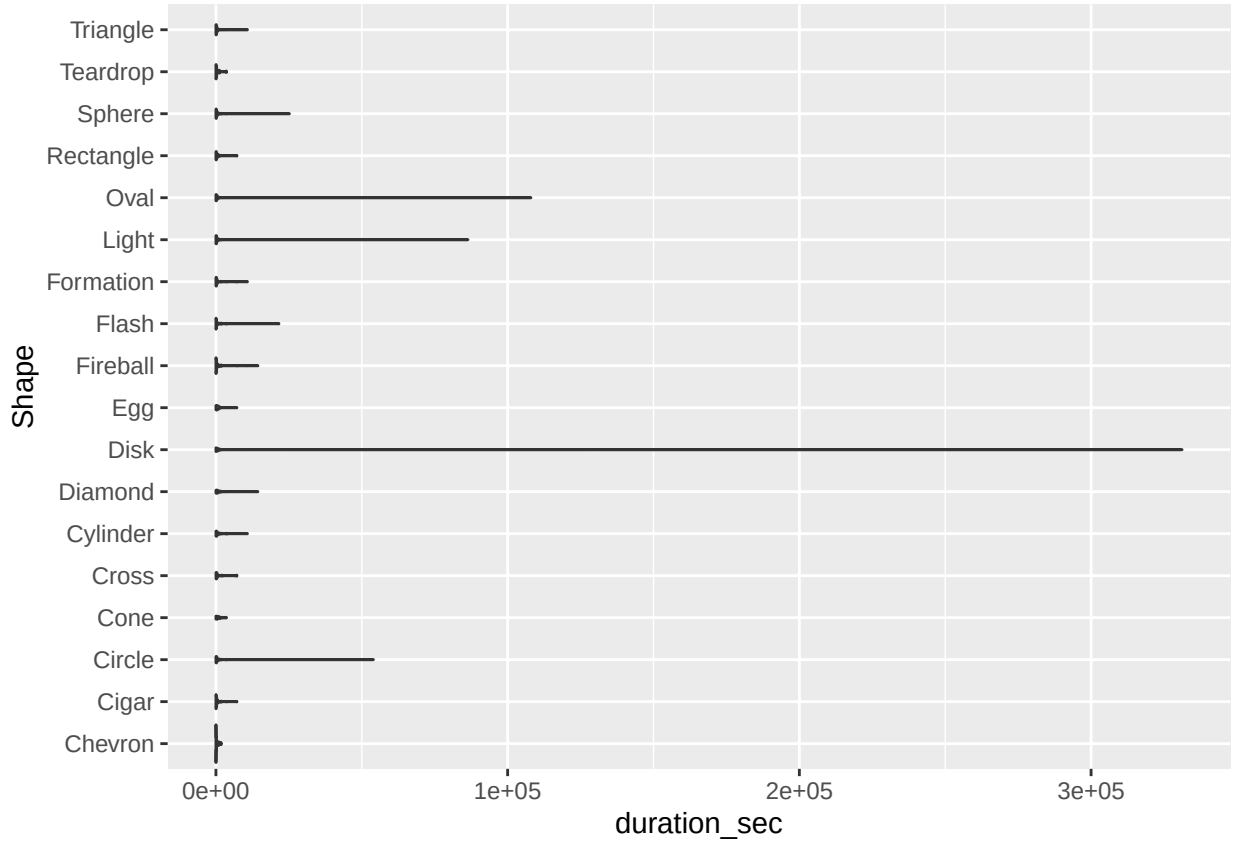
ROUGH_ANALYSIS

SP

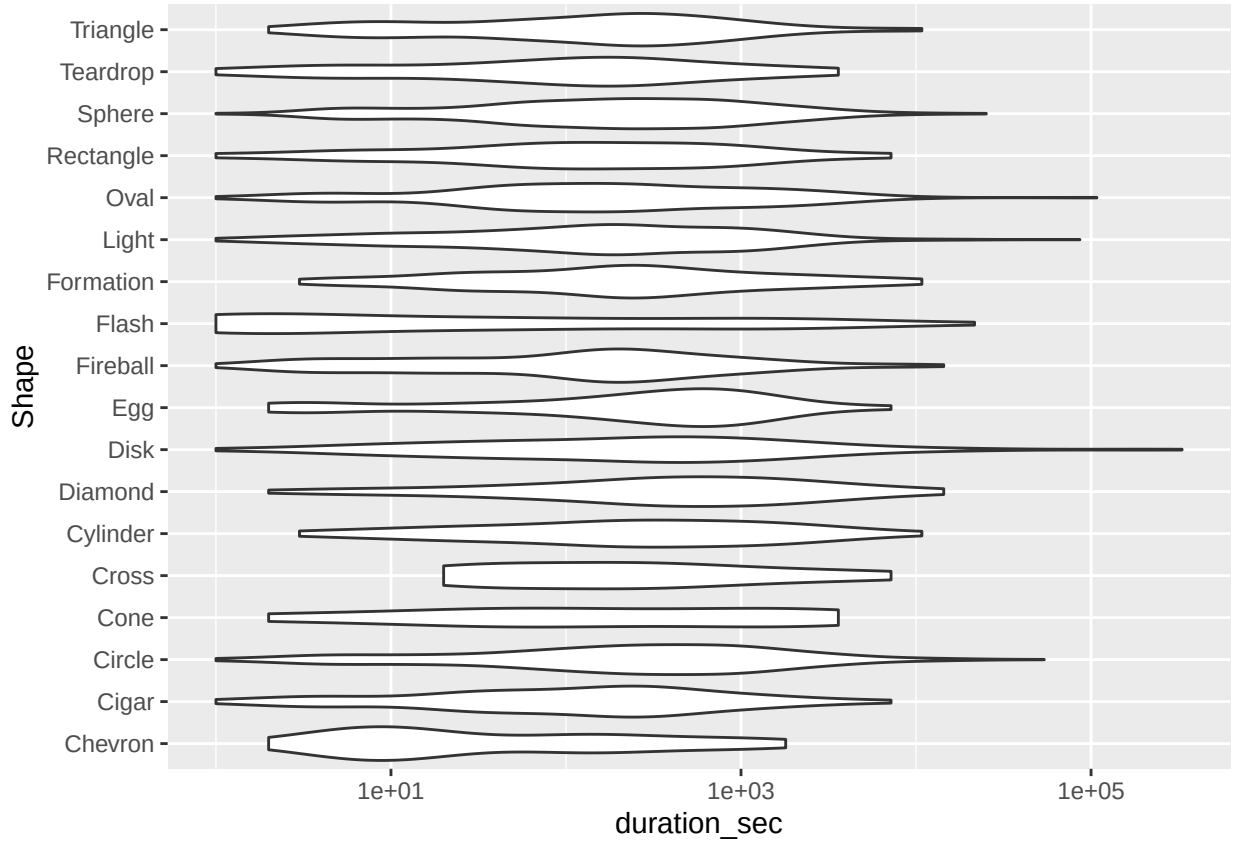
26/11/2020

```
df <- read_feather('../data/processed/aliens_pro.feather')
# df <- read_csv('../data/processed/aliens.csv')

df <- df %>%
  select(Shape, duration_sec) %>%
  filter(Shape != c('Flash','Light')) %>%
  mutate('duration_log_sec' = log10(duration_sec),
         Shape = factor(Shape))
```

```
ggplot(df) +
  aes(x = duration_sec,
      y = Shape)+
  geom_violin()
```



```
ggplot(df) +
  aes(x = duration_sec,
      y = Shape)+
  geom_violin() +
  scale_x_log10()
```




```
library(FSA)
```

