Machine Learning applied to Planetary Sciences

PTYS 595B/495B

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https://leonpalafox.github.io/MLClass/

Quiz!!!

Quiz Answers

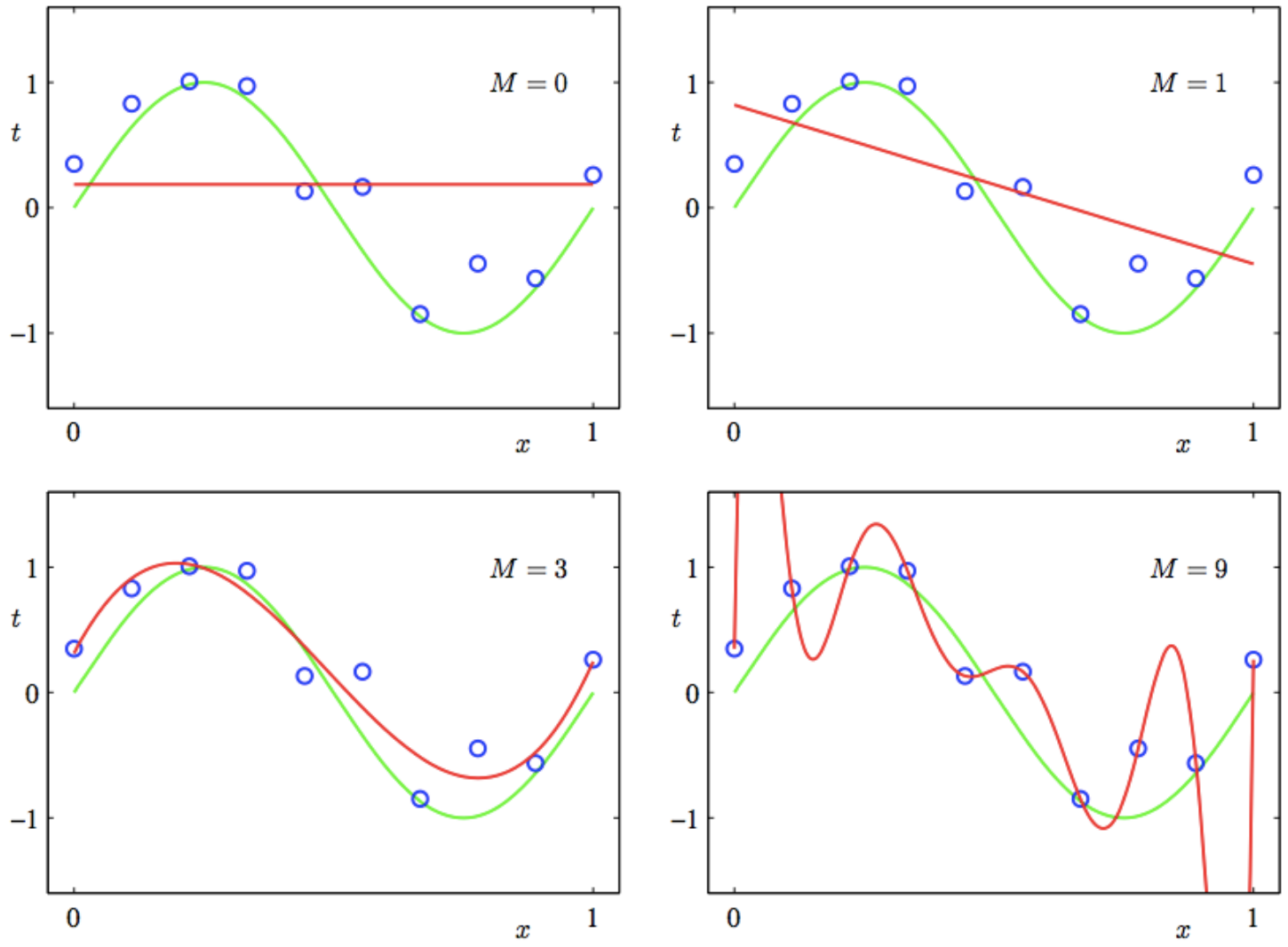
- Supervised and Unsupervised Learning, we don't have labels available to unsupervised learning.
- They indicate the importance of different features in the final regression, they also work as a catch-all for units and scales.
- Matrix Algebra and Gradient Descent. Matrix Algebra is fast and good for a small number of data points, while Gradient Descent woks better for big data. Bonus: Gradient Descent can be used in online optimization.
- Transform the space, so we can find hyperplanes that can separate our data points cleanly.
- If the network is too deep, units in the initial layers won't update. This happens because the backpropagation error gets diluted.
- 1.518 billion USD

