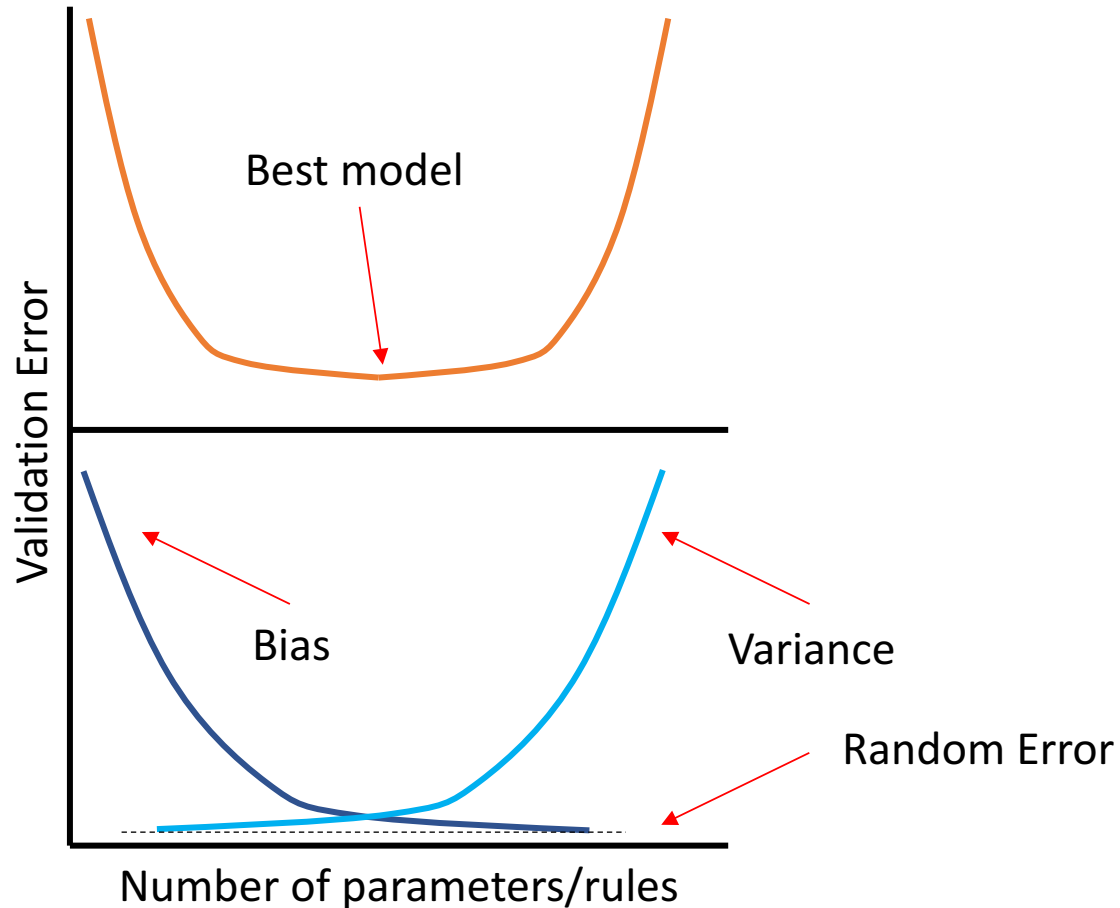


The Bias / Variance Trade-off

Total Error = Bias + Variance + Random Error =
 $(\hat{f}(x) - f(x))^2$



Bias = $E[\hat{f}(x)] - f(x)$ or the error that arises from a model's inability to replicate the fundamental phenomena represented by a data set.

Variance = $(\hat{f}(x) - E[\hat{f}(x)])^2$ or the error that arises from a model's ability to produce differing predictions from the values in a new data set.

