Final homework

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**HW1-1 Memory of personal computer**

First stage:

1982, Compaq created the first IBM laptop, the memory is 128KB RAM

Taiwan promoted 72pin SO DIMM laptop

In Pentium MMX period, 144pin 3.3V EDO SO DIMM appeared,

Second stage:

Synchronous Dynamic Random Access Memory(SDRAM), standardized 144pin

Third stage:

Double Data Rate(DDR): 1GB

**HW1-2 Logistic Regression**

A regression model where the dependent variable is categorical.

Logistic regression was developed by statistician David Cox in 1958.

The binary logistic model is used to estimate the probability of a binary response based on one or more predictor (or independent) variables (features). It allows one to say that the presence of a risk factor increases the odds of a given outcome by a specific factor

Logistic regression can be used in various fields, including machine learning, most medical fields, and social sciences.

Compared with multiple linear regression, they all belong to generalized linear model, but they have different dependent variables: if DV is continuous, then it’s multiple linear regression; if DV is binomial distribution, then it’s logistic regression.

Example: Probability of passing an exam versus hours of study

A group of 20 students spend between 0 and 6 hours studying for an exam.How does the number of hours spent studying affect the probability that the student will pass the exam?The dependent variable pass/fail represented by "1" and "0" are not cardinal numbers

**HW 2**

**# HW 2-1 & 2-2 #**

year<-c(1988,1991,1996,2000,2003,2007,2014)

RAM<c(0.002,0.004,0.5,1,2,8,16)

plot(year,RAM)

lines(spline(year,RAM))

lines(spline(year,RAM, n = 201), col = 2)

**# HW 2-3 #**

x = 6

n = 1000

lambda = 2

p = lambda / n

dbinom (x,2\*n,p) # binomial probability mass function

dpois (x, 2\*lambda ) # Poisson probability mass function

dpois (0, 5 )

**HW3-1**

install.packages(“digest”,repos=‘http://cran.us.r-project.org’)

library(“digest”)

digest(“I learn a lot from this class when I am proper listening to the professor”,“sha256”)

digest("I do not learn a lot from this class when i am absent and playing on my Iphone","sha256")

**HW3-2 Digital Signature Algorithms**

The Digital Signature Algorithm (DSA) is a Federal Information Processing Standard for digital signatures.

For the key generation, it has two phases. The first phase is a choice of algorithm parameters which may be shared between different users of the system, while the second phase computes public and private keys for a single user.

For the Parameter generation, the steps are: Choose an approved cryptographic hash function *H*; Decide on a key length L and N which is the primary measure of the cryptographic strength of the key; Choose an N-bit prime q; Choose an L-bit prime p such that p − 1 is a multiple of q; Choose g, a number whose multiplicative order modulo p is q.

The algorithm parameters (p, q, g) may be shared between different users of the system.

Per-user keys: Given a set of parameters, the second phase computes private and public keys for a single user.  
Apart from these, we also need signing and verifying process, then check the Correctness of the algorithm

**HW3-3**

# Create a JSON data set#

install.packages(“rjson”)

library(rjson)

Num <-c(1:5)

Name <-c(“Jack”,“Bob”,“Jobbs”,“Dell”,“apple”)

data <-as.matrix(data.frame(Num,Name))

cat(toJSON(data))

# Read the JSON data set #

library(“rjson”)

json\_data = fromJSON(file=data)

**HW3-4**

install.packages("rjson", repos="http://cran.us.r-project.org")

library("rjson")

json\_file = "http://crix.hu-berlin.de/data/crix.json"

json\_data = fromJSON(file=json\_file)

crix\_data\_frame = as.data.frame(json\_data)

a<-seq(1,2348,2)

b<-seq(2,2348,2)

date<-t(crix\_data\_frame[1,a])

price<-t(crix\_data\_frame[1,b])

return<-1:1174

for(i in 1:1174)

{return[i+1]<-log(price[i+1]/price[i])}

new<-data.frame(date,price,return[1:1174])

names(new)<-c("date","price","return")

plot(new$date,new$return)

arima(new$return, order = c(2,0,1))

#These results suggest that the CRIX return series can be modeled by some ARIMA process,

for example ARIMA(2, 0, 2).

library(timeDate)

library(timeSeries)

library(fBasics)

library(fGarch)

garchFit(new$return ~ garch(1, 1))

**HW4**

#install.packages("rjson", repos="http://cran.us.r-project.org")

library("rjson")

json\_file = "http://crix.hu-berlin.de/data/crix.json"

json\_data = fromJSON(file=json\_file)

crix\_data\_frame = as.data.frame(json\_data)

n<-dim(crix\_data\_frame)

a<-seq(1,n[2],2)

b<-seq(2,n[2],2)

date<-t(crix\_data\_frame[1,a])

price<-t(crix\_data\_frame[1,b])

ts.plot(price)

ret<-diff(log(price))

plot(ret)

ts.plot(ret)

# histogram of returns

hist(ret, col = "grey", breaks = 20, freq = FALSE, ylim = c(0, 25), xlab = NA)

lines(density(ret), lwd = 2)

mu = mean(ret)

sigma = sd(ret)

x = seq(-4, 4, length = 100)

curve(dnorm(x, mean = mean(ret), sd = sd(ret)), add = TRUE, col = "darkblue", lwd = 2)

# qq-plot

qqnorm(ret)

qqline(ret, col = "blue", lwd = 3)

