Predictive And Forecasting Models For Unscheduled Out Of Service Aircraft(AOS)

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September 4, 2019

```
colnames(df0)
```

```
##  [1] "FMR_OPEN_DATE"       "AIRCRAFT"            "ATA_fmr"
##  [4] "Chapter"             "PRIOR_CD"            "Reason"
##  [7] "PART"                "PART_QTY"            "DAYS_OPEN"
## [10] "DFRL_COUNT"          "LABOR_GENERAL_HOURS" "LABOR_GROUND_TIME"
## [13] "DEFERRALTYPE"        "DEFERRAL_REASON_CD"  "Reasn"
```

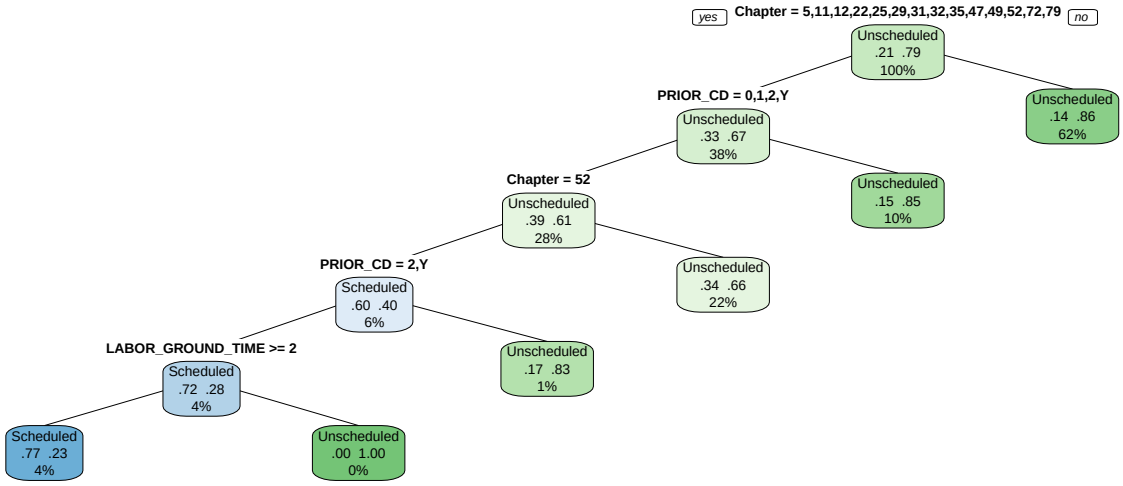
```
## [1] 5445   15
```

```
## [1] 1360   15
```

```
mod0 = glm(Reasn~ Chapter + PRIOR_CD + LABOR_GENERAL_HOURS + DAYS_OPEN + LABOR_GROUND_TIME + DFRL_COUNT
           family = binomial(link = 'logit'), data = df_train)
```

```
print(mod_final, n = 50)
```

```
## # A tibble: 23 x 5
##    term                estimate std.error statistic       p.value
##    <chr>                  <dbl>     <dbl>     <dbl>         <dbl>
##  1 Chapter36               2.09     0.351      5.97 0.00000000242
##  2 Chapter30               2.29     0.409      5.60 0.0000000213
##  3 Chapter78               1.92     0.376      5.11 0.000000322
##  4 LABOR_GENERAL_HOURS -0.0181    0.00395     -4.59 0.00000451
##  5 Chapter24               2.92     0.651      4.48 0.00000745
##  6 PRIOR_CD2              -0.543    0.122      -4.43 0.00000930
##  7 Chapter34               1.59     0.371      4.27 0.0000197
##  8 Chapter50               1.32     0.407      3.25 0.00115
##  9 Chapter28               1.04     0.321      3.24 0.00121
## 10 Chapter77               2.11     0.659      3.21 0.00133
## 11 PRIOR_CDN               0.433    0.143      3.02 0.00252
## 12 Chapter26               1.79     0.598      3.00 0.00271
## 13 LABOR_GROUND_TIME      0.0123    0.00427    2.87 0.00406
## 14 Chapter38               0.875    0.324      2.70 0.00698
## 15 Chapter33               1.01     0.385      2.62 0.00885
## 16 Chapter21               0.764    0.293      2.61 0.00907
## 17 Chapter71               1.33     0.518      2.57 0.0102
## 18 Chapter27               0.774    0.305      2.54 0.0112
## 19 PART_QTY               0.0127    0.00507    2.51 0.0120
## 20 Chapter73               0.940    0.401      2.34 0.0191
## 21 DFRL_COUNT             0.00645   0.00282    2.29 0.0221
## 22 (Intercept)             0.653    0.289      2.26 0.0239
## 23 Chapter44               1.45     0.680      2.14 0.0325
```