```
## ## FSA v0.8.31. See citation('FSA') if used in publication.
## ## Run fishR() for related website and fishR('IFAR') for related book.
```

```
# df$Shape <- factor(df$Shape)

kusk <- kruskal.test(duration_sec ~ Shape, data = df)


dunn <- dunnTest(duration_sec ~ Shape, data = df, method='bonferroni', table=TRUE)
dunn_table <- dunn$res
dunn_table
```

```
##               Comparison           Z      P.unadj        P.adj
## 1         Chevron - Cigar -2.10231836 3.552540e-02 1.000000e+00
## 2        Chevron - Circle -4.43288578 9.298013e-06 1.422596e-03
## 3          Cigar - Circle -2.35168751 1.868847e-02 1.000000e+00
## 4          Chevron - Cone -2.22685757 2.595679e-02 1.000000e+00
## 5            Cigar - Cone -0.76917858 4.417873e-01 1.000000e+00
## 6           Circle - Cone  0.46583114 6.413364e-01 1.000000e+00
```

```
## 7         Chevron - Cross -2.22373074 2.616657e-02 1.000000e+00
## 8           Cigar - Cross -0.95294407 3.406184e-01 1.000000e+00
## 9          Circle - Cross  0.07415848 9.408843e-01 1.000000e+00
## 10           Cone - Cross -0.24570570 8.059101e-01 1.000000e+00
## 11     Chevron - Cylinder -3.74713543 1.788655e-04 2.736643e-02
## 12       Cigar - Cylinder -1.94643821 5.160212e-02 1.000000e+00
## 13      Circle - Cylinder -0.29935977 7.646656e-01 1.000000e+00
## 14        Cone - Cylinder -0.57095571 5.680297e-01 1.000000e+00
## 15       Cross - Cylinder -0.20516997 8.374393e-01 1.000000e+00
## 16      Chevron - Diamond -4.87599389 1.082620e-06 1.656408e-04
## 17        Cigar - Diamond -3.21072875 1.323988e-03 2.025702e-01
## 18       Circle - Diamond -1.90108944 5.729030e-02 1.000000e+00
## 19         Cone - Diamond -1.40016556 1.614637e-01 1.000000e+00
## 20        Cross - Diamond -0.91616580 3.595799e-01 1.000000e+00
## 21     Cylinder - Diamond -1.17639239 2.394381e-01 1.000000e+00
## 22         Chevron - Disk -4.06489187 4.805474e-05 7.352374e-03
## 23           Cigar - Disk -2.02315691 4.305697e-02 1.000000e+00
## 24          Circle - Disk  0.17606697 8.602413e-01 1.000000e+00
## 25            Cone - Disk -0.38484463 7.003525e-01 1.000000e+00
## 26           Cross - Disk -0.01688726 9.865266e-01 1.000000e+00
## 27        Cylinder - Disk  0.37877847 7.048524e-01 1.000000e+00
## 28         Diamond - Disk  1.84145599 6.555476e-02 1.000000e+00
## 29          Chevron - Egg -3.24918112 1.157378e-03 1.770788e-01
## 30            Cigar - Egg -1.60770321 1.079002e-01 1.000000e+00
## 31           Circle - Egg -0.17938450 8.576358e-01 1.000000e+00
## 32             Cone - Egg -0.49161931 6.229885e-01 1.000000e+00
## 33            Cross - Egg -0.16252347 8.708936e-01 1.000000e+00
## 34         Cylinder - Egg  0.04521227 9.639381e-01 1.000000e+00
## 35          Diamond - Egg  1.05040312 2.935328e-01 1.000000e+00
## 36             Disk - Egg -0.25397173 7.995174e-01 1.000000e+00
## 37     Chevron - Fireball -2.37440508 1.757725e-02 1.000000e+00
## 38       Cigar - Fireball  0.15822689 8.742780e-01 1.000000e+00
## 39      Circle - Fireball  4.42654164 9.575590e-06 1.465065e-03
## 40        Cone - Fireball  0.93647703 3.490276e-01 1.000000e+00
## 41       Cross - Fireball  1.09626504 2.729628e-01 1.000000e+00
## 42    Cylinder - Fireball  2.58029322 9.871646e-03 1.000000e+00
## 43     Diamond - Fireball  4.21445689 2.503800e-05 3.830814e-03
## 44        Disk - Fireball  3.26309550 1.102024e-03 1.686096e-01
## 45         Egg - Fireball  1.98567683 4.706922e-02 1.000000e+00
## 46        Chevron - Flash -0.03808835 9.696172e-01 1.000000e+00
## 47          Cigar - Flash  2.13196324 3.300987e-02 1.000000e+00
## 48         Circle - Flash  4.61078114 4.011587e-06 6.137728e-04
## 49           Cone - Flash  2.23516698 2.540639e-02 1.000000e+00
## 50          Cross - Flash  