###Read table with header

data<-read.csv("challenger.csv", header = TRUE);data

###Attaches data to a matrix with headers as variables

attach(data)

###Data preparation

O.ring2<-ifelse(O.ring>0,1,0);O.ring2

###Logistic regression

fit<-glm(O.ring2~Temp+Pressure,family=binomial(logit))

summary(fit)

###Likelihood Ratio CI

lr<-confint(fit);lr

elr<-exp(lr);elr

###LRT

nul<-fit$null.deviance;nul

res<-fit$deviance;res

lrt<-nul-res;lrt

##New fit without pressure

fit2<-glm(O.ring2~Temp,family=binomial(logit))

predict(object = fit2, newdata = data.frame(Temp), type = "response")

###Plots

#ag<-aggregate(formula = O.ring2 ~ Temp, data = data, FUN = sum)

n<-sum(fit2$y)

plot(x = Temp,y = O.ring2,col="black",main="O.ring vs. Temp",xlab="Temp",ylab="O.ring",xlim=c(31,51),ylim=c(0,1));

curve(expr = predict(object = fit2, newdata = data.frame(Temp = x), type = "response"), col = "black", add = T, xlim=c(31,51))

ci.pi<-function(newdata, mod.fit.obj, alpha){

# print(newdata) # Test

linear.pred<-predict(object = mod.fit.obj, newdata = newdata, type = "link", se = TRUE)

CI.lin.pred.lower<-linear.pred$fit - qnorm(p = 1-alpha/2)\*linear.pred$se

CI.lin.pred.upper<-linear.pred$fit + qnorm(p = 1-alpha/2)\*linear.pred$se

CI.pi.lower<-exp(CI.lin.pred.lower) / (1 + exp(CI.lin.pred.lower))

CI.pi.upper<-exp(CI.lin.pred.upper) / (1 + exp(CI.lin.pred.upper))

list(lower = CI.pi.lower, upper = CI.pi.upper)

}

###Plot C.I. bands

curve(expr = ci.pi(newdata = data.frame(Temp = x), mod.fit.obj = fit2, alpha = 0.05)$lower, col = "blue", lty = "dotdash", add = TRUE, xlim = c(31, 51))

curve(expr = ci.pi(newdata = data.frame(Temp = x), mod.fit.obj = fit2, alpha = 0.05)$upper, col = "blue", lty = "dotdash", add = TRUE, xlim = c(31, 51))

###95%CI for Temp = 31

new<-data.frame(Temp = 31)

prednew<-predict(object = fit2, newdata = new, type = "response", se = T);prednew

alpha<-.05

lower<-prednew$fit-qnorm(1-alpha/2)\*prednew$se;lower

upper<-prednew$fit+qnorm(1-alpha/2)\*prednew$se;upper

###90%CI for Temp = 31

new<-data.frame(Temp = 31)

prednew<-predict(object = fit2, newdata = new, type = "response", se = T);prednew

alpha<-.1

lower<-prednew$fit-qnorm(1-alpha/2)\*prednew$se;lower

upper<-prednew$fit+qnorm(1-alpha/2)\*prednew$se;upper

###90%CI for Temp = 72

new<-data.frame(Temp = 72)

prednew<-predict(object = fit2, newdata = new, type = "response", se = T);prednew

alpha<-.1

lower<-prednew$fit-qnorm(1-alpha/2)\*prednew$se;lower

upper<-prednew$fit+qnorm(1-alpha/2)\*prednew$se;upper

###New fit with quadratic term

fit3<-glm(O.ring2~Temp+I(Temp^2),family=binomial(logit))

summary(fit3)

###Other fits

#Probit

probfit<-glm(O.ring2~Temp,family=binomial(probit))

summary(probfit)

###90%CI for Temp = 31

new<-data.frame(Temp = 31)

prednew<-predict(object = probfit, newdata = new, type = "response", se = T);prednew

alpha<-.1

lower<-prednew$fit-qnorm(1-alpha/2)\*prednew$se;lower

upper<-prednew$fit+qnorm(1-alpha/2)\*prednew$se;upper

###90%CI for Temp = 72

new<-data.frame(Temp = 72)

prednew<-predict(object = probfit, newdata = new, type = "response", se = T);prednew

alpha<-.1

lower<-prednew$fit-qnorm(1-alpha/2)\*prednew$se;lower

upper<-prednew$fit+qnorm(1-alpha/2)\*prednew$se;upper

#Log-log

logfit<-glm(O.ring2~Temp,family=binomial(cloglog))

summary(logfit)

###90%CI for Temp = 31

new<-data.frame(Temp = 31)

prednew<-predict(object = logfit, newdata = new, type = "response", se = T);prednew

alpha<-.1

lower<-prednew$fit-qnorm(1-alpha/2)\*prednew$se;lower

upper<-prednew$fit+qnorm(1-alpha/2)\*prednew$se;upper

###90%CI for Temp = 72

new<-data.frame(Temp = 72)

prednew<-predict(object = logfit, newdata = new, type = "response", se = T);prednew

alpha<-.1

lower<-prednew$fit-qnorm(1-alpha/2)\*prednew$se;lower

upper<-prednew$fit+qnorm(1-alpha/2)\*prednew$se;upper

###Read table with header

data2<-read.csv("placekick.csv", header = TRUE);data2

###Attaches data to a matrix with headers as variables

attach(data2)

###Logistic regression and LRT

##Interaction

modfit<-glm(good~distance+wind+I(wind\*distance),family=binomial(logit))

summary(modfit)

#LRT

nul<-modfit$null.deviance;nul

res<-modfit$deviance;res

lrt<-nul-res;lrt

##No interaction

modfit2<-glm(good~distance+wind,family=binomial(logit))

summary(modfit2)

#LRT

nul<-modfit2$null.deviance;nul

res<-modfit2$deviance;res

lrt<-nul-res;lrt