Homework 8 - LogitBoost

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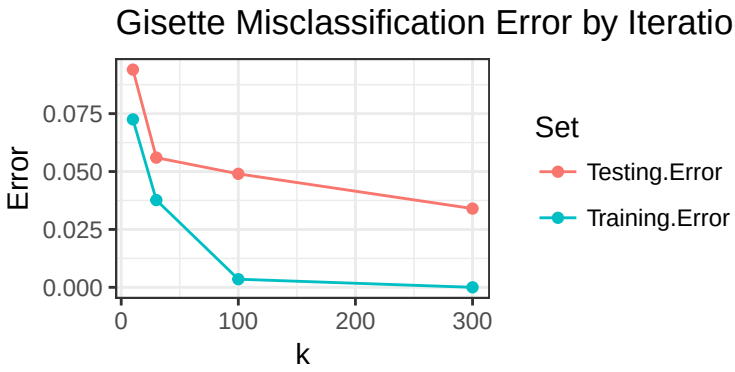
Method

The "ada" package in R was used to run LogitBoost on four datasets. The ada function was modified to also return the loss so that it could be plotted. The plots below show the loss vs. iteration and misclassification error vs. iteration. A table of results is also included, as well as the script and a bibliography.

Gisette

R ran out of memory on full dataset, so a subset of 500 features was used for analysis.



Arcene

R ran out of memory on full dataset, so a subset of 2000 features was used for analysis.

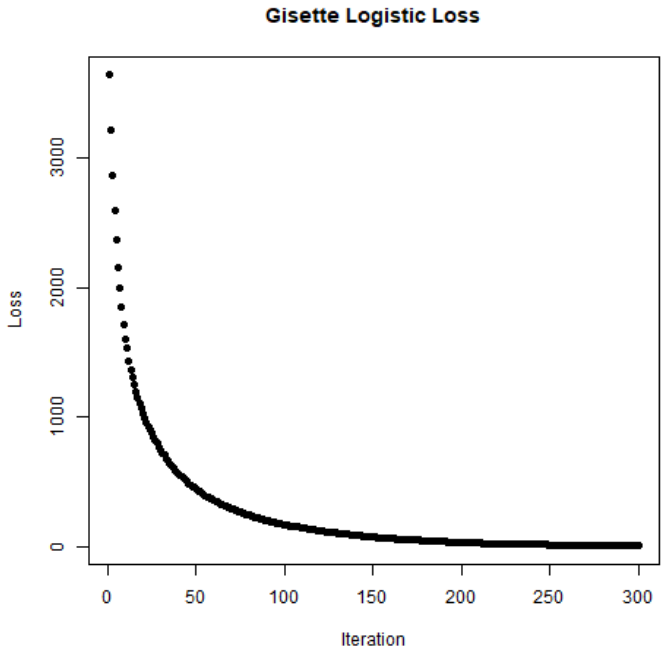
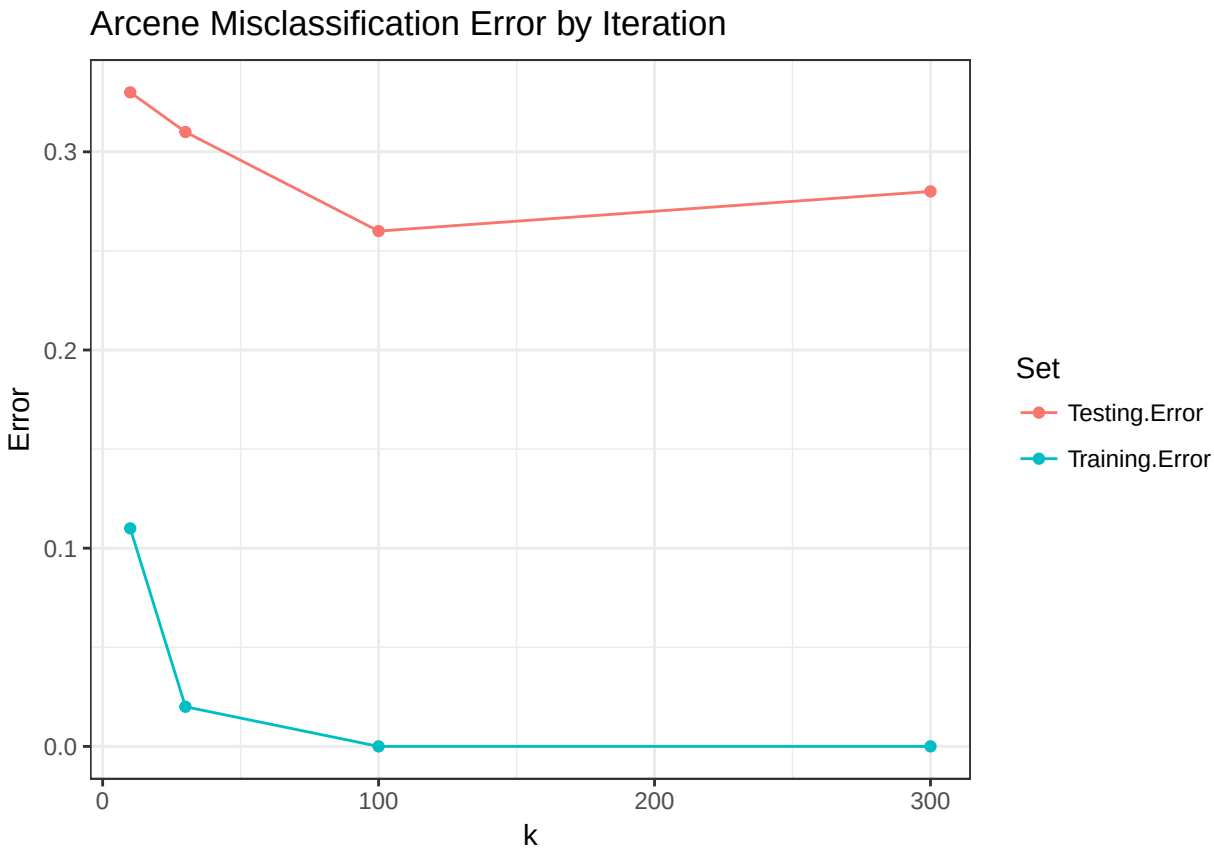

