Battery_plots

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Appendix (R studio Code)

```r
#set working directory:
#Copy and paste file directory address here.
setwd("G:\\My
Drive\\HSU\\current_Semester\\F18\\Comp3\\Battery_Project\\final_program")
library("data.table")

## Warning: package 'data.table' was built under R version 3.4.4

library("ggplot2")

## Warning: package 'ggplot2' was built under R version 3.4.4

library("reshape2")

##
## Attaching package: 'reshape2'

## The following objects are masked from 'package:data.table':
##
##      dcast, melt

library(devtools)
source_gist("524eade46135f6348140"
            ,filename="ggplot_smooth_func.R")

## Sourcing
https://gist.githubusercontent.com/kdauria/524eade46135f6348140/raw/676acaca9
a0a144ef320ae2ef00a31c3daa7179d/ggplot_smooth_func.R

## SHA-1 hash of file is c0b163b9fd2d7fe7bd5541e3266d8d36ff3b895d
```

This chunk tests the reading of each sensitivity analysis.

```r
c = fread("c1.csv")
v = fread("v1.csv")
r = fread("r1.csv")
t = fread("t1.csv")
```

This chunk plots sensitivity analysis c,v,R,and t

```r
c = fread("c1.csv")
v = fread("v1.csv")
r = fread("r1.csv")
```

```
t = fread("t1.csv")
ggplot(v, aes(v$percent, y = v, color = Parameter))+
  geom_point(aes(y = c$capacity, col = "c"))+
  geom_point(aes(y = v$capacity, col = "V"))+
  geom_point(aes(y = r$capacity, col = "R"))+
  geom_point(aes(y = t$capacity, col = "t"))+
  labs(x="Change in Parameter (%)", y = "Minimum Battery Capacity (mAh)")+
  theme(legend.position = "top",legend.text = element_text(size=17),
        axis.text.x = element_text(size=13),
        axis.text.y = element_text(size=13),
        axis.title = element_text(size=15))
```
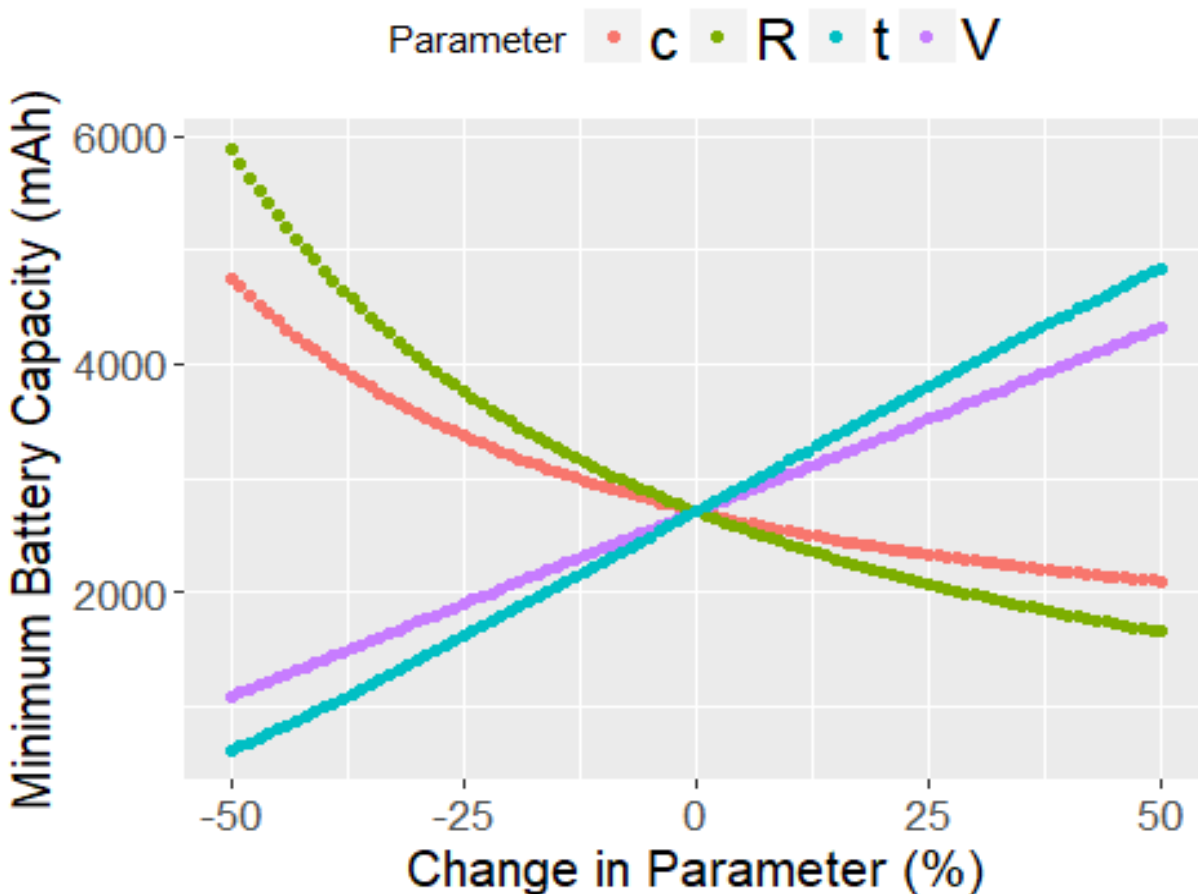


```
ggsave("sensitivity_time.png",width=12, height = 8)
```

This chunk plots the main parameters of only c, v and R

```
c = fread("c1.csv")
v = fread("v1.csv")
r = fread("r1.csv")
ggplot(v, aes(v$percent, y = v, color = Parameter))+
  geom_point(aes(y = c$capacity, col = "c" ), shape = 15, size = 1 )+
  geom_point(aes(y = v$capacity, col = "V"), shape = 16, size = 1 )+
```

```
