

Prob. 1

(a)–(e) Plots for regression are shown in Figure 1.

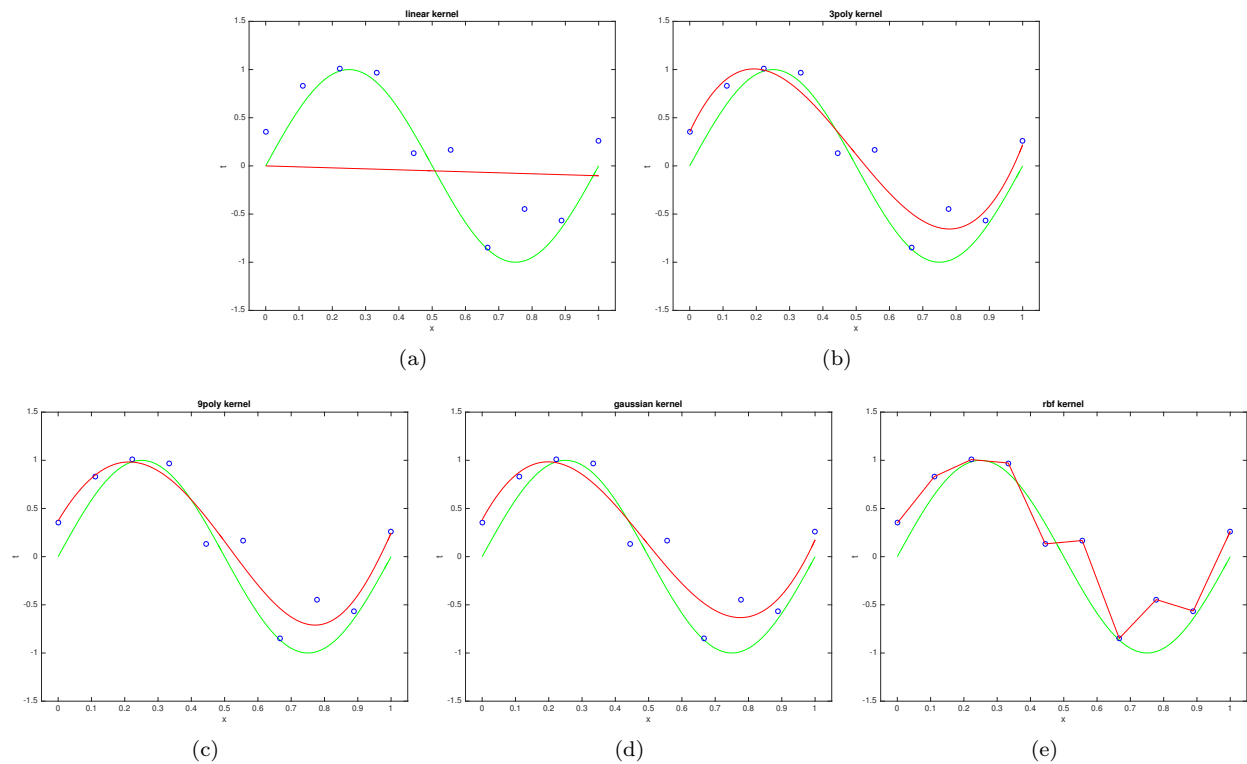


Figure 1: Recreation of Figure 1.4 using kernel regression with (a) linear kernel, (b) 3rd order polynomial feature space map, (c) 9th order polynomial feature space map, (d) Gaussian kernel, and (e) RBF kernel.

(f) RMS training and test errors are shown in Table 1.

Table 1: RMS training and test errors

Kernel/Feature Space Map	RMS Training Error	RMS Test Error
Linear	0.6391	0.7461
3rd Order Polynomial	0.1885	0.3849
9th Order Polynomial	0.1877	0.3751
Gaussian	0.1906	0.3877
RBF	$3.6857e - 4$	0.4002

Prob. 2

(a) Scatter plot of the classification training data including the decision boundary resulting from training a Gaussian kernel-based binary classifier is shown in Figure 2(a).

(b) Classifier accuracy is 77.5%. Scatter plot of the classification test data for the Gaussian kernel-based binary classifier is shown in Figure 2(b).

