```
library(gplots)
```

```
##
## Attaching package: 'gplots'
```

```
## The following object is masked from 'package:stats':
##
##     lowess
```

```
library(patchwork)
```

```
## Warning: package 'patchwork' was built under R version 4.2.3
```

First Round of Experiments

Due to a flaw in design choice this data could not be used in any analysis

Second Round of Experiments

```
final_data <-read.csv(file = '../results_encoded_EXP1.csv')
```

```
model <- lm(Browse_Time ~ Prev_Length * Match_Score * Tile_Size * Prev_Type, data=final_data)
summary(model)
```

```
##
## Call:
## lm(formula = Browse_Time ~ Prev_Length * Match_Score * Tile_Size *
##     Prev_Type, data = final_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.3718 -0.6329 -0.0051  0.6431  2.8849
##
## Coefficients:
##                                              Estimate Std. Error  t value
## (Intercept)                                 20.7468463  0.0240804  861.567
## Prev_Length                                  0.8635337  0.0240804   35.860
## Match_Score                                 -0.7245971  0.0240804  -30.091
## Tile_Size                                   -0.0325695  0.0240804   -1.353
## Prev_Type                                   -2.4833158  0.0240804 -103.126
## Prev_Length:Match_Score                      1.4038212  0.0240804   58.297
## Prev_Length:Tile_Size                       -0.0268820  0.0240804   -1.116
## Match_Score:Tile_Size                       -0.0307261  0.0240804   -1.276
## Prev_Length:Prev_Type                        0.0494300  0.0240804    2.053
## Match_Score:Prev_Type                       -0.0061987  0.0240804   -0.257
## Tile_Size:Prev_Type                          0.0027799  0.0240804    0.115
## Prev_Length:Match_Score:Tile_Size            0.0079499  0.0240804    0.330
```

```
## Prev_Length:Match_Score:Prev_Type            0.0068455  0.0240804    0.284
## Prev_Length:Tile_Size:Prev_Type              0.0001886  0.0240804    0.008
## Match_Score:Tile_Size:Prev_Type              0.0342813  0.0240804    1.424
## Prev_Length:Match_Score:Tile_Size:Prev_Type  0.0240772  0.0240804    1.000
##                                                        Pr(>|t|)
## (Intercept)                                             <2e-16 ***
## Prev_Length                                             <2e-16 ***
## Match_Score                                             <2e-16 ***
## Tile_Size                                               0.1764
## Prev_Type                                               <2e-16 ***
## Prev_Length:Match_Score                                 <2e-16 ***
## Prev_Length:Tile_Size                                   0.2644
## Match_Score:Tile_Size                                   0.2021
## Prev_Length:Prev_Type                                   0.0403 *
## Match_Score:Prev_Type                                   0.7969
## Tile_Size:Prev_Type                                     0.9081
## Prev_Length:Match_Score:Tile_Size                       0.7413
## Prev_Length:Match_Score:Prev_Type                       0.7762
## Prev_Length:Tile_Size:Prev_Type                         0.9938
## Match_Score:Tile_Size:Prev_Type                         0.1548
## Prev_Length:Match_Score:Tile_Size:Prev_Type             0.3175
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9632 on 1584 degrees of freedom
## Multiple R-squared:  0.9111, Adjusted R-squared:  0.9103
## F-statistic:  1082 on 15 and 1584 DF,  p-value: < 2.2e-16
```