Gisette Logistic Loss
Loss
0
1000
2000
3000
0
50
100
150
200
250
300
Iteration

Figure 1:


Arcene Misclassification Error by Iteration
Error
0.0
0.1
0.2
0.3
0
100
200
300
k
Set
Testing.Error
Training.Error

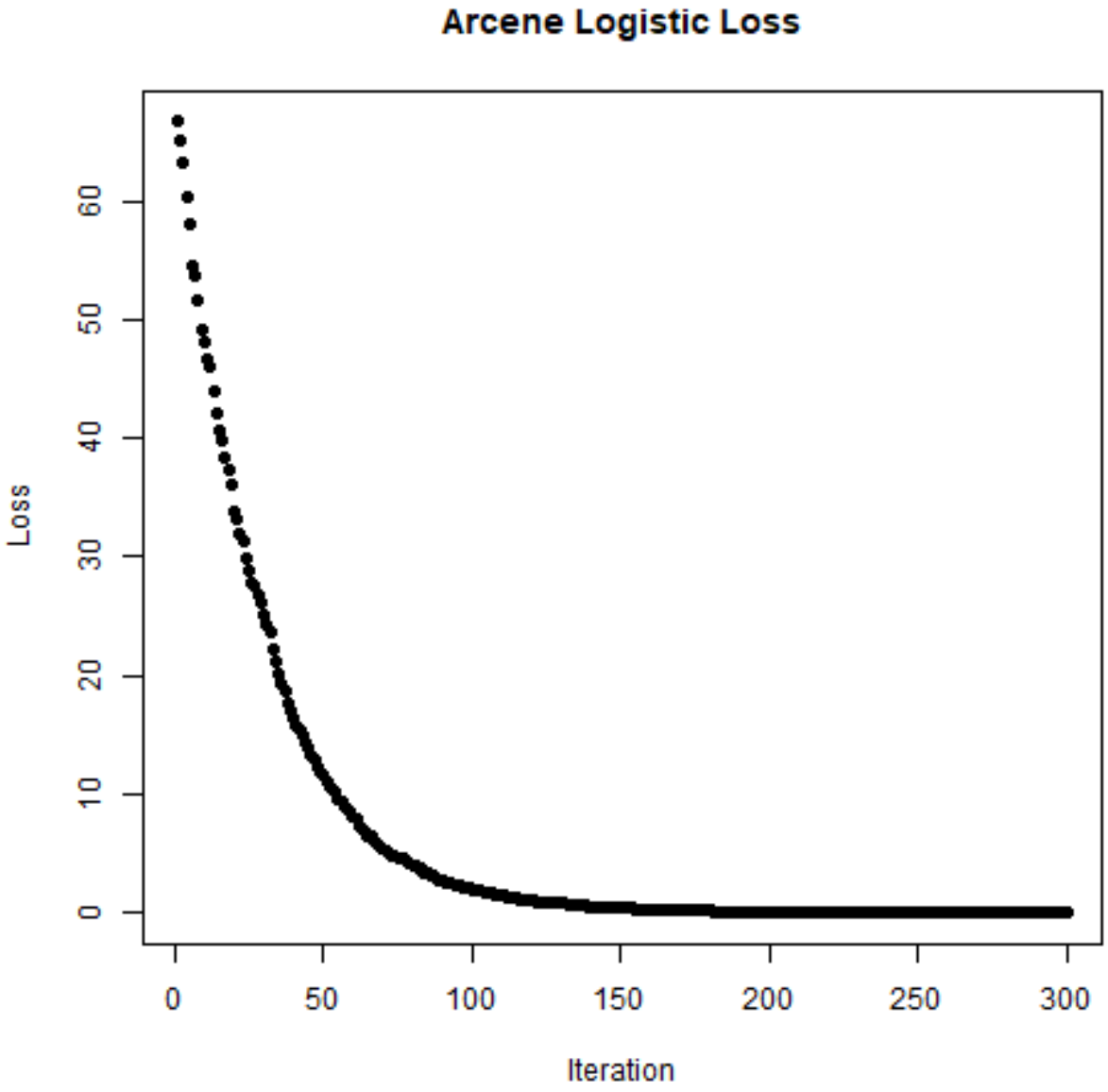
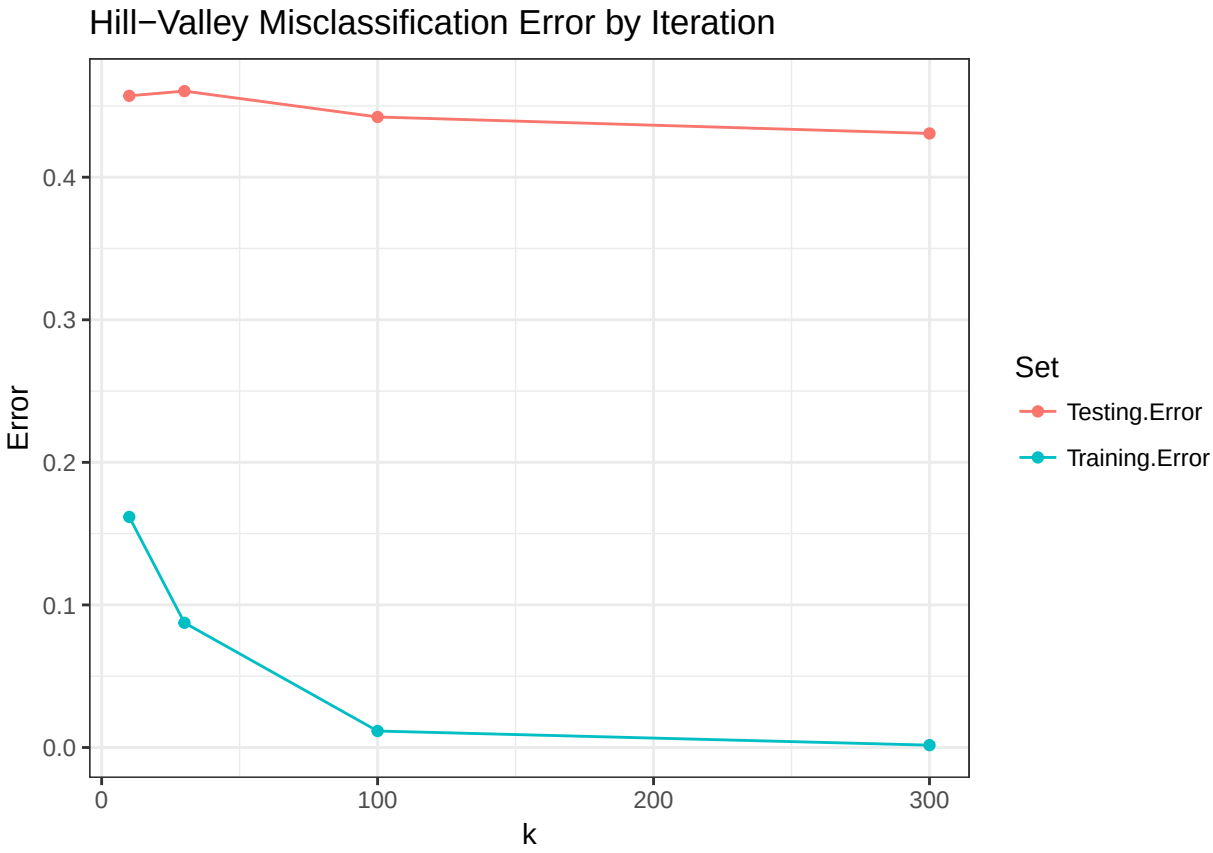

