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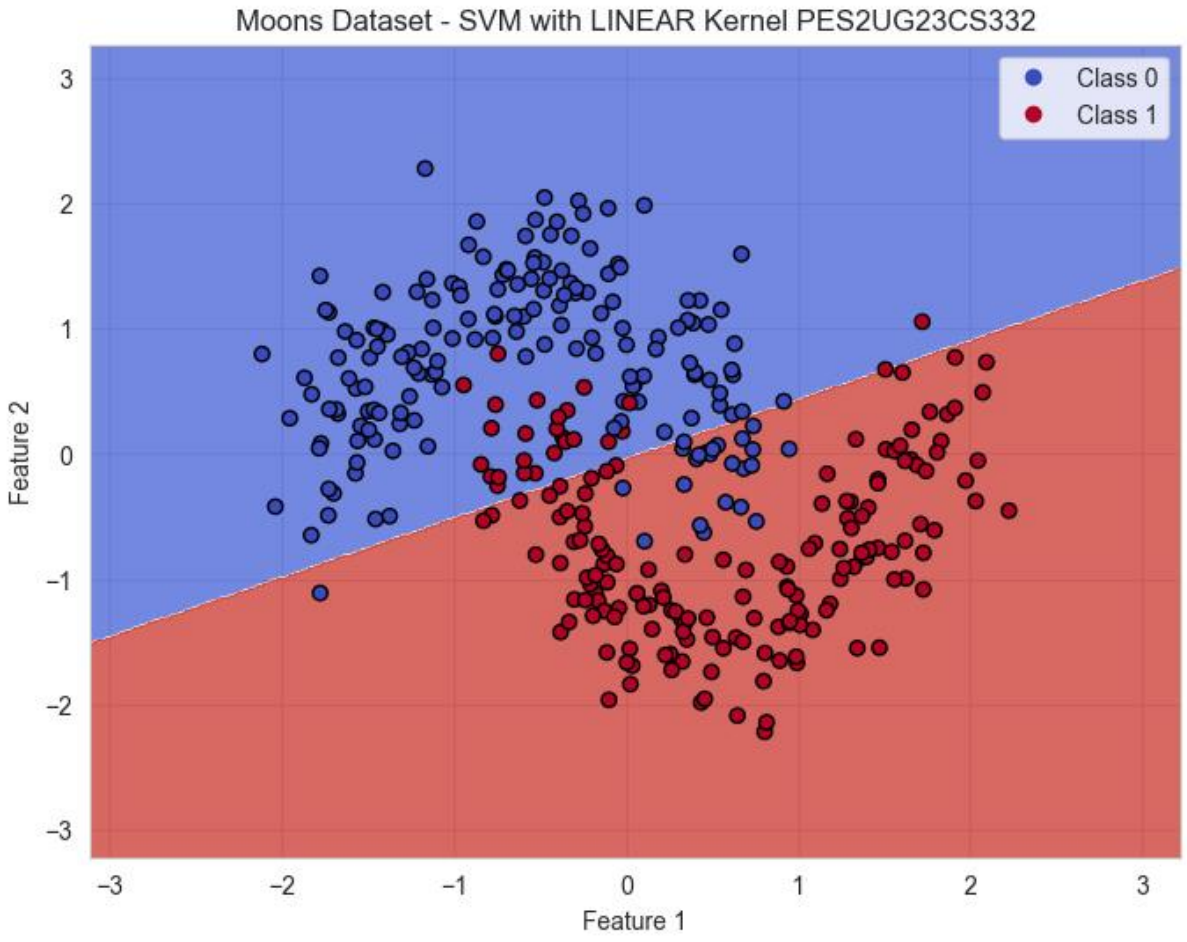
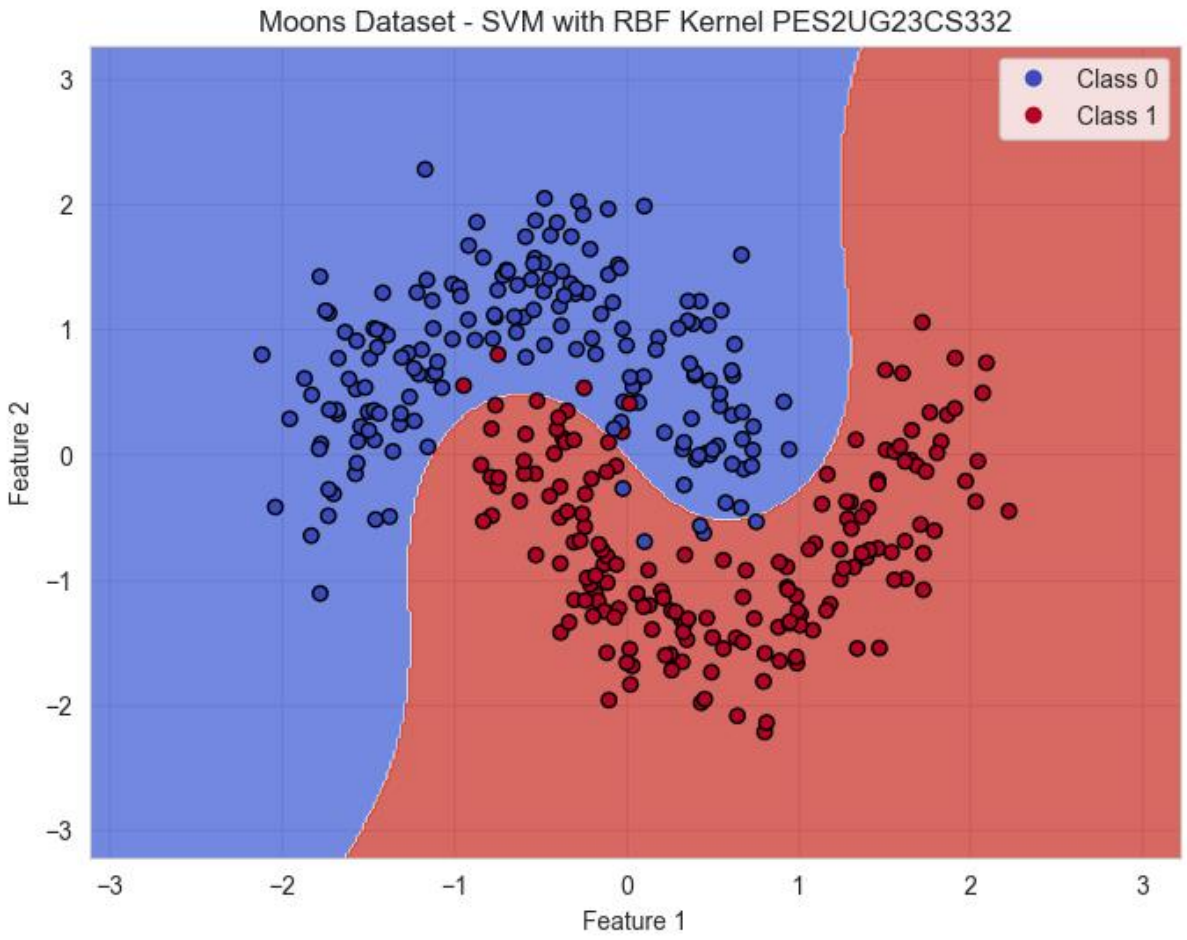
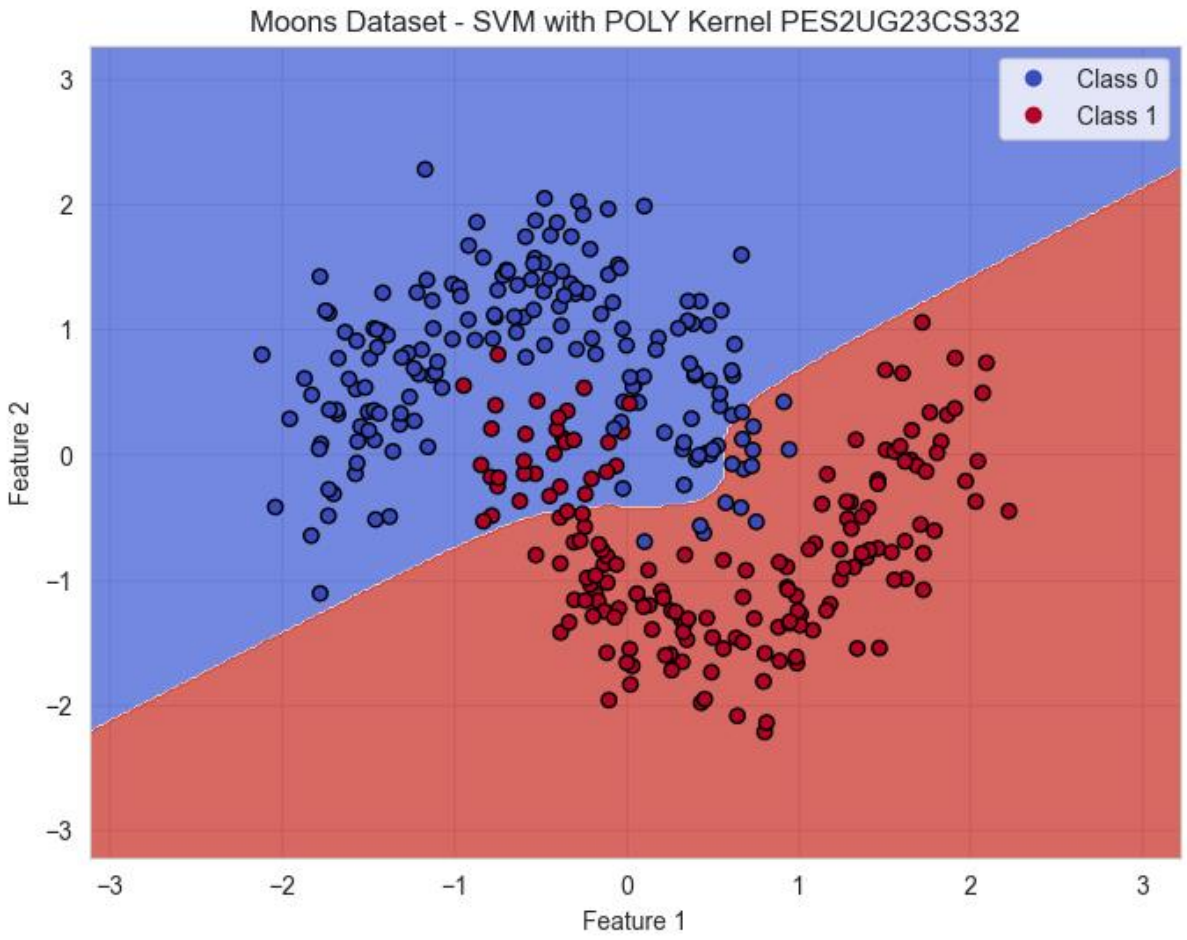
SRN: PES2UG23CS332
Section: F

1. **Which kernel was most effective for this dataset?**
   The RBF kernel performed best on the Moons dataset, as it captured the non-linear shape of the data and achieved higher classification accuracy compared to the linear and polynomial kernels.
2. **Why might the Polynomial kernel have underperformed here?**
   The Polynomial kernel tends to overfit when data is noisy or non-linearly separable with irregular boundaries, which causes it to perform worse than the RBF kernel for the Moons dataset.