geom_point(aes(y = r$capacity, col = "R"), shape = 17, size = 1)+
labs(x="Change in Parameter (%)", y = "Required Battery Capacity (mAh)")+
theme(legend.position = "top",legend.text = element_text(size=20),
      axis.text.x = element_text(size=15),
      axis.text.y = element_text(size=15),
      axis.title = element_text(size=17))
```
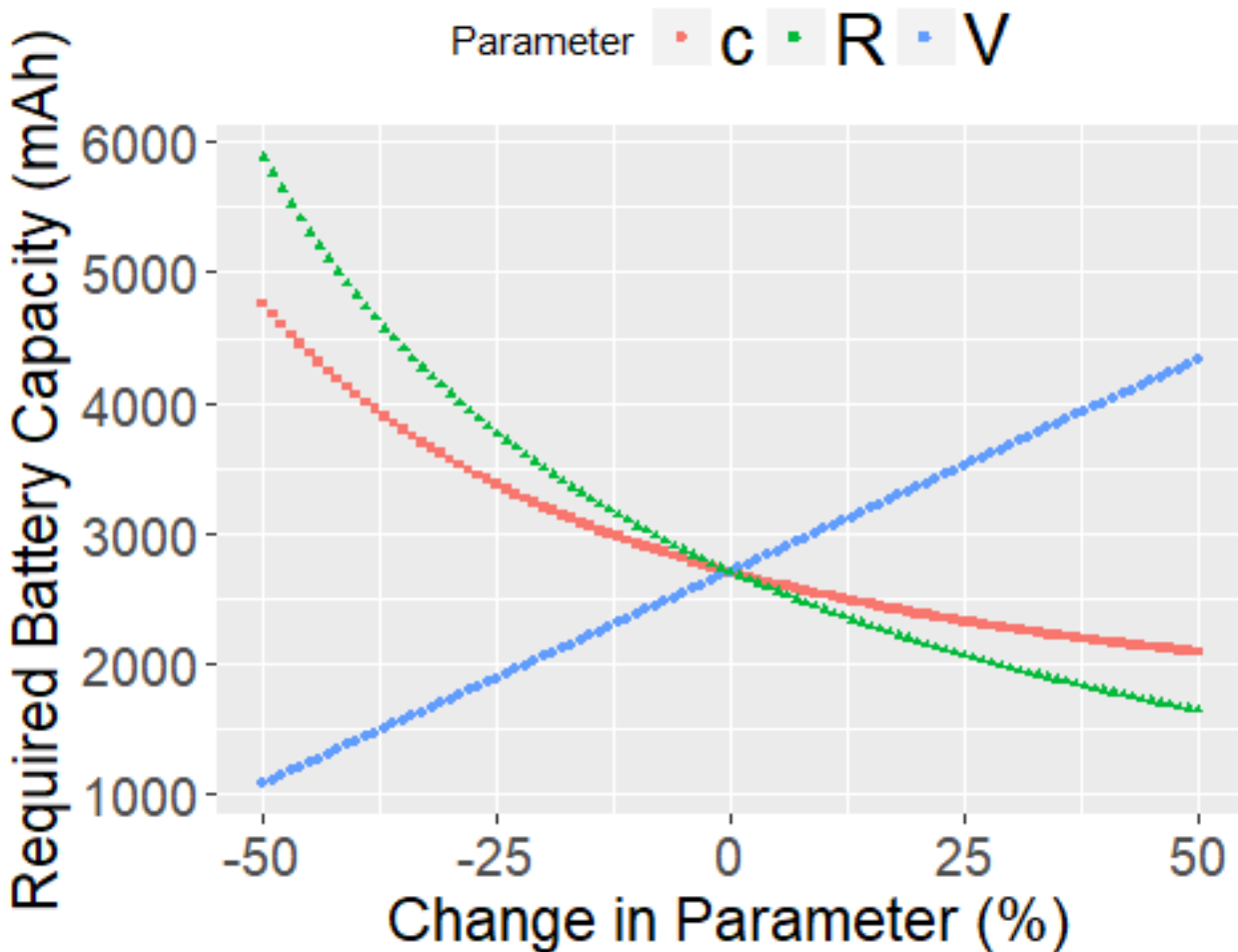


```
ggsave("sensitivity.png",width=12, height = 8)
```

Plotting the affect of time required on the initial charge, with equation formula

```
t = fread("t1.csv")
ggplot(data = t, aes(x = t$tgoal, y = t$capacity))+
  geom_point(col = "darkgray", alpha = 0.99, size = 1)+
  labs(x="Battery Runtime (minutes)",
       y = "Required Battery Capacity (mAh)")+
  theme(legend.position = "top",legend.text = element_text(size=17),
        axis.text.x = element_text(size=15),
        axis.text.y = element_text(size=15),
        axis.title = element_text(size=17))+
  stat_smooth_func(geom="text"
```

```
                     ,method="lm",hjust=-.5,vjust=1,parse=TRUE, size = 7)+
   stat_smooth(method = lm)
