Regression Analysis

Regression Analysis in Practice

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Customer Churn Analysis in the Telecom Sector

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About This Lesson

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Customer Churn Analysis

Customer Churn is of great interest in industries where revenues are heavily dependent on subscriptions.

Dataset: Customer data for 7,043 telecom clients, all located in CA, USA.

Data Source: IBM Business Analytics Community

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Response & Predicting Variables

Response variables:

- *Churn Value:* 1 = the customer left the company. 0 = the customer remained with the company.

Predicting variables:

- **Demographics:** 4 variables including customer's gender (*Gender*), marital status (*Partner*) among others.
- **Location:** 7 variables including customer's primary residence ZIP Code (*Zip Code*), latitude (*Latitude*) among others.
- **Services:** 15 variables including customer's subscriptions to home phone (*Phone Services*), internet (*Internet services*), tech support (*Tech Support*) among others services.
- **Status:** 6 variables including customer's ID (*CustomerID*), reason for leaving the company (*Churn Reason*), customer's lifetime value (CLTV) among others.

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Objective and Methods

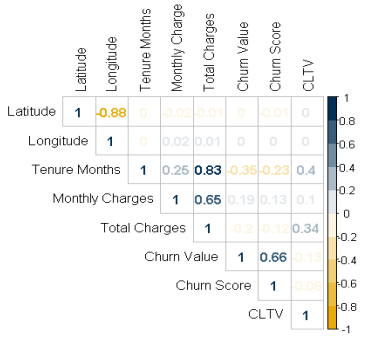
- Predict which customers are likely to churn.
  - Logistic Regression
  - K Nearest Neighbors
  - Decision Tree
  - Random Forest

Exploratory Data Analysis in R

```
## Correlation among the numeric variables
# Select numerical variables
dat.num <- na.omit(dat[ , which(sapply(dat, is.numeric))])

# Create correlation matrix
corr <- cor(dat.num)

# Create correlation plot
col <- colorRampPalette(c(buzzgold,"white", gtblue))(10)
corrplot(corr, method = "number", type = "upper",
         tl.col="black", col = col)
```



There appears to be strong correlation among some of the predicting variables.

Exploratory Data Analysis in R (cont'd)

```
## Relationship between binary response and numerical variables

par(mfrow=c(2,2))
boxplot(Total.Charges ~ Churn.Value, main="", xlab="Churn Value", ylab="Total Charges",
col=c(techgold,buzzgold), data=dat)

boxplot(Monthly.Charges ~ Churn.Value, main="", xlab="Churn Value", ylab="Monthly Charges",
col=c(techgold,buzzgold), data=dat)

boxplot(Tenure.Months ~ Churn.Value, main="", xlab="Churn Value", ylab="Tenure Months",
col=c(techgold,buzzgold), data=dat)
```

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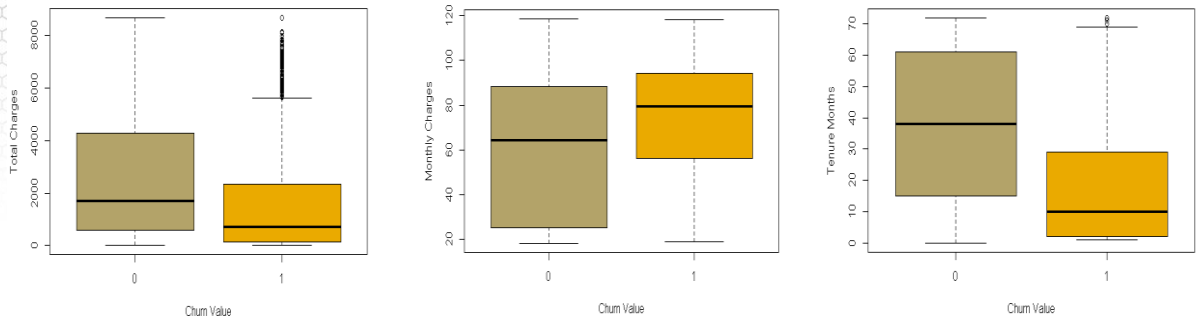
Exploratory Data Analysis in R (cont'd)



Customers that remain with the company appear to have higher total charges and tenure months but lower monthly charges than customers that have churned.

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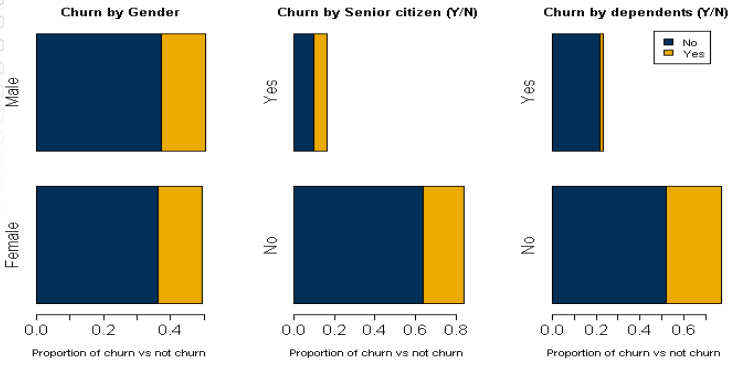
Exploratory Data Analysis in R (cont'd)

```
## Relationship between binary response and categorical variables
par(mfrow=c(1,3))

tb_obgender = xtabs(~dat$Churn.Value+ dat$Gender)
barplot(prop.table(tb_obgender),axes=T,space=0.3,  cex.axis=1.5, cex.names=1.5,
        xlab="Proportion of churn vs not churn",
        horiz=T, col=c(gtblue,buzzgold),main="Churn by Gender")

tb_citizen = xtabs(~dat$Churn.Value+ dat$Senior.Citizen)
barplot(prop.table(tb_citizen),axes=T,space=0.3, cex.axis=1.5, cex.names=1.5,
        xlab="Proportion of churn vs not churn",
        horiz=T, col=c(gtblue,buzzgold),main="Churn by Senior citizen (Y/N)")

tb_Dependents = xtabs(~dat$Churn.Value+ dat$Dependents)
barplot(prop.table(tb_Dependents),axes=T,space=0.3,cex.axis=1.5, cex.names=1.5,
        xlab="Proportion of churn vs not churn ",
       horiz=T, col=c(gtblue,buzzgold),main="Churn by dependents (Y/N)",
       legend.text = c("No", "Yes"))
```



There seems to exist significant differences in the proportions for each group in the predicting variables *Senior Citizen* and *Dependents*.

Summary