Reduced model to confirm, this is not really needed.

```
# formally test the reduced model
# insignificant terms
model_reduced <- lm(Browse_Time ~ Tile_Size +
                      Prev_Length:Tile_Size +
                      Match_Score:Tile_Size +
                      Prev_Length:Prev_Type +
                      Match_Score:Prev_Type +
                      Tile_Size:Prev_Type +
                      Prev_Length:Match_Score:Tile_Size +
                      Prev_Length:Match_Score:Prev_Type +
                      Prev_Length:Tile_Size:Prev_Type +
                      Match_Score:Tile_Size:Prev_Type +
                      Prev_Length:Match_Score:Tile_Size:Prev_Type,
                    data = final_data
                    )

summary(model_reduced)
```

```
##
## Call:
## lm(formula = Browse_Time ~ Tile_Size + Prev_Length:Tile_Size +
##     Match_Score:Tile_Size + Prev_Length:Prev_Type + Match_Score:Prev_Type +
##     Tile_Size:Prev_Type + Prev_Length:Match_Score:Tile_Size +
```

```
##     Prev_Length:Match_Score:Prev_Type + Prev_Length:Tile_Size:Prev_Type +
##     Match_Score:Tile_Size:Prev_Type + Prev_Length:Match_Score:Tile_Size:Prev_Type,
##     data = final_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -7.9918 -1.9951 -0.4317  3.0124  6.8800
##
## Coefficients:
##                                             Estimate Std. Error t value
## (Intercept)                                20.7468463  0.0806413 257.273
## Tile_Size                                  -0.0325695  0.0806413  -0.404
## Tile_Size:Prev_Length                      -0.0268820  0.0806413  -0.333
## Tile_Size:Match_Score                      -0.0307261  0.0806413  -0.381
## Prev_Length:Prev_Type                       0.0494300  0.0806413   0.613
## Match_Score:Prev_Type                      -0.0061987  0.0806413  -0.077
## Tile_Size:Prev_Type                         0.0027799  0.0806413   0.034
## Tile_Size:Prev_Length:Match_Score           0.0079499  0.0806413   0.099
## Prev_Length:Match_Score:Prev_Type           0.0068455  0.0806413   0.085
## Tile_Size:Prev_Length:Prev_Type             0.0001886  0.0806413   0.002
## Tile_Size:Match_Score:Prev_Type             0.0342813  0.0806413   0.425
## Tile_Size:Prev_Length:Match_Score:Prev_Type 0.0240772  0.0806413   0.299
##                                            Pr(>|t|)
## (Intercept)                                  <2e-16 ***
## Tile_Size                                     0.686
## Tile_Size:Prev_Length                         0.739
## Tile_Size:Match_Score                         0.703
## Prev_Length:Prev_Type                         0.540
## Match_Score:Prev_Type                         0.939
## Tile_Size:Prev_Type                           0.973
## Tile_Size:Prev_Length:Match_Score             0.921
## Prev_Length:Match_Score:Prev_Type             0.932
## Tile_Size:Prev_Length:Prev_Type               0.998
## Tile_Size:Match_Score:Prev_Type               0.671
## Tile_Size:Prev_Length:Match_Score:Prev_Type   0.765
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.226 on 1588 degrees of freedom
## Multiple R-squared:  0.0006853,  Adjusted R-squared:  -0.006237
## F-statistic: 0.099 on 11 and 1588 DF,  p-value: 0.9999
```