2.22664300 2.597114e-02 1.000000e+00
## 51       Cylinder - Flash  3.82679597 1.298220e-04 1.986277e-02
## 52        Diamond - Flash  4.99685886 5.827169e-07 8.915568e-05
## 53           Disk - Flash  4.19987677 2.670603e-05 4.086022e-03
## 54            Egg - Flash  3.29317703 9.906208e-04 1.515650e-01
## 55       Fireball - Flash  2.44120013 1.463854e-02 1.000000e+00
## 56    Chevron - Formation -3.79997224 1.447123e-04 2.214098e-02
## 57      Cigar - Formation -1.74934546 8.023132e-02 1.000000e+00
## 58     Circle - Formation  0.48136713 6.302556e-01 1.000000e+00
## 59       Cone - Formation -0.25255403 8.006129e-01 1.000000e+00
## 60      Cross - Formation  0.09125993 9.272861e-01 1.000000e+00
```

```
## 61   Cylinder - Formation  0.56605745 5.713547e-01 1.000000e+00
## 62    Diamond - Formation  1.98914577 4.668512e-02 1.000000e+00
## 63       Disk - Formation  0.27073175 7.865974e-01 1.000000e+00
## 64        Egg - Formation  0.41080271 6.812172e-01 1.000000e+00
## 65   Fireball - Formation -2.73780683 6.185039e-03 9.463110e-01
## 66      Flash - Formation -3.91607376 9.000272e-05 1.377042e-02
## 67        Chevron - Light -3.28922292 1.004644e-03 1.537106e-01
## 68          Cigar - Light -0.90756005 3.641107e-01 1.000000e+00
## 69         Circle - Light  2.94034775 3.278441e-03 5.016014e-01
## 70           Cone - Light  0.34989868 7.264147e-01 1.000000e+00
## 71         Cross - Light  0.60693047 5.438971e-01 1.000000e+00
## 72       Cylinder - Light  1.66829467 9.525724e-02 1.000000e+00
## 73        Diamond - Light  3.33275021 8.599211e-04 1.315679e-01
## 74           Disk - Light  1.96361424 4.957485e-02 1.000000e+00
## 75            Egg - Light  1.24664349 2.125282e-01 1.000000e+00
## 76       Fireball - Light -1.92153076 5.466483e-02 1.000000e+00
## 77          Flash - Light -3.40927990 6.513461e-04 9.965596e-02
## 78      Formation - Light  1.48537676 1.374440e-01 1.000000e+00
## 79         Chevron - Oval -3.37242856 7.450841e-04 1.139979e-01
## 80           Cigar - Oval -1.15925069 2.463540e-01 1.000000e+00
## 81          Circle - Oval  1.65650007 9.762059e-02 1.000000e+00
## 82            Cone - Oval  0.14451956 8.850902e-01 1.000000e+00
## 83          Cross - Oval  0.43026066 6.670060e-01 1.000000e+00
## 84        Cylinder - Oval  1.23095193 2.183408e-01 1.000000e+00
## 85         Diamond - Oval  2.74298401 6.088365e-03 9.315198e-01
## 86            Disk - Oval  1.20530194 2.280868e-01 1.000000e+00
## 87             Egg - Oval  0.93669486 3.489155e-01 1.000000e+00
## 88        Fireball - Oval -2.01087185 4.433899e-02 1.000000e+00
## 89           Flash - Oval -3.47911562 5.030715e-04 7.696994e-02
## 90       Formation - Oval  0.85824965 3.907546e-01 1.000000e+00
## 91           Light - Oval -0.55131071 5.814207e-01 1.000000e+00
## 92    Chevron - Rectangle -2.32502982 2.007037e-02 1.000000e+00
## 93      Cigar - Rectangle -0.36644759 7.140311e-01 1.000000e+00
## 94     Circle - Rectangle  1.65106143 9.872603e-02 1.000000e+00
## 95       Cone - Rectangle  0.49400593 6.213020e-01 1.000000e+00
## 96      Cross - Rectangle  0.71330591 4.756565e-01 1.000000e+00
## 97   Cylinder - Rectangle  1.48069928 1.386867e-01 1.000000e+00
## 98    Diamond - Rectangle  2.65824684 7.854834e-03 1.000000e+00
## 99       Disk - Rectangle  1.42308009 1.547129e-01 1.000000e+00
## 100       Egg - Rectangle  1.23388564 2.172455e-01 1.000000e+00
## 101  Fireball - Rectangle -0.59501838 5.518312e-01 1.000000e+00
## 102     Flash - Rectangle -2.35669254 1.843851e-02 1.000000e+00
## 103 Formation - Rectangle  1.19248556 2.330709e-01 1.000000e+00
## 104     Light - Rectangle  0.34825249 7.276506e-01 1.000000e+00
## 105      Oval - Rectangle  0.62412173 5.325476e-01 1.000000e+00
## 106      Chevron - Sphere -3.77585102 1.594623e-04 2.439773e-02
## 107        Cigar - Sphere -1.58294458 1.134341e-01 1.000000e+00
## 108       Circle - Sphere  1.23116558 2.182609e-01 1.000000e+00
## 109         Cone - Sphere -0.06570420 9.476133e-01 1.000000e+00
## 110        Cross - Sphere  0.25705896 7.971333e-01 1.000000e+00
## 111     Cylinder - Sphere  0.93478334 3.499000e-01 1.000000e+00
## 112      Diamond - Sphere  2.50504985 1.224341e-02 1.000000e+00
## 113         Disk - Sphere  0.79627453 4.258725e-01 1.000000e+00
## 114          Egg - Sphere  0.68638432 4.924708e-01 1.000000e+00
```

```
## 115     Fireball - Sphere -2.86436505 4.178462e-03 6.393046e-01
## 116        Flash - Sphere -3.91137440 9.177238e-05 1.404117e-02
## 117    Formation - Sphere  0.44328645 6.575586e-01 1.000000e+00
## 118        Light - Sphere -1.31396119 1.888593e-01 1.000000e+00
## 119         Oval - Sphere -0.53616692 5.918432e-01 1.000000e+00
## 120    Rectangle - Sphere -0.98255844 3.258248e-01 1.000000e+00
## 121    Chevron - Teardrop -1.32478978 1.852409e-01 1.000000e+00
## 122      Cigar - Teardrop  0.32149198 7.478376e-01 1.000000e+00
## 123     Circle - Teardrop  1.83310232 6.678736e-02 1.000000e+00
## 124       Cone - Teardrop  0.89975909 3.682485e-01 1.000000e+00
## 125      Cross - Teardrop  1.06032973 2.889946e-01 1.000000e+00
## 126   Cylinder - Teardrop  1.75321169 7.956568e-02 1.000000e+00
## 127    Diamond - Teardrop  2.66829941 7.623629e-03 1.000000e+00
## 128       Disk - Teardrop  1.68792212 9.142618e-02 1.000000e+00
## 129        Egg - Teardrop  1.55705057 1.194585e-01 1.000000e+00
## 130   Fireball - Teardrop  0.25994670 7.949049e-01 1.000000e+00
## 131      Flash - Teardrop -1.31884697 1.872203e-01 1.000000e+00
## 132  Formation - Teardrop  1.52296913 1.277664e-01 1.000000e+00
## 133      Light - Teardrop  0.92978528 3.524823e-01 1.000000e+00
## 134       Oval - Teardrop  1.11224490 2.660329e-01 1.000000e+00
## 135  Rectangle - Teardrop  0.58428414 5.590292e-01 1.000000e+00
## 136     Sphere - Teardrop  1.36937230 1.708829e-01 1.000000e+00
## 137    Chevron - Triangle -2.78862779 5.293186e-03 8.098575e-01
## 138      Cigar - Triangle -0.35141825 7.252746e-01 1.000000e+00
## 139     Circle - Triangle  3.51921288 4.328293e-04 6.622288e-02
## 140       Cone - Triangle  0.64509068 5.188684e-01 1.000000e+00
## 141      Cross - Triangle  0.85240952 3.939868e-01 1.000000e+00
## 142   Cylinder - Triangle  2.10530387 3.526487e-02 1.000000e+00
## 143    Diamond - Triangle  3.72556802 1.948759e-04 2.981601e-02
## 144       Disk - Triangle  2.55474985 1.062641e-02 1.000000e+00
## 145        Egg - Triangle  1.60939125 1.075308e-01 1.000000e+00
## 146   Fireball - Triangle -0.84900792 3.958769e-01 1.000000e+00
## 147      Flash - Triangle -2.87631544 4.023474e-03 6.155915e-01
## 148  Formation - Triangle  2.07625592 3.787029e-02 1.000000e+00
## 149      Light - Triangle  0.97776469 3.281907e-01 1.000000e+00
## 150       Oval - Triangle  1.27171162 2.034756e-01 1.000000e+00
## 151  Rectangle - Triangle  0.13483427 8.927429e-01 1.000000e+00
## 152     Sphere - Triangle  2.03850709 4.149925e-02 1.000000e+00
## 153   Teardrop - Triangle -0.58399557 5.592233e-01 1.000000e+00
```

```
alpha <- 0.05
```

```
library(coin)
```

```
## Loading required package: survival
```

```
##
## Attaching package: 'coin'
```

```
## The following object is masked _by_ '.GlobalEnv':
##
##     alpha
```

```
## The following object is masked from 'package:testthat':
##
##     expectation
```

```r
library(rcompanion)

df$Shape <- factor(df$Shape)

one_anova <- aov(duration_log_sec ~ Shape, data = df)
tidy(one_anova)
```

```
