

ADS Project

C Chen

12/8/2016

```
data = read.csv("../Final_Data/final1213_resaped.csv")
data = data[,-1]
data$Hour = as.factor(data$Hour)
data$Month = as.factor(data$Month)
data$WeekofYear = as.factor(data$WeekofYear)
data$DayofWeek = as.factor(data$DayofWeek)
data$Year = as.factor(data$Year)
```

```
train = data[which(data$Year == "2012"),]
test = data[which(data$Year == "2013"),]
train = na.omit(train)
test = na.omit(test)
```

```
m = lm(Consumption ~ Income + Wind_Speed_MPH + Humidity + Temperature_F + Month + DayofWeek + Hour + We
summary(m)
```

```
##
## Call:
## lm(formula = Consumption ~ Income + Wind_Speed_MPH + Humidity +
##      Temperature_F + Month + DayofWeek + Hour + WeekofYear, data = train)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.23647 -0.04009 -0.00405  0.03510  0.44456
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.372e-01  6.695e-03  80.228 < 2e-16 ***
## IncomeLow      -1.109e-01  9.361e-04 -118.433 < 2e-16 ***
## IncomeMedium   -7.422e-02  9.361e-04 -79.280 < 2e-16 ***
## Wind_Speed_MPH  5.698e-04  1.030e-04   5.530 3.23e-08 ***
## Humidity        6.888e-04  3.825e-05  18.006 < 2e-16 ***
## Temperature_F  -2.209e-03  9.159e-05 -24.119 < 2e-16 ***
## Month2          3.104e-02  6.193e-03   5.012 5.42e-07 ***
## Month3          2.682e-02  8.468e-03   3.168 0.001539 **
## Month4          2.858e-02  1.171e-02   2.440 0.014689 *
## Month5          2.523e-02  1.430e-02   1.764 0.077800 .
## Month6          1.039e-02  1.556e-02   0.668 0.504185
## Month7         -8.157e-03  1.769e-02  -0.461 0.644691
## Month8         -7.552e-03  1.885e-02  -0.401 0.688714
## Month9         -8.421e-03  1.998e-02  -0.422 0.673359
## Month10        -5.038e-02  1.018e-02  -4.947 7.57e-07 ***
## Month11        -4.309e-02  8.374e-03  -5.146 2.69e-07 ***
## Month12        -1.232e-02  5.542e-03  -2.223 0.026195 *
## DayofWeek1     -4.416e-03  1.439e-03  -3.070 0.002145 **
## DayofWeek2     -5.088e-03  1.453e-03  -3.501 0.000464 ***
```

## DayofWeek3	-7.655e-03	1.465e-03	-5.227	1.74e-07	***
## DayofWeek4	-6.474e-03	1.465e-03	-4.420	9.92e-06	***
## DayofWeek5	4.545e-03	1.483e-03	3.064	0.002186	**
## DayofWeek6	2.354e-02	1.500e-03	15.693	< 2e-16	***
## Hour1	2.729e-02	2.671e-03	10.217	< 2e-16	***
## Hour2	-4.629e-02	2.667e-03	-17.359	< 2e-16	***
## Hour3	-9.058e-02	2.670e-03	-33.927	< 2e-16	***
## Hour4	-1.121e-01	2.684e-03	-41.746	< 2e-16	***
## Hour5	-1.079e-01	