# acf plot

autocorr = acf(ret, lag.max = 20, ylab = "Sample Autocorrelation", main = NA,lwd = 2, ylim = c(-0.3, 1))

# plot of pacf

autopcorr = pacf(ret, lag.max = 20, ylab = "Sample Partial Autocorrelation", main = NA, ylim = c(-0.3, 0.3), lwd = 2)

# select p and q order of ARIMA model

fit4 = arima(ret, order = c(2, 0, 3))

tsdiag(fit4)

Box.test(fit4$residuals, lag = 1)

fitr4 = arima(ret, order = c(2, 1, 3))

tsdiag(fitr4)

Box.test(fitr4$residuals, lag = 1)

# to conclude, 202 is better than 213

fit202 = arima(ret, order = c(2, 0, 2))

tsdiag(fit202)

tsdiag(fit4)

tsdiag(fitr4)

# arima202 predict

fit202 = arima(ret, order = c(2, 0, 2))

crpre = predict(fit202, n.ahead = 30)

dates = seq(as.Date("02/08/2014", format = "%d/%m/%Y"), by = "days", length = length(ret))

plot(ret, type = "l", xlim = c(0, 644), ylab = "log return", xlab = "days",lwd = 1.5)

lines(crpre$pred, col = "red", lwd = 3)

lines(crpre$pred + 2 \* crpre$se, col = "red", lty = 3, lwd = 3)

lines(crpre$pred - 2 \* crpre$se, col = "red", lty = 3, lwd = 3)

**HW5**

vec\_abs<-c("ROMEO: He jests at scars that never felt a wound. But,soft! what light through yonder window breaks? It is the east，and Juliet is the sun．Arise, fair sun, and kill the envious moon, Who is already sick and pale with grief, That thou her maid art far more fair than she: Be not her maid, since she is envious；Her vestal livery is but sick and green And none but fools do wear it; castit off. It is my lady, O, it is my love! O, that she knew she were! She speaks yet she says nothing: what of that? Her eye discourses, I will answer it．I am too bold, 'tis not to me she speaks: Two of the fairest stars in all the heaven, Having some business, do entreat her eyes To twinklein their spheres till they return. What if her eyes were there, they in her head? The brightness of her cheek would shame those stars, As daylight doth a lamp; her eyes in heavenWould through the airy region stream so bright That birds would sing and think it were not night. See, how she leans her cheek upon her hand! O, that I were a glove upon that hand, That I might touch that cheek!" ,

"JULIET: Ay me! ",

"ROMEO: She speaks: O, speak again, bright angel!for thou art As glorious to this night, being o'er my head As is a winged messenger of heaven Unto the white-upturned wondering eyes Of mortals that fall back to gazeon himWhen he bestrides the lazy-pacing clouds And sails upon the bosomof the air. ",

"JULIET: O Romeo, Romeo! whereforeart thou Romeo? Deny thy father and refuse thy name; Or, if thou wilt not，be but sworn my love, And I'll no longer be a Capulet.",

"ROMEO: Shall I hear more，or shall I speak at this?",

"JULIET: 'Tisbut thy name that is my enemy; Thou art thyself，though not a Montague. What's Montague? it is nor hand, nor foot, Nor arm, nor face, nor any other part Belonging to a man. O, be some other name! What's in a name? that which we call a roseBy any other name would smell as sweet; So Romeo would, were he not Romeo call'd, Retain that dear perfection which he owes Without that title. Romeo, doffthy name, And for that name which is no part of thee Take all myself.",

"ROMEO: I take thee at thy word: Call me but love, and I'll be new baptized, HenceforthI never will be Romeo. ",

"JULIET: What man art thou that thus bescreen'din night So stumblest on my counsel? ",

"ROMEO: By a nameI know not haw to tell thee who I am：My name, dear saint, is hateful to myself, Because it is an enemy to thee, Had I it written,I would tear the word. ",

"JULIET: My ears have not yet drunk a hundred words Of that tongue's utterance, yet I know the sound:Art thou not Romeo and a Montague? ",

"ROMEO: Neither，fair saint, if either thee dislike. ",

"JULIET: How camest thou hither，tell me，and wherefore? The orchard walls are high and hard to climb, And the place death, considering who thou art, If any of my kinsmen find thee here."

)

library(NLP)

library(tm)

library(SnowballC)

abs = Corpus(VectorSource(vec\_abs))

abs\_dtm = DocumentTermMatrix(abs, control = list(

stemming = TRUE, stopwords = TRUE, minWordLength = 3,

removeNumbers = TRUE, removePunctuation = TRUE))

dim(abs\_dtm)

inspect(abs\_dtm)

findFreqTerms(abs\_dtm, 3)

removeSparseTerms(abs\_dtm, 0.5)

inspect(removeSparseTerms(abs\_dtm, 0.5))

library(ggplot2)

library(RColorBrewer)

library(wordcloud)

freq = colSums(as.matrix(abs\_dtm))

wf = data.frame(word=names(freq), freq=freq)

#HW5.2

plot = ggplot(subset(wf, freq>1), aes(word, freq))

plot = plot + geom\_bar(stat="identity")

plot = plot + theme(axis.text.x=element\_text(angle=45, hjust=1))

plot

#HW5.1

dark2 = brewer.pal(6, "Dark2")

wordcloud(names(freq), freq, max.words=100, rot.per=0.2, colors=dark2)