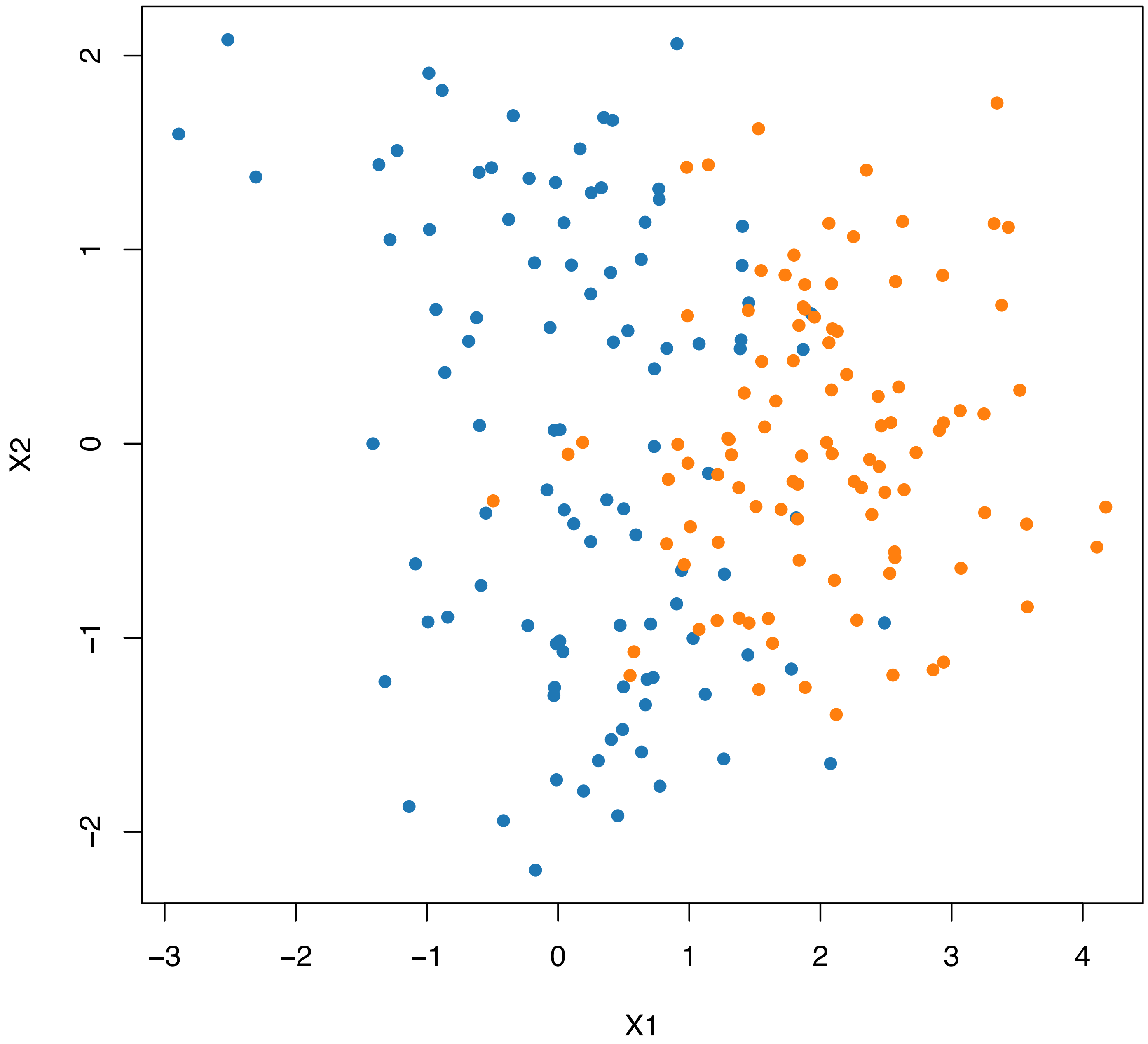
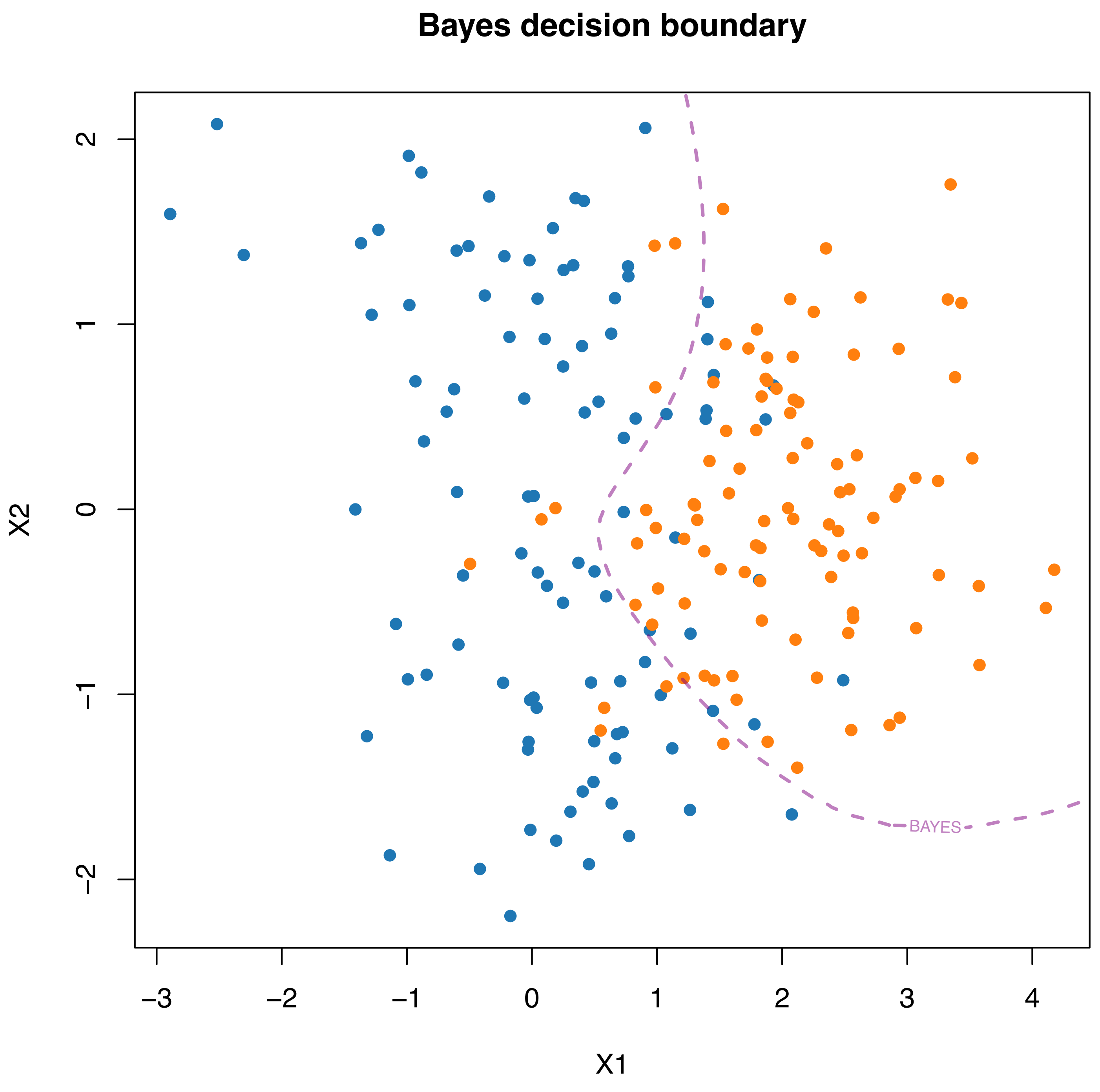
