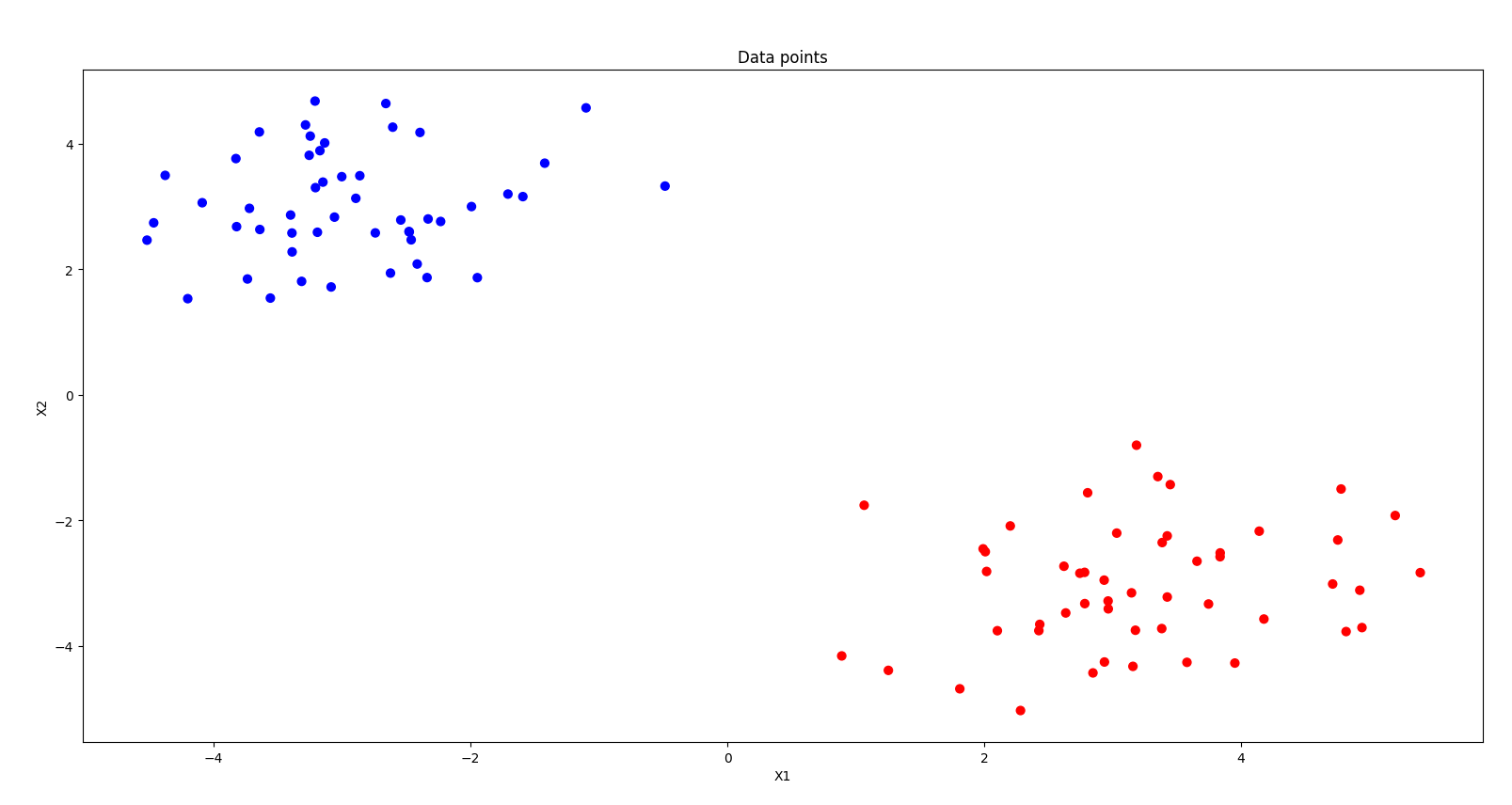
**Assignment 3**

