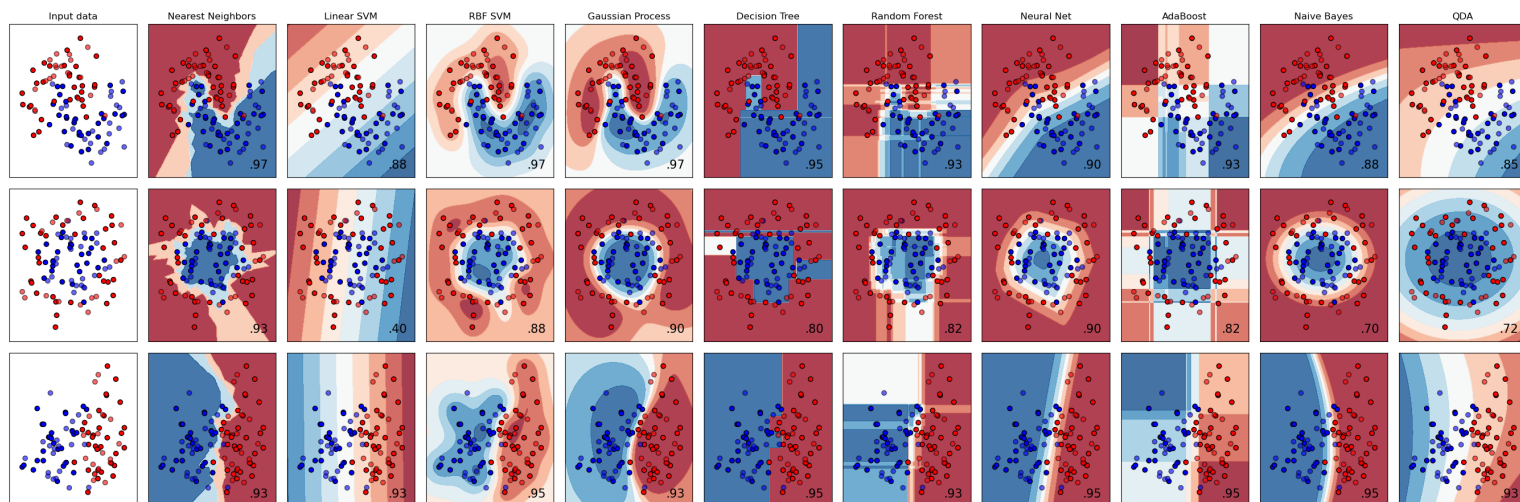


Notes: Model Zoo



Source: https://scikit-learn.org/stable/auto_examples/classification/plot_classifier_comparison.html

1 Pre-lecture Work

None. Get plenty of sleep and do well on all your midterms :)

2 Lecture

Problem 1. What is a decision boundary?

Problem 2. What is a universal approximation theorem?

Problem 3. Neural Networks.

1. Optional Videos:

(a) 3Blue1Brown on Neural Networks: https://www.youtube.com/watch?v=aircAruvnKk&list=PLZHQ0b0WTQDNU6R1_67000Dx_ZCJB-3pi

2. What is the hypothesis class of 1-layer neural networks?

3. What is the hypothesis class of n-layer neural networks?

4. What is the VC-dimension of neural networks? (Theorem 20.6)

Problem 4. Decision Trees

1. Optional Videos:

- (a) StatQuest on decision trees: <https://www.youtube.com/watch?v=7VeUPuFGJHk>
- (b) StatQuest on regression trees: <https://www.youtube.com/watch?v=g9c66TUylZ4>

2. What is the hypothesis class of decision stumps?

3. What is the hypothesis class of depth k decision trees?

4. What is the VC-dimension of depth k decision trees?

Problem 5. Ensemble Methods

1. Optional Videos:

- (a) StatQuest on random forests: https://www.youtube.com/watch?v=J4Wdy0Wc_xQ
- (b) StatQuest on AdaBoost: <https://www.youtube.com/watch?v=LsK-xG1cLYA>
- (c) StatQuest on XGBoost (4 videos): https://www.youtube.com/watch?v=0tD8wVaFm6E&list=PLb1h5JK0oLUICTaGLRoHQDuF_7q2GfuJF&index=57
- (d) Alex Ihler on bagging: <https://www.youtube.com/watch?v=Rm6s6gmLTdg>

2. What is the hypothesis class of ensemble methods?

3. What is the VC-dimension of ensemble methods?

Problem 6. Nearest Neighbor

1. Optional Videos:

(a) StatQuest: <https://www.youtube.com/watch?v=HVXimeOnQeI>

2. What is the k -nearest neighbor classification rule?

3. What is the VC-dimension of k -nearest neighbor?

4. Nearest neighbor can still be effective in practice. Why?