## # A tibble: 2 x 6
##   term         df  sumsq meansq statistic   p.value
##   <chr>     <dbl>  <dbl>  <dbl>     <dbl>     <dbl>
## 1 Shape        17   70.2  4.13       5.14  3.10e-11
## 2 Residuals  2295 1843.   0.803     NA    NA
```

```r
pairwise_perm <- pairwisePermutationTest(duration_log_sec ~ Shape, data = df)
pairwise_perm
```

```
##                    Comparison     Stat   p.value  p.adjust
## 1         Chevron - Cigar = 0   -2.234   0.02552 8.399e-02
## 2        Chevron - Circle = 0   -4.346 1.384e-05 3.156e-04
## 3          Chevron - Cone = 0   -2.093    0.0363 1.103e-01
## 4         Chevron - Cross = 0    -2.46    0.0139 5.317e-02
## 5      Chevron - Cylinder = 0   -3.696 0.0002189 1.970e-03
## 6       Chevron - Diamond = 0   -4.486 7.249e-06 3.156e-04
## 7          Chevron - Disk = 0   -3.806 0.0001415 1.443e-03
## 8           Chevron - Egg = 0   -2.949  0.003187 1.681e-02
## 9      Chevron - Fireball = 0   -2.433   0.01499 5.461e-02
## 10        Chevron - Flash = 0   0.5709    0.5681 7.493e-01
## 11    Chevron - Formation = 0   -4.111 3.933e-05 5.015e-04
## 12        Chevron - Light = 0   -3.468  0.000524 4.009e-03
## 13         Chevron - Oval = 0   -3.569 0.0003587 2.888e-03
## 14    Chevron - Rectangle = 0   -2.359   0.01833 6.522e-02
## 15       Chevron - Sphere = 0   -4.161 3.169e-05 4.849e-04
## 16     Chevron - Teardrop = 0   -1.341    0.1799 3.441e-01
## 17     Chevron - Triangle = 0   -3.054  0.002262 1.248e-02
## 18         Cigar - Circle = 0    -2.23   0.02575 8.399e-02
## 19           Cigar - Cone = 0  -0.6809    0.4959 6.774e-01
## 20          Cigar - Cross = 0   -1.166    0.2437 4.189e-01
## 21       Cigar - Cylinder = 0   -1.974   0.04833 1.334e-01
## 22        Cigar - Diamond = 0   -3.105  0.001905 1.166e-02
## 23           Cigar - Disk = 0    -2.01   0.04442 1.264e-01
## 24            Cigar - Egg = 0   -1.358    0.1746 3.427e-01
## 25       Cigar - Fireball = 0   0.1791    0.8578 9.178e-01
## 26          Cigar - Flash = 0     2.49   0.01276 5.006e-02
## 27      Cigar - Formation = 0   -2.041   0.04127 1.214e-01
## 28          Cigar - Light = 0  -0.9482    0.3431 5.197e-01
## 29           Cigar - Oval = 0   -1.326    0.1848 3.491e-01
## 30      Cigar - Rectangle = 0  -0.3703    0.7112 8.206e-01
## 31         Cigar - Sphere = 0   -1.774   0.07608 1.848e-01
## 32       Cigar - Teardrop = 0      0.4    0.6891 8.206e-01
## 33       Cigar - Triangle = 0  -0.4095    0.6822 8.206e-01
## 34          Circle - Cone = 0   0.4876    0.6259 7.914e-01
## 35         Circle - Cross = 0  -0.1564    0.8757 9.240e-01
## 36      Circle - Cylinder = 0  -0.3701    0.7113 8.206e-01
## 37       Circle - Diamond = 0    -1.91   0.05614 1.507e-01
```

```
## 38          Circle - Disk = 0  -0.2178    0.8276 9.176e-01
## 39           Circle - Egg = 0  0.05192    0.9586 9.809e-01
## 40      Circle - Fireball = 0    4.185  2.85e-05 4.845e-04
## 41         Circle - Flash = 0     5.19 2.102e-07 3.216e-05
## 42     Circle - Formation = 0  0.04655    0.9629 9.809e-01
## 43         Circle - Light = 0    2.716  0.006612 3.263e-02
## 44          Circle - Oval = 0    1.266    0.2054 3.715e-01
## 45     Circle - Rectangle = 0    1.539    0.1239 2.788e-01
## 46        Circle - Sphere = 0   0.9686    0.3328 5.197e-01
## 47      Circle - Teardrop = 0    1.826   0.06778 1.734e-01
## 48      Circle - Triangle = 0      3.3 0.0009666 6.619e-03
## 49           Cone - Cross = 0  -0.4194    0.6749 8.206e-01
## 50        Cone - Cylinder = 0  -0.6297    0.5289 7.098e-01
## 51         Cone - Diamond = 0   -1.391    0.1641 3.304e-01
## 52            Cone - Disk = 0  -0.5033    0.6147 7.837e-01
## 53             Cone - Egg = 0   -0.346    0.7294 8.328e-01
## 54        Cone - Fireball = 0   0.8444    0.3984 5.861e-01
## 55           Cone - Flash = 0     1.97   0.04883 1.334e-01
## 56       Cone - Formation = 0  -0.4734    0.6359 7.975e-01
## 57           Cone - Light = 0   0.2592    0.7955 8.884e-01
## 58            Cone - Oval = 0 -0.02388    0.9809 9.809e-01
## 59       Cone - Rectangle = 0   0.3932    0.6941 8.206e-01
## 60          Cone - Sphere = 0  -0.2014    0.8404 9.178e-01
## 61        Cone - Teardrop = 0   0.8066    0.4199 6.071e-01
## 62        Cone - Triangle = 0   0.5616    0.5744 7.511e-01
## 63       Cross - Cylinder = 0 -0.02799    0.9777 9.809e-01
## 64        Cross - Diamond = 0  -0.7421     0.458 6.429e-01
## 65           Cross - Disk = 0  0.07475    0.9404 9.722e-01
## 66            Cross - Egg = 0   0.1673    0.8671 9.213e-01
## 67       Cross - Fireball = 0    1.276    0.2019 3.715e-01
## 68          Cross - Flash = 0    2.088   0.03676 1.103e-01
## 69      Cross - Formation = 0   0.1815     0.856 9.178e-01
## 70          Cross - Light = 0   0.8053    0.4206 6.071e-01
## 71           Cross - Oval = 0   0.5525    0.5806 7.528e-01
## 72      Cross - Rectangle = 0   0.8754    0.3813 5.664e-01
## 73         Cross - Sphere = 0   0.4487    0.6537 8.131e-01
## 74        Cross - Teardrop = 0    1.245    0.2131 3.791e-01
## 75        Cross - Triangle = 0    1.077    0.2813 4.678e-01
## 76     Cylinder - Diamond = 0   -1.179    0.2386 4.174e-01
## 77        Cylinder - Disk = 0   0.1921    0.8477 9.178e-01
## 78         Cylinder - Egg = 0     0.29    0.7718 8.683e-01
## 79    Cylinder - Fireball = 0    2.545   0.01094 4.696e-02
## 80       Cylinder - Flash = 0    3.614 0.0003013 2.561e-03
## 81   Cylinder - Formation = 0    0.384     0.701 8.206e-01
## 82       Cylinder - Light = 0    1.672    0.0945 2.192e-01
## 83        Cylinder - Oval = 0      1.1    0.2712 4.560e-01
## 84   Cylinder - Rectangle = 0    1.468    0.1422 3.022e-01
## 85      Cylinder - Sphere = 0   0.9272    0.3538 5.307e-01
## 86    Cylinder - Teardrop = 0    1.812   0.06996 1.734e-01
## 87    Cylinder - Triangle = 0     2.15   0.03152 9.842e-02
## 88         Diamond - Disk = 0    1.493    0.1354 2.959e-01
## 89          Diamond - Egg = 0    1.264    0.2064 3.715e-01
## 90     Diamond - Fireball = 0     4.03 5.573e-05 6.559e-04
## 91        Diamond - Flash = 0    4.337 1.444e-05 3.156e-04
```

```
## 92    Diamond - Formation = 0     1.82    0.0688 1.734e-01
## 93        Diamond - Light = 0    3.292  0.000995 6.619e-03
## 94         Diamond - Oval = 0     2.55   0.01077 4.696e-02
## 95    Diamond - Rectangle = 0    2.526   0.01154 4.772e-02
## 96       Diamond - Sphere = 0    2.541   0.01105 4.696e-02
## 97     Diamond - Teardrop = 0    2.593  0.009513 4.411e-02
## 98     Diamond - Triangle = 0    3.726 0.0001949 1.864e-03
## 99              Disk - Egg = 0   0.1435    0.8859 9.284e-01
## 100       Disk - Fireball = 0    3.318 0.0009054 6.596e-03
## 101          Disk - Flash = 0    4.288 1.804e-05 3.450e-04
## 102      Disk - Formation = 0   0.2091    0.8344 9.178e-01
## 103          Disk - Light = 0    2.167   0.03022 9.633e-02
## 104           Disk - Oval = 0    1.175    0.2401 4.174e-01
## 105      Disk - Rectangle = 0    1.426    0.1539 3.142e-01
## 106         Disk - Sphere = 0   0.9517    0.3412 5.197e-01
## 107       Disk - Teardrop = 0     1.68   0.09305 2.192e-01
## 108       Disk - Triangle = 0    2.697  0.007006 3.350e-02
## 109        Egg - Fireball = 0    1.672   0.09454 2.192e-01
## 110           Egg - Flash = 0    2.795  0.005189 2.646e-02
## 111       Egg - Formation = 0  -0.0267    0.9787 9.809e-01
## 112           Egg - Light = 0   0.9486    0.3428 5.197e-01
## 113            Egg - Oval = 0   0.5431     0.587 7.547e-01
## 114       Egg - Rectangle = 0     0.96    0.3371 5.197e-01
## 115          Egg - Sphere = 0   0.3674    0.7133 8.206e-01
## 116        Egg - Teardrop = 0    1.357    