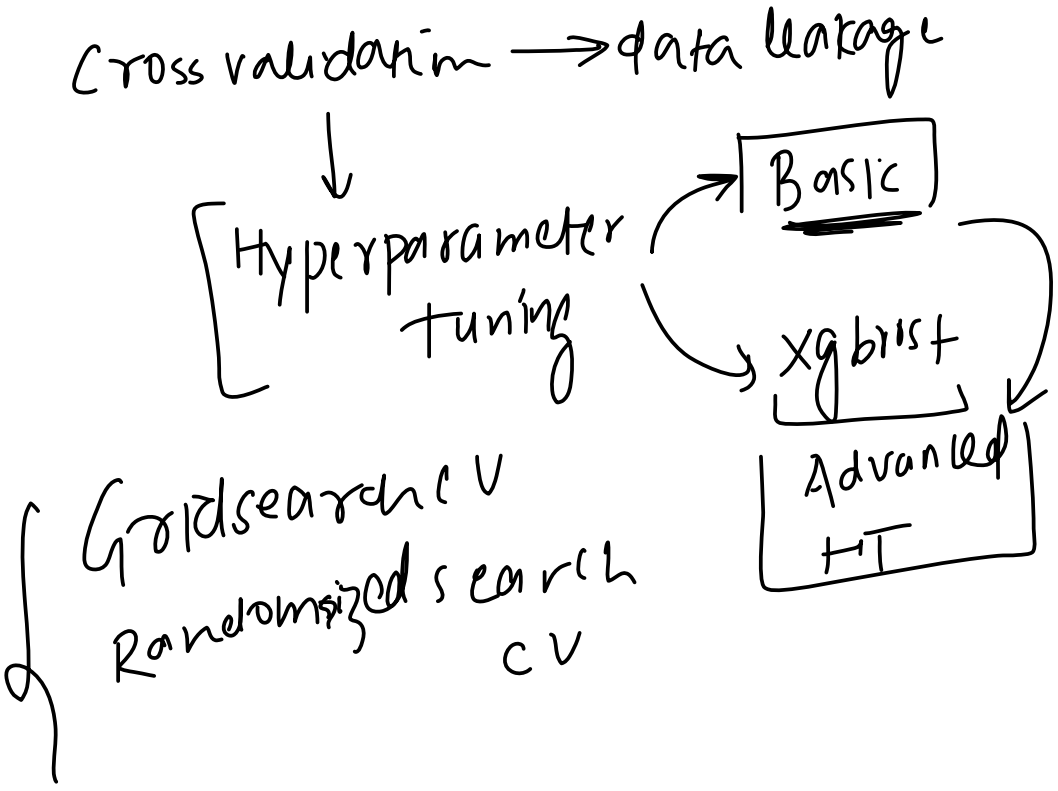
Context

14 June 2023 19:12



Parameter Vs Hyperparameter Tuning

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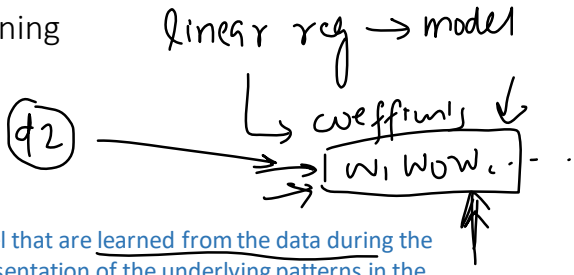


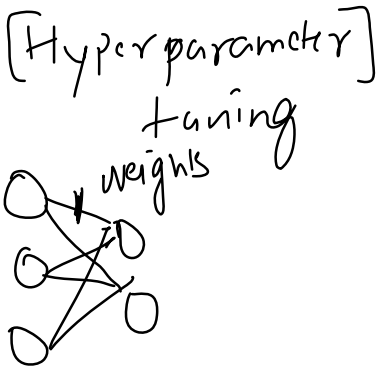
Parameters

Parameters are the internal variables of a model that are learned from the data during the training process. They define the model's representation of the underlying patterns in the data.

For example:

- In a linear regression model, the parameters are the coefficients of the predictors.
- In a neural network, the parameters are the weights and biases of the nodes.
- In a decision tree, the parameters are the split points and split criteria at each node.

