

1 Simulation

$$\begin{aligned}
\mu_1, \mu_2, \mu_3 &\stackrel{\text{i.i.d.}}{\sim} \mathcal{N}_2(\vec{0}_2, \mathbb{I}) & \log \sigma_1^2, \log \sigma_2^2, \log \sigma_3^2 &\stackrel{\text{i.i.d.}}{\sim} \mathcal{N}_2(\vec{0}_2, \mathbb{I}) \\
y_i^{Tr} &\stackrel{\text{i.i.d.}}{\sim} \text{Multinomial}(1, (0.5, 0.5, 0.0)) & i &= 1, \dots, n \\
x_i^{Tr} | y_i^{Tr} &\stackrel{\text{i.i.d.}}{\sim} \mathcal{N}_2\left(\mu_{y_i^{Tr}}, \text{diag}(\sigma_{y_i^{Tr}}^2)\right) & i &= 1, \dots, n \\
y_j^{Te} &\stackrel{\text{i.i.d.}}{\sim} \text{Multinomial}(1, (0.4, 0.4, 0.2)) & j &= 1, \dots, m \\
x_j^{Te} | y_j^{Te} &\stackrel{\text{i.i.d.}}{\sim} \mathcal{N}_2\left(\mu_{y_j^{Te}}, \text{diag}(\sigma_{y_j^{Te}}^2)\right) & j &= 1, \dots, m
\end{aligned}$$

Figure 1: Sample simulated data set. In the training set, two clusters are present. In the test set, a third cluster is present that has the same label as the red group in the training set. This third cluster looks more like the green cluster in the training set and is thus likely to get the same label. We could interpret this as a cancer data set. Green denotes healthy cells and red denotes cancerous cells.

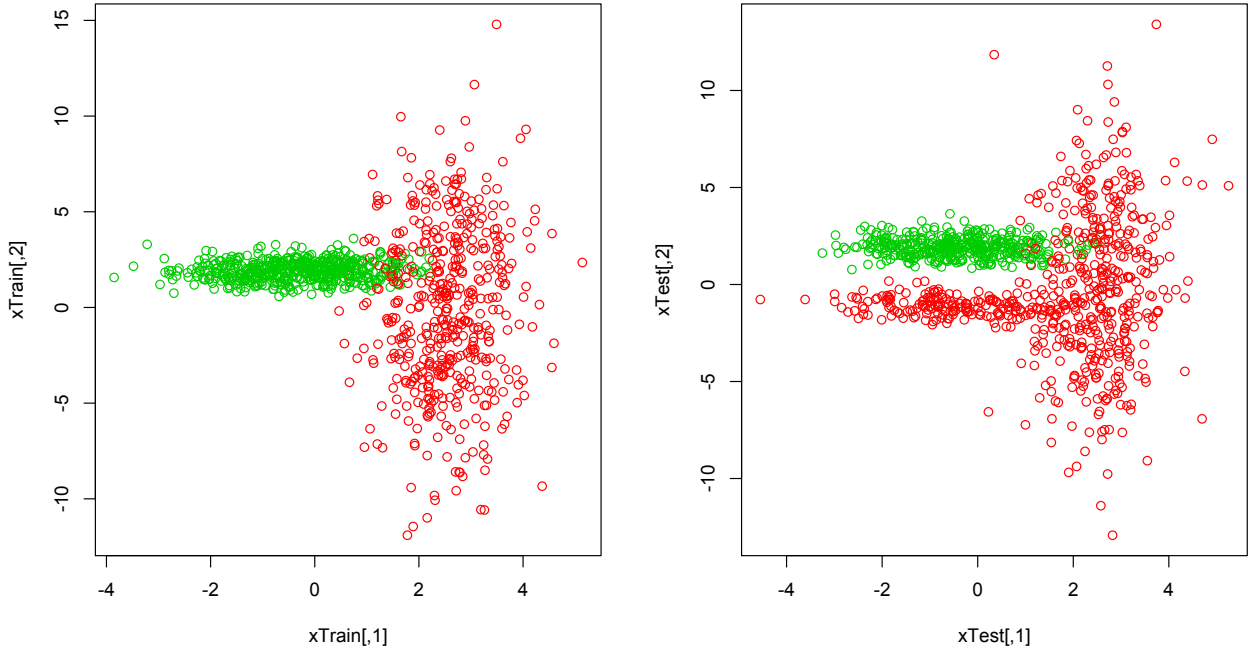


Table 1: Performance of several methods in the simulation. Performance is split up by whether the test point belongs to one of the clusters present in the training set (clusters 1 and 2) or not (cluster 3).

method	clusters 1 and 2		cluster 3	
	test error	rejection rate	test error	rejection rate
lasso	24%	—	48%	—
naive bayes	18%	—	52%	—
customized training	19%	0%	50%	2%
new idea	23%	5%	42%	11%