Theodore Kim

CS-UY 4563 – Introduction to Machine Learning

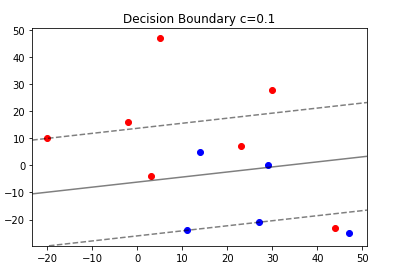
HW #5b

1. Using soft-margin SVM:

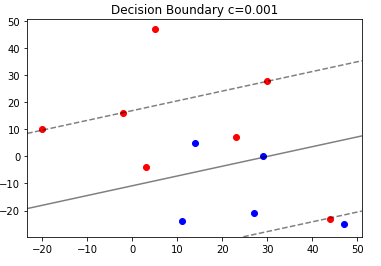
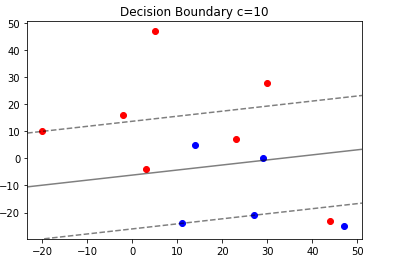
(a) If the cost (ξ1) of a point xi is 0, the point is located on the outside of the margin and is correctly classified.

(b) If the cost (ξ1) of a point xi is greater than 0 and less than 1, the point is located within the margin but on the "correct" side of classifier line, therefore the classification was "correct" but there is a chance that, the relaxation of the margin misclassified the point.

(c) If the cost (ξ1) of a point xi is greater than 1, the point is located on the wrong side of the classifier line and the margin and is therefore incorrectly classified.

2. Plot the decision boundary when C=0.1 and C=10

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 5 | 47 | -1 |
| 14 | 5 | 1 |
| 47 | -25 | 1 |
| 3 | -4 | -1 |
| -2 | 16 | -1 |
| 30 | 28 | -1 |
| 27 | -21 | 1 |
| 11 | -24 | 1 |
| 29 | 0 | 1 |
| 23 | 7 | -1 |
| -20 | 10 | -1 |
| 44 | -23 | -1 |



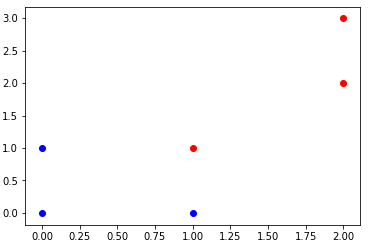
3.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1.0000 | 0.6496 | 0.3516 | 0.5551 | 0.9326 | 0.9593 | 0.5391 | 0.4693 | 0.4564 | 0.5283 | 0.1670 |
| 0.6496 | 1.0000 | 0.7579 | 0.9831 | 0.6102 | 0.7604 | 0.9642 | 0.9552 | 0.5985 | 0.9780 | 0.5774 |
| 0.3516 | 0.7579 | 1.0000 | 0.8431 | 0.2597 | 0.5043 | 0.6728 | 0.7888 | 0.2226 | 0.7603 | 0.8765 |
| 0.5551 | 0.9831 | 0.8431 | 1.0000 | 0.5018 | 0.6851 | 0.9492 | 0.9790 | 0.5158 | 0.9833 | 0.6887 |
| 0.9326 | 0.6102 | 0.2597 | 0.5018 | 1.0000 | 0.8338 | 0.5498 | 0.4478 | 0.6216 | 0.5104 | 0.1270 |
| 0.9593 | 0.7604 | 0.5043 | 0.6851 | 0.8338 | 1.0000 | 0.6266 | 0.5820 | 0.4247 | 0.6365 | 0.2636 |
| 0.5391 | 0.9642 | 0.6728 | 0.9492 | 0.5498 | 0.6266 | 1.0000 | 0.9742 | 0.6968 | 0.9888 | 0.5648 |
| 0.4693 | 0.9552 | 0.7888 | 0.9790 | 0.4478 | 0.5820 | 0.9742 | 1.0000 | 0.5625 | 0.9942 | 0.7020 |
| 0.4564 | 0.5985 | 0.2226 | 0.5158 | 0.6216 | 0.4247 | 0.6968 | 0.5625 | 1.0000 | 0.6074 | 0.1663 |
| 0.5283 | 0.9780 | 0.7603 | 0.9833 | 0.5104 | 0.6365 | 0.9888 | 0.9942 | 0.6074 | 1.0000 | 0.6440 |
| 0.1670 | 0.5774 | 0.8765 | 0.6887 | 0.1270 | 0.2636 | 0.5648 | 0.7020 | 0.1663 | 0.6440 | 1.0000 |

5. Given the data:

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 1 | 1 | -1 |
| 2 | 3 | -1 |
| 2 | 2 | -1 |
| 0 | 0 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |

a) Plot the points and determine if they are separable.



They do seem linearly separable.