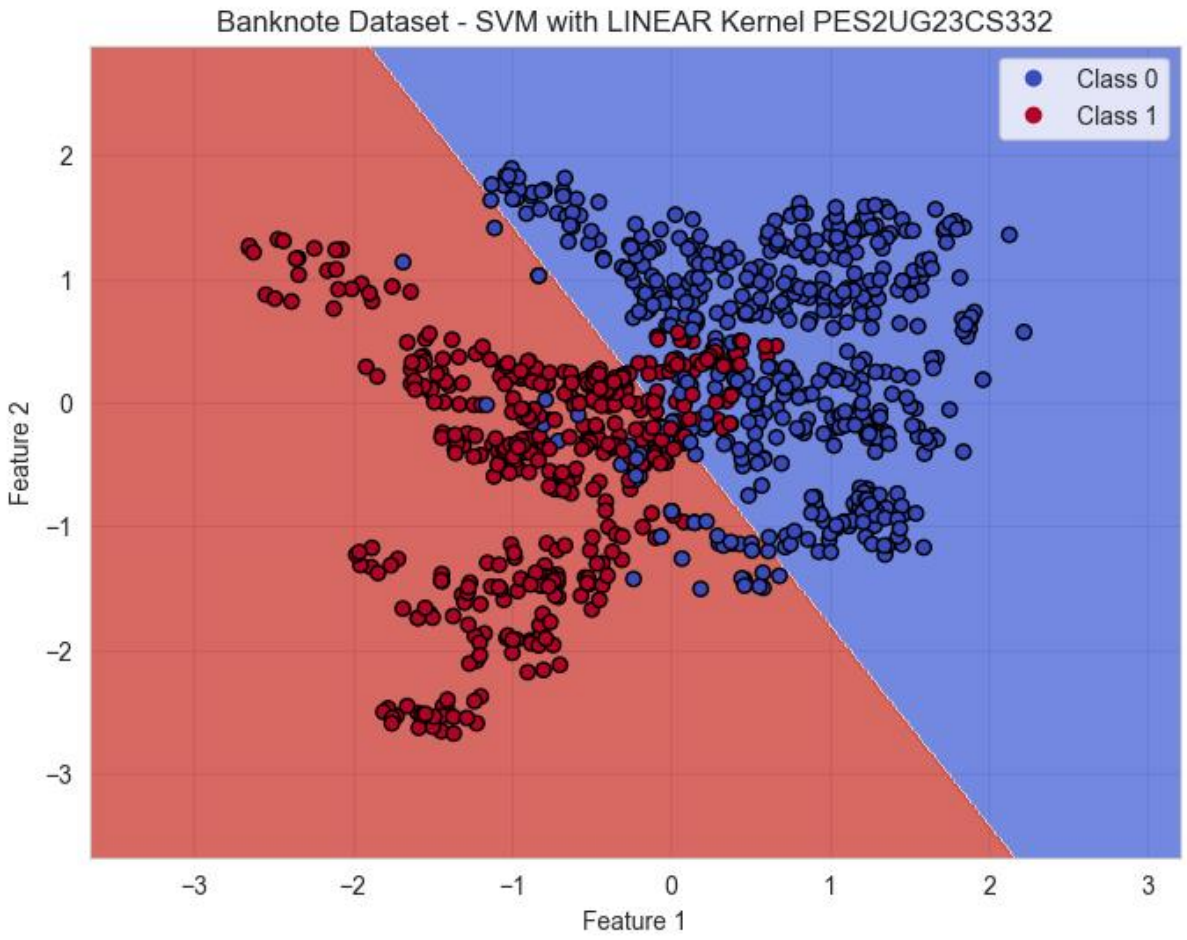


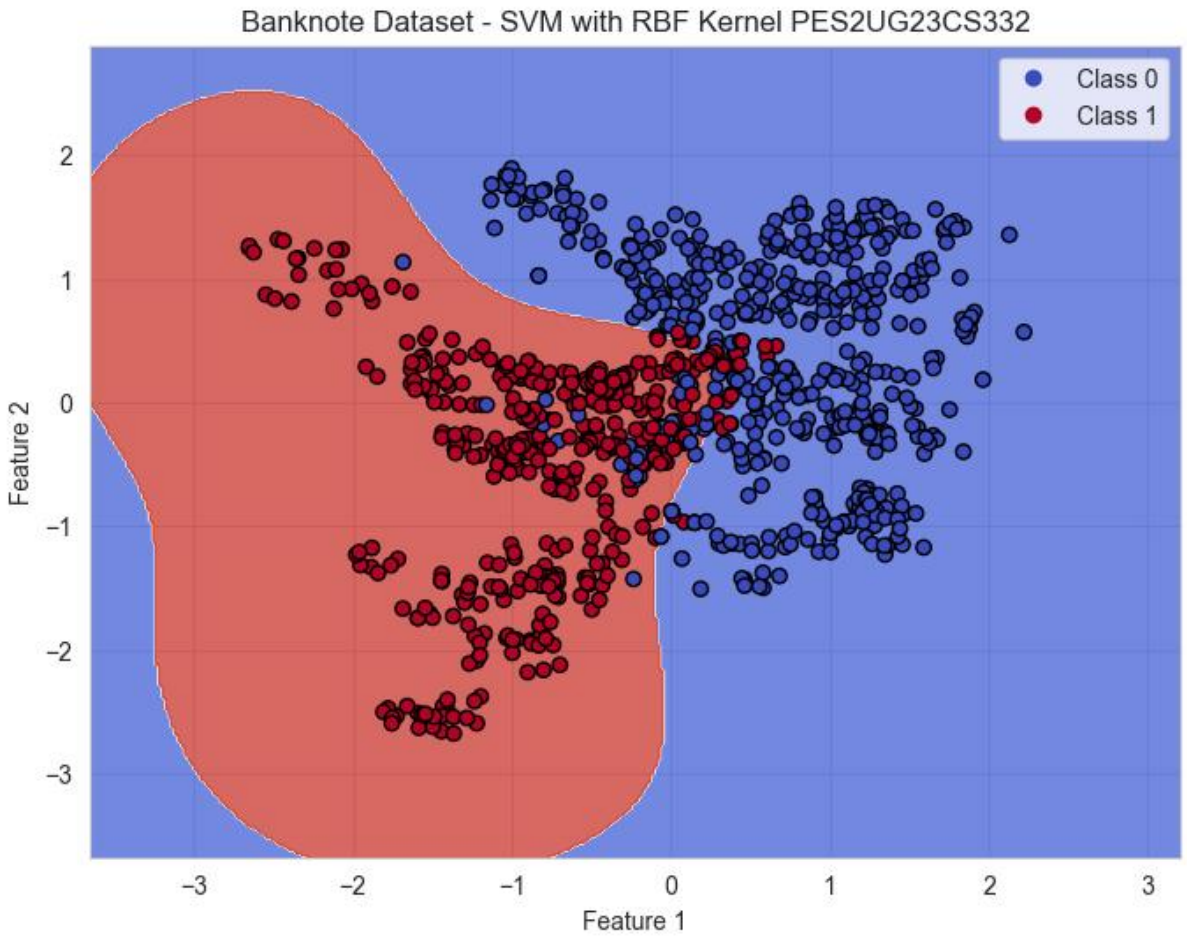

Moons Dataset - SVM with RBF Kernel PES2UG23CS332
Class 0
Class 1
Feature 2