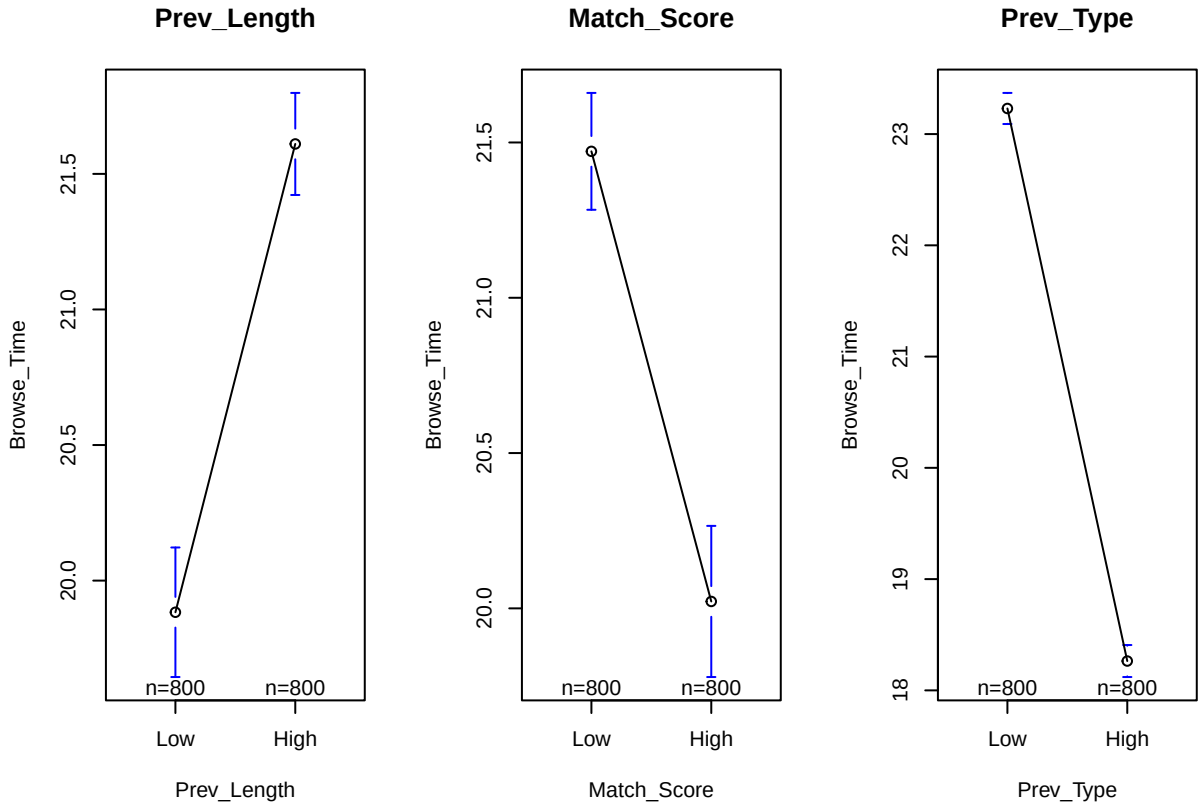
Huge p-value for reduced model so fail to reject that the H0 (insignificant) is zero, this is a weird way to test by trying to prove evidence for the null hypothesis but okay.

```
par(mfrow = c(1, 3))
plotmeans(Browse_Time ~ Prev_Length,
          data = final_data,
      #    ylim = c(0.4, 0.7),
          main = "Prev_Length",
          legends = c("Low", "High"))

plotmeans(Browse_Time ~ Match_Score,
          data = final_data,
```

```
      #    ylim = c(0.4, 0.7),
          main = "Match_Score",
          legends = c("Low", "High"))

plotmeans(Browse_Time ~ Prev_Type,
          data = final_data,
      #    ylim = c(0.4, 0.7),
          main = "Prev_Type",
          legends = c("Low", "High"))
```



Lower browsing times are associated with:

Preview length is lower

Match score is higher

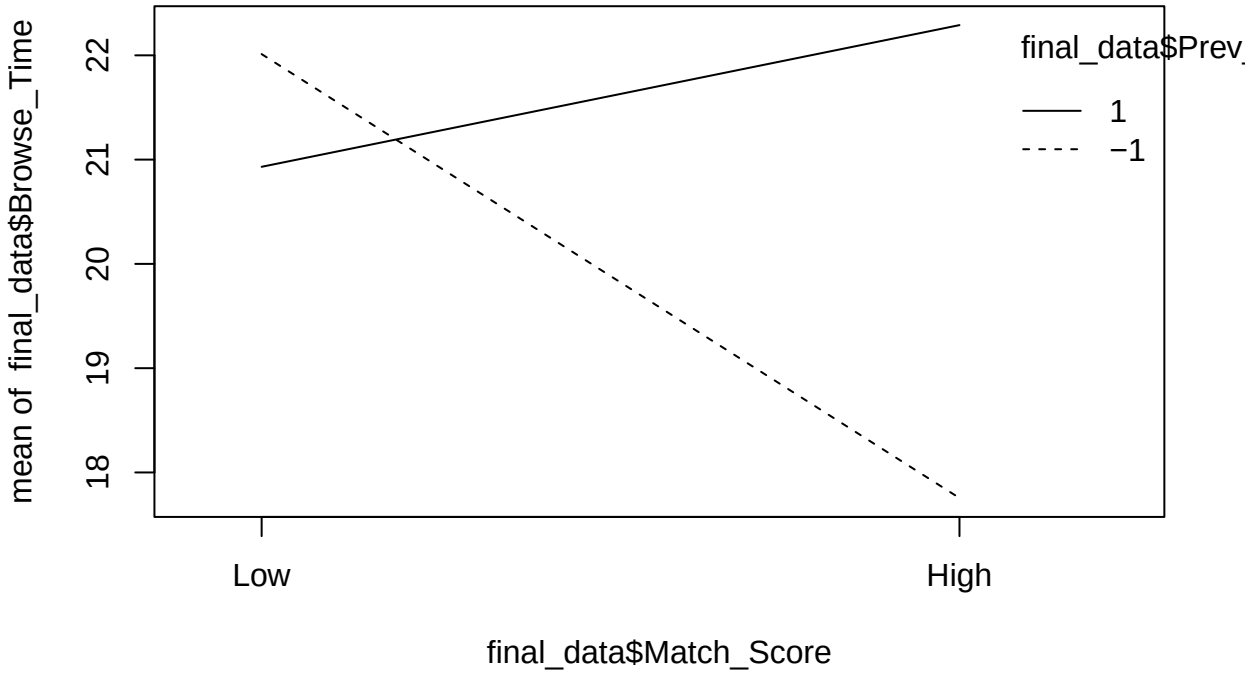
Preview type is a teaser trailer

```
# par(mfrow = c(1, 2))

# Preview Length and Match Score interaction effect
interaction.plot(
  final_data$Match_Score,
  final_data$Prev_Length,
  final_data$Browse_Time,
  xaxt = "n",
  legend = T,
```

```
  # ylab = "Avg Session Duration (min)",
#  xlab = "Opening Feed",
 #  ylim = c(2, 10)
  )

axis(
    side = 1,
    at = 1:2,
    labels = c("Low", "High")
    )
```




```
# axis(
#   side = 1, at = 1:2, labels = c("Home", "Popular"))
# legend("topleft", legend = c("Feed Type", "Infinite Scroll", "Pagination"),
#     lty = c(1, 1, 2), col = c("white", "black", "black"), cex = 0.5, bty = "n")
# moi.by.A.by.B <- aggregate(x = redditFD$y, by = list(A = redditFD$A, B = redditFD$B),
#     FUN = mean)
# points(x = c(1, 2, 1, 2), y = moi.by.A.by.B$x, pch = 16)
```

When preview length and match score are both low browsing time is above 20 minutes, on average.

When match score is at a high level this browsing time is much lower, however this is only true when preview types are shorter. When preview types are shorter in duration, there is an interaction effect that reduces the average browse time for high scoring matches.

In turn, the next round of experiments should probably be one where match score in a high range and browsing time is in a low range.

Third Round of Experiments

Because tile size was not a significant predictor it is dropped, and we also decide to hold preview type fixed at a teaser trailer this is because it is a significant indicator of decreased browsing time.

```
final_data_exp2 <- read.csv(file = '../results_encoded_EXP2.csv')
```

```
head(final_data_exp2)
```

```
##   Prev_Length Match_Score Tile_Size Prev_Type Browse_Time
## 1          -1          -1         1         1    12.99458
## 2          -1           1         1         1    13.70756
## 3           1          -1         1         1    14.55020
## 4           1           1         1         1    18.42728
## 5          -1          -1         1         1    13.96156
## 6          -1           1         1         1    13.79851
```

```
model <- lm(Browse_Time ~ Prev_Length * Match_Score, data=final_data_exp2)
summary(model)
```