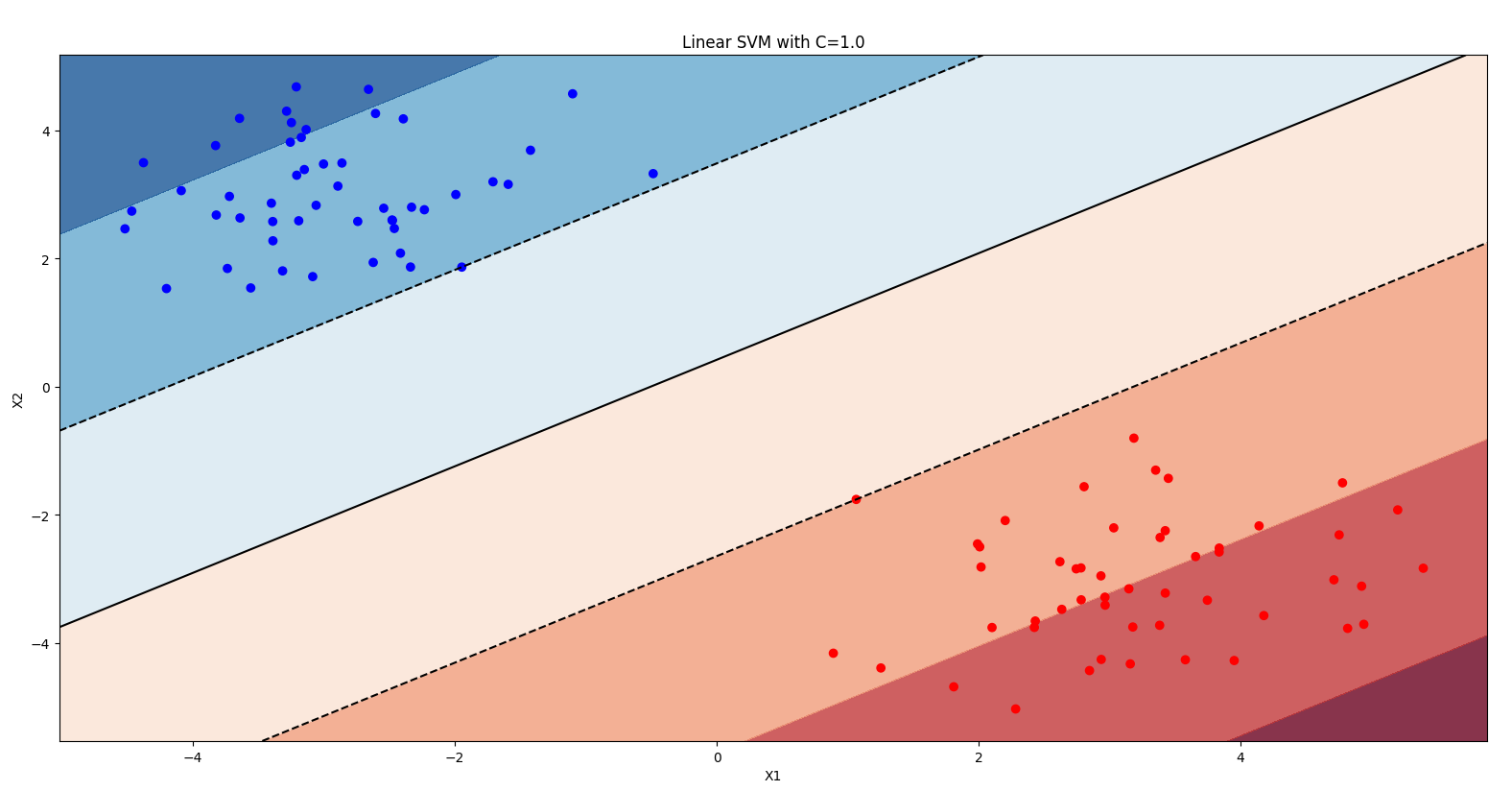
# Computational Intelligence SEW, SS2017

