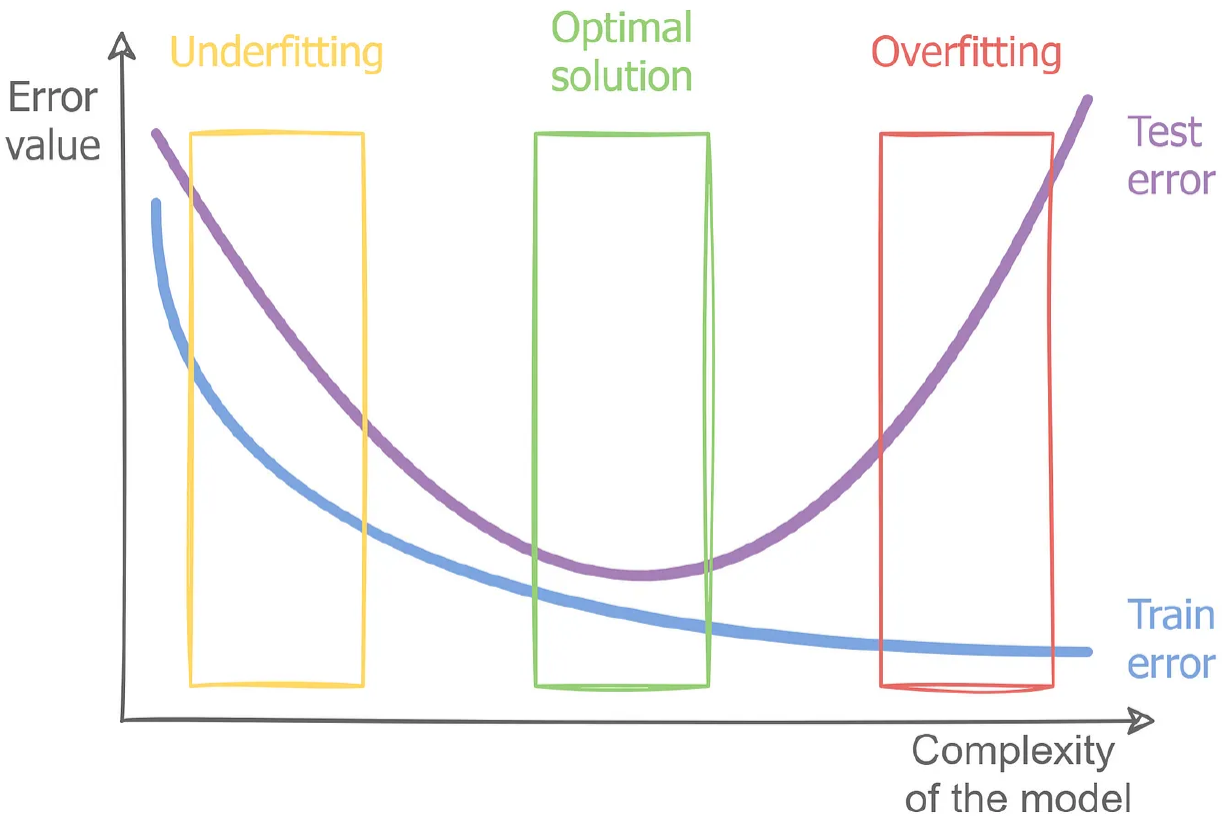
DS084- Underfitting & Overfitting the Model