Feature 1
3
2
1
0
−1
−2
−3
−3
−2
−1
0
1
2
3

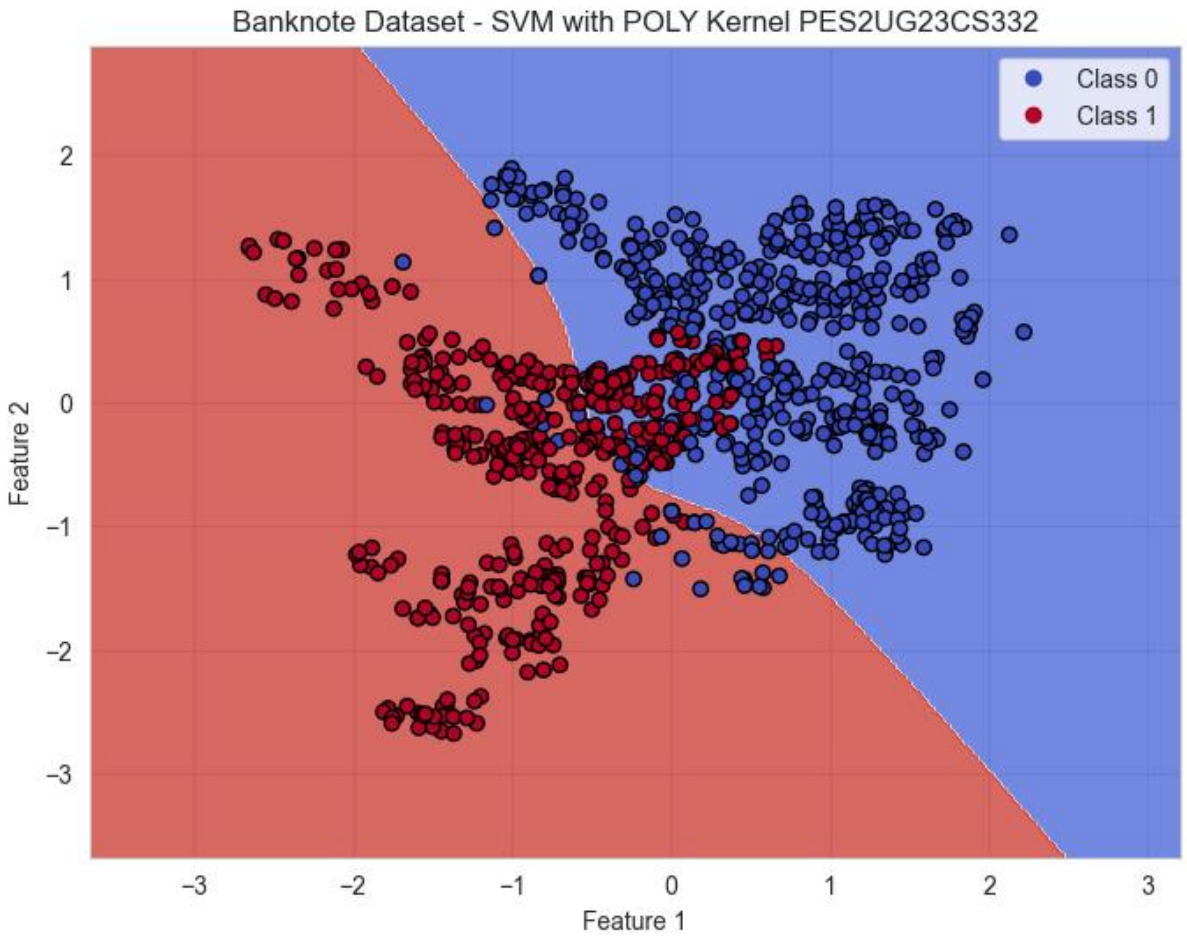


3. **Which kernel was most effective for this dataset?**
   The Linear kernel performed best for the Banknote dataset because the data is nearly linearly separable, allowing a simple hyperplane to classify the samples accurately.