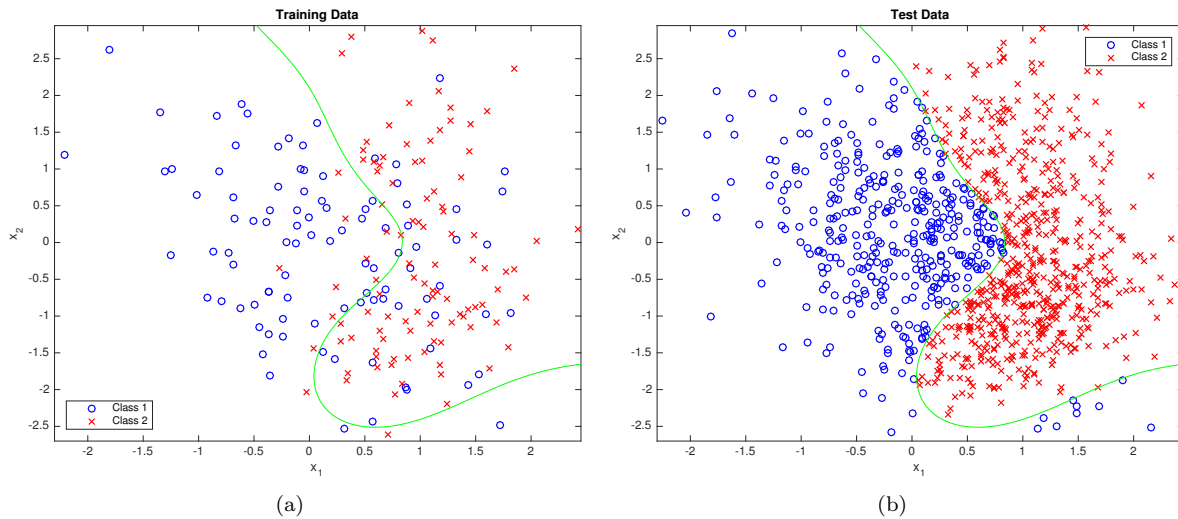


Figure 2: Kernel method for classification (a) recreation of Figure A.7(a) and (b) classifier decisions using synthetic test data.

Prob. 3

(a) Recreation of Figure 7.4 is shown in Figure 3(a) using STPR toolbox and in Figure 3(b) using Statistics toolbox . The number of support vectors is **108** using STPR toolbox and **107** using Statistics toolbox (out of 200 training points).

(b) Classifier accuracy is 76.6% with STPR toolbox and 76.7% with Statistics toolbox. Test data with class decisions are shown in Figure 3(c) for STPR toolbox and (d) for Statistics toolbox.