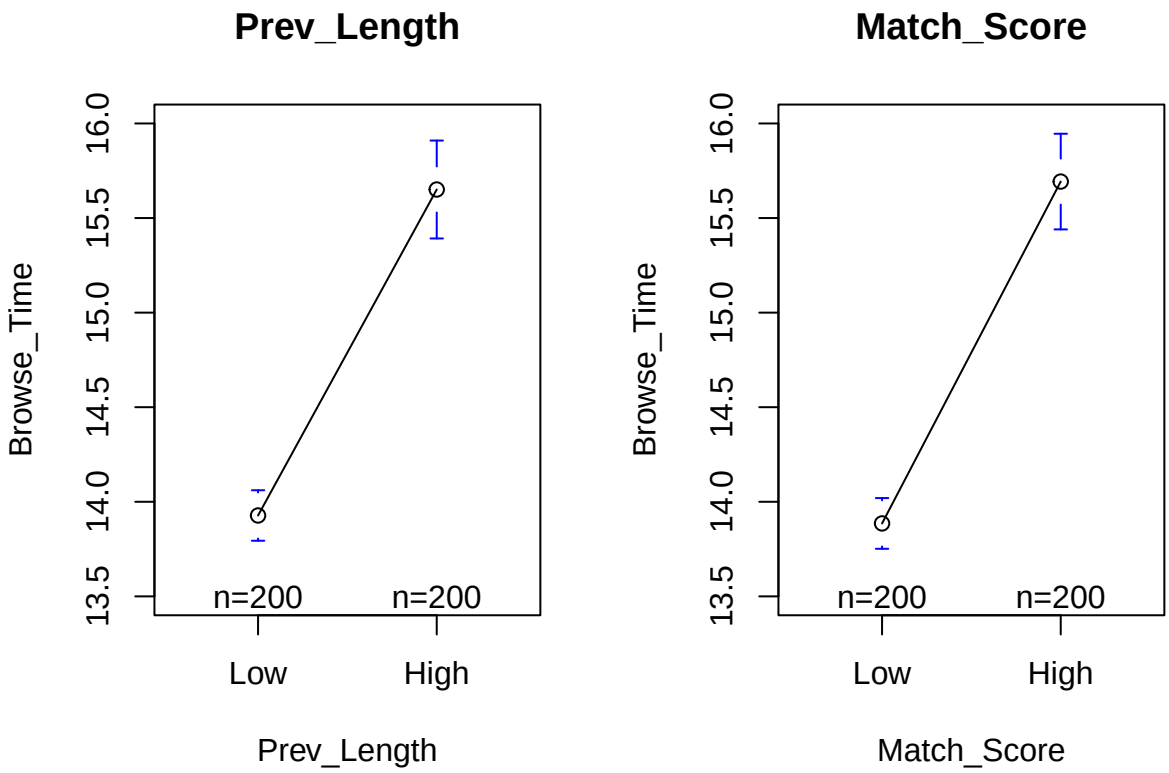
```
##
## Call:
## lm(formula = Browse_Time ~ Prev_Length * Match_Score, data = final_data_exp2)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.5379 -0.6856 -0.0353  0.7599  2.8639
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)              14.78918    0.04761  310.62   <2e-16 ***
## Prev_Length               0.86170    0.04761   18.10   <2e-16 ***
## Match_Score               0.90364    0.04761   18.98   <2e-16 ***
## Prev_Length:Match_Score   0.67521    0.04761   14.18   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9522 on 396 degrees of freedom
## Multiple R-squared:  0.6918, Adjusted R-squared:  0.6895
## F-statistic: 296.3 on 3 and 396 DF,  p-value: < 2.2e-16
```

```
par(mfrow = c(1, 2))

plotmeans(Browse_Time ~ Prev_Length,
          data = final_data_exp2,
          ylim = c(13.5, 16.0),
          main = "Prev_Length",
          legends = c("Low", "High"))

plotmeans(Browse_Time ~ Match_Score,
          data = final_data_exp2,
          ylim = c(13.5, 16.0),
```