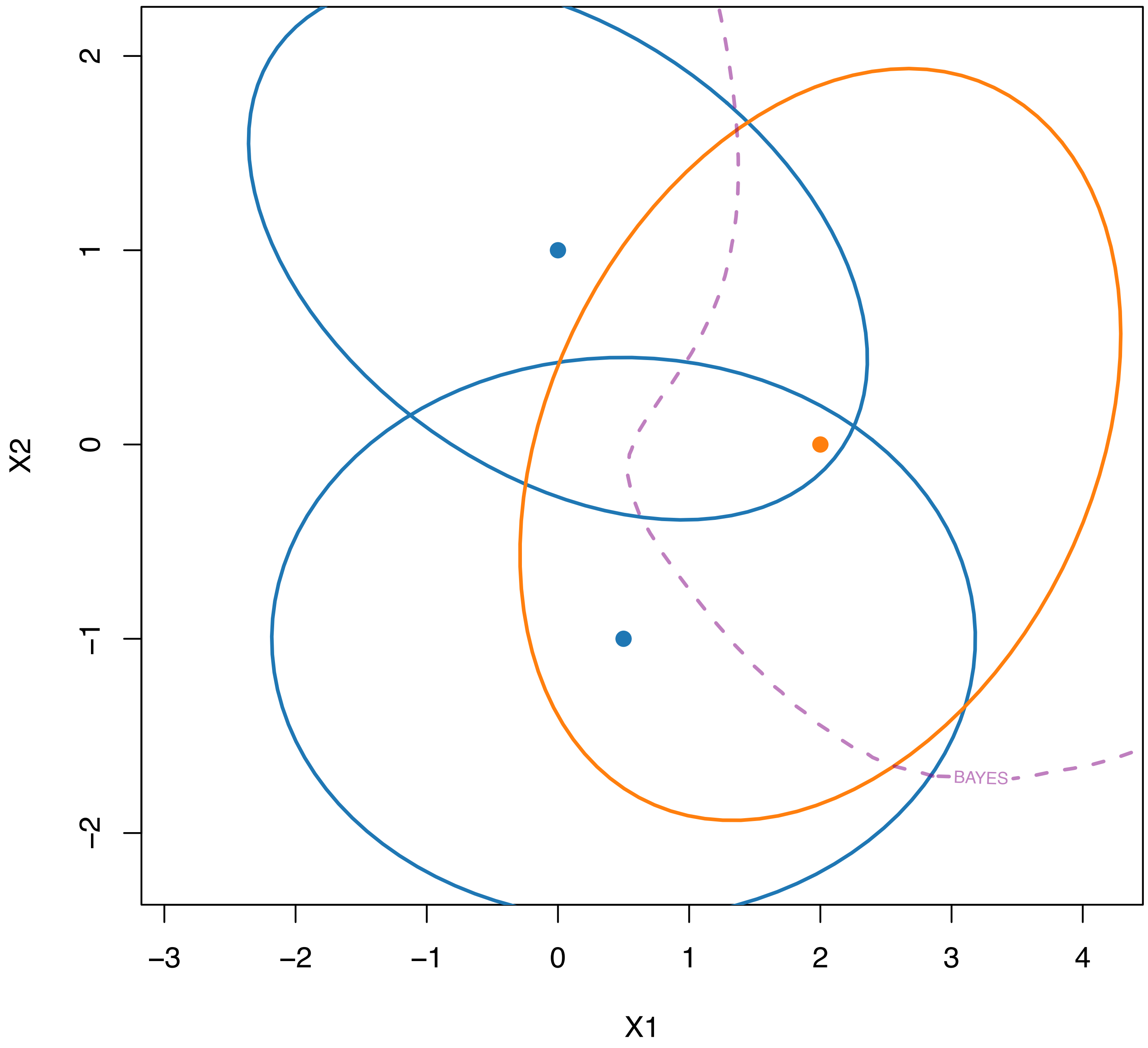


