CSPB 4622 - Truong - Machine Learning

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State	Finished
Completed on	Monday, 30 September 2024, 10:43 AM
Time taken	5 mins 23 secs
Marks	11.00/11.00
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Suppose you train a linear Hard-Margin Support Vector Machine on a training set and observe the resulting decision boundary. Which of the following modifications to the training data would **necessarily** cause the decision boundary to change?

a. Removing the training example farthest from the decision boundary.

b. Removing the positive training example closest to the decision boundary, in the case that there is exactly one positively labeled support vector. ✔

c. Removing a positive training example exactly one margin away from the decision boundary, in the case that there are multiple positively labeled support vectors.

Question **2**

Correct

Mark 1.00 out of 1.00

Which of the following are characteristics of a linear Hard-Margin Support Vector Machine? (Select all that apply)

- [x] Achieves a training error of zero on linearly separable data
- [ ] Achieves a training error of zero on non-linearly separable data
- [ ] Allows for a few misclassifications in order to achieve a larger margin
- [x] Has a decision boundary which depends only on a subset of the training examples

Question **3**

Correct

Mark 1.00 out of 1.00

Suppose we fit three different soft-margin SVMs with different values of the hyperparameter C to the linearly separable training set shown below. Which of the displayed models correspond to the largest value of C? (Select one) Note: Support vectors for the model are indicated by circled data points.