The goal of the training process is to find the optimal values for these parameters, which minimize the discrepancy between the model's predictions and the actual outcomes.

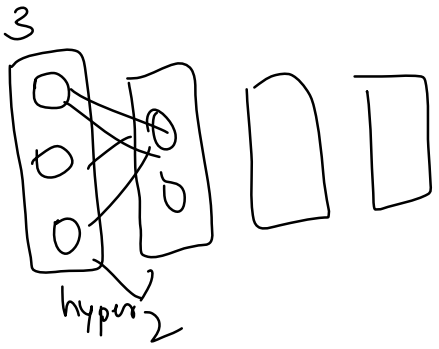


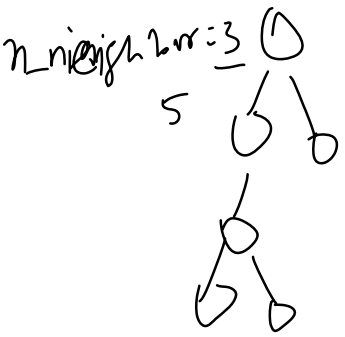
Hyperparameters → setting knobs

In machine learning, hyperparameters are parameters whose values are set before the learning process begins. These parameters are not learned from the data and must be predefined. They help in controlling the learning process and can significantly influence the performance of the model.

- In a neural network, hyperparameters might include the learning rate, the number of layers in the network, or the number of nodes in each layer.
- In a support vector machine, the regularization parameter C or the kernel type can be considered as hyperparameters.
- In a decision tree, the maximum depth of the tree is a hyperparameter.

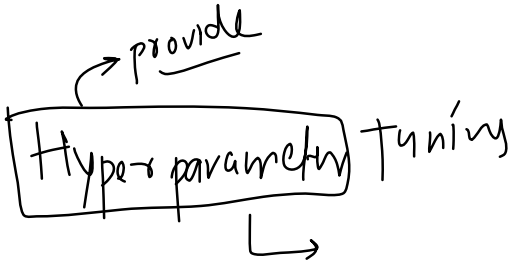
The best values for hyperparameters often cannot be determined in advance, and must be found through trial and error.





Why the word 'hyper'?

The choice of the word is primarily a naming convention to differentiate between the two types of values (internal parameters and guiding parameters) that influence the behaviour of a machine learning model. It's also a nod to the fact that the role they play is a meta one, in the sense that they control the structural aspects of the learning process itself rather than being part of the direct pattern-finding mission of the model.



Requirement

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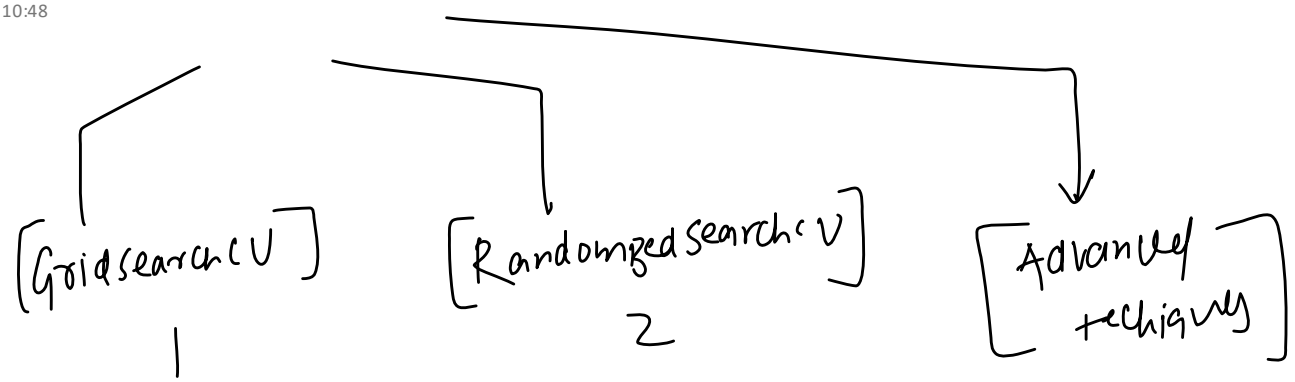

GridSearchCV

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CV → cross validation

GridSearchCV refers to an algorithm that performs an exhaustive search over a specified grid of hyperparameters, using cross-validation to determine which hyperparameter combination gives the best model performance.

