Modeling Data with Dependencies

Solutions to Hands on Exercises

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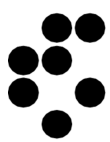

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Hands On Time Series

Package **quantmod** (an extra package that you need to install) contains several facilities to handle financial time series. Among them, the function `getSymbols` allows you to download the prices of financial assets from *yahoo finance*. Explore the help page of the function to try to understand how it works, and the answer the following:

1. Obtain the prices of Apple during the last year solution
2. Using these prices create a time series of the percentage variation of the Closing prices (tip: check function `Cl()` and `Delt` from package **quantmod**) solution
3. Create and embed data set of the previous series using function `createEmbedDS()` of package **DMwR2** solution
4. Split the data set in two consecutive periods. Train a random forest with the first and apply it to the second. solution
5. Analyse the results solution

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Solution to Exercise 1

- Obtain the prices of Apple during the last year

```
library(quantmod)
library(lubridate)
getSymbols("AAPL",from=Sys.Date() - years(1))

## [1] "AAPL"

# checking
start(AAPL)

## [1] "2016-01-20"

end(AAPL)

## [1] "2017-01-19"
```

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Solution to Exercise 2

- Using these prices create a time series ...

```
apl <- Delt(Cl(AAPL))
```

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Solution to Exercise 3

- Create and embed data set ...

```
library(DMwR2)
library(TTR)
dat <- createEmbedDS(apl, emb=7)
dat <- data.frame(cbind(lag(apl,-1),
                        dat,
                        MA10=SMA(apl,10),
                        RSI=RSI(apl),
                        BB=BBands(apl)$pctB))
colnames(dat)[1] <- "FutureT"
dat <- na.omit(dat)
```

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Solution to Exercise 4

- Split the data set in two consecutive periods. Train a random forest with the first and apply it to the second.

```
set.seed(1234)
sztr <- as.integer(0.7*nrow(dat))
tr <- dat[1:sztr,]
ts <- dat[(sztr+1):nrow(dat),]
library(randomForest)
mdl <- randomForest(FutureT ~ ., tr, ntrees=1000)
preds <- predict(mdl, ts)
```

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Solution to Exercise 5

- Analyse the results

```
(mae <- mean(abs(preds-ts$FutureT)))

## [1] 0.007684985
```

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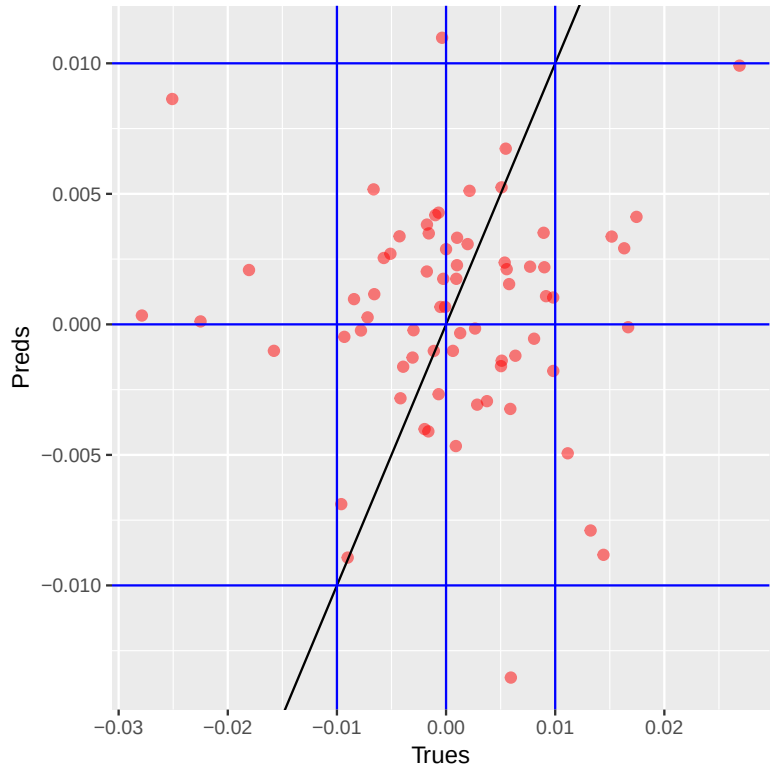
Solution to Exercise 5 - cont.

```
library(ggplot2)
dt <- data.frame(Trues=ts$FutureT, Preds=preds)
ggplot(dt, aes(x=Trues, y=Preds)) +
    geom_point(col="red", size=2, alpha=0.5) +
    geom_abline(slope=1,intercept=0) +
    geom_hline(yintercept=c(-0.01,0,0.01),col="blue") +
    geom_vline(xintercept=c(-0.01,0,0.01),col="blue") +
    guides(col=FALSE)
```



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Hands On Spatial Forecasting

Using the `meuse` data set from package **sp**:

1. Build a multiple regression data set to predict the variable *cadmium* through the function `getVars()` shown during the classes. Explore other statistics apart from the defaults of the function. solution
2. Split the obtained data set randomly in two 70-30% partitions solution
3. Obtain an SVM with the larger partition solution
4. Apply the model to obtain predictions for the smaller partition and analyse the results solution

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Solutions to Exercise 1

- Build a multiple regression data set ...

```
library(sp)
data(meuse)
coordinates(meuse) <- ~x+y
proj4string(meuse) <- CRS("+init=epsg:28992")
dat <- NULL
for(r in 1:nrow(meuse))
    dat <- rbind(dat,
                 getVars(meuse[r,],meuse[-r,],"cadmium",
                         nns=c(2,5,7),
                         funcs=c("mean","sd","median","max","min")))
dat <- data.frame(dat,tgtCad=meuse[["cadmium"]])
```

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Solutions to Exercise 2

- Split the obtained data set randomly in two 70-30% partitions

```
set.seed(1234)
idx <- sample(1:nrow(dat),as.integer(0.7*nrow(dat)))
tr <- dat[idx,]
ts <- dat[-idx,]
```

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Solutions to Exercise 3

- Obtain an SVM with the larger partition

```
library(e1071)

mdl <- svm(tgtCad ~ ., tr, cost=10, epsilon=0.01)
```

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Solutions to Exercise 4

- Apply the model to obtain predictions for the smaller partition and analyse the results

```
preds <- predict(mdl, ts)
mae <- mean(abs(preds-ts$tgtCad))
mae
```

```
## [1] 2.24393
```

```
library(DMwR)
regr.eval(ts$tgtCad, preds, train.y=tr$tgtCad)
```

```
##         mae         mse        rmse        mape        nmse        nmae
##   2.2439297 10.7390299  3.2770459  2.6506198  0.9005765  0.8731525
```

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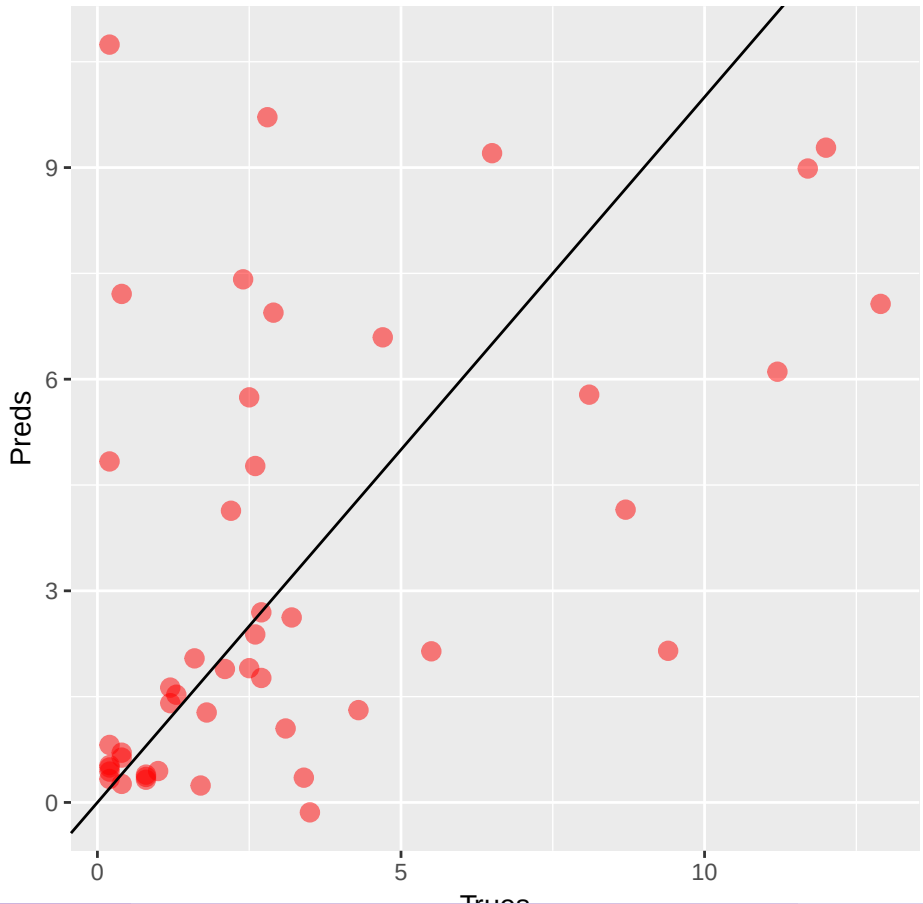
Solutions to Exercise 4 - cont.

```
library(ggplot2)
dt <- data.frame(Trues=ts$tgtCad, Preds=preds)
ggplot(dt, aes(x=Trues, y=Preds)) +
    geom_point( col="red", size=3, alpha=0.5) +
    geom_abline(slope=1,intercept=0) +
    guides(col=FALSE)
```



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