Overfitting & Regularization in Logistic Regression

8 questions

1.
Consider four classifiers, whose classification performance is given by the following table:

	Classification error on training set	Classification error on validation set
Classifier 1	0.2	0.6
Classifier 2	0.8	0.6
Classifier 3	0.2	0.2
Classifier 4	0.5	0.4

Which of the four classifiers is most likely overfit?

- Classifier 1
- Classifier 2
- Classifier 3
- Classifier 4

2.
Suppose a classifier classifies 23100 examples correctly and 1900 examples incorrectly. Compute error by hand. Round your answer to 3 decimal places.

0.076

3.
(True/False) Accuracy and error measured on the same dataset always sum to 1.

- ○ True
- ● False

4.
Which of the following is NOT a correct description of complex models?

- ● Complex models accommodate many features.
- ● Complex models tend to produce lower training error than simple models.
- ○ Complex models tend to generalize better than simple models.
- ● Complex models tend to exhibit high variance in response to perturbation in the training data.
- ● Complex models tend to exhibit low bias, capturing many patterns in the training data that simple models may have missed.

5.
Which of the following is a symptom of overfitting in the context of logistic regression? Select all that apply.

- ☐ Large estimated coefficients
- ☐ Good generalization to previously unseen data
- ☐ Simple decision boundary
- ☐ Complex decision boundary
- ☐ Overconfident predictions of class probabilities

6.

Suppose we perform L2 regularized logistic regression to fit a sentiment classifier. Which of the following plots does NOT describe a possible coefficient path? Choose all that apply.

Note. Assume that the algorithm runs for a wide range of L2 penalty values and each coefficient plot is zoomed out enough to capture all long-term trends.

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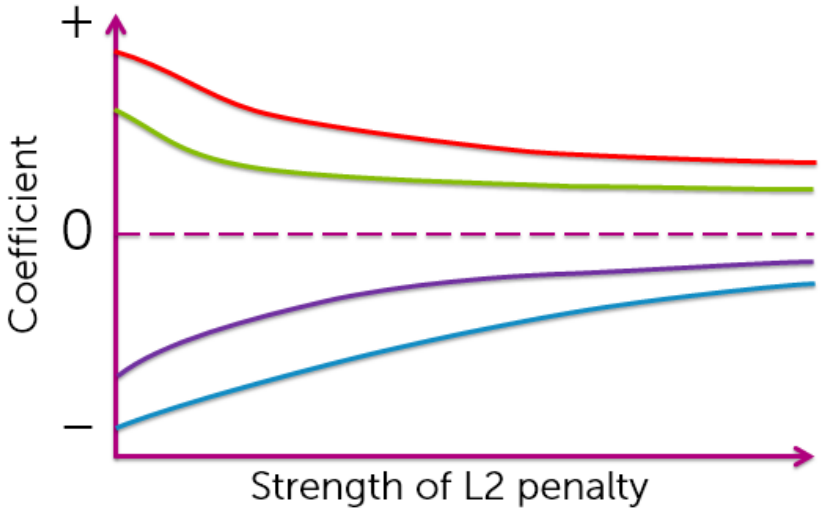

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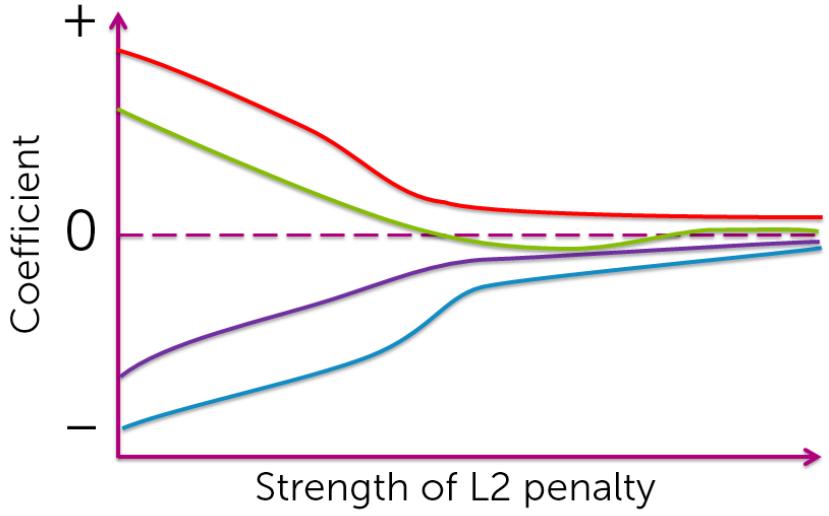

