfs/bergstra_hyperopt.pdf)
- <https://github.com/scikit-optimize>
- <http://jaberg.github.io/hyperopt/>
- <https://github.com/JasperSnoek/spearmint>
- <https://github.com/fmfn/BayesianOptimization>
- <http://xgboost.readthedocs.io/en/latest/>
- [http://www.cs.ubc.ca/~hutter/papers/13-BayesOpt\\_EmpiricalFoundation.pdf](http://www.cs.ubc.ca/~hutter/papers/13-BayesOpt_EmpiricalFoundation.pdf)
- Qucit's blog article: <http://www.qucit.com/2016/12/06/how-to-optimize-hyperparameters/>