Validation Methods

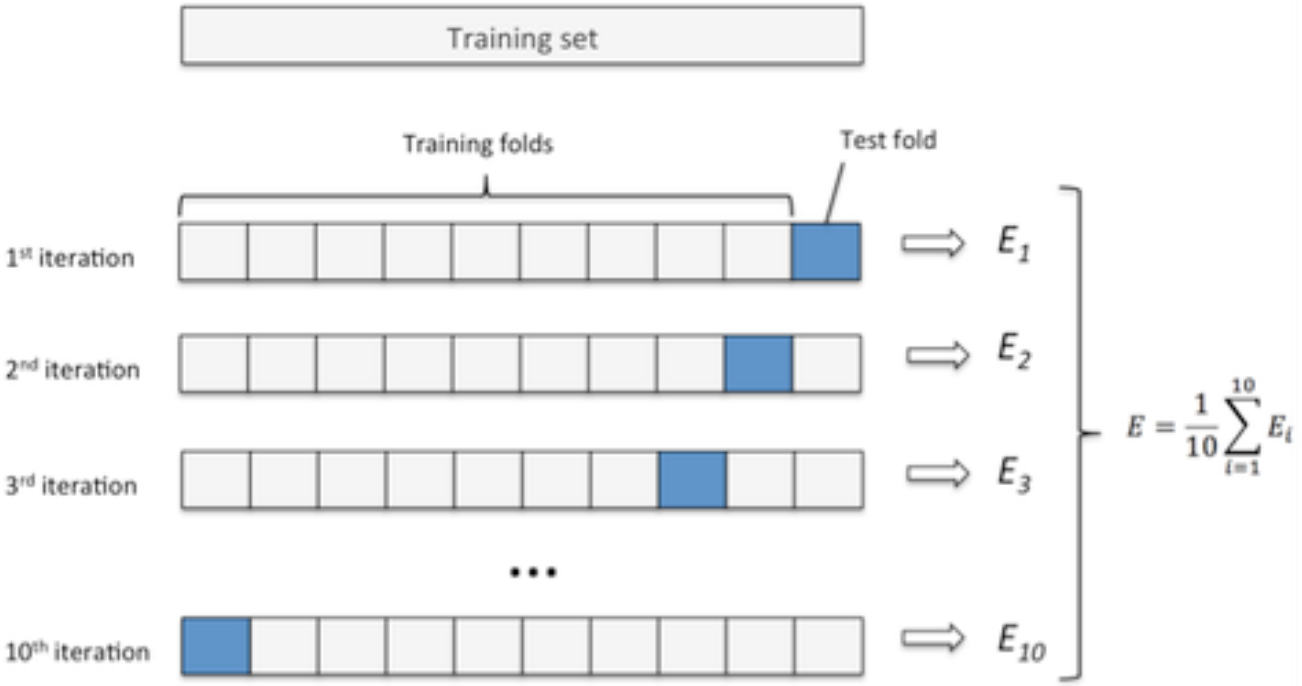
Cross Validation

- The hypothesis with the smallest training error, won't be the best.
  - Why?
  - We need test sets and training sets
- Our first tool is called hold-out cross validation.