→ SD

1000

cgpa	iq	placement
10	100	1
9	90	0
8	80	1

n_n1 metric

→ model → KNN

y/N

new cgpa iq

→ n_neighbors = 3, 5, 10

metric = L1 L2

~~algorithm = brute, kd tree, ball tree~~

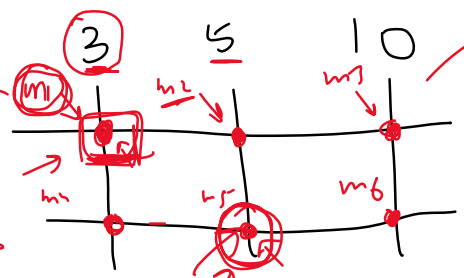
grid

parameter space

grid

2 hp

CV = 5



→ all the possible combinations

knn(n_n = 3, L1)

knn(n_n = 5, L1)

6 × 5 = 30

6 distinct values

m1 5 1	m2 5 2	5 3
3 L1	5 L1	10 L1
3 L2	5 L2	10 L2
5 4	5 5	5 6

→ 5 × 6

30 model

Brute force

[1, 2, 3]

1.5

1.5

1, 2, 3

RandomizedSearchCV

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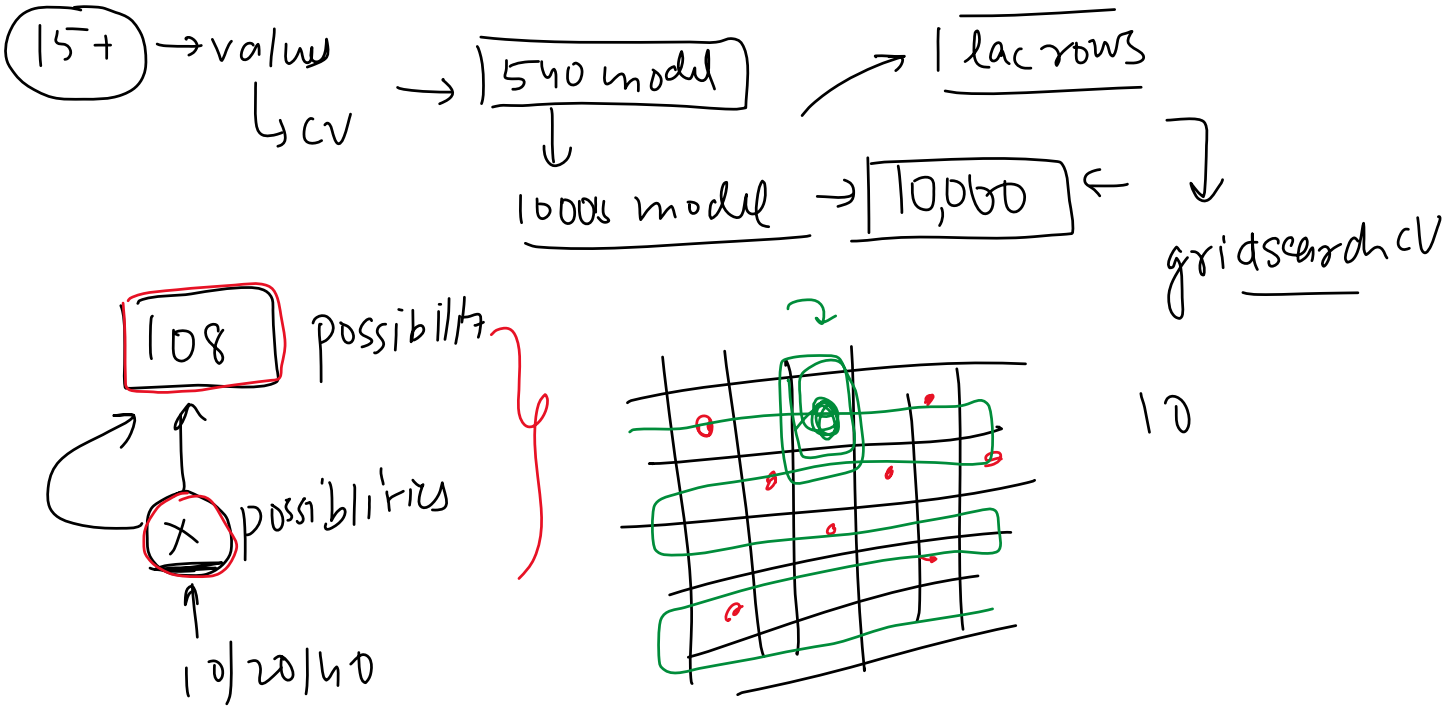
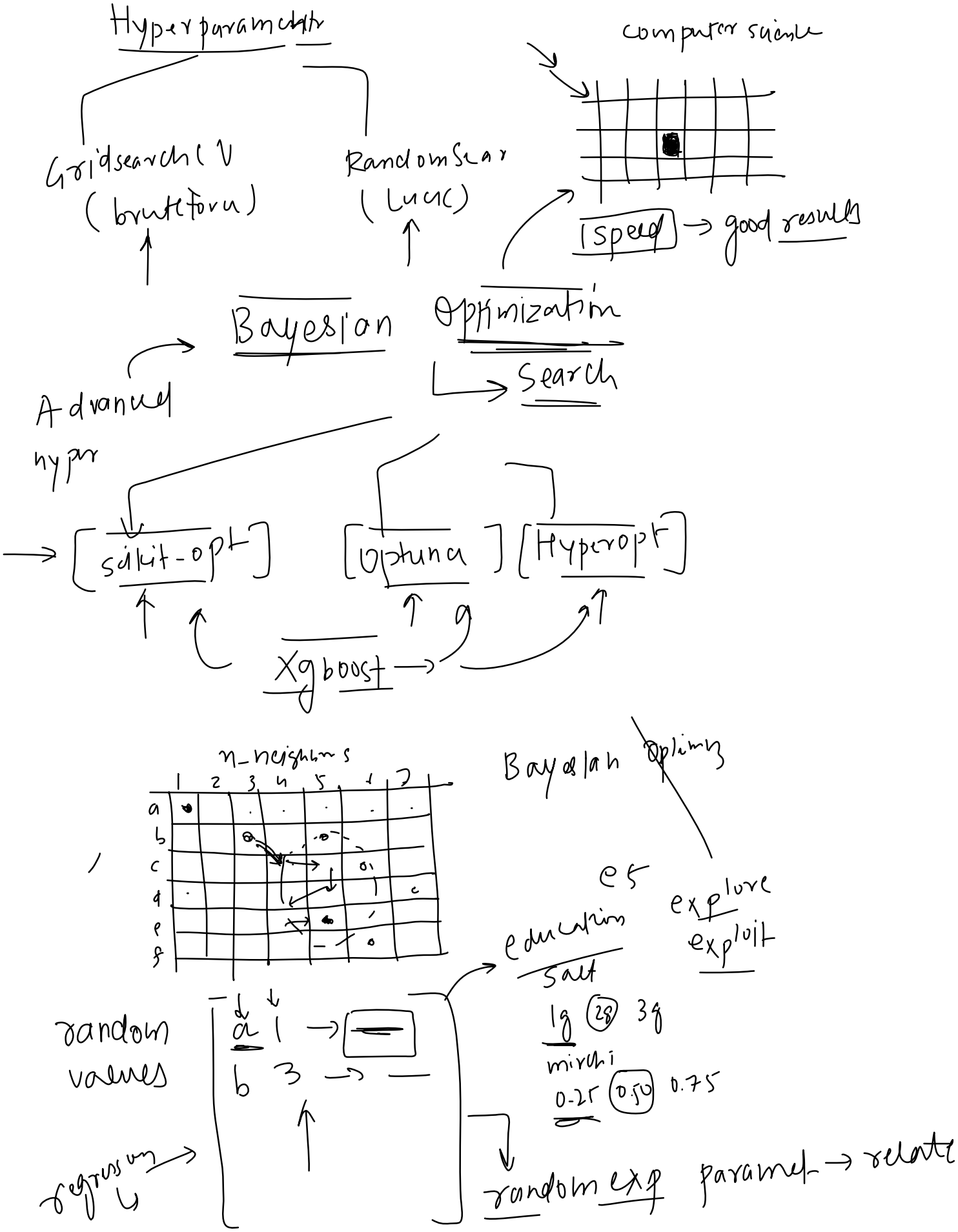


Can this be improved?

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