Arcene Logistic Loss
Loss
0
10
20
30
40
50
60
0
50
100
150
200
250
300
Iteration

Figure 2:

Hill-Valley


Hill−Valley Misclassification Error by Iteration
Error
0.0
0.1
0.2
0.3
0.4
0
100
200
300
k
Set
Testing.Error
Training.Error

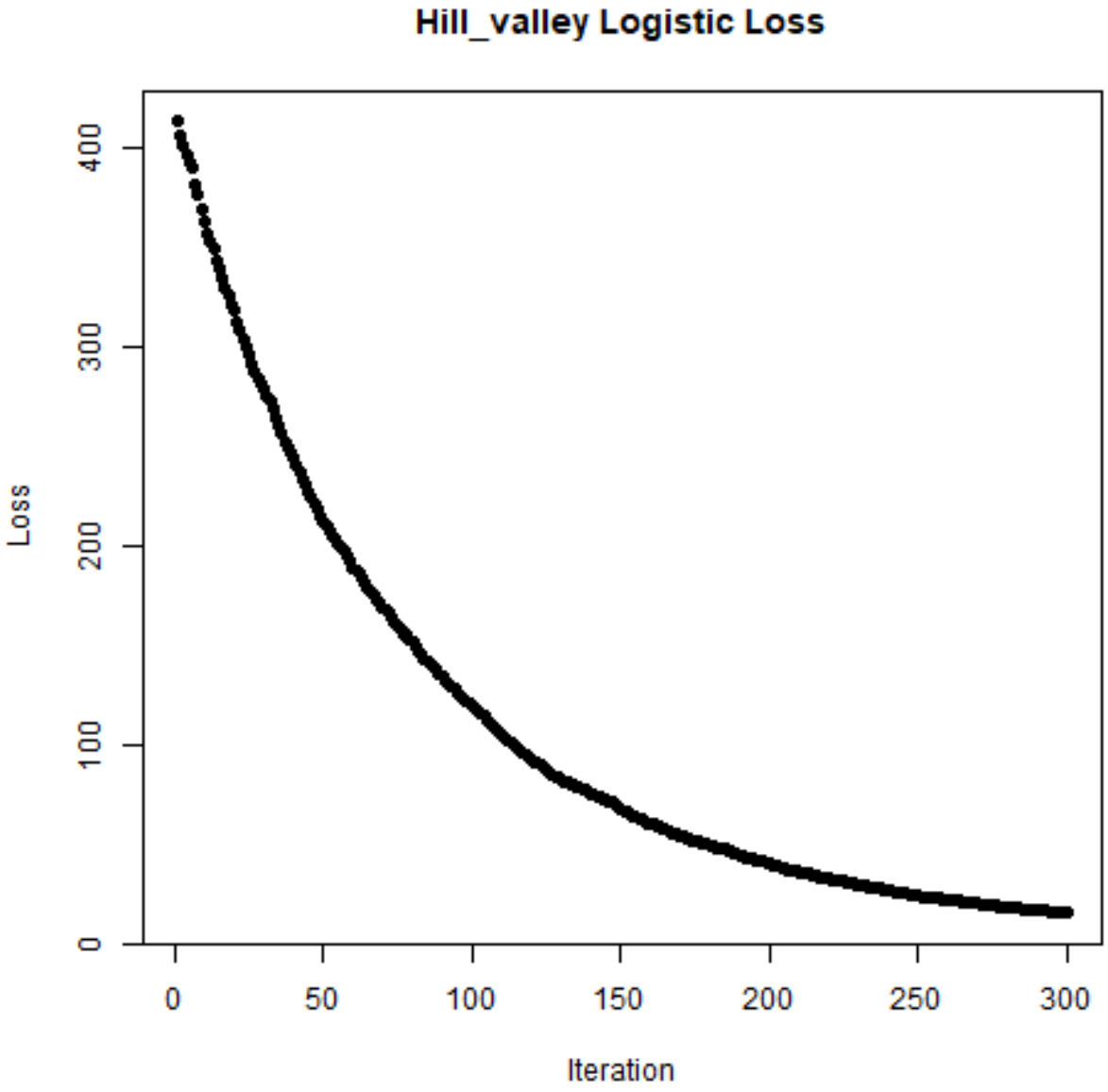

Hill_valley Logistic Loss
Loss
0
100
200
300
400
0
50
100
150
200
250
300
Iteration

Figure 3:

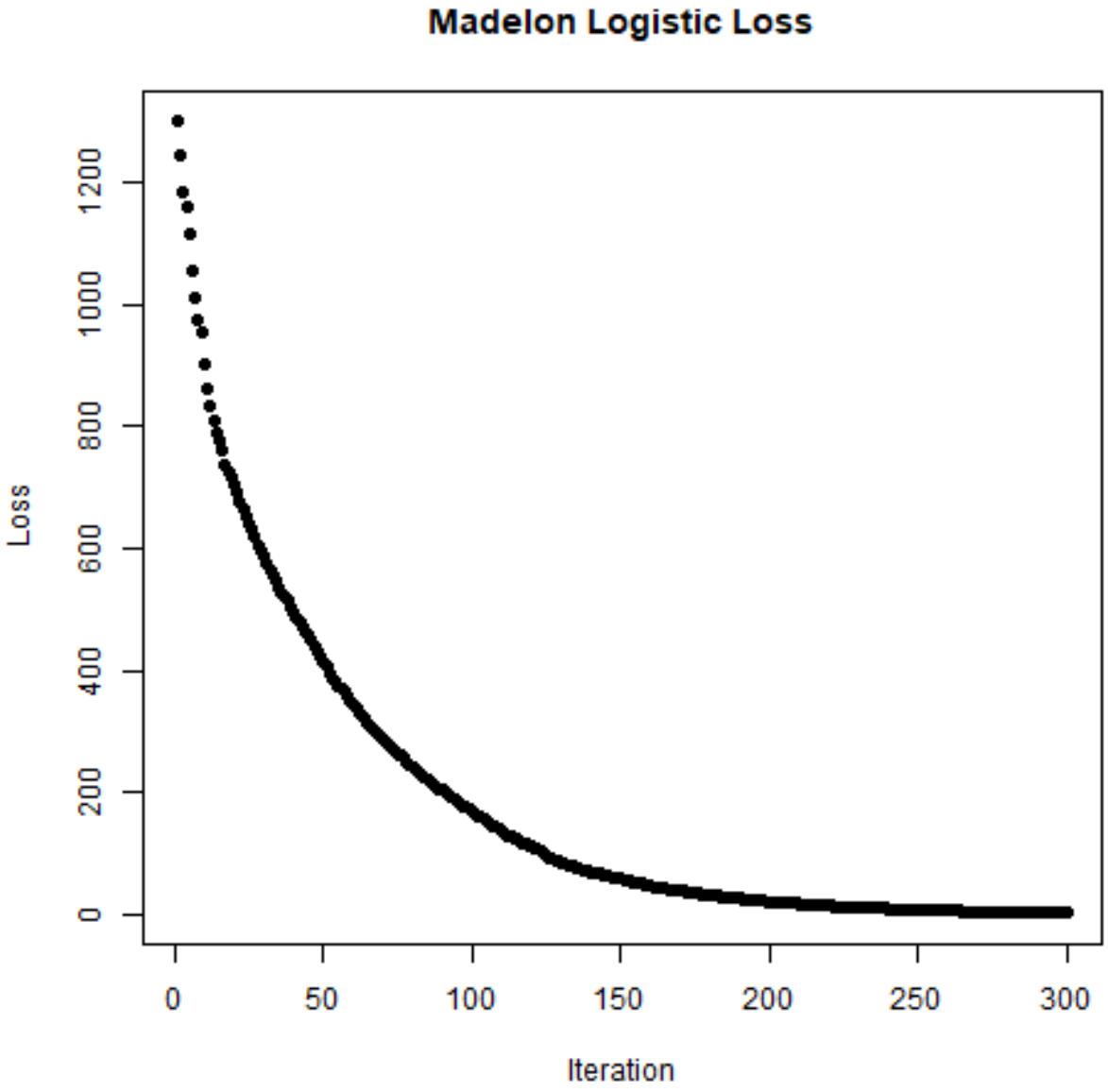

Madelon Logistic Loss
Loss
0
200
400
600
800
1000
1200
0
50
100
150
200
250
300
Iteration

Figure 4:

Madelon

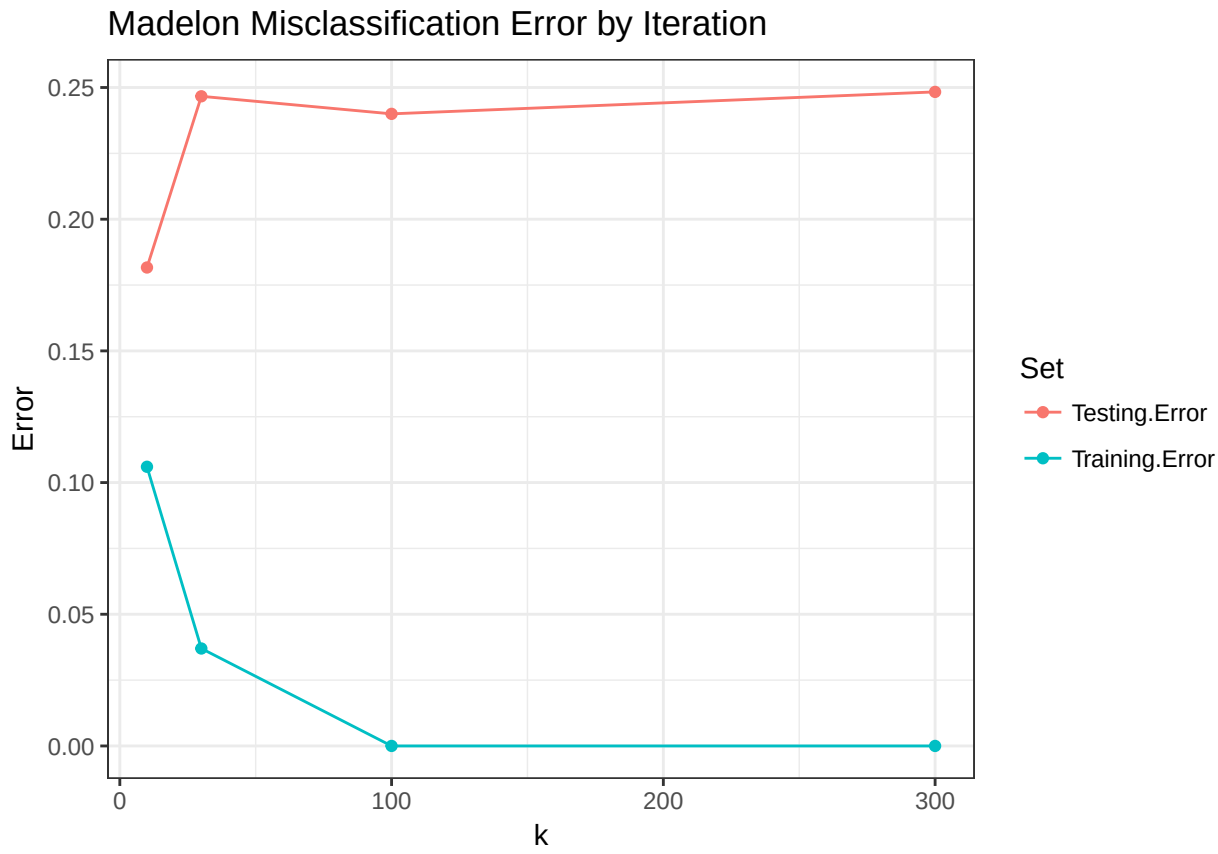


Table of Results

Data	k	Training.Error	Testing.Error
gisette	10	0.0725000	0.0940000
gisette	30	0.0376667	0.0560000
gisette	100	0.0035000	0.0490000
gisette	300	0.0000000	0.0340000
arcene	10	0.1100000	0.3300000
arcene	30	0.0200000	0.3100000
arcene	100	0.0000000	0.2600000
arcene	300	0.0000000	0.2800000
hill_valley	10	0.1617162	0.4570957
hill_valley	30	0.0874587	0.4603960
hill_valley	100	0.0115512	0.4422442
hill_valley	300	0.0016502	0.4306931
madelon	10	0.1060000	0.1816667
madelon	30	0.0370000	0.2466667
madelon	100	0.0000000	0.2400000
madelon	300	0.0000000	0.2483333

Script

```
## run logitboost
library(ada)
results <- data.frame()
set.seed(5)
files <- c("gisette", "arcene", "hill_valley", "madelon")
propcase <- function(string) {paste0(toupper(substring(string, 1, 1)), substring(string, 2))}
print(Sys.time())
for (i in 1:4) {
  message(paste("Begin", files[i]))
  filelist <- read_data(files[i])
  for (k in c(10, 30, 100, 300)) {
    logitBoost <- ada(filelist$X, filelist$Y$Y, filelist$Xtest, filelist$Ytest$Y,
                                  loss="logistic", iter=k, verbose = FALSE)
    if (k == 300) {
      png(filename = paste0("C:/Users/joh10/Desktop/FSU/FA17/5635/git/hw8/", files[i], "_loss.png"))
      plot(logitBoost$model$plot_loss, xlab = "Iteration", ylab = "Loss",