Smallest training error



K-Fold Cross validation



K-Fold Cross validation

M_1

M_4

M_2

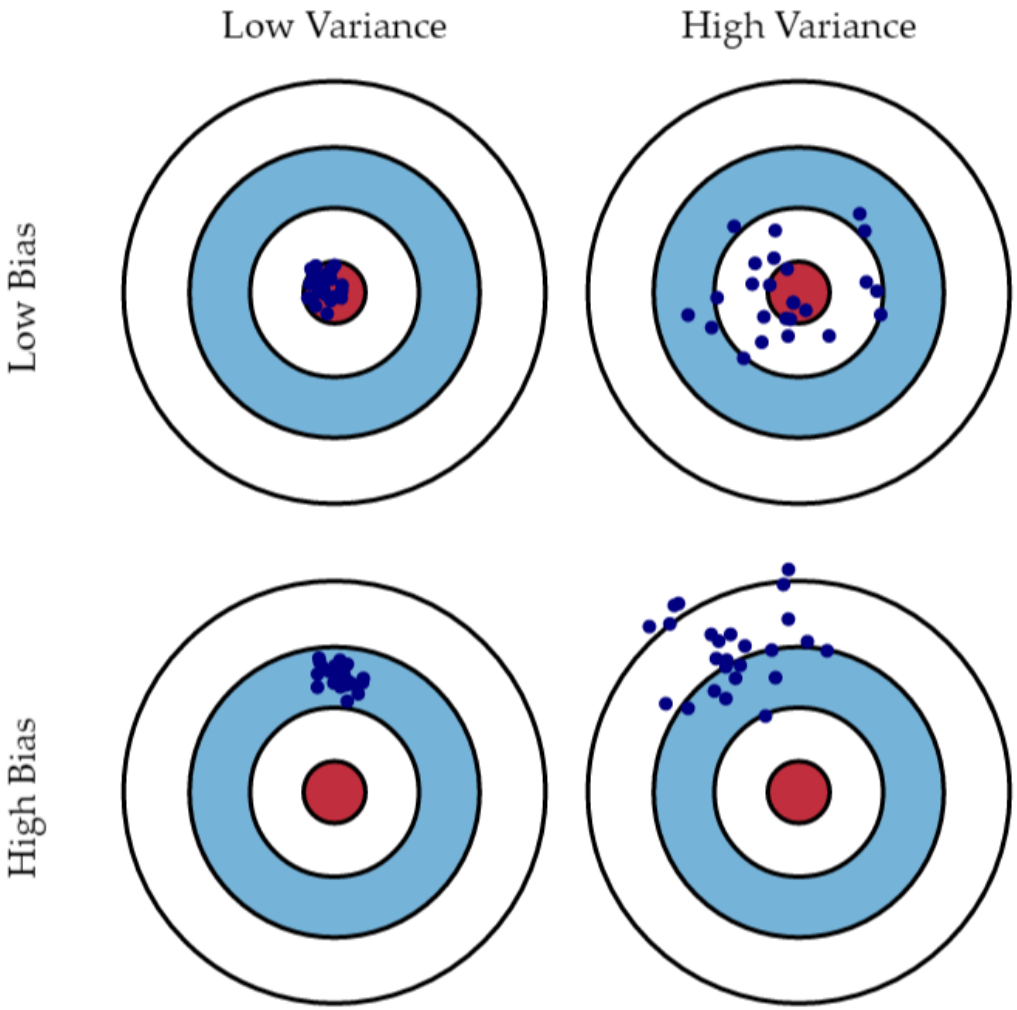
M_3

Bias–Variance Analysis

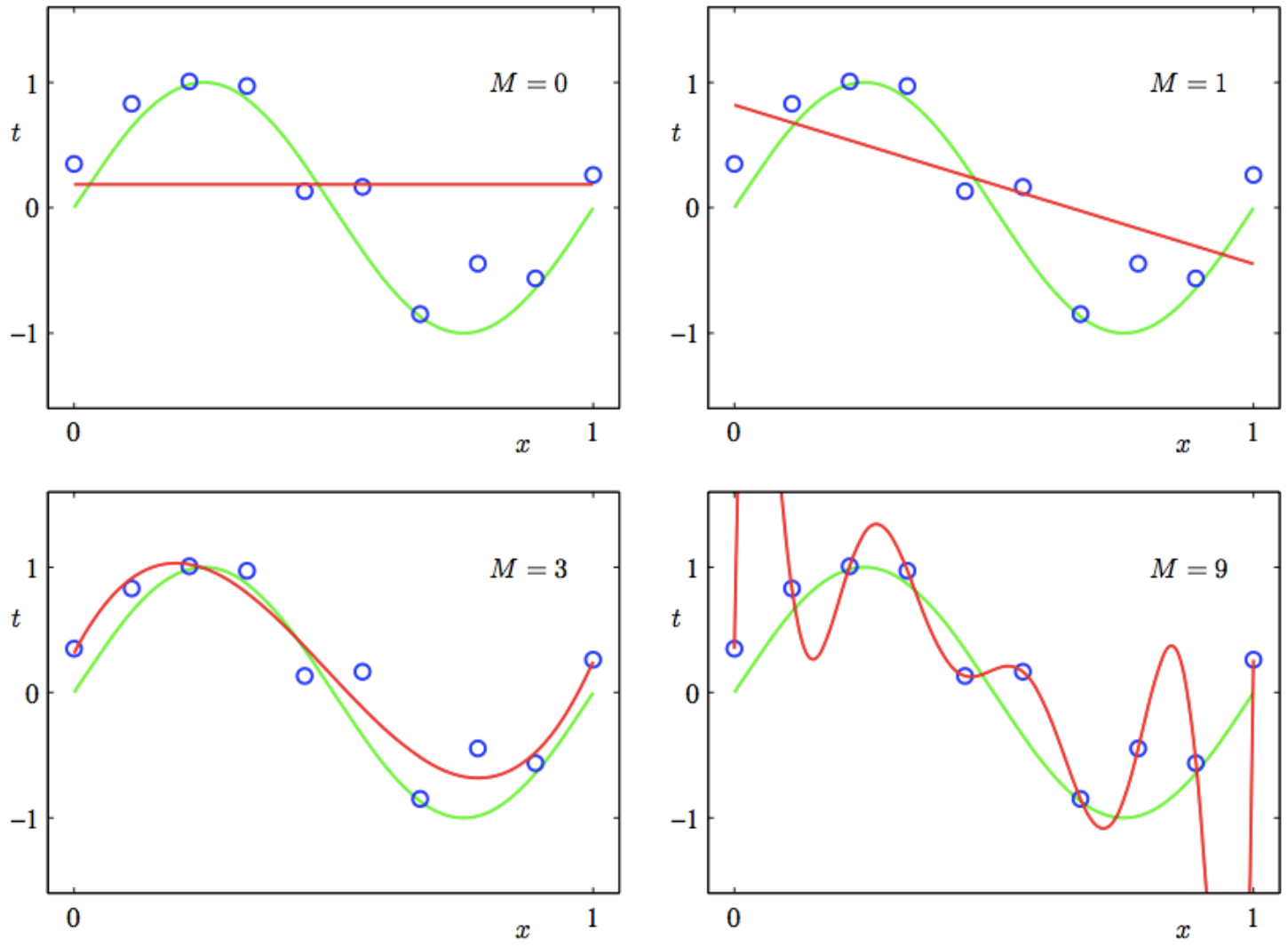
Concepts

- Bias: Measures how far off is our model from the correct set of predictions.
- Variance: It measures how consistent are the predictions of the model.
- Is a trade-off.