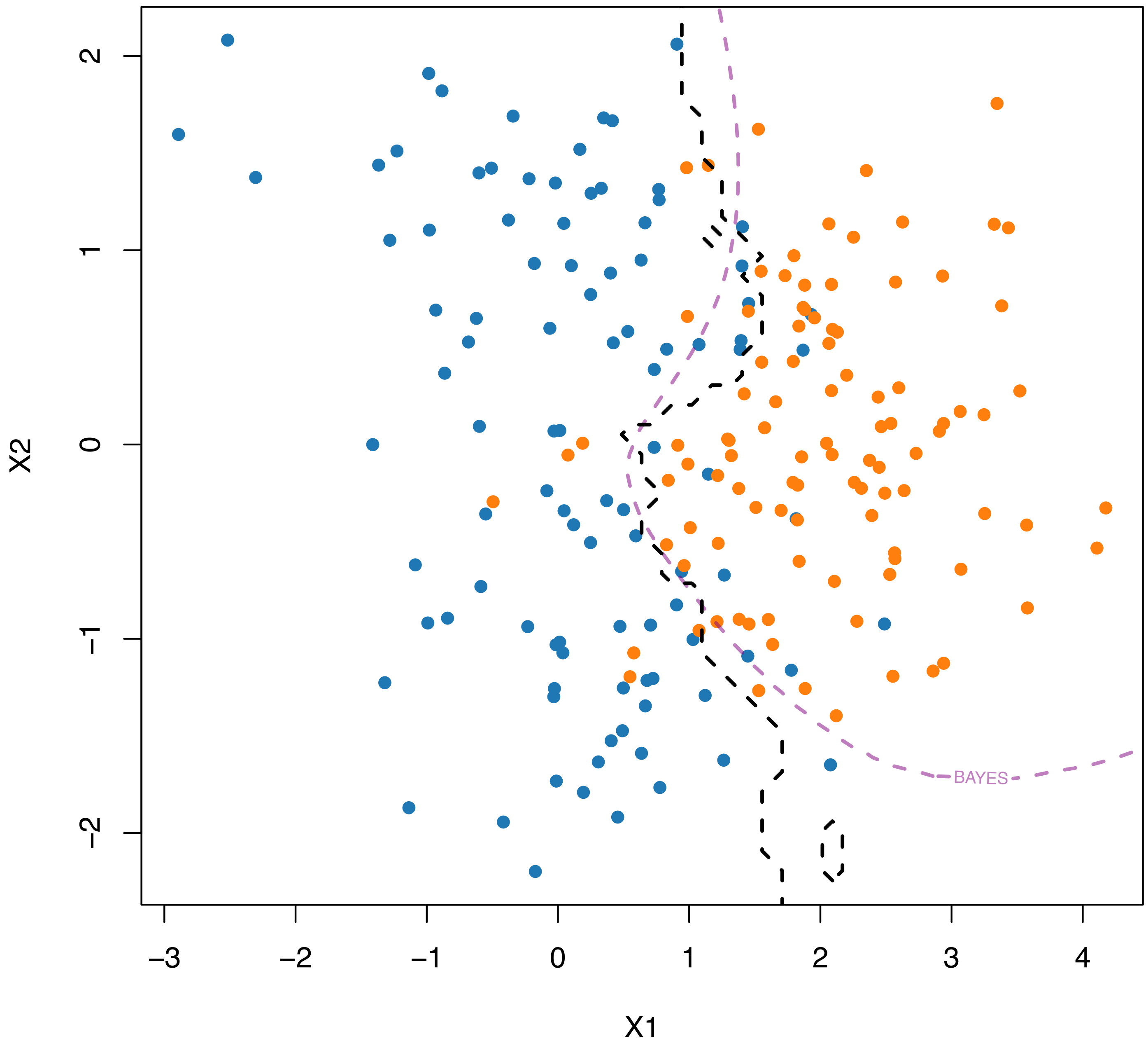
X1
X2
−3
−2
−1
0
1
2
3
4

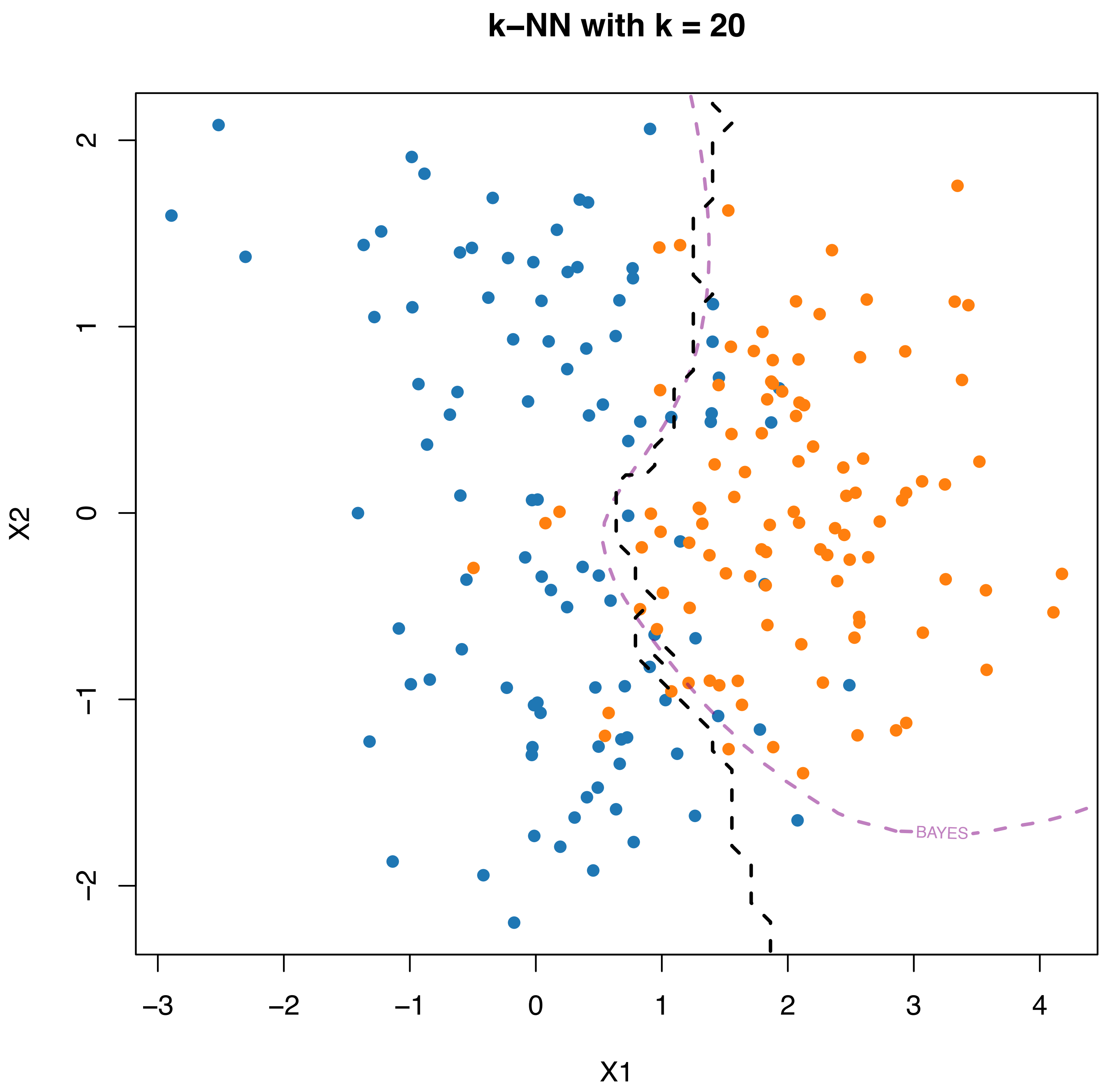

Bayes decision boundary
X1
X2
BAYES
−3
−2
−1
0
1
2
3
4
2
1
0
−1
−2

Bayes decision boundary

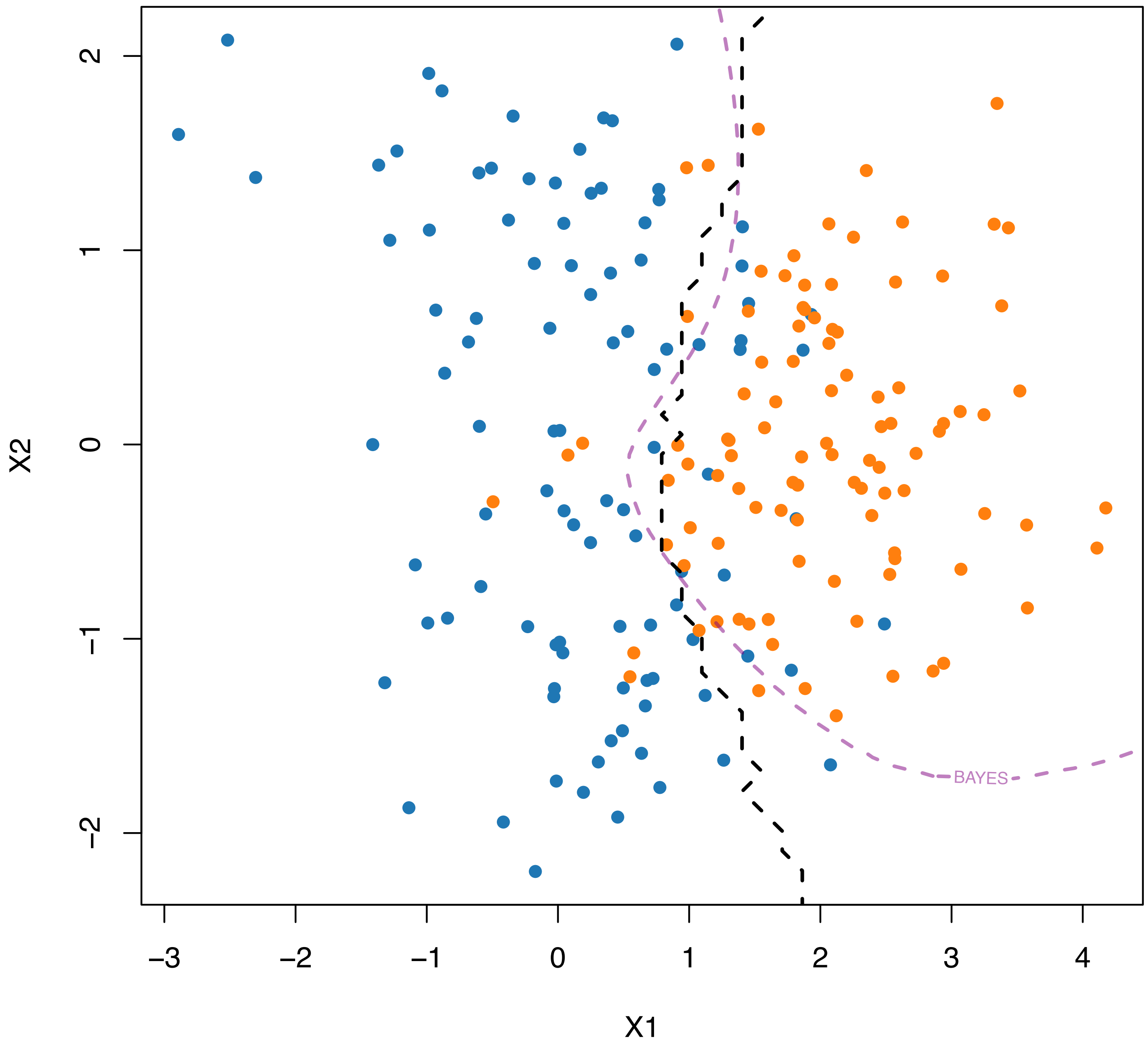


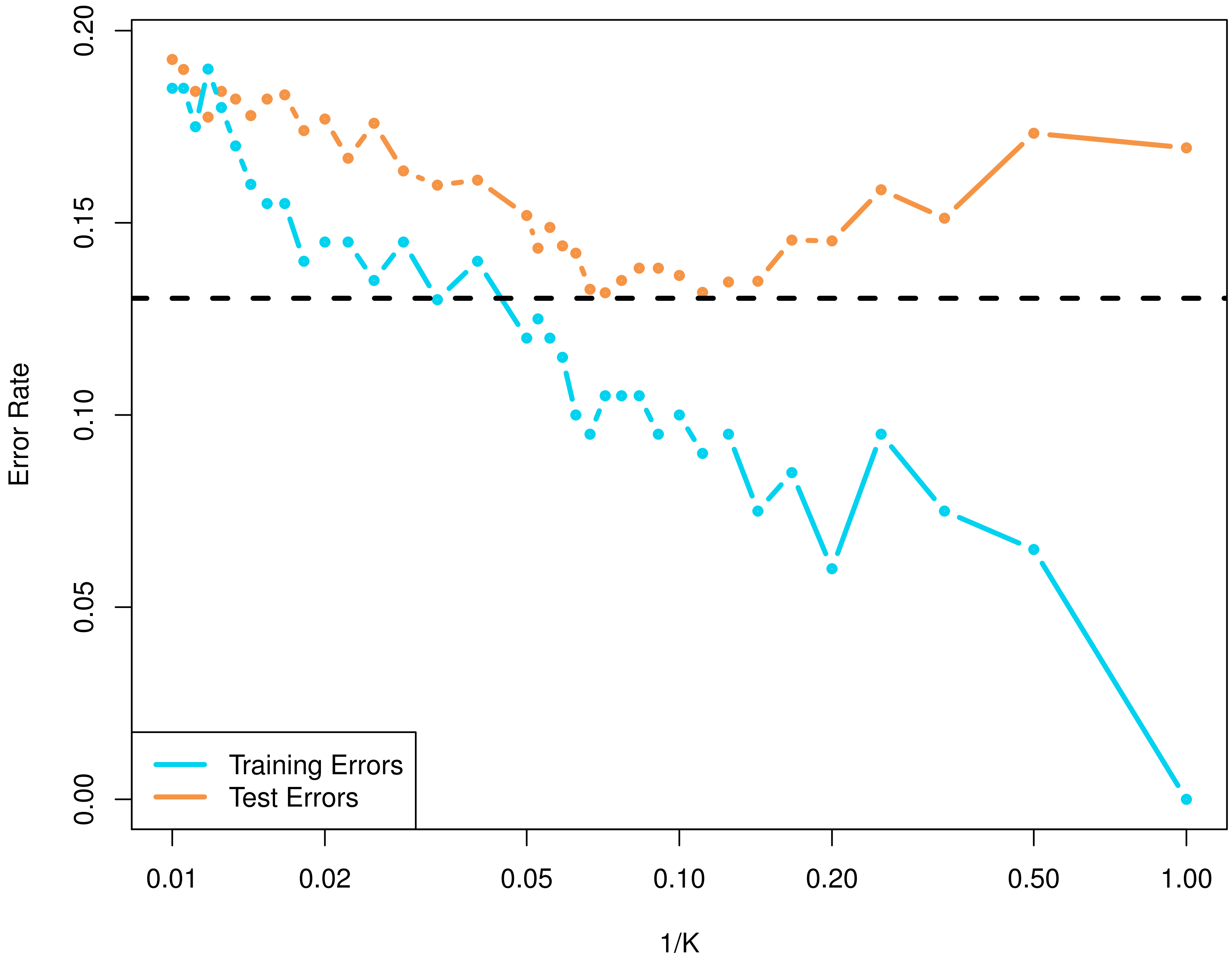
k−NN with k = 05