                     main = paste0(propcase(files[i]), " Logistic Loss"), pch=16)
      dev.off()
      message("Plot saved.")
    }
    results <- rbind(results, c(k, logitBoost$model$errs[k,1], logitBoost$model$errs[k,3]))
    message(paste("k =", k, "finished"))
  }
  print(Sys.time())
}

colnames(results) <- c("k", "Training Error", "Testing Error")
results <- data.frame(Data = rep(files, each = 4), results)
saveRDS(results, "C:/Users/joh10/Desktop/FSU/FA17/5635/git/hw8/results.rds")
```

Modifying the ada function

The "trace" function in base R was used to modify the ada package so that the loss function could be plotted.

```
trace(ada:::ada.default, edit = TRUE)
trace(ada:::ada.machine, edit = TRUE)

## code added:
# plot_loss <- c()
# plot_loss[m] <- sum(log(1 + exp(-y * fits)))
# add plot_loss to return obj

#untrace(ada:::ada.machine)
```

Bibliography

- Mark Culp, Kjell Johnson and George Michailidis (2016). ada: The R Package Ada for Stochastic Boosting. R package version 2.0-5. https://CRAN.R-project.org/package=ada
- H. Wickham. ggplot2: Elegant Graphics for Data Analysis. Springer-Verlag New York, 2009.
- Hadley Wickham and Lionel Henry (2017). tidyr: Easily Tidy Data with 'spread()' and 'gather()' Functions. R package version 0.7.2. https://CRAN.R-project.org/package=tidyr