RWorksheet_PAMA#4C

Miko Pama BSIT 2-B

2023-12-12

#1

```
data1 <- read.csv("mpg.csv")
data1
```

```
##       X manufacturer                model displ year cyl        trans drv cty
## 1     1         audi                   a4   1.8 1999   4     auto(l5)   f  18
## 2     2         audi                   a4   1.8 1999   4   manual(m5)   f  21
## 3     3         audi                   a4   2.0 2008   4   manual(m6)   f  20
## 4     4         audi                   a4   2.0 2008   4     auto(av)   f  21
## 5     5         audi                   a4   2.8 1999   6     auto(l5)   f  16
## 6     6         audi                   a4   2.8 1999   6   manual(m5)   f  18
## 7     7         audi                   a4   3.1 2008   6     auto(av)   f  18
## 8     8         audi           a4 quattro   1.8 1999   4   manual(m5)   4  18
## 9     9         audi           a4 quattro   1.8 1999   4     auto(l5)   4  16
## 10   10         audi           a4 quattro   2.0 2008   4   manual(m6)   4  20
## 11   11         audi           a4 quattro   2.0 2008   4     auto(s6)   4  19
## 12   12         audi           a4 quattro   2.8 1999   6     auto(l5)   4  15
## 13   13         audi           a4 quattro   2.8 1999   6   manual(m5)   4  17
## 14   14         audi           a4 quattro   3.1 2008   6     auto(s6)   4  17
## 15   15         audi           a4 quattro   3.1 2008   6   manual(m6)   4  15
## 16   16         audi           a6 quattro   2.8 1999   6     auto(l5)   4  15
## 17   17         audi           a6 quattro   3.1 2008   6     auto(s6)   4  17
## 18   18         audi           a6 quattro   4.2 2008   8     auto(s6)   4  16
## 19   19    chevrolet   c1500 suburban 2wd   5.3 2008   8     auto(l4)   r  14
## 20   20    chevrolet   c1500 suburban 2wd   5.3 2008   8     auto(l4)   r  11
## 21   21    chevrolet   c1500 suburban 2wd   5.3 2008   8     auto(l4)   r  14
## 22   22    chevrolet   c1500 suburban 2wd   5.7 1999   8     auto(l4)   r  13
## 23   23    chevrolet   c1500 suburban 2wd   6.0 2008   8     auto(l4)   r  12
## 24   24    chevrolet             corvette   5.7 1999   8   manual(m6)   r  16
## 25   25    chevrolet             corvette   5.7 1999   8     auto(l4)   r  15
## 26   26    chevrolet             corvette   6.2 2008   8   manual(m6)   r  16
## 27   27    chevrolet             corvette   6.2 2008   8     auto(s6)   r  15
## 28   28    chevrolet             corvette   7.0 2008   8   manual(m6)   r  15
## 29   29    chevrolet      k1500 tahoe 4wd   5.3 2008   8     auto(l4)   4  14
## 30   30    chevrolet      k1500 tahoe 4wd   5.3 2008   8     auto(l4)   4  11
## 31   31    chevrolet      k1500 tahoe 4wd   5.7 1999   8     auto(l4)   4  11
## 32   32    chevrolet      k1500 tahoe 4wd   6.5 1