```
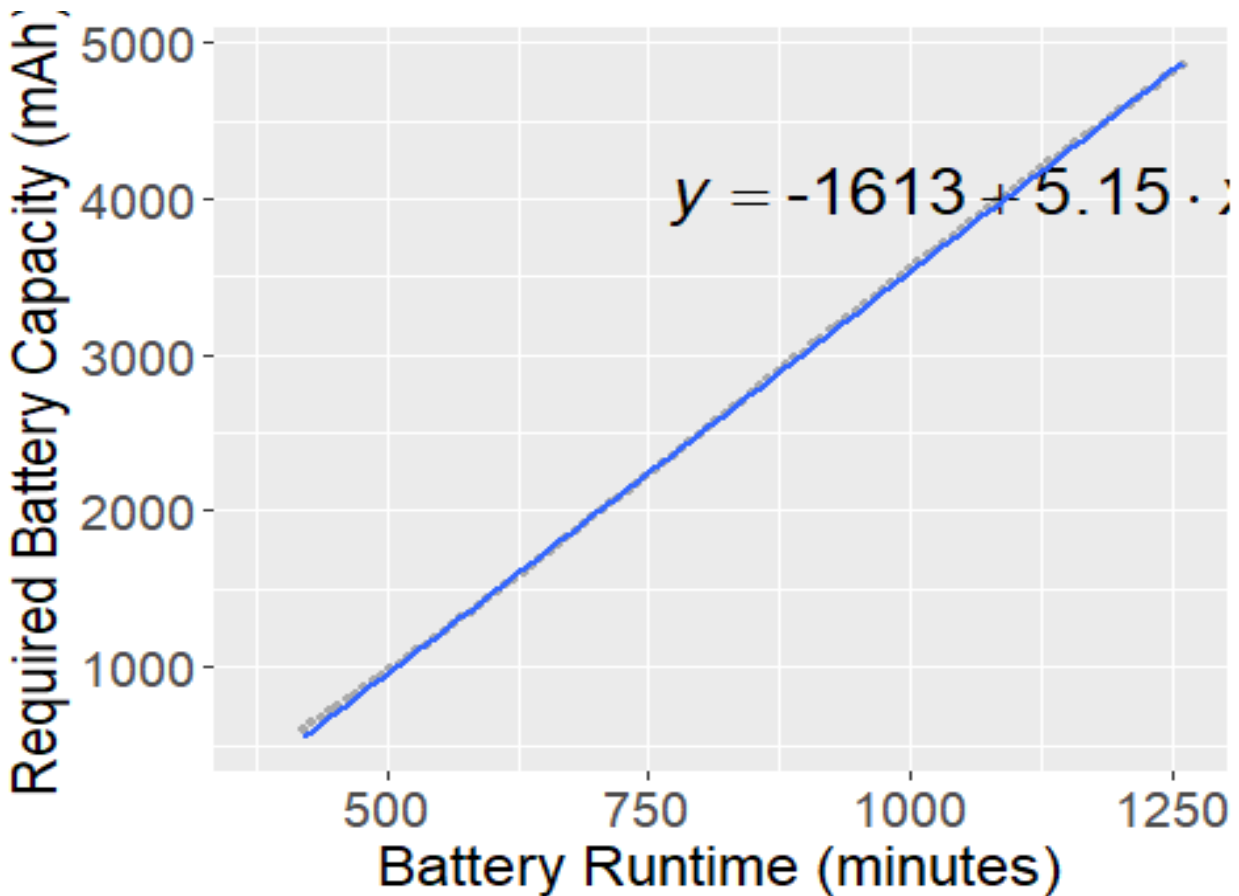


```
ggsave('t.png',width=12,height=8)

charge = fread("output_NEW_capacity.csv")
charge

##          Time(minutes) Available(Coulombs) Bound(Coulombs)
##      1:             1             6265.197        1319.983
##      2:             2             6207.735        1377.385
##      3:             3             6152.702        1432.318
##      4:             4             6099.994        1484.887
##      5:             5             6049.510        1535.193
##    ---
## 10996:             0                0.000           0.000
## 10997:             0                0.000           0.000
## 10998:             0                0.000           0.000
## 10999:             0                0.000           0.000
## 11000:             0                0.000           0.000
##          Total Charge(Coulombs)
##      1:               7585.180
##      2:               7585.120
##      3:               7585.021
```

```