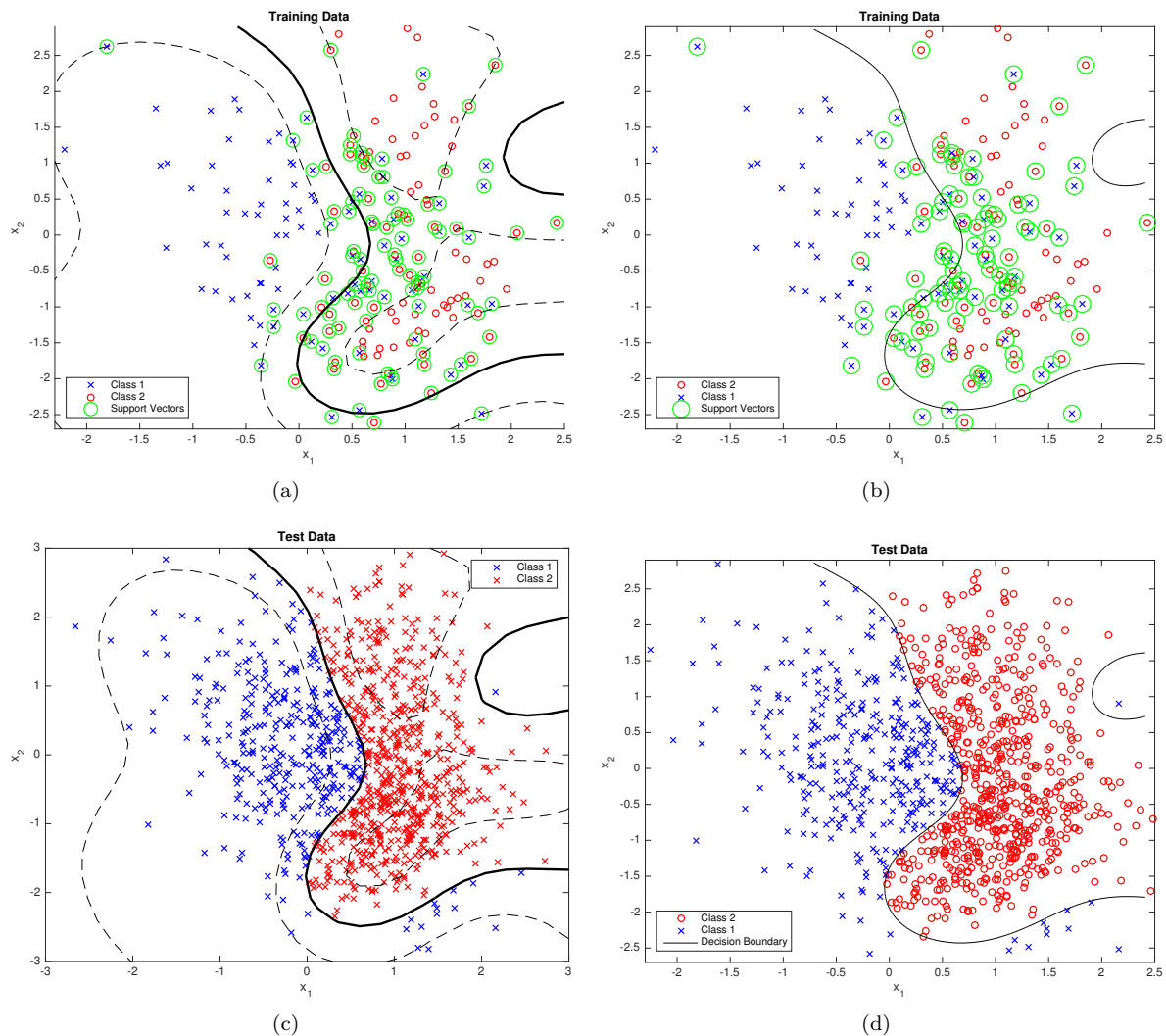


Figure 3: Recreation of Figure 7.4 using (a) STPR toolbox and (b) Statistics toolbox and (b) classifier decisions with synthetic test data using (c) STPR toolbox and (d) Statistics toolbox

Prob. 4

(a) Recreation of Figure 7.12(a) is shown in Figure 4(a). The number of support vectors is **18** (out of 200 training points).

(b) Classifier accuracy is 74.1%. Test data with class decisions are shown in Figure 4(b).

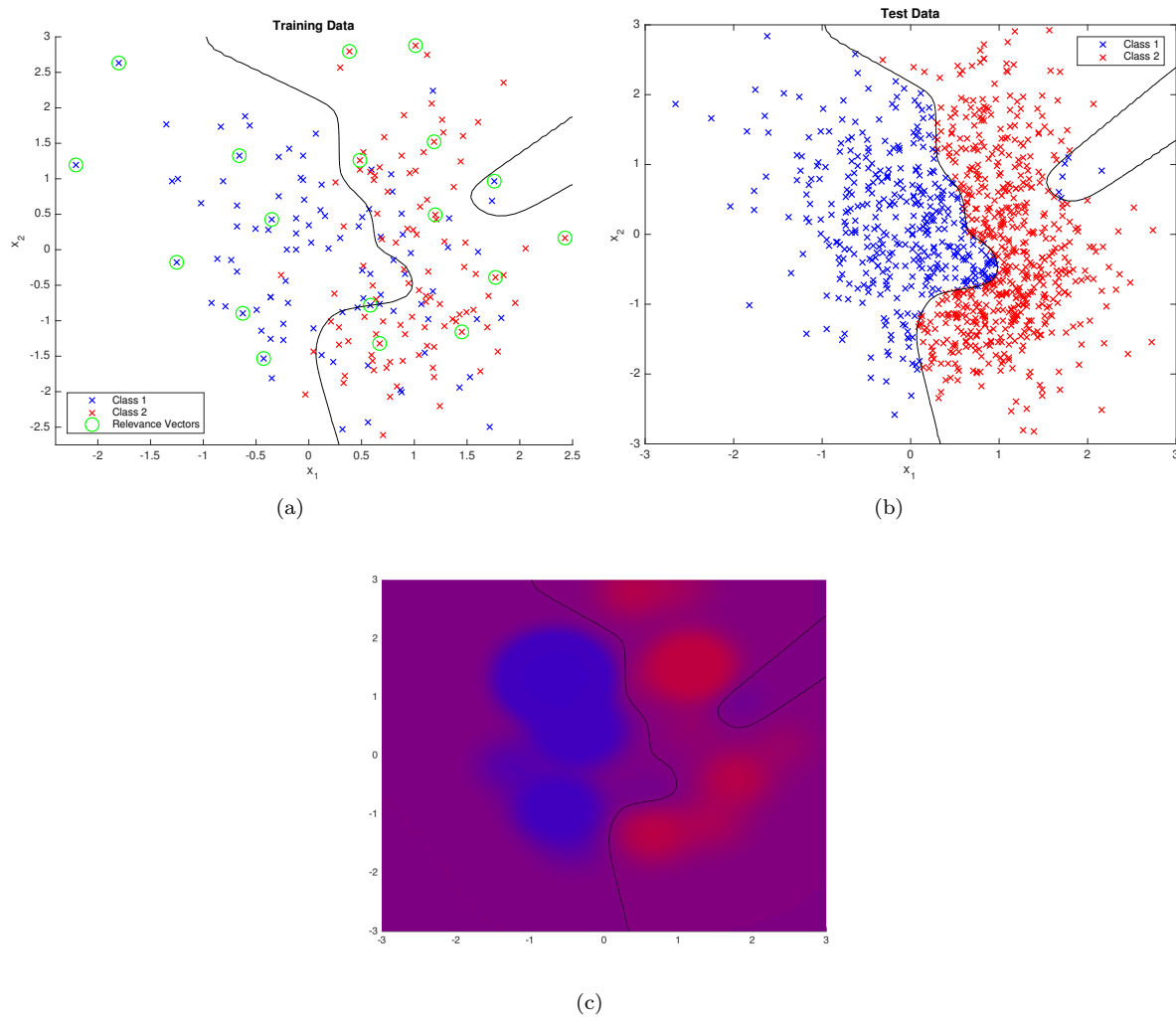


Figure 4: (a) Recreation of Figure 7.12(a), (b) classifier decisions using synthetic test data, and (c) Recreation of Figure 7.12(b).