The Bias / Variance Trade-off: predictions



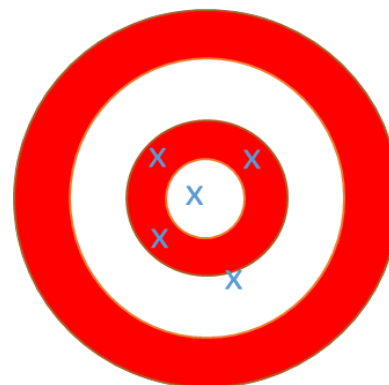
**High Bias
Low Variance**



**High Bias
High Variance**

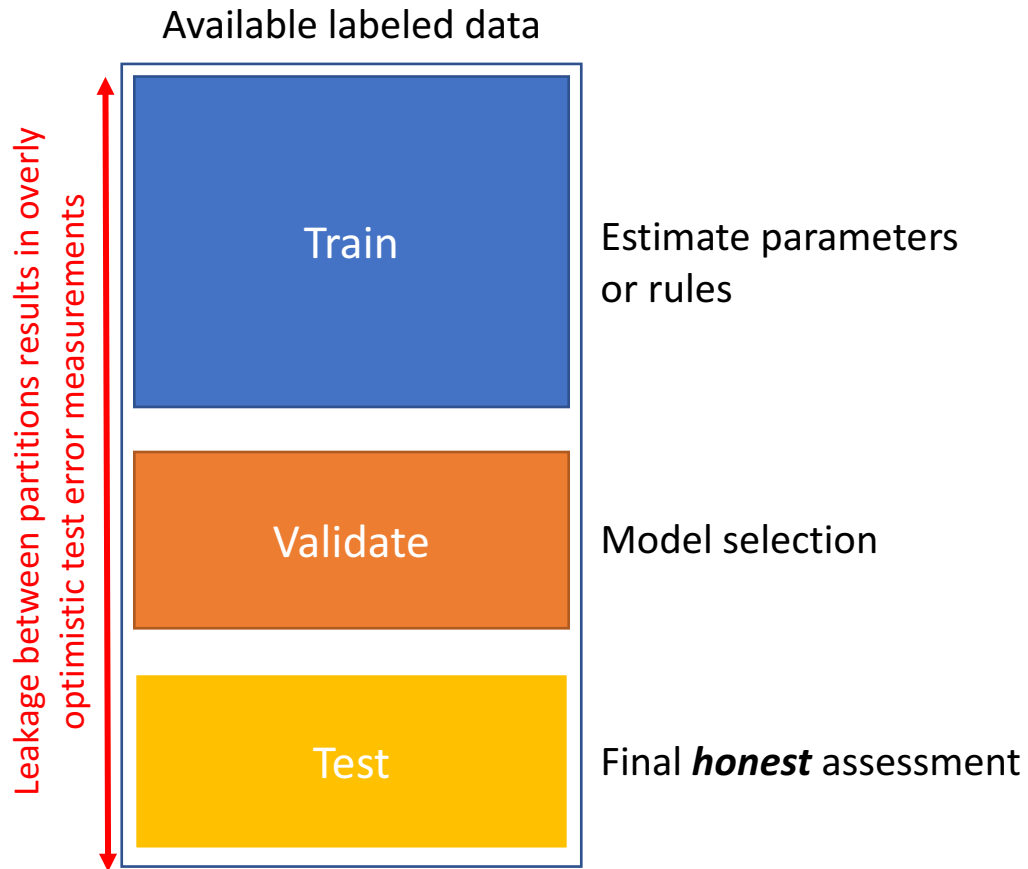


**Low Bias
Low Variance**

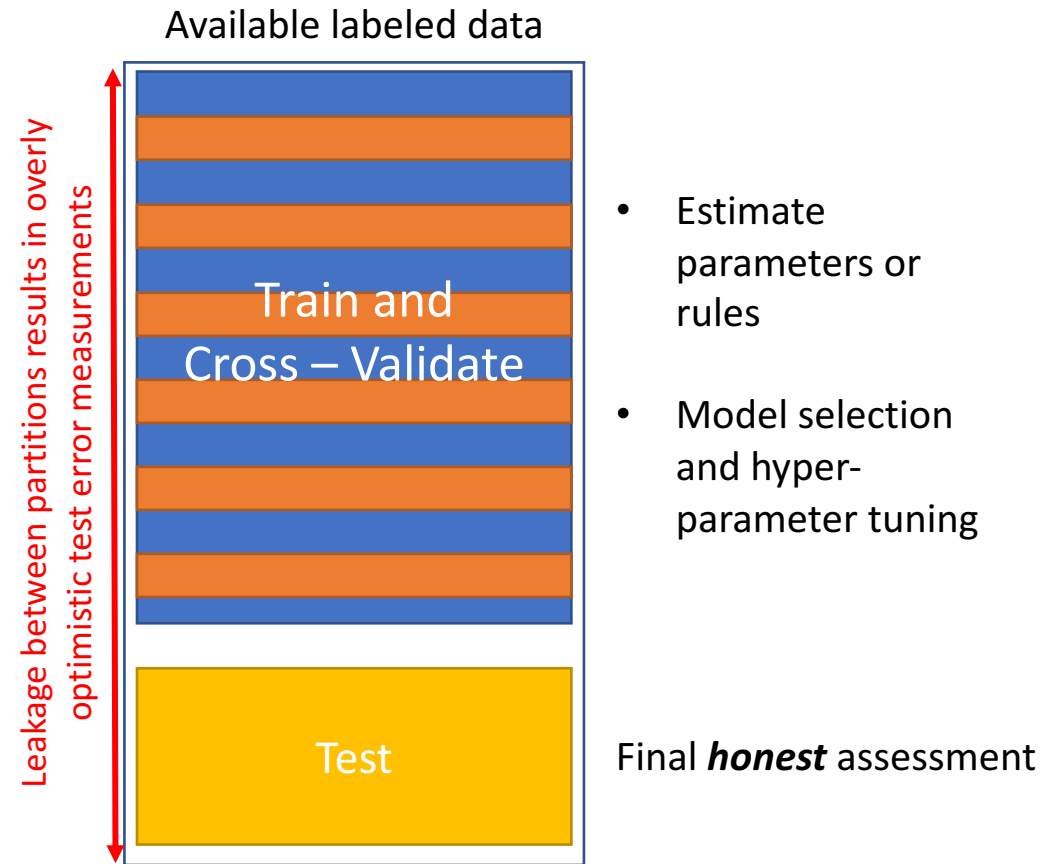


**Low Bias
High Variance**

Bias / Variance trade-off in-practice: Honest assessment



Best suited for big data or linear models using traditional forward, backward, or stepwise selection.



Nearly always a more generalizable approach, but computationally intensive. Best suited for complex models with many hyper-parameters and small to medium sized data.