By: eng. Esraa Madhi

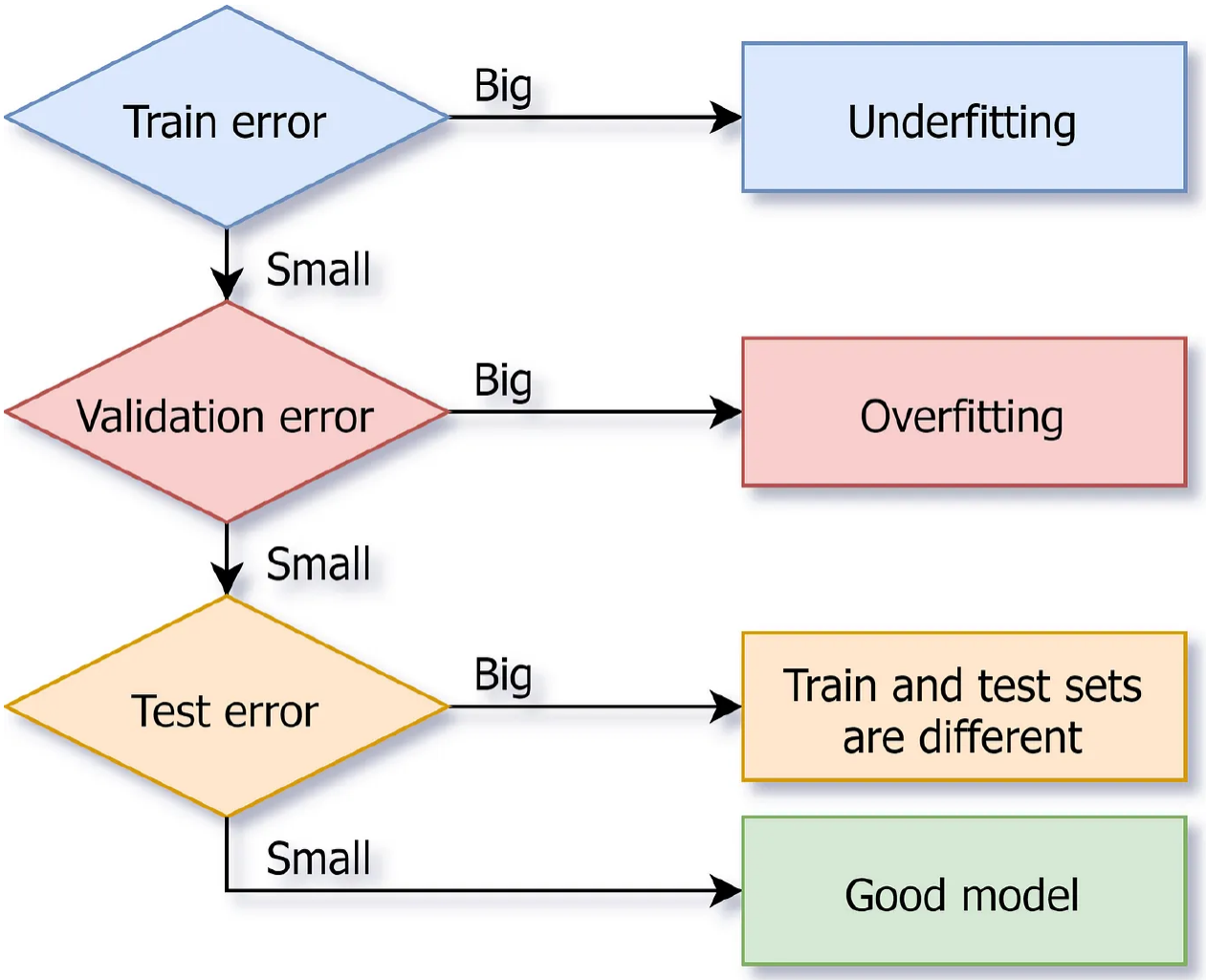
https://youtu.be/o3DztvnfAJg

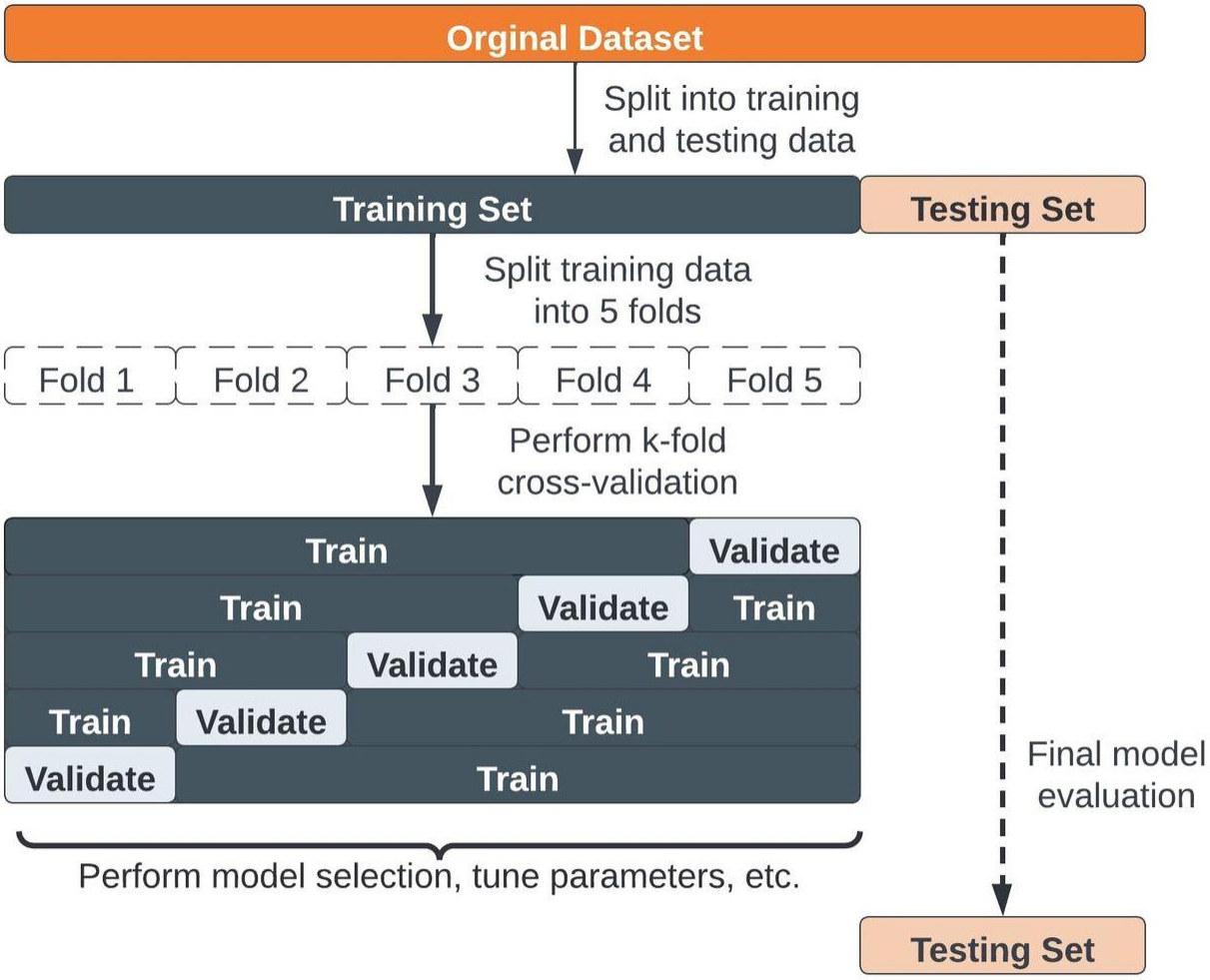
https://youtu.be/o3DztvnfAJg

How to Detect Underfitting and Overfitting?



- **Underfitting:** In this case, **train error is large** and **val/test error is large** too.
- **Overfitting** In this case, **train error is very small** and **val/test error is large.**
- When you find a **good model**, **train error is small** , and **val/test error is small** too.


Train error
Big
Underfitting
Small
Validation error
Big
Overfitting
Small
Test error
Big
Train and test sets are different
Small
Good model



User-uploaded image: Blank-diagram-2-1.jpg

Techniques to prevent underfitting and overfitting:

Techniques to fight underfitting and overfitting		
	Underfitting	**Overfitting**
Complexity of the model	More complex model Try a more powerful model with a larger number of parameters Ensemble learning More layers / number of neurons per layer	More simple model Try a less powerful model with a fewer number of parameters Less layers / number of neurons per layer
Regularization	Less regularization Decrease regularization	More regularization Increase regularization impact Early stopping, L1 / L2 regularization, dropout
Quantity of features	A larger quantity of features Get additional features, feature engineering, polynomial features, etc.	A smaller quantity of features Remove all additional features, feature selection
Data	Data cleaning, hold-out validation or cross validation. ~~Getting more data most likely will not help~~	Data cleaning, hold-out validation or cross validation. Getting more data most likely will help (data augmentation)

- Using cross-validation can safeguard against overfitting more effectively than using a simple train/test split. This is because it ensures that the model's ability to generalize is not just due to a lucky split of data, but rather a consistent pattern across multiple splits.

Resources :

- https://www.analyticsvidhya.com/blog/2020/02/underfitting-overfitting-best-fitting-machine-learning/
- https://www.baeldung.com/cs/ml-underfitting-overfitting#:~:text=However%2C%20an%20overfitted%20model%20generates,even%20with%20the%20training%20data.
- https://www.geeksforgeeks.org/underfitting-and-overfitting-in-machine-learning/
- http://www.r2d3.us/visual-intro-to-machine-learning-part-2/