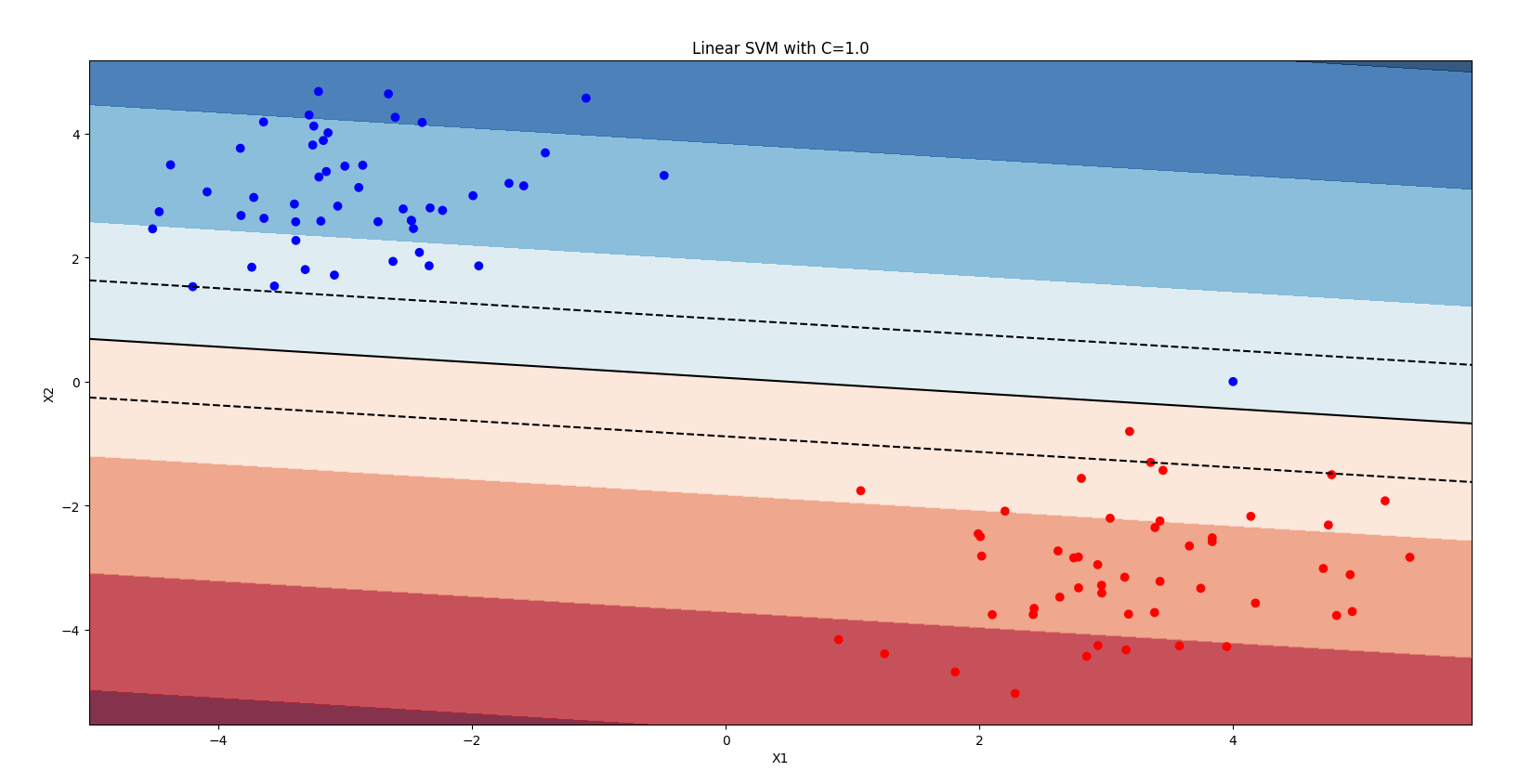
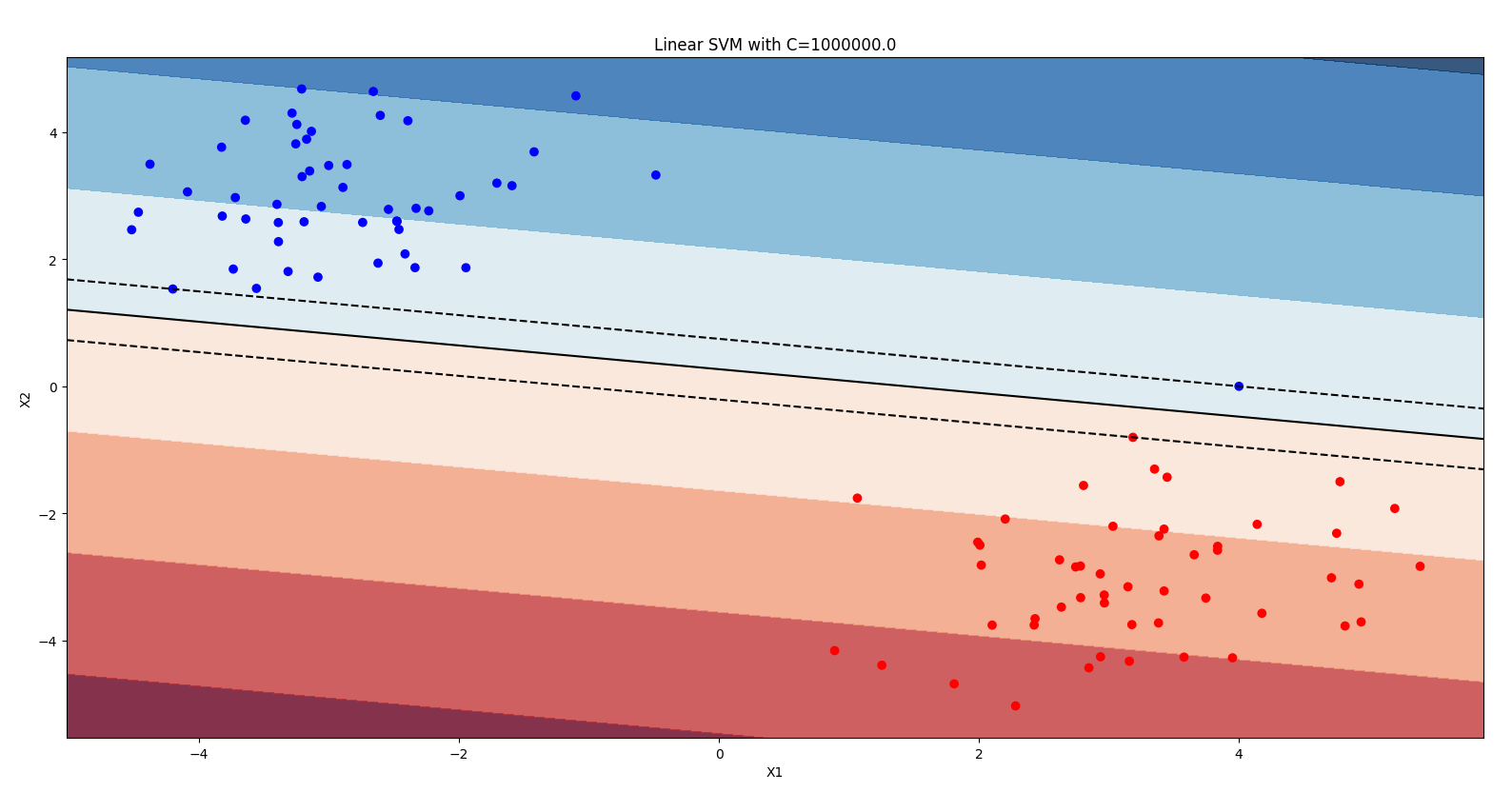
|  |  |  |
| --- | --- | --- |
| **Team Members** | | |
| Last name | First name | Matriculation Number |
| Papst | Stefan | 1430868 |
| Guggi | Simon | 1430534 |
| Perkonigg | Michelle | 1430153 |