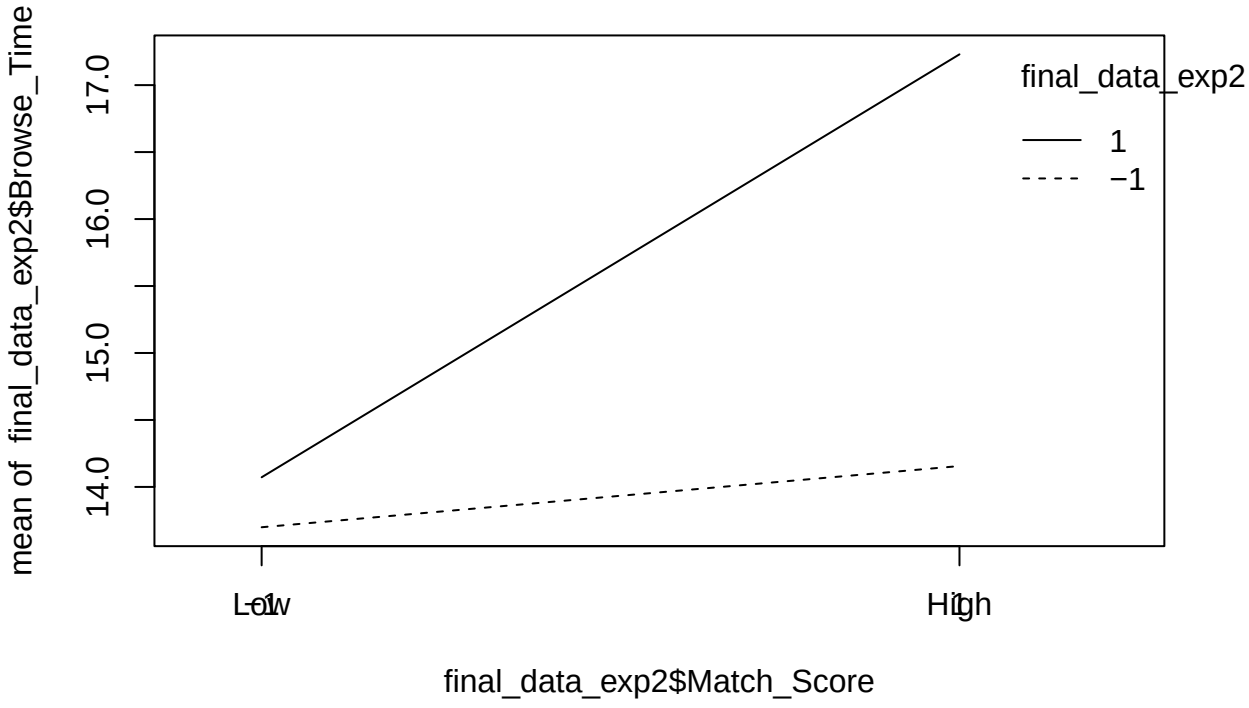
```
          main = "Match_Score",
          legends = c("Low", "High"))
```



Same insights as before, but we note that average browse time has decreased since the conditions were changed.

```
# Preview Length and Match Score interaction effect
interaction.plot(
  final_data_exp2$Match_Score,
  final_data_exp2$Prev_Length,
  final_data_exp2$Browse_Time,
  #xaxt = "n",
  legend = T,
 # ylab = "Browse_Time",
#  xlab = "Prev_Length",
 #  ylim = c(2, 10)
  )

axis(
    side = 1,
    at = 1:2,
    labels = c("Low", "High")
    )
```



In the second round of experiments the interaction changes. It is not as drastic but still remains a statistically significant interaction.

When preview length changes from low to high level there is a much wider gap between mean browsing times

The plot indicates that we should stay with lower ranges of preview types as higher configurations are associated with higher browse times, as specially when match score is higher.

Effect size of factors?

From the interaction plot seems it has a greater effect on browsing time, but the slope is much steeper when preview length

Scratch Section

2^3 is a cube, square to cube

effect size

OLS

estimation of beta hat with OLS

F

Next step

Prev.Length : $\{low, medium, high\}$Match.Score : $\{low, medium, high\}$Prev.Type : $\{AC, TT\}$