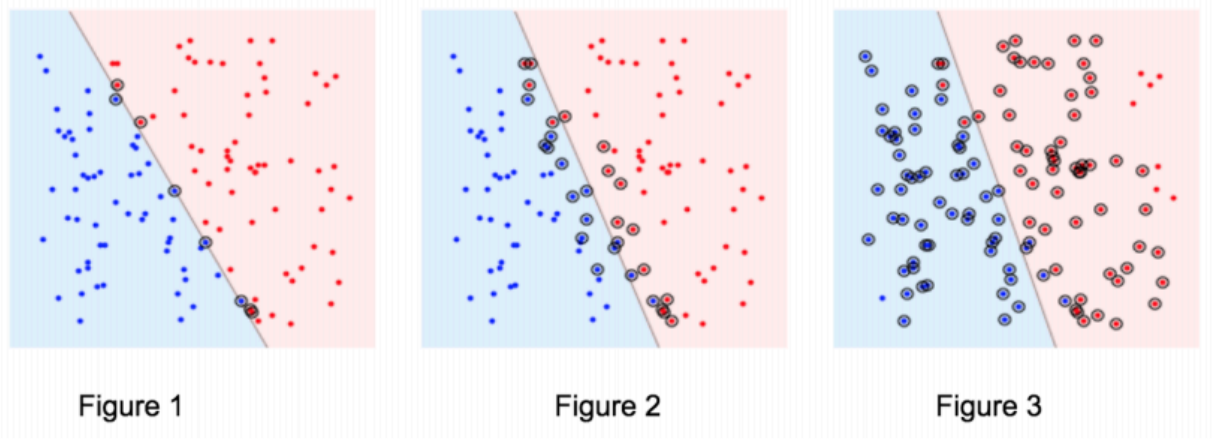


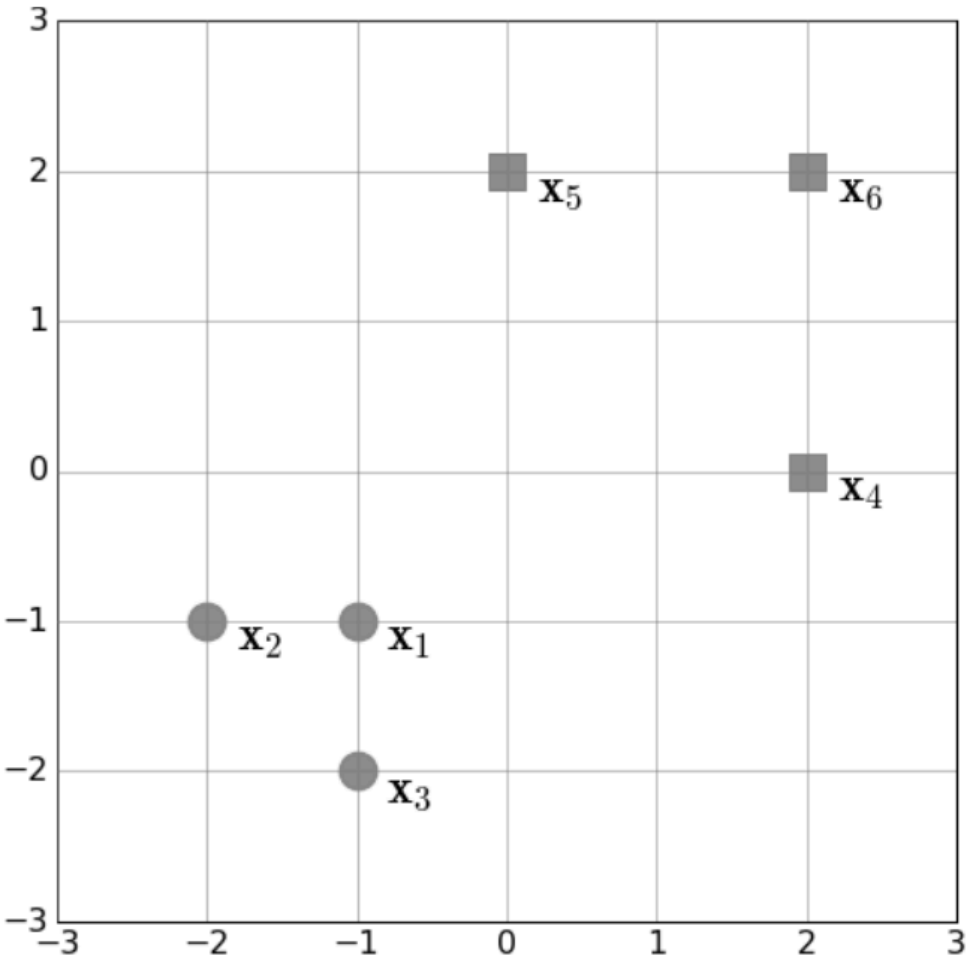
Figure 1 Figure 2 Figure 3

- a. Figure 1
- b. Figure 2
- c. Figure 3 ✔

Question **4**

Correct

Mark 1.00 out of 1.00



Suppose you fit a Hard-Margin Support Vector Machine to the data shown above. Which examples are the support vectors? Select one or more:

- [x] x_1 ✔
- [ ] x_2
- [ ] x_3
- [x] x_4 ✔
- [x] x_5 ✔
- [ ] x_6

Question **5**

Correct

Mark 1.00 out of 1.00

Select all statements which are true about the role of C (select one or more):

- [x] The margin becomes wider as C increases ✔
- [ ] The margin becomes narrower as C increases
- [x] Small C gives lower bias ✔
- [ ] Small C gives higher bias
- [ ] Small C gives lower variance
- [x] Small C gives higher variance ✔

Question **6**

Correct

Mark 1.00 out of 1.00

Which models benefit from normalization (scaling) of input features? Select all that apply.

- [ ] Random Forest (tree ensemble)
- [ ] Gradient boosting (tree ensemble)
- [x] KNN ✔
- [x] SVM ✔
- [x] Logistic regression ✔

Question **7**

Correct

Mark 1.00 out of 1.00

Which models are less sensitive to curse of dimensionality? Assume the models don't have additional regularization used.

- [ ] Linear regression
- [x] Random forest ✔
- [ ] KNN
- [x] SVM ✔

Question **8**

Correct

Mark 1.00 out of 1.00

Select all models that are non-parametric.

- [x] decision tree ✔
- [x] support vector classifier ✔
- [ ] linear regression
- [x] random forest ✔
- [ ] logistic regression
- [x] Adaboost ✔
- [ ] neural network
- [x] knn ✔

Question **9**

Correct

Mark 1.00 out of 1.00

Choose all methods that can help reducing overfitting.