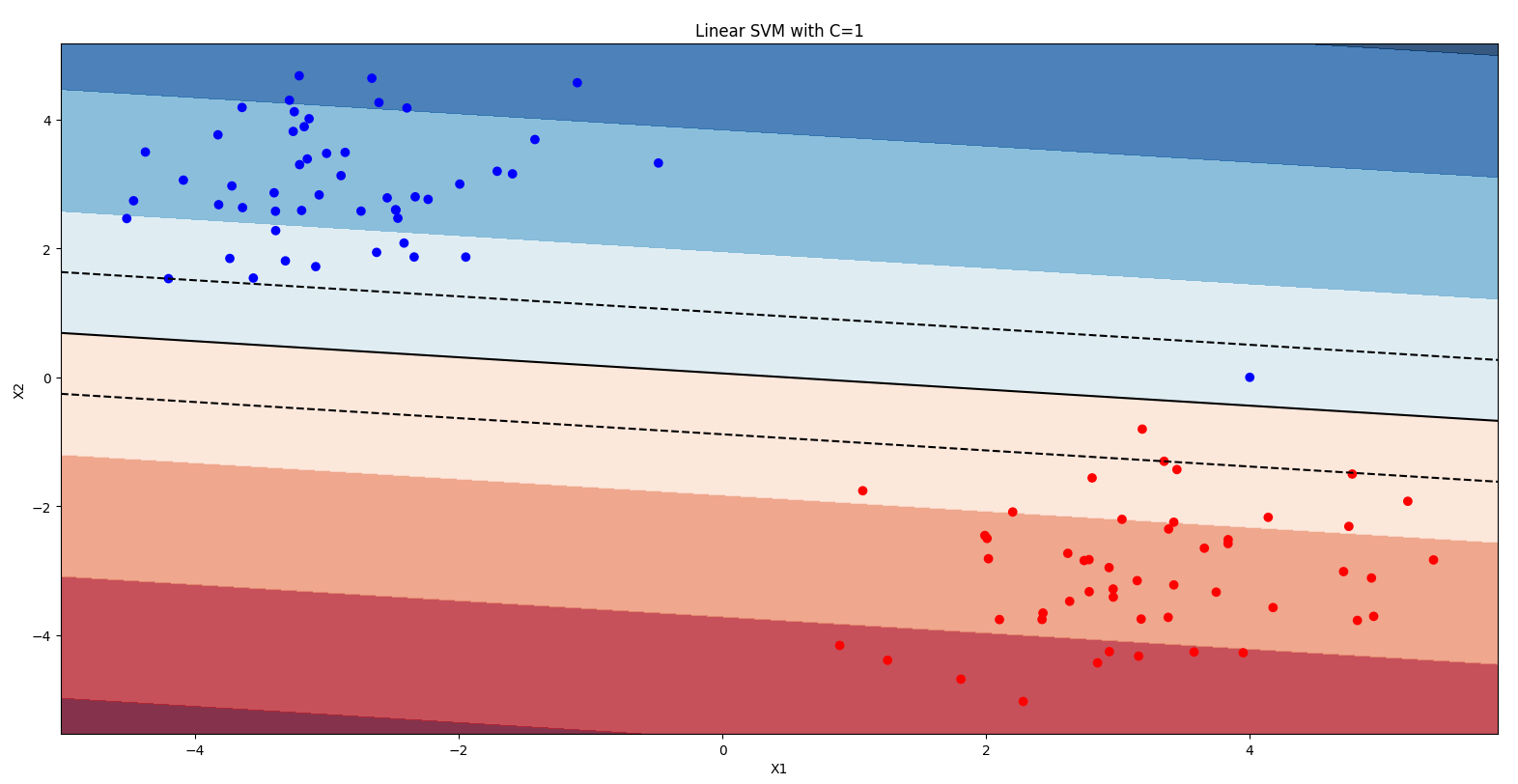
1 Linear SVM

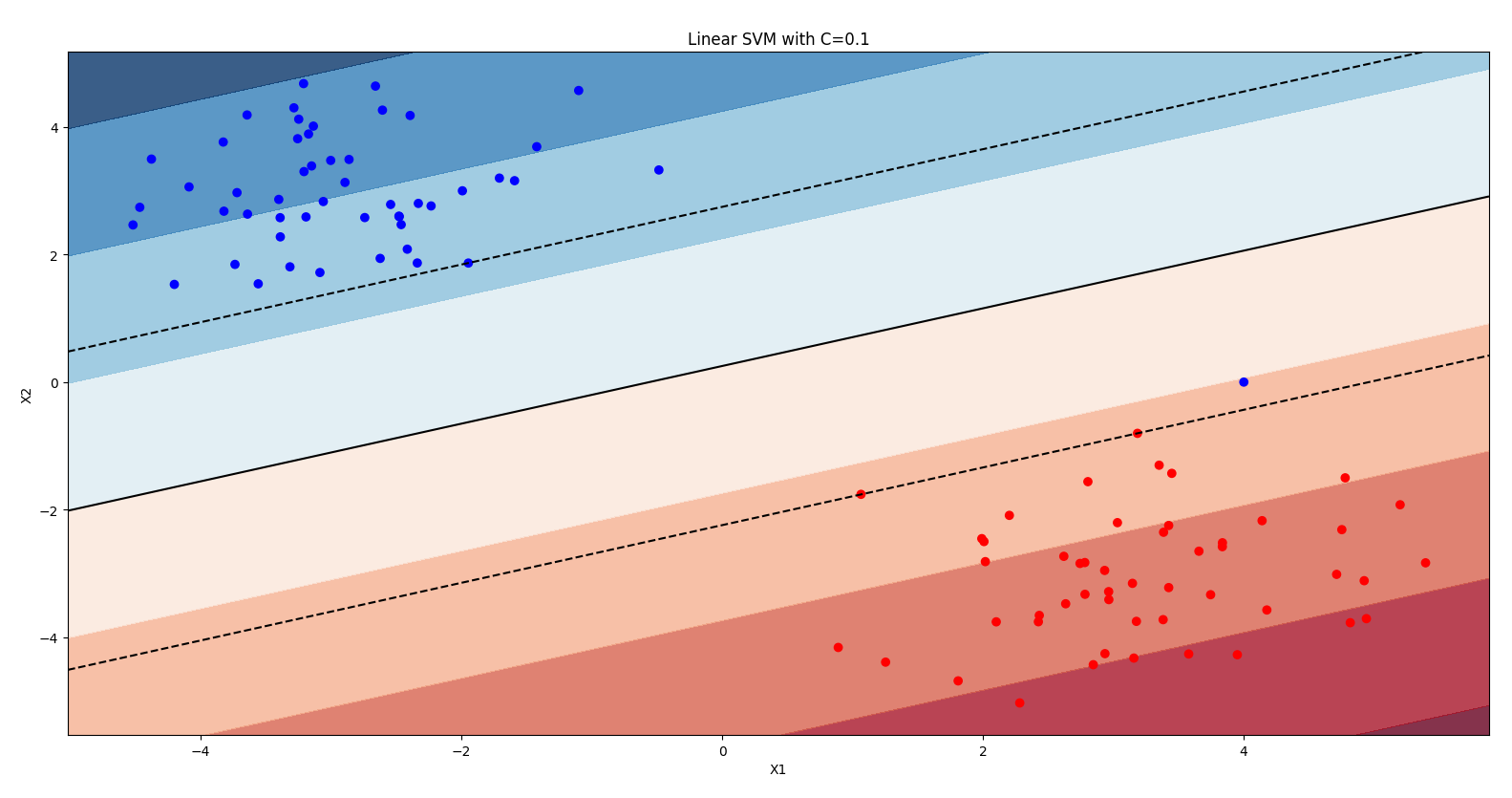
Include plots of all the results

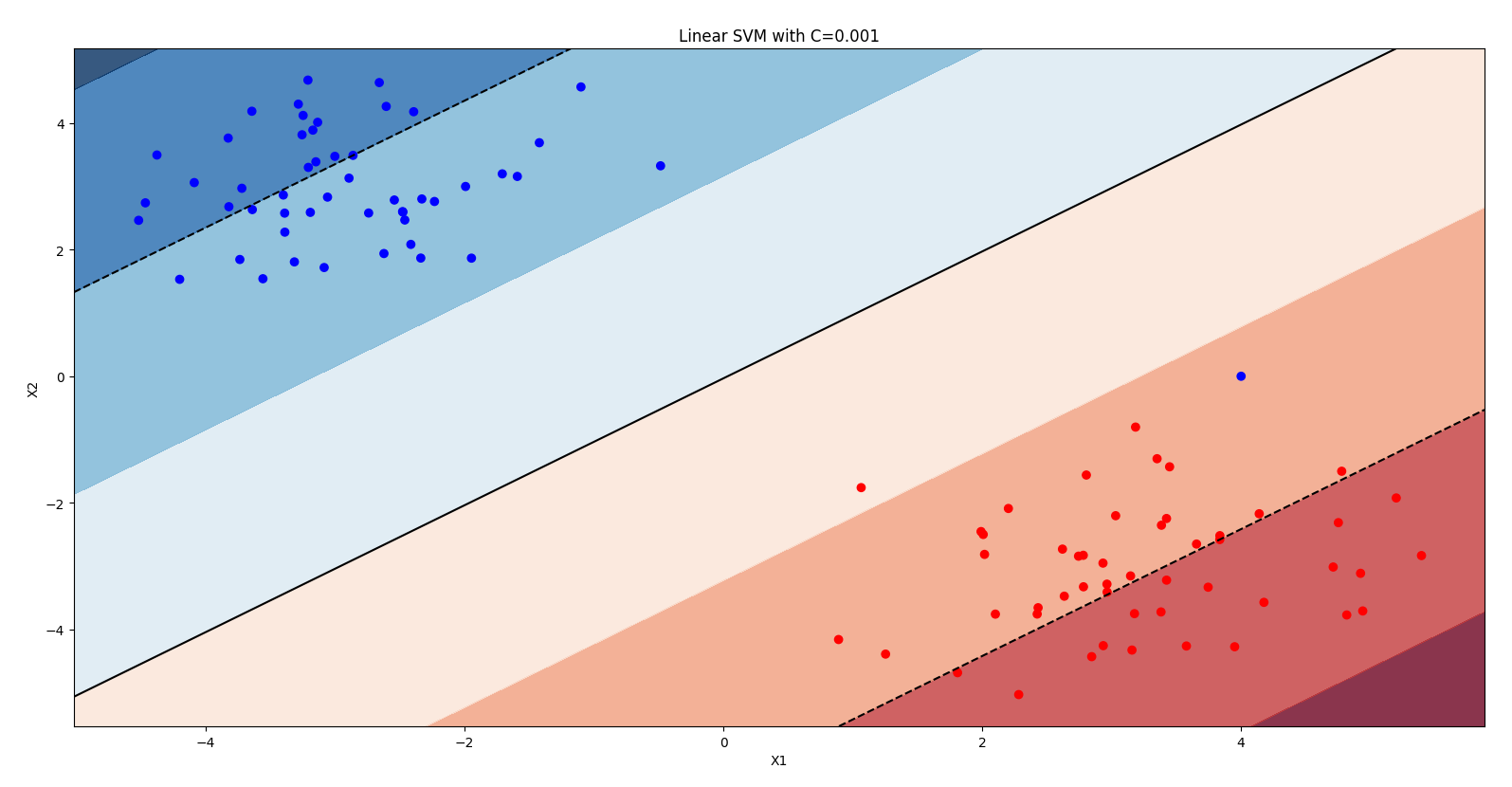










For task b), discuss how and why the decision boundary changed when the new point was added.

For task c):

* Report how the parameter *C* influences the decision boundary found by the SVM
* How does the number of support vectors found by the SVM change with the value of *C*? Why?

2 Nonlinear (kernel) SVM

Include plots of all the results

For task b), which degree of the polynomial produces the highest test score (accuracy)? Report this test score.

For task c), which value of gamma produces the highest test score (accuracy)? Report this test score.

Compare results obtained by each of these three kernels:

* State the maximum test score achieved for each of these kernels and the kernel parameter for which that was achieved.
* Which of the considered kernels performs best and why?
* Compare the complexity of decision boundaries and the number of Support Vectors found.
* Which kernel generalizes best for the given dataset?

3 Multiclass classification

Recall the algorithms `One-versus-Rest' (or versus-all) and `One-versus-one' multi-class classification procedures. How many binary classifiers need to be trained in both cases?

Include plots for ex\_3\_a with the scores of a linear and a rbf kernels.

Discuss those results. In particular why does a linear kernel perform well on images?

Find the digit class for which you get the highest error rate.

Include plots for ex\_3\_b of the confusion matrix and the first 10 images from the test set of the most misclassified digit.

With the help of these two plots, discuss why the classifier is doing these mistakes.