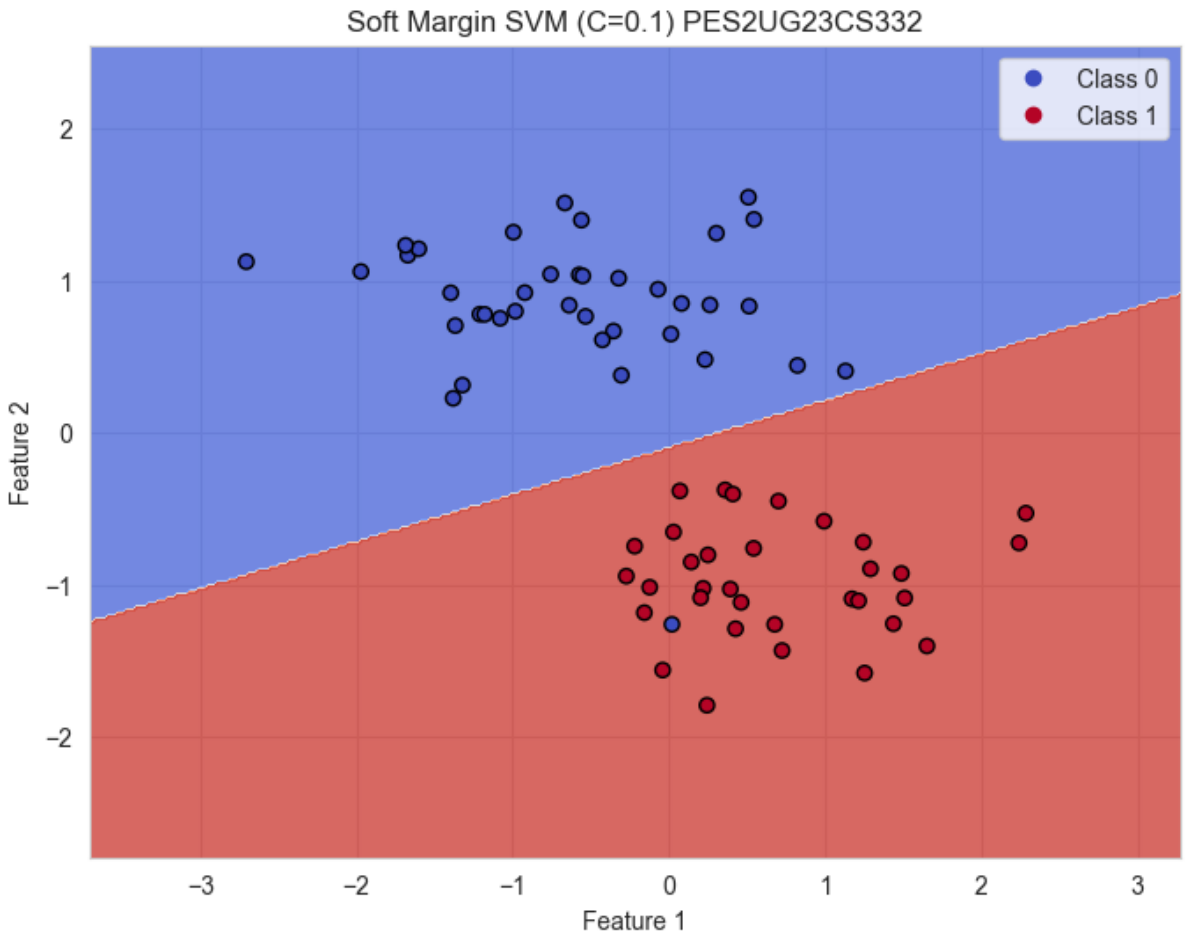
4. **Why might the Polynomial kernel have underperformed here?**
   The Polynomial kernel introduced unnecessary complexity for a dataset that is linearly separable, leading to slight overfitting and reduced generalization on the test set.