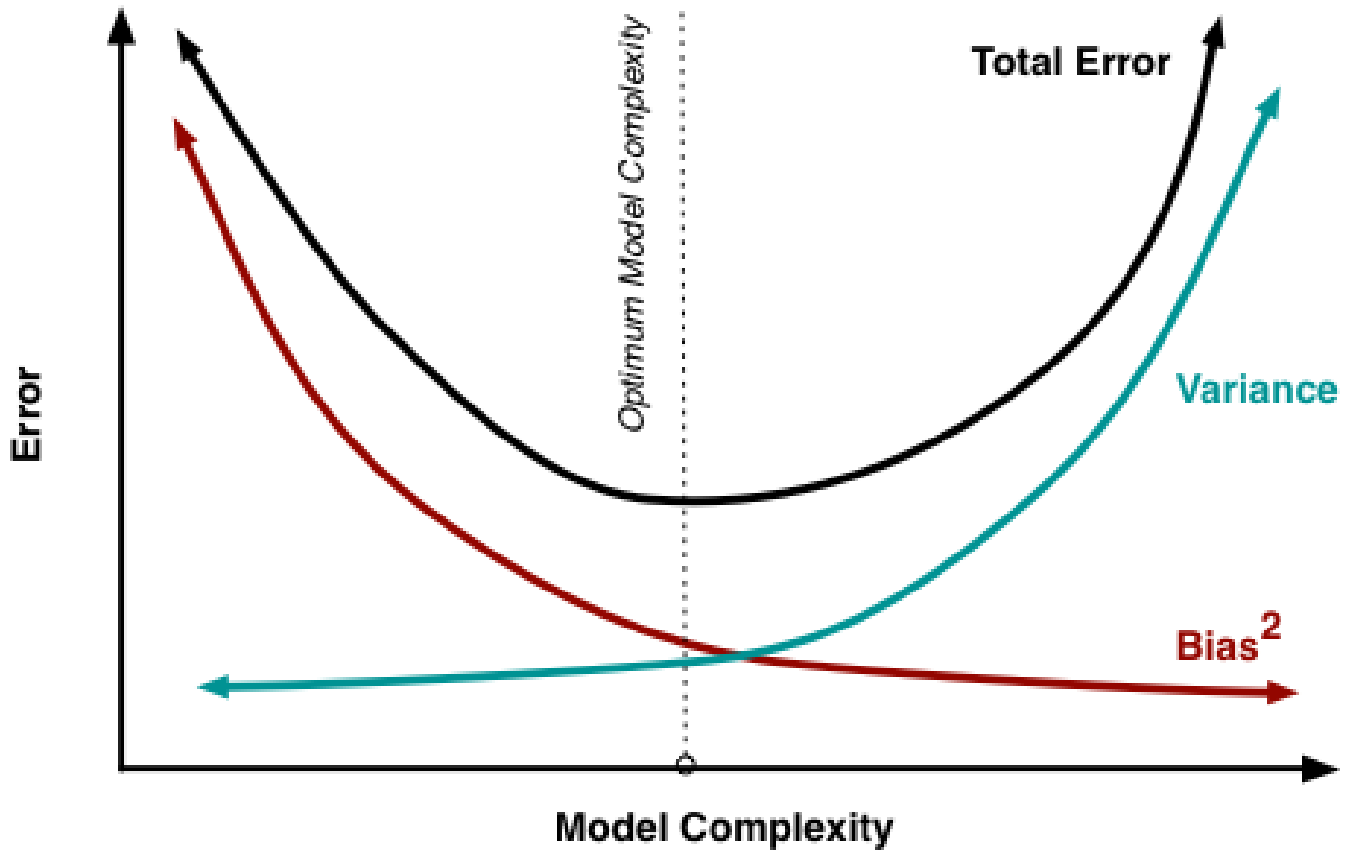
An example



Smallest training error



Bias-Variance Plot



Notes

- Is best used as a stop point when running CV.
- You can use it without CV, and you can still have very good results.
- Bias and Variance are defined differently for different algorithms. Thus, it adds an extra layer of complexity in implementation.