2.675e-03	-40.322	< 2e-16	***
## Hour6	-6.057e-02	2.674e-03	-22.655	< 2e-16	***
## Hour7	1.893e-02	2.665e-03	7.105	1.24e-12	***
## Hour8	6.491e-02	2.655e-03	24.449	< 2e-16	***
## Hour9	8.965e-02	2.664e-03	33.654	< 2e-16	***
## Hour10	9.103e-02	2.687e-03	33.875	< 2e-16	***
## Hour11	9.429e-02	2.712e-03	34.762	< 2e-16	***
## Hour12	1.070e-01	2.759e-03	38.761	< 2e-16	***
## Hour13	1.095e-01	2.770e-03	39.541	< 2e-16	***
## Hour14	1.003e-01	2.780e-03	36.095	< 2e-16	***
## Hour15	1.011e-01	2.790e-03	36.230	< 2e-16	***
## Hour16	1.273e-01	2.763e-03	46.071	< 2e-16	***
## Hour17	1.931e-01	2.742e-03	70.433	< 2e-16	***
## Hour18	2.650e-01	2.723e-03	97.293	< 2e-16	***
## Hour19	3.006e-01	2.693e-03	111.653	< 2e-16	***
## Hour20	2.962e-01	2.674e-03	110.764	< 2e-16	***
## Hour21	2.681e-01	2.668e-03	100.509	< 2e-16	***
## Hour22	2.075e-01	2.662e-03	77.927	< 2e-16	***
## Hour23	1.058e-01	2.659e-03	39.781	< 2e-16	***
## WeekofYear2	-1.259e-02	3.946e-03	-3.191	0.001418	**
## WeekofYear3	5.204e-03	3.862e-03	1.348	0.177800	
## WeekofYear4	-4.416e-03	3.906e-03	-1.131	0.258241	
## WeekofYear5	1.266e-02	5.968e-03	2.122	0.033885	*
## WeekofYear6	9.213e-03	7.417e-03	1.242	0.214199	
## WeekofYear7	-2.417e-02	7.316e-03	-3.304	0.000955	***
## WeekofYear8	-4.867e-02	7.342e-03	-6.628	3.47e-11	***
## WeekofYear9	-7.109e-02	8.094e-03	-8.784	< 2e-16	***
## WeekofYear10	-4.676e-02	9.330e-03	-5.011	5.45e-07	***
## WeekofYear11	-9.605e-02	9.375e-03	-10.246	< 2e-16	***
## WeekofYear12	-1.076e-01	9.414e-03	-11.430	< 2e-16	***
## WeekofYear13	-1.255e-01	9.539e-03	-13.156	< 2e-16	***
## WeekofYear14	-1.235e-01	1.238e-02	-9.972	< 2e-16	***
## WeekofYear15	-1.274e-01	1.236e-02	-10.307	< 2e-16	***
## WeekofYear16	-1.234e-01	1.234e-02	-9.997	< 2e-16	***
## WeekofYear17	-1.281e-01	1.237e-02	-10.356	< 2e-16	***
## WeekofYear18	-1.364e-01	1.426e-02	-9.568	< 2e-16	***
## WeekofYear19	-1.417e-01	1.491e-02	-9.507	< 2e-16	***
## WeekofYear20	-1.567e-01	1.486e-02	-10.545	< 2e-16	***
## WeekofYear21	-1.525e-01	1.513e-02	-10.082	< 2e-16	***
## WeekofYear22	-1.621e-01	1.534e-02	-10.567	< 2e-16	***
## WeekofYear23	-1.482e-01	1.617e-02	-9.166	< 2e-16	***
## WeekofYear24	-1.429e-01	1.618e-02	-8.830	< 2e-16	***
## WeekofYear25	-1.525e-01	1.624e-02	-9.394	< 2e-16	***
## WeekofYear26	-1.451e-01	1.641e-02	-8.841	< 2e-16	***
## WeekofYear27	-1.336e-01	1.841e-02	-7.259	4.02e-13	***
## WeekofYear28	-1.393e-01	1.834e-02	-7.592	3.27e-14	***