0.1747 3.427e-01
## 117        Egg - Triangle = 0    1.342    0.1796 3.441e-01
## 118      Fireball - Flash = 0    3.228  0.001246 7.943e-03
## 119  Fireball - Formation = 0   -3.051  0.002284 1.248e-02
## 120      Fireball - Light = 0   -2.008   0.04462 1.264e-01
## 121       Fireball - Oval = 0   -2.247   0.02466 8.399e-02
## 122  Fireball - Rectangle = 0  -0.6071    0.5438 7.235e-01
## 123     Fireball - Sphere = 0   -3.082  0.002053 1.208e-02
## 124   Fireball - Teardrop = 0   0.3236    0.7463 8.458e-01
## 125   Fireball - Triangle = 0  -0.9667    0.3337 5.197e-01
## 126     Flash - Formation = 0   -4.417 1.001e-05 3.156e-04
## 127         Flash - Light = 0   -4.391 1.128e-05 3.156e-04
## 128          Flash - Oval = 0   -4.116 3.861e-05 5.015e-04
## 129     Flash - Rectangle = 0   -2.506   0.01222 4.920e-02
## 130        Flash - Sphere = 0   -4.847 1.253e-06 9.585e-05
## 131      Flash - Teardrop = 0   -1.448    0.1477 3.096e-01
## 132      Flash - Triangle = 0   -3.841 0.0001227 1.341e-03
## 133     Formation - Light = 0    1.826   0.06788 1.734e-01
## 134      Formation - Oval = 0   0.9762     0.329 5.197e-01
## 135 Formation - Rectangle = 0    1.425     0.154 3.142e-01
## 136    Formation - Sphere = 0   0.6993    0.4844 6.677e-01
## 137  Formation - Teardrop = 0     1.81   0.07025 1.734e-01
## 138  Formation - Triangle = 0    2.441   0.01466 5.461e-02
## 139          Light - Oval = 0  -0.7832    0.4335 6.199e-01
## 140     Light - Rectangle = 0   0.3693    0.7119 8.206e-01
## 141        Light - Sphere = 0   -1.469    0.1419 3.022e-01
## 142      Light - Teardrop = 0    1.046    0.2957 4.865e-01
## 143      Light - Triangle = 0   0.9728    0.3306 5.197e-01
## 144      Oval - Rectangle = 0   0.7591    0.4478 6.344e-01
## 145         Oval - Sphere = 0  -0.4371     0.662 8.168e-01
```

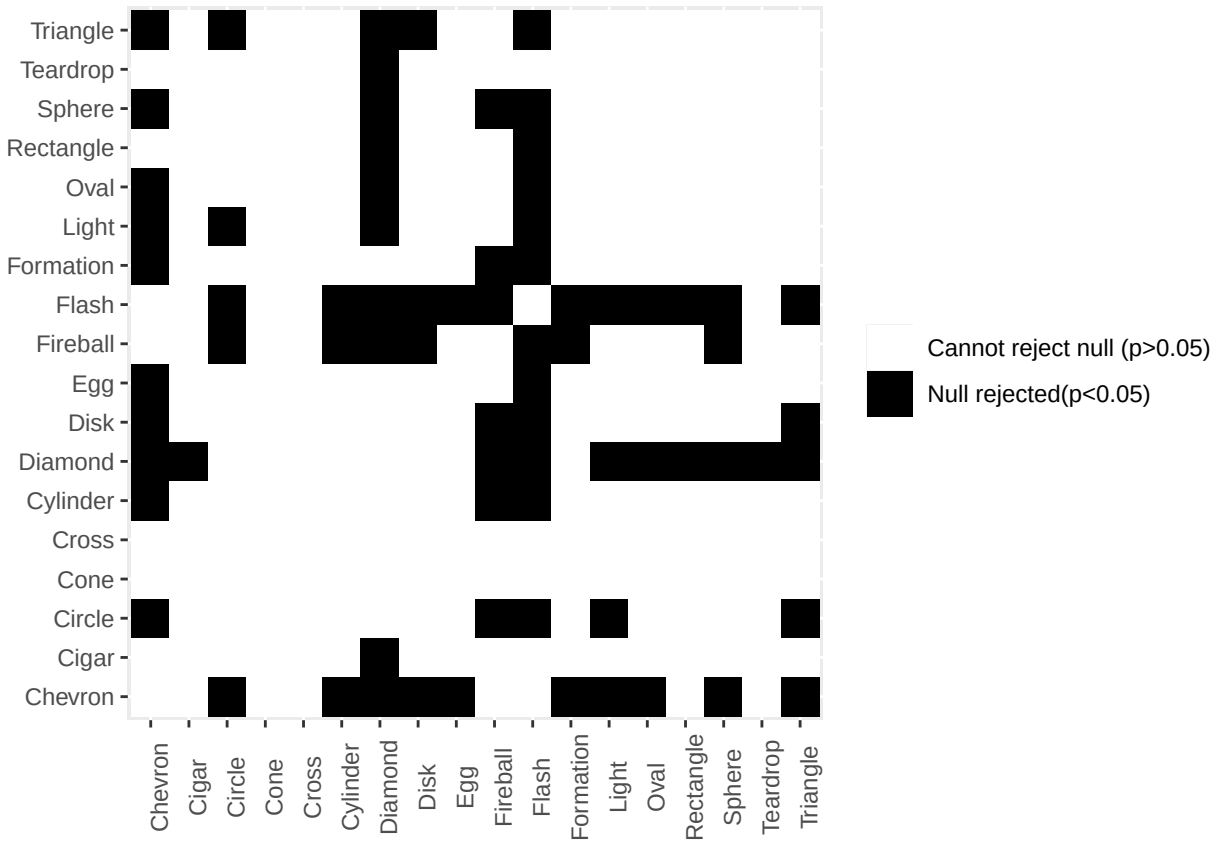
```
## 146       Oval - Teardrop = 0    1.296    0.1951 3.640e-01
## 147       Oval - Triangle = 0    1.495     0.135 2.959e-01
## 148    Rectangle - Sphere = 0   -1.114    0.2654 4.512e-01
## 149  Rectangle - Teardrop = 0   0.6361    0.5247 7.098e-01
## 150  Rectangle - Triangle = 0   0.1072    0.9146 9.519e-01
## 151     Sphere - Teardrop = 0    1.608    0.1077 2.459e-01
## 152     Sphere - Triangle = 0    2.229    0.0258 8.399e-02
## 153   Teardrop - Triangle = 0  -0.7241     0.469 6.523e-01
```

```r
#Visualization
alpha <- 0.05
pairwise_matrix <- pairwisePermutationMatrix(duration_log_sec ~ Shape, data = df)
pairwise_matrix_sig <- pairwise_matrix$Adjusted < alpha

library(ggplot2)
library(reshape2)
```

```
##
## Attaching package: 'reshape2'
```

```
## The following object is masked from 'package:tidyr':
##
##     smiths
```

```r
pairwise_melted = melt(pairwise_matrix_sig)


ggplot(pairwise_melted) +
  aes(x = Var1,
      y = Var2,
      fill = value) +
  geom_tile() +
  scale_fill_manual(labels = c('Cannot reject null (p>0.05)','Null rejected(p<0.05)', ''),values=c('whi
  theme(axis.text.x = element_text(angle = 90),
        axis.title.x=element_blank(),
        axis.title.y=element_blank(),
        legend.title=element_blank())
```

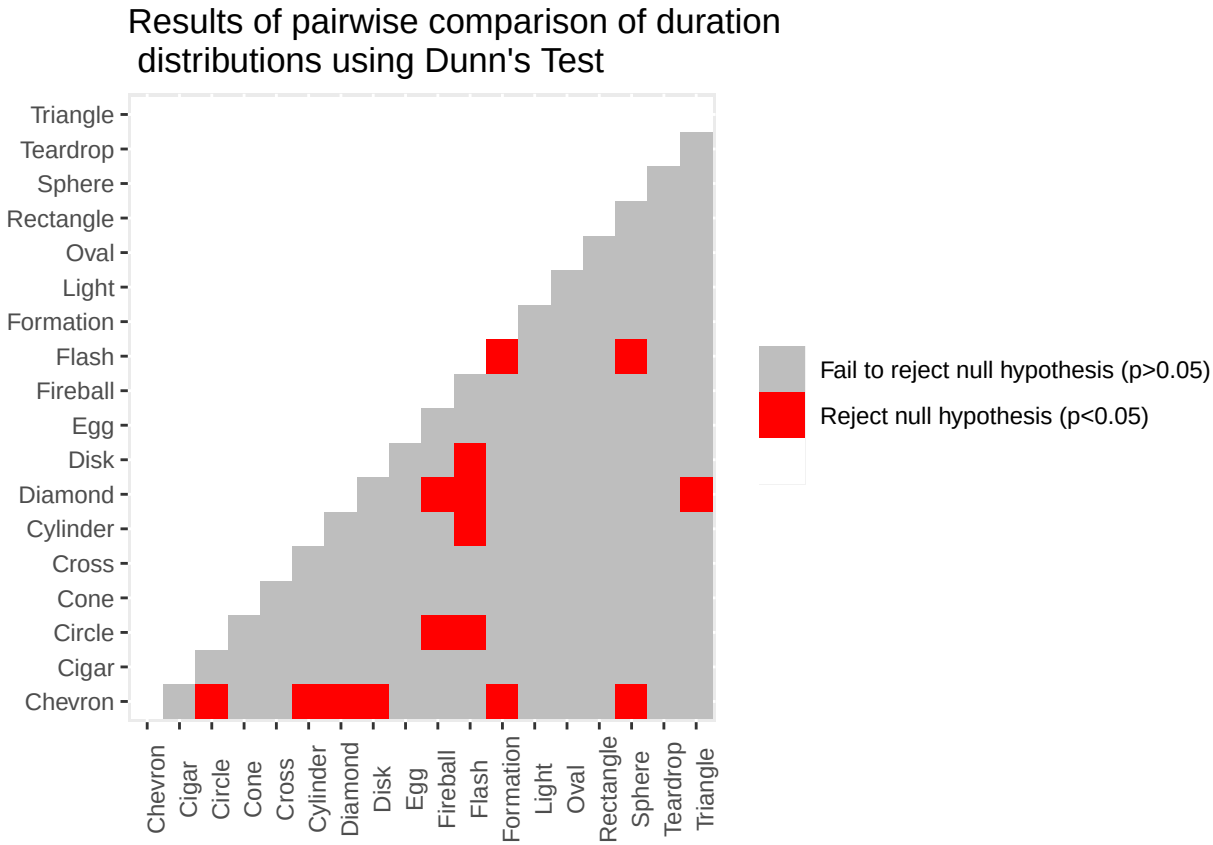



```
# pairwise_matrix_sig <- tibble(ifelse(pairwise_matrix > alpha, FALSE, TRUE))
# pairwise_matrix_sig
```

```
# # ATTEMPTING TO FIGURE OUT HOW ADONIS WORKS
# test_data <- data.frame(c(1,2,3,1,1,5))
# test_class <- data.frame(shape = c('s','s','s','r','r','r'))
# data_dist <- dist(test_data, method='euclidean')
#
# adonis(data_dist ~ shape, data=test_class)
#
# library(here)
#
# fp_pro = 'data/processed/aliens_pro.feather'
# fp_results = 'data'
#
# processed_data <- read_feather(here(fp_pro))
#
# # Remove unwanted shapes and group data
# shape_duration <- processed_data %>%
#   select(Shape, duration_sec) %>%
#   filter(Shape != c('Flash','Light')) %>%
#   mutate(Shape = factor(Shape))
#
# # Kruskal-Wallis test
# kusk <- kruskal.test(duration_sec ~ Shape, data = df)
# write_rds(tidy(kusk), here(fp_results,'KW.rds'))
```