##     4:                   7584.881
##     5:                   7584.702
##    ---
## 10996:                      0.000
## 10997:                      0.000
## 10998:                      0.000
## 10999:                      0.000
## 11000:                      0.000
```

Plots the model of the charge in each well with time

```
charge = fread("output_NEW_capacity.csv")

ggplot(charge, aes(charge$`Time(minutes)`, y = charge, color = Location))+
  geom_point(aes(y = charge$`Available(Coulombs)`, col = "Available"))+
  geom_point(aes(y = charge$`Bound(Coulombs)`, col = "Bound"))+
  geom_point(aes(y = charge$`Total Charge(Coulombs)`, col = "Total"))+
  labs(x="Time (Minutes)", y = "Charge (Coulombs)")+
  theme(legend.position = "top",legend.text = element_text(size=15),
        axis.text.x = element_text(size=13),
        axis.text.y = element_text(size=13),
        axis.title = element_text(size=15))+
  scale_y_continuous(breaks=seq(0,9000,1000))+
  scale_x_continuous(breaks=seq(0,900,100))+
  guides(colour = guide_legend(override.aes=list(size=2)))
```
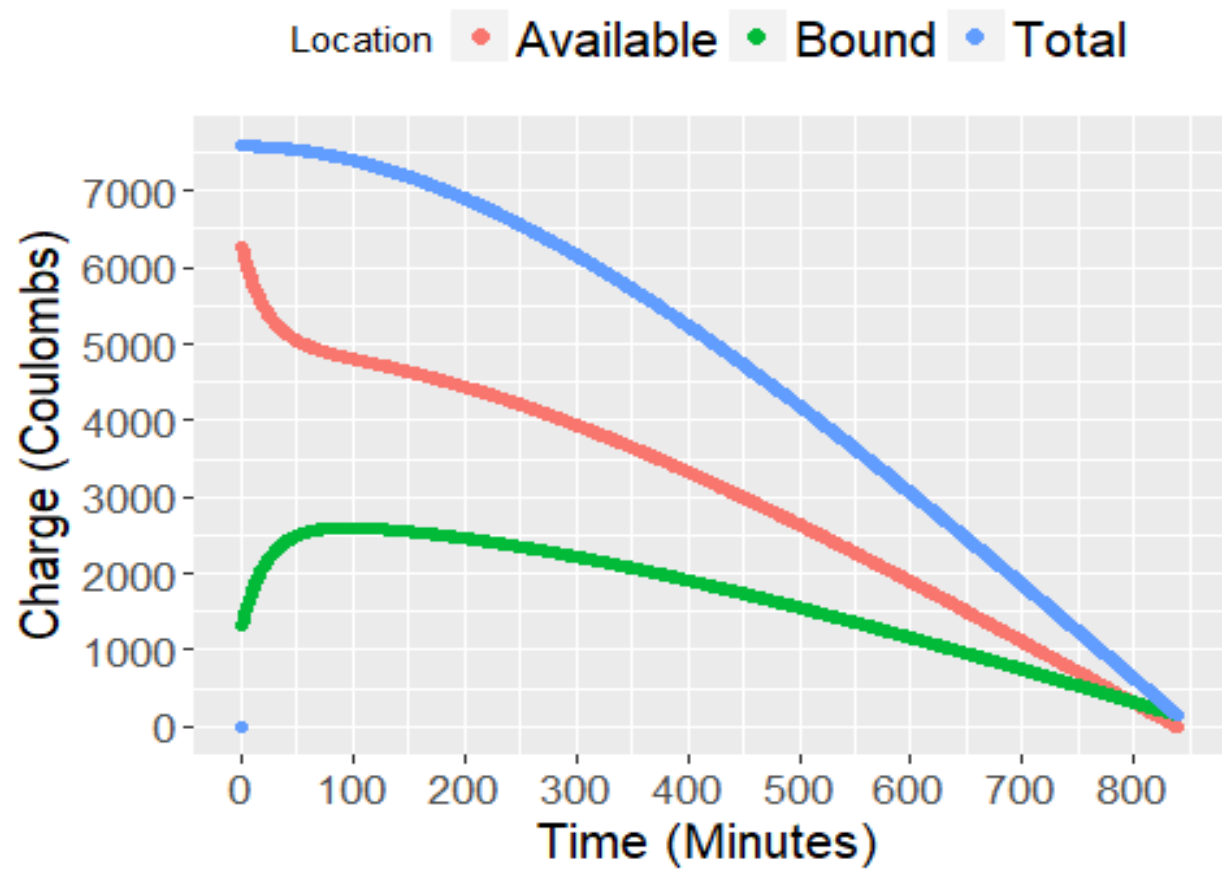
```
ggsave("model.png",width=12,height=8)
```