```
## WeekofYear29 -1.377e-01 1.839e-02 -7.486 7.32e-14 ***
## WeekofYear30 -1.178e-01 1.855e-02 -6.350 2.18e-10 ***
## WeekofYear31 -1.412e-01 1.899e-02 -7.435 1.08e-13 ***
## WeekofYear32 -1.306e-01 1.959e-02 -6.665 2.69e-11 ***
## WeekofYear33 -1.243e-01 1.966e-02 -6.322 2.63e-10 ***
## WeekofYear34 -1.421e-01 1.953e-02 -7.275 3.56e-13 ***
## WeekofYear35 -1.376e-01 1.959e-02 -7.023 2.22e-12 ***
## WeekofYear36 -1.240e-01 2.065e-02 -6.007 1.92e-09 ***
## WeekofYear37 -1.332e-01 2.052e-02 -6.490 8.75e-11 ***
## WeekofYear38 -1.231e-01 2.047e-02 -6.013 1.84e-09 ***
## WeekofYear39 -1.094e-01 2.044e-02 -5.354 8.68e-08 ***
## WeekofYear40 -6.503e-02 1.051e-02 -6.189 6.16e-10 ***
## WeekofYear41 -5.099e-02 1.052e-02 -4.848 1.26e-06 ***
## WeekofYear42 -4.433e-02 1.052e-02 -4.215 2.51e-05 ***
## WeekofYear43 -3.241e-02 1.052e-02 -3.082 0.002060 **
## WeekofYear44 -2.078e-02 9.174e-03 -2.265 0.023512 *
## WeekofYear45 -1.403e-02 8.831e-03 -1.588 0.112210
## WeekofYear46 -1.657e-02 8.857e-03 -1.870 0.061439 .
## WeekofYear47 -1.085e-02 8.792e-03 -1.234 0.217241
## WeekofYear48 2.935e-04 7.725e-03 0.038 0.969696
## WeekofYear49 -1.465e-03 6.213e-03 -0.236 0.813582
## WeekofYear50 -3.913e-03 6.242e-03 -0.627 0.530779
## WeekofYear51 -2.153e-02 6.202e-03 -3.471 0.000519 ***
## WeekofYear52 -2.385e-02 5.558e-03 -4.292 1.78e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0616 on 25880 degrees of freedom
## Multiple R-squared:  0.8466, Adjusted R-squared:  0.8461
## F-statistic: 1488 on 96 and 25880 DF, p-value: < 2.2e-16
```

```
prediction <- predict(m, newdata = test)
mean(abs(prediction - test$Consumption))
```

```
## [1] NaN
```

```
test$predicted = prediction
```

```
m1 = lm(Consumption ~ Income + DayofWeek + Hour + WeekofYear, data = train)
summary(m1)
```

```
##
## Call:
## lm(formula = Consumption ~ Income + DayofWeek + Hour + WeekofYear,
##     data = train)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.25007 -0.04130 -0.00330  0.03532  0.45476
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
```

## (Intercept)	0.5030491	0.0034064	147.678	< 2e-16	***
## IncomeLow	-0.1108680	0.0009605	-115.424	< 2e-16	***
## IncomeMedium	-0.0742163	0.0009605	-77.266	< 2e-16	***
## DayofWeek1	-0.0057909	0.0014635	-3.957	7.62e-05	***
## DayofWeek2	-0.0070511	0.0014652	-4.812	1.50e-06	***
## DayofWeek3	-0.0095637	0.0014657	-6.525	6.92e-11	***
## DayofWeek4	-0.0075878	0.0014627	-5.188	2.14e-07	***
## DayofWeek5	0.0037692	0.0014669	2.569	0.010192	*
## DayofWeek6	0.0255760	0.0014603	17.514	< 2e-16	***
## Hour1	0.0299841	0.0027391	10.947	< 2e-16	***
## Hour2	-0.0422546	0.0027333	-15.459	< 2e-16	***
## Hour3	-0.0853186	0.0027353	-31.192	< 2e-16	***
## Hour4	-0.1053431	0.0027470	-38.348	< 2e-16	***
## Hour5	-0.1009781	0.0027372	-36.892	< 2e-16	***
## Hour6	-0.0555063	0.0027391	-20.265	< 2e-16	***
## Hour7	0.0218954	0.0027314	8.016	1.14e-15	***
## Hour8	0.0637592	0.0027219	23.424	< 2e-16	***
## Hour9	0.0818854	0.0027201	30.104	< 2e-16	***
## Hour10	0.0778660	0.0027238	28.587	< 2e-16	***
## Hour11	0.0755050	0.0027182	27.777	< 2e-16	***
## Hour12	0.0819356	0.0027219	30.102	< 2e-16	***
## Hour13	0.0831240	0.0027201	30.559	< 2e-16	***
## Hour14	0.0726622	0.0027201	26.713	< 2e-16	***
## Hour15	0.0718088	0.0027164	26.435	< 2e-16	***
## Hour16	0.1009854	0.0027182	37.151	< 2e-16	***
## Hour17	0.1691351	0.0027164	62.265	< 2e-16	***
## Hour18	0.2438707	0.0027182	89.716	< 2e-16	***
## Hour19	0.2849875	0.0027201	104.771	< 2e-16	***
## Hour20	