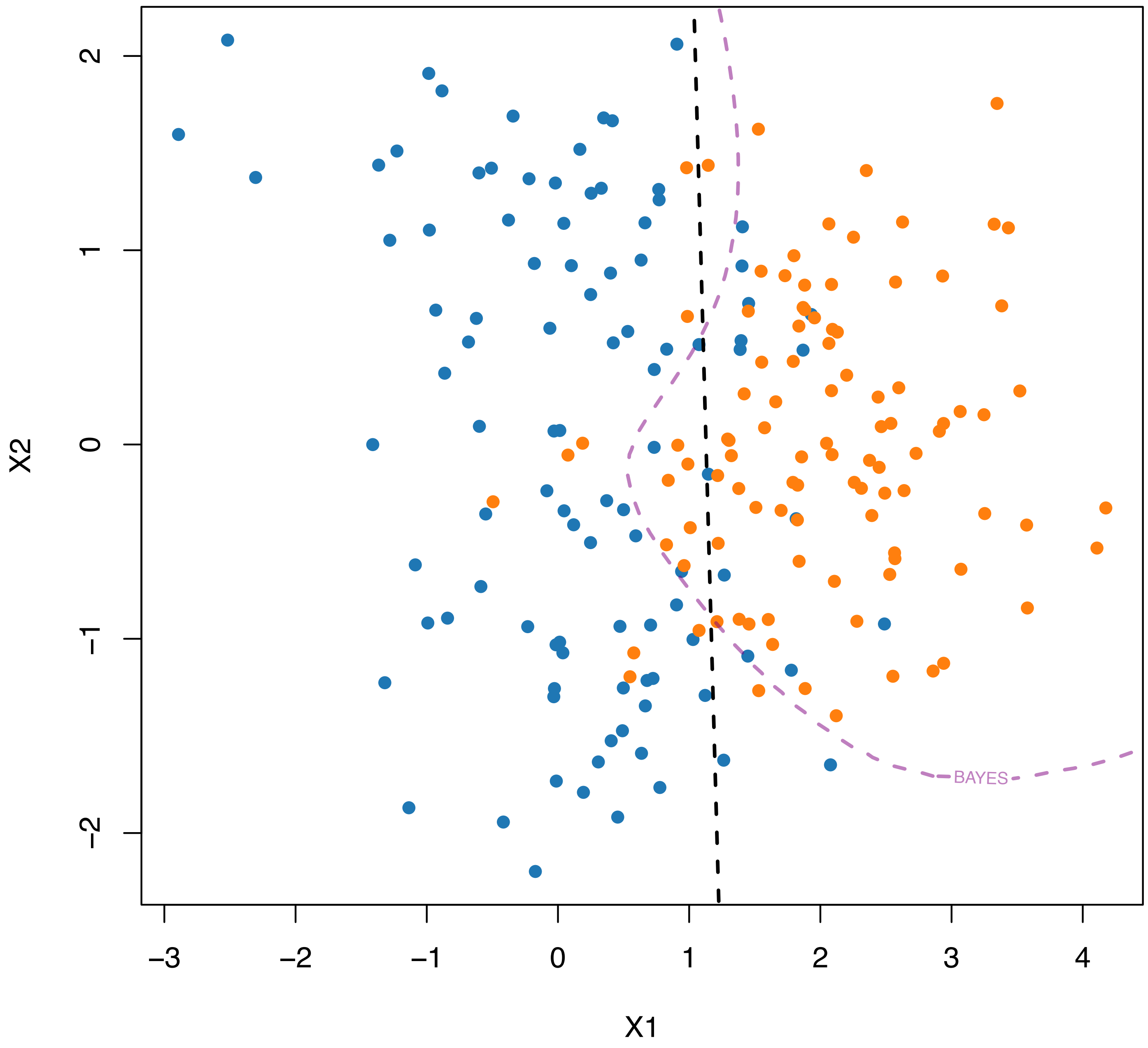

k–NN with k = 20
X1
X2
−3
−2
−1
0
1
2
3
4
BAYES

k−NN with k = 50




Error Rate
0.00
0.05
0.10
0.15
0.20
0.01
0.02
0.05
0.10
0.20
0.50
1.00
1/K
Training Errors
Test Errors

Logistic Regression



```r
# estimating the logistic regression classifier for this data
logreg <- glm(y ~ ., data=df_train, family=binomial)