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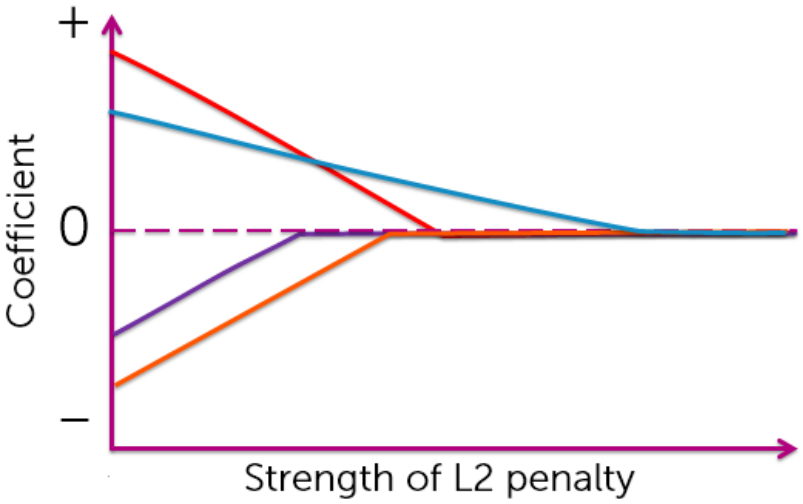
+
Coefficient
0
–
Strength of L2 penalty

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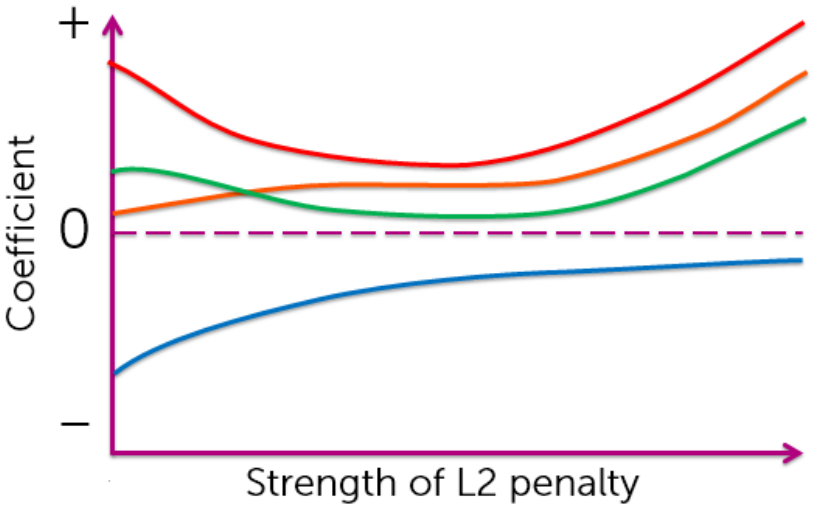
+
Coefficient
0
–
Strength of L2 penalty

7.

Suppose we perform L1 regularized logistic regression to fit a sentiment classifier. Which of the following plots does NOT describe a possible coefficient path? Choose all that apply.

Note. Assume that the algorithm runs for a wide range of L1 penalty values and each coefficient plot is zoomed out enough to capture all long-term trends.

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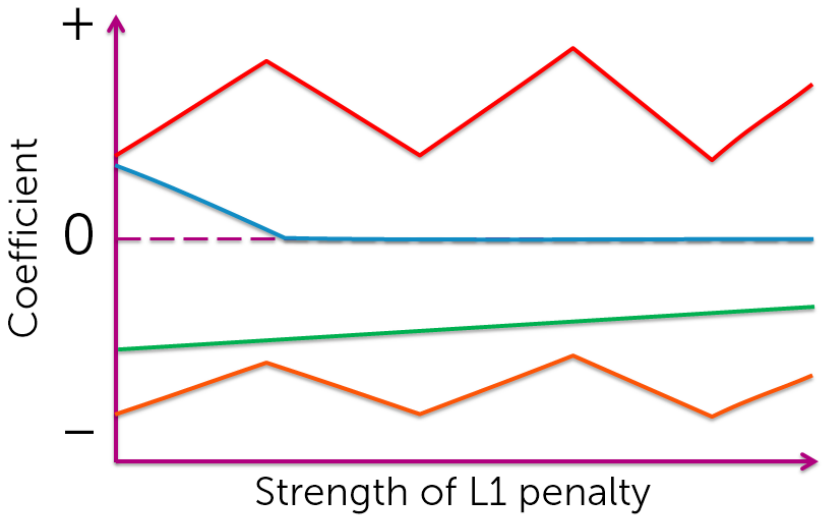