```
#
# dunn <- dunnTest(duration_sec ~ Shape, data = df, method='bonferroni')
# dunn_table <- dunn$res
# filter(dunn_table,

  # Kruskal-Wallis test
  # kusk <- kruskal.test(duration_sec ~ Shape, data = df)
  # write_rds(tidy(kusk), here(opt$fp_results,'KW.rds'))

  # Dunn Test
  # Dunn_table <- DunnTest(df$duration_sec, df$Shape, method='bonferroni')
  # Dunn_table <- as_tibble(Dunn_table[[1]], rownames = 'Comparison') %>%
  #   select(Comparison, pval) %>%
  #   filter(pval>alpha) %>%
  #   write_rds(here(opt$fp_results,'Dunn.rds'))

  # Create matrix of pairwise adjusted p values from Dunn test for plotting

library(DescTools)
library(reshape2)
library(ggplot2)

alpha=0.05

Dunn_matrix <- DunnTest(df$duration_sec, df$Shape, method='bonferroni', out.list=FALSE)[[1]]
n_shapes = dim(Dunn_matrix)[1] + 1
Dunn_matrix=rbind(rep(NA,n_shapes-1),Dunn_matrix)
Dunn_matrix=cbind(Dunn_matrix,rep(NA,n_shapes))
rownames(Dunn_matrix)[1] = colnames(Dunn_matrix)[1]
colnames(Dunn_matrix)[n_shapes]=rownames(Dunn_matrix)[n_shapes]
# Dunn_matrix <- t(Dunn_matrix)
# Dunn_matrix <- Dunn_matrix[[1]]*lower.tri(Dunn_matrix[[1]], diag = TRUE)

pairwise_matrix_sig <- Dunn_matrix < alpha
pairwise_melted <- melt(pairwise_matrix_sig)
```

```
ggplot(pairwise_melted) +
  aes(x = Var1,
      y = Var2,
      fill = value) +
  geom_tile() +
  scale_fill_manual(labels= c('Fail to reject null hypothesis (p>0.05)', 'Reject null hypothesis (p<0.05
  theme(axis.text.x = element_text(angle = 90),
        axis.title.x=element_blank(),
        axis.title.y=element_blank(),
        legend.title=element_blank())+
  ggtitle("Results of pairwise comparison of duration \n distributions using Dunn's Test")
```




```r
library(DescTools)

Dunn_table <- DunnTest(df$duration_sec, df$Shape, method='bonferroni')
Dunn_matrix <- DunnTest(df$duration_sec, df$Shape, method='bonferroni', out.list=FALSE)
# dunn_table <-
# dunn_table
#
# alpha <- 0.05

# pairwise_matrix_sig <- dunn$res$P.adj < alpha
#
# library(ggplot2)
# library(reshape2)
#
# pairwise_melted = melt(pairwise_matrix_sig)
#
#
# ggplot(pairwise_melted) +
#   aes(x = Var1,
#       y = Var2,
#       fill = value) +
#   geom_tile() +
#   scale_fill_manual(labels = c('Cannot reject null (p>0.05)','Null rejected(p<0.05)', ''),values=c('w
#   theme(axis.text.x = element_text(angle = 90),
#         axis.title.x=element_blank(),
#         axis.title.y=element_blank(),
```

```
#         legend.title=element_blank())
```

```
# # EXAMPLES OF PERMANOVA FROM VEGAN DOCUMENTATION
#
# ### Example of use with strata, for nested (e.g., block) designs.
# dat <- expand.grid(rep=gl(2,1), NO3=factor(c(0,10)),field=gl(3,1) )
# dat
# Agropyron <- with(dat, as.numeric(field) + as.numeric(NO3)+2) +rnorm(12)/2
# Schizachyrium <- with(dat, as.numeric(field) - as.numeric(NO3)+2) +rnorm(12)/2
# total <- Agropyron + Schizachyrium
# dotplot(total ~ NO3, dat, jitter.x=TRUE, groups=field,
#         type=c('p','a'), xlab="NO3", auto.key=list(columns=3, lines=TRUE) )
#
# Y <- data.frame(Agropyron, Schizachyrium)
# mod <- metaMDS(Y, trace = FALSE)
# plot(mod)
# ### Ellipsoid hulls show treatment
# with(dat, ordiellipse(mod, field, kind = "ehull", label = TRUE))
# ### Spider shows fields
# with(dat, ordispider(mod, field, lty=3, col="red"))
#
# ### Incorrect (no strata)
# perm <- how(nperm = 199)
# adonis2 (Y ~ NO3, data = dat, permutations = perm)
#
# ## Correct with strata
# setBlocks(perm) <- with(dat, field)
# adonis2(Y ~ NO3, data = dat, permutations = perm)
```