```
tree_rules
```

```
##                         Sche Unsc
## Reasn is Scheduled    [ .77  .23] with cover 4% when
##                                   Chapter is 52
##                                   PRIOR_CD is 2 or Y
##                                   LABOR_GROUND_TIME >= 2
##
## Reasn is Unscheduled [ .34  .66] with cover 22% when
##                                   Chapter is 5 or 11 or 12 or 22 or 25 or 29 or 31 or 32 or 35 or 47 o
##                                   PRIOR_CD is 0 or 1 or 2 or Y
##
## Reasn is Unscheduled [ .17  .83] with cover 1% when
##                                   Chapter is 52
##                                   PRIOR_CD is 0 or 1
##
## Reasn is Unscheduled [ .15  .85] with cover 10% when
##                                   Chapter is 5 or 11 or 12 or 22 or 25 or 29 or 31 or 32 or 35 or 47 o
##                                   PRIOR_CD is N
##
## Reasn is Unscheduled [ .14  .86] with cover 62% when
##                                   Chapter is 21 or 23 or 24 or 26 or 27 or 28 or 30 or 33 or 34 or 36
##
## Reasn is Unscheduled [ .00 1.00] with cover 0% when
##                                   Chapter is 52
##                                   PRIOR_CD is 2 or Y
##                                   LABOR_GROUND_TIME < 2
```

```
df_matrix
```

```
##
## df_pred          0    1
##   Scheduled     41    5
##   Unscheduled  244 1070
```

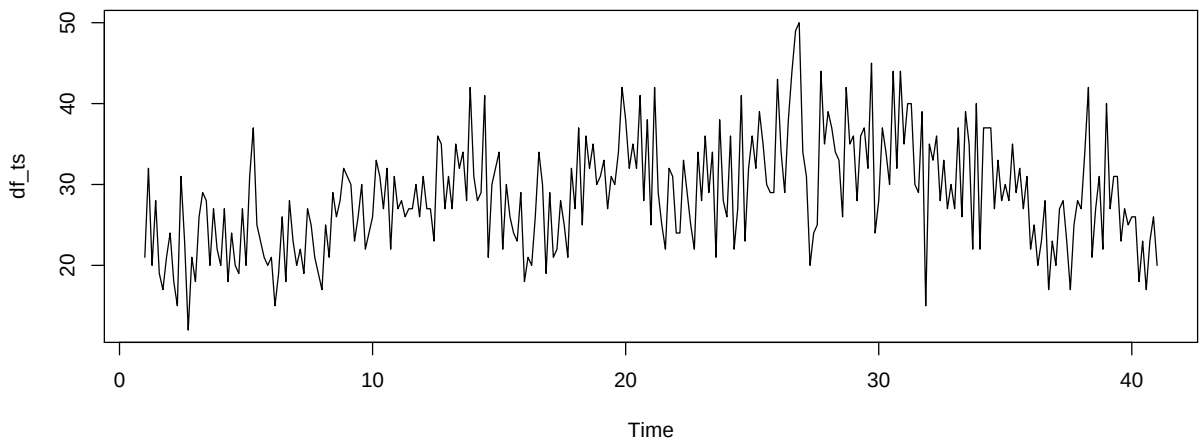
```
accuracy
```

```
## [1] 0.8169118
```

```r
df_ts= ts(df1$Incident, frequency = 7)
df_ts
```

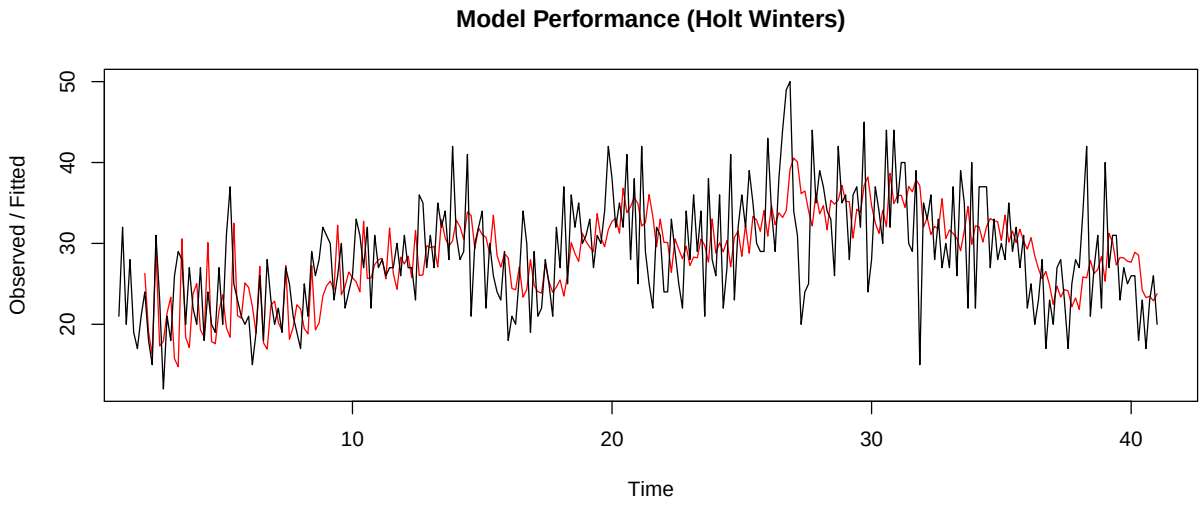
```
## Time Series:
## Start = c(1, 1)
## End = c(41, 1)
## Frequency = 7
##   [1] 21 32 20 28 19 17 21 24 18 15 31 23 12 21 18 26 29 28 20 27 22 20 27
##  [24] 18 24 20 19 27 20 31 37 25 23 21 20 21 15 19 26 18 28 23 20 22 19 27
##  [47] 25 21 19 17 25 21 29 26 28 32 31 30 23 26 30 22 24 26 33 31 27 32 22
##  [70] 31 27 28 26 27 27 30 26 31 27 27 23 36 35 27 31 27 35 32 34 28 42 31
##  [93] 28 29 41 21 30 32 34 22 30 26 24 23 29 18 21 20 26 34 30 19 29 21 22
## [116] 28 25 21 32 27 37 25 36 32 35 30 31 33 27 31 30 34 42 38 32 35 32 41
## [139] 28 38 25 42 29 25 22 32 31 24 24 33 29 25 22 34 28 36 29 34 21 38 28
## [162] 26 36 22 27 41 23 32 36 32 39 35 30 29 29 43 34 29 38 44 49 50 34 31
## [185] 20 24 25 44 35 39 37 34 33 26 42 35 36 28 36 37 32 45 24 28 37 34 30
## [208] 44 32 44 35 40 40 30 29 39 15 35 33 36 28 33 27 30 27 37 26 39 35 22
## [231] 40 22 37 37 37 27 33 28 30 28 35 29 32 27 31 22 25 20 23 28 17 23 20
## [254] 27 28 23 17 25 28 27 34 42 21 27 31 22 40 27 31 31 23 27 25 26 26 18
## [277] 23 17 23 26 20
```

```r
plot(df_ts)
```




```r
# Model 1 - Holt winters

mod1 = HoltWinters(df_ts)
plot(mod1, main = 'Model Performance (Holt Winters)')
```




```
df_forcast_final
```

```
##    Projected Unsched AOS 80% 95%
## 1                      24  16  12
## 2                      24  16  11
## 3                      22  14   9
## 4                      21  12   8
## 5                      22  14  10
## 6                      22  14   9
## 7                      22  13   9
## 8                      24  15  10
## 9                      23  14   9
## 10                     21  12   7
## 11                     20  11   6
## 12                     22  12   7
## 13                     22  12   7
## 14                     21  11   6
## 15                     23  13   8
## 16                     22  12   7
## 17                     20  10   5
## 18                     19   9   3
## 19                     21  10   5
## 20                     21  10   4
## 21                     20  10   4
## 22                     22  11   5
## 23                     21  10   4
## 24                     20   8   2
## 25                     18   7   1
## 26                     20   8   2
## 27                     20   8   2
## 28                     20   8   1
## 29                     21   9   2
## 30                     21   8   1
```