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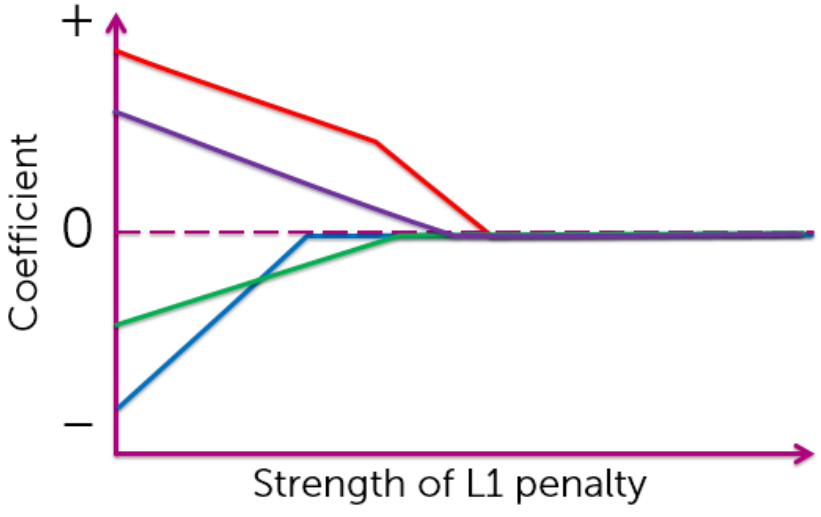

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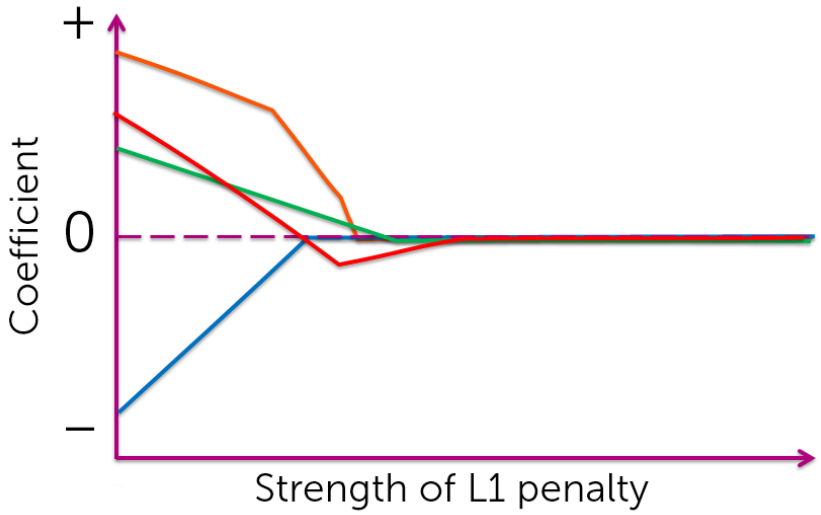

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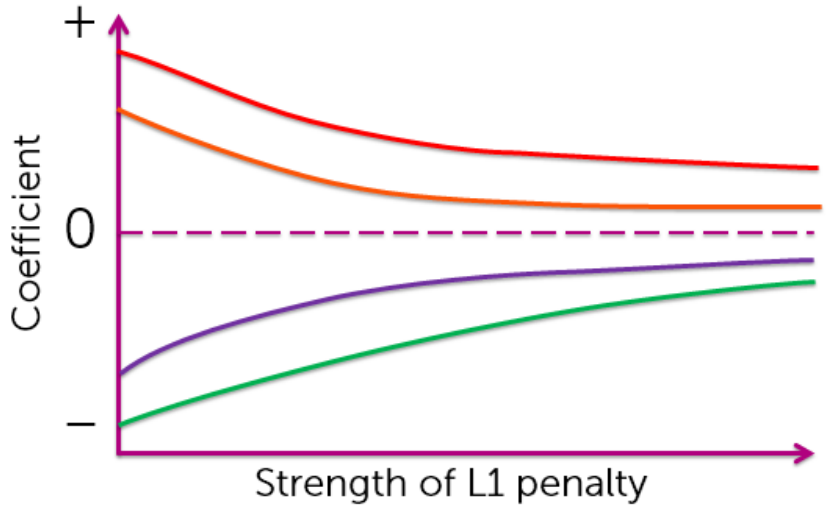

8.

In the context of L2 regularized logistic regression, which of the following occurs as we increase the L2 penalty λ? Choose all that apply.

☐ The L2 norm of the set of coefficients gets smaller

- [x] Region of uncertainty becomes narrower, i.e., the classifier makes predictions with higher confidence.
- [ ] Decision boundary becomes less complex
- [x] Training error decreases
- [ ] The classifier has lower variance
- [x] Some features are excluded from the classifier

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