- [ ] Increase max depth of the tree
- [ ] Optimize hyperparamters
- [ ] Increase the learning rate of boosting
- [ ] Reduce the C parameter value in SVR
- [x] Increase λ of ridge regression

✔

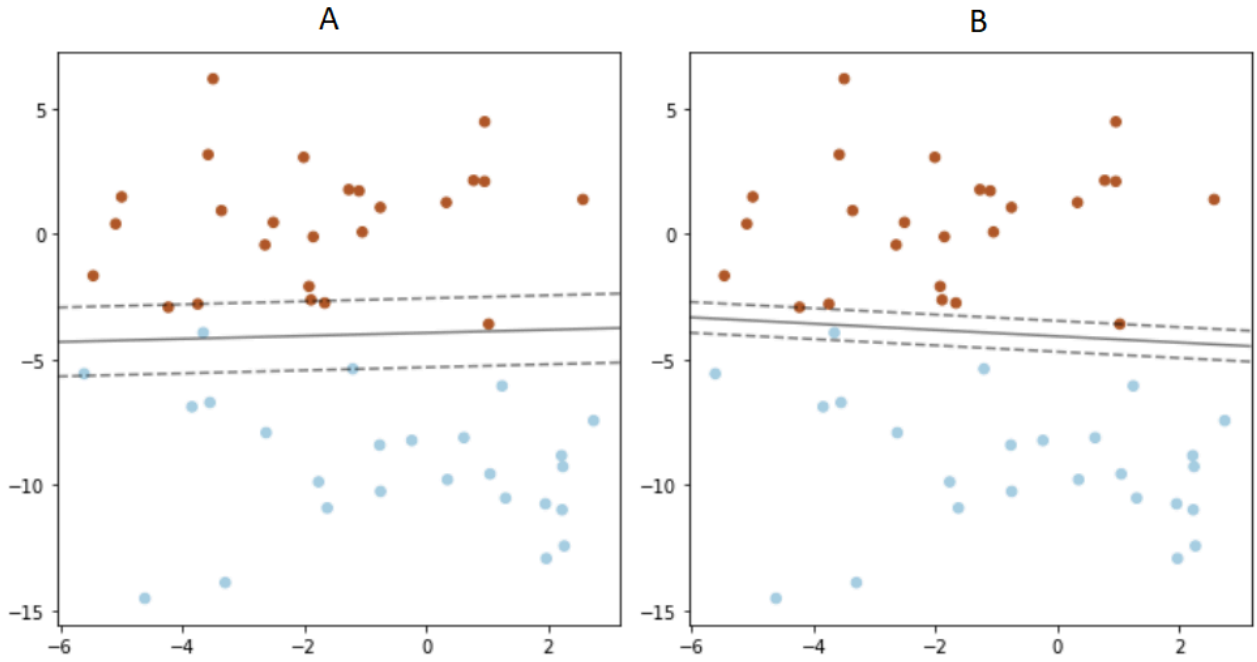
- [x] Decrease the number of trees in a boosting model ✔
- [x] Add lasso to the loss function ✔
- [x] Set aside some part of the train dataset and use it as validation ✔
- [x] Increase k in KNN model ✔
- [ ] Normalize each feature column
- [ ] Increase the model's variance
- [x] Cross validate ✔
- [x] Increase training data ✔
- [x] Reduce the number of features ✔
- [ ] Set ccp_alpha value to 0

Question **10**

Correct

Mark 1.00 out of 1.00

Select all that are true about the SVC models A and B fitted to the train data as shown below.



- [x] The model A is more regularized. ✔
- [ ] The test error of the model B is always smaller than the test error of the model A.
- [x] The training error of the model A is larger than the training error of the model B. ✔
- [ ] The model A has larger variance.
- [x] The model B has a smaller C parameter. ✔

Question **11**

Correct

Mark 1.00 out of 1.00

Choose models that can be used to predict numeric target values.

- [x] random forest
- [ ] logistic regression
- [x] support vector machine
- [x] linear regression
- [x] k-nearest neighbor