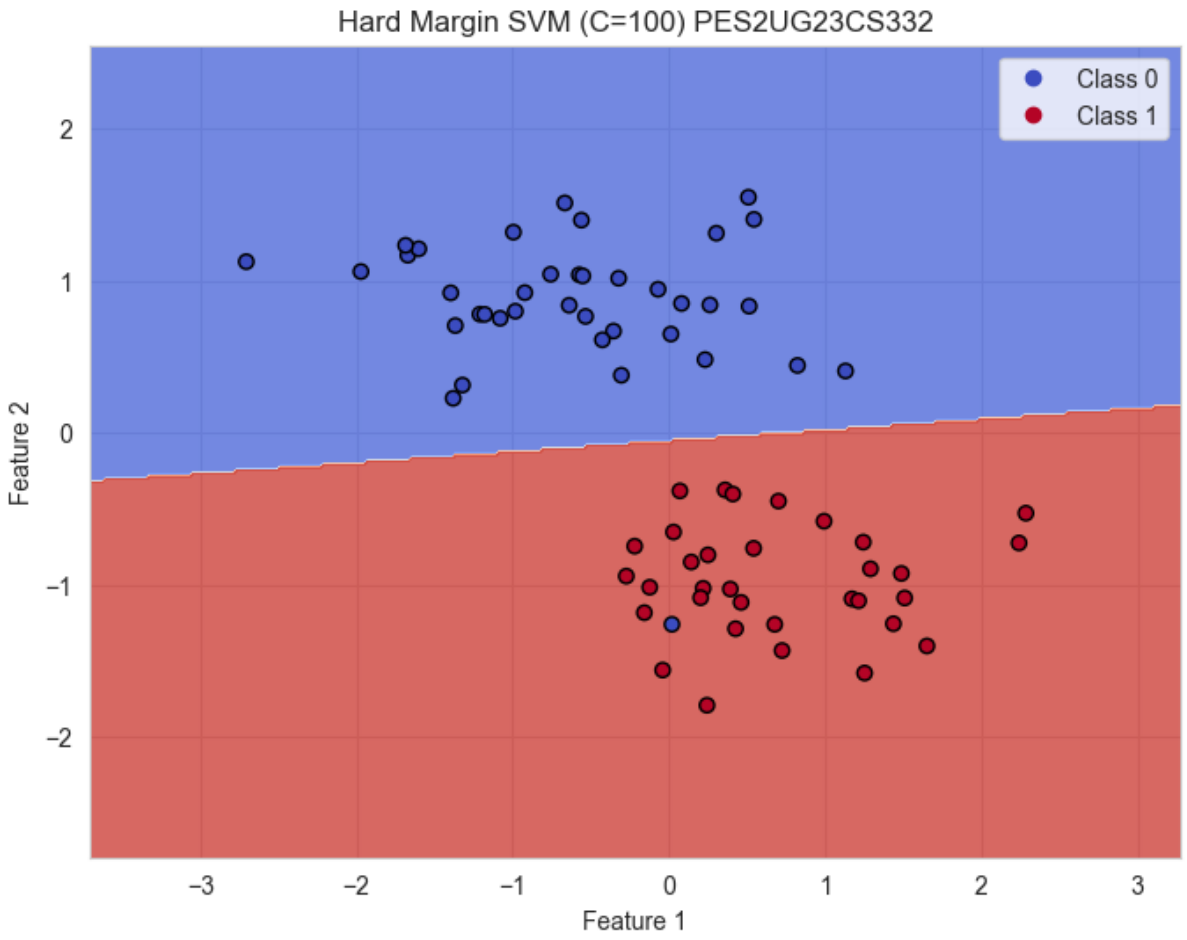

Banknote Dataset - SVM with LINEAR Kernel PES2UG23CS332
Class 0
Class 1
Feature 2
Feature 1
2
1
0
−1
−2
−3
−3
−2
−1
0
1
2
3


Banknote Dataset - SVM with RBF Kernel PES2UG23CS332
Class 0
Class 1
Feature 2
Feature 1
2
1
0
−1
−2
−3
−3
−2
−1
0
1
2
3



5. **Which margin (soft or hard) is wider?**
   The soft margin (C=0.1) produces a wider margin because it allows more flexibility and tolerance for misclassifications.
6. **Why does the soft margin model allow "mistakes"?**
   The soft margin SVM trades off perfect classification for a larger margin, improving generalization by allowing some misclassified points near or within the margin
7. **Which model is more likely to be overfitting and why?**
   The hard margin SVM (C=100) is more likely to overfit since it forces perfect classification on training data, making it sensitive to noise and outliers.
8. **Which model would you trust more for new data and why?**
   The soft margin SVM (C=0.1) is more reliable for unseen data because it generalizes better by avoiding overfitting to training samples.


Soft Margin SVM (C=0.1) PES2UG23CS332
Class 0
Class 1
Feature 2
Feature 1
2
1
0
−1
−2
−3
−2
−1
0
1
2
3


Hard Margin SVM (C=100) PES2UG23CS332
Class 0
Class 1
Feature 2
Feature 1
2
1
0
−1
−2
−3
−2
−1
0
1
2
3