```

Generalized
Linear
Model

because we consider **categorical** variables

Take a look at Section 4.6.3 of James et al. if you're curious

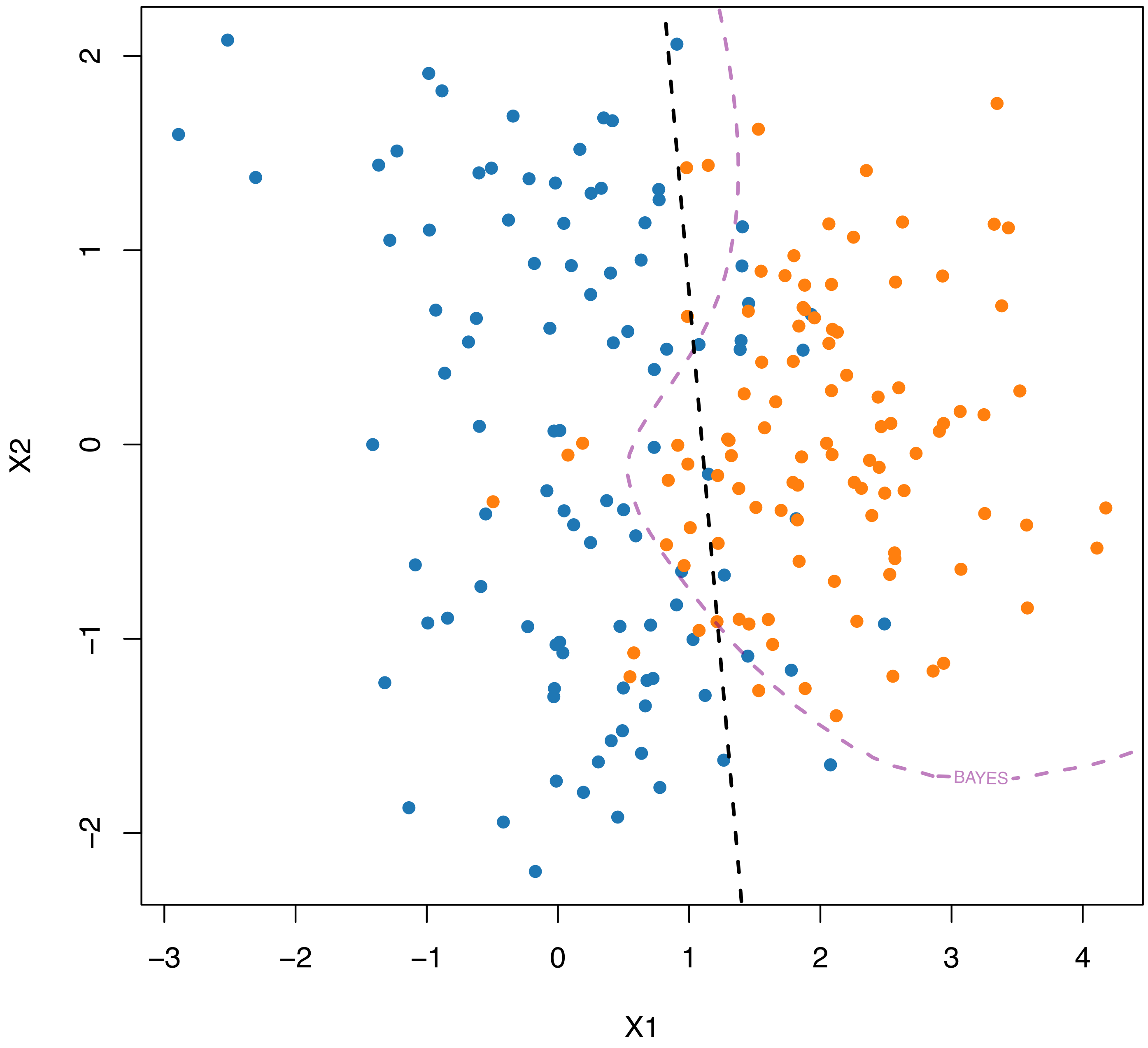
```r
# estimating the logistic regression classifier for this data
logreg <- glm(y ~ ., data=df_train, family=binomial)
```

```
> summary(logreg)

Call:
glm(formula = y ~ ., family = binomial, data = df_train)

Deviance Residuals:
     Min        1Q    Median        3Q       Max
-2.53908  -0.47746   0.01229   0.46460   2.81335

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -2.71826    0.43988  -6.179 6.43e-10 ***
X1           2.40805    0.33359   7.219 5.26e-13 ***
X2           0.09884    0.23342   0.423    0.672
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 277.26  on 199  degrees of freedom
Residual deviance: 135.80  on 197  degrees of freedom
AIC: 141.8

Number of Fisher Scoring iterations: 6
```

We could also do statistical inference on the coefficients of the classifier

Mostly related to the non-convex optimization of the loss function for logistic regression

Linear Discriminant Analysis



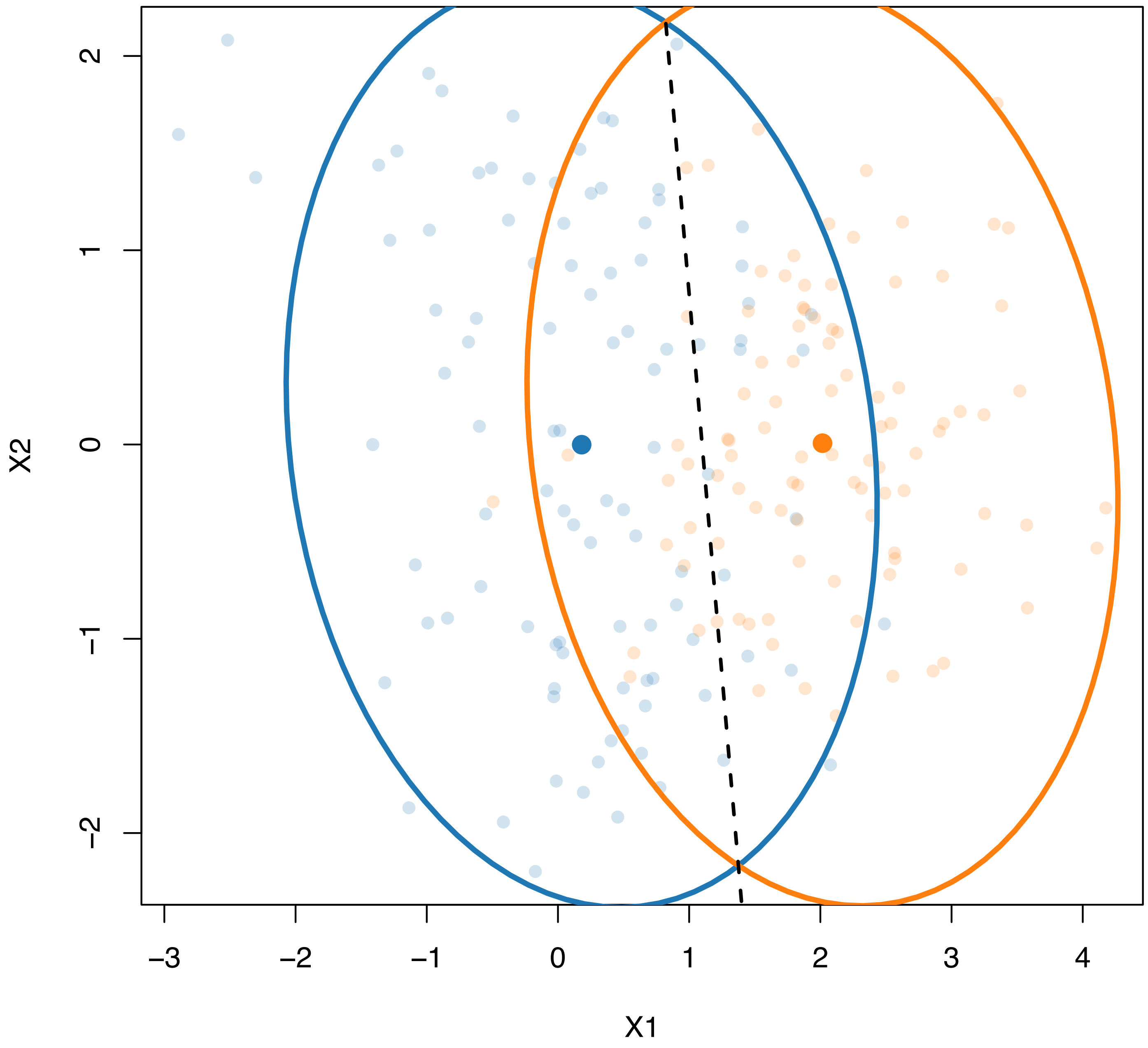
```r
# estimating the LDA classifier for this data
library("MASS")
ldaclf <- lda(y ~ ., data=df_train)
y_pred <- predict(ldaclf, newdata=df_test)
```

data structure containing the results of the LDA fitting

```
> y_pred$
```

- class
- posterior
- x

LDA



Naive Bayes classifier