0.2845964	0.0027201	104.628	< 2e-16	***
## Hour21	0.2592457	0.0027220	95.242	< 2e-16	***
## Hour22	0.2022867	0.0027257	74.216	< 2e-16	***
## Hour23	0.1040446	0.0027275	38.146	< 2e-16	***
## WeekofYear2	-0.0050151	0.0039240	-1.278	0.201238	
## WeekofYear3	0.0108522	0.0038787	2.798	0.005147	**
## WeekofYear4	0.0089878	0.0038663	2.325	0.020100	*
## WeekofYear5	0.0631183	0.0038913	16.221	< 2e-16	***
## WeekofYear6	0.0707025	0.0039108	18.079	< 2e-16	***
## WeekofYear7	0.0096402	0.0038786	2.485	0.012945	*
## WeekofYear8	-0.0220356	0.0038985	-5.652	1.60e-08	***
## WeekofYear9	-0.0422965	0.0038912	-10.870	< 2e-16	***
## WeekofYear10	-0.0236799	0.0038724	-6.115	9.80e-10	***
## WeekofYear11	-0.0670604	0.0038725	-17.317	< 2e-16	***
## WeekofYear12	-0.0977698	0.0039042	-25.042	< 2e-16	***
## WeekofYear13	-0.1249991	0.0039041	-32.017	< 2e-16	***
## WeekofYear14	-0.1024664	0.0038789	-26.417	< 2e-16	***
## WeekofYear15	-0.1035477	0.0038851	-26.653	< 2e-16	***
## WeekofYear16	-0.0952151	0.0038725	-24.588	< 2e-16	***
## WeekofYear17	-0.1010945	0.0038663	-26.147	< 2e-16	***
## WeekofYear18	-0.1196711	0.0038724	-30.903	< 2e-16	***
## WeekofYear19	-0.1363261	0.0038856	-35.085	< 2e-16	***
## WeekofYear20	-0.1439048	0.0038725	-37.161	< 2e-16	***
## WeekofYear21	-0.1804859	0.0038663	-46.681	< 2e-16	***
## WeekofYear22	-0.1791554	0.0038727	-46.261	< 2e-16	***
## WeekofYear23	-0.1581104	0.0038849	-40.699	< 2e-16	***

```
## WeekofYear24 -0.1577324 0.0038663 -40.796 < 2e-16 ***
## WeekofYear25 -0.1753946 0.0038725 -45.293 < 2e-16 ***
## WeekofYear26 -0.1801058 0.0038725 -46.509 < 2e-16 ***
## WeekofYear27 -0.1729438 0.0038663 -44.731 < 2e-16 ***
## WeekofYear28 -0.1745542 0.0038663 -45.147 < 2e-16 ***
## WeekofYear29 -0.1819224 0.0038663 -47.053 < 2e-16 ***
## WeekofYear30 -0.1872325 0.0038786 -48.273 < 2e-16 ***
## WeekofYear31 -0.1853893 0.0038725 -47.874 < 2e-16 ***
## WeekofYear32 -0.1871750 0.0038849 -48.180 < 2e-16 ***
## WeekofYear33 -0.1899647 0.0038786 -48.977 < 2e-16 ***
## WeekofYear34 -0.1918296 0.0038725 -49.537 < 2e-16 ***
## WeekofYear35 -0.1784096 0.0038663 -46.144 < 2e-16 ***
## WeekofYear36 -0.1831423 0.0039106 -46.833 < 2e-16 ***
## WeekofYear37 -0.1754946 0.0038663 -45.390 < 2e-16 ***
## WeekofYear38 -0.1553406 0.0038663 -40.178 < 2e-16 ***
## WeekofYear39 -0.1331107 0.0038663 -34.428 < 2e-16 ***
## WeekofYear40 -0.1273217 0.0038724 -32.879 < 2e-16 ***
## WeekofYear41 -0.1098658 0.0038787 -28.326 < 2e-16 ***
## WeekofYear42 -0.1037855 0.0039040 -26.584 < 2e-16 ***
## WeekofYear43 -0.0847046 0.0038725 -21.873 < 2e-16 ***
## WeekofYear44 -0.0602685 0.0038663 -15.588 < 2e-16 ***
## WeekofYear45 -0.0521814 0.0039045 -13.364 < 2e-16 ***
## WeekofYear46 -0.0568152 0.0039172 -14.504 < 2e-16 ***
## WeekofYear47 -0.0502509 0.0038913 -12.914 < 2e-16 ***
## WeekofYear48 -0.0143441 0.0038789 -3.698 0.000218 ***
## WeekofYear49 0.0044694 0.0038975 1.147 0.251504
## WeekofYear50 0.0078397 0.0038912 2.015 0.043943 *
## WeekofYear51 -0.0255375 0.0038917 -6.562 5.41e-11 ***
## WeekofYear52 -0.0306181 0.0037385 -8.190 2.73e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0632 on 25894 degrees of freedom
## Multiple R-squared:  0.8385, Adjusted R-squared:  0.8379
## F-statistic: 1639 on 82 and 25894 DF, p-value: < 2.2e-16
```

```
prediction1 <- predict(m1, newdata = test)
mean(sqrt((prediction1 - test$Consumption)^2))
```

```
## [1] 0.05575679
```

```
test$predict2 = prediction1
write.csv(test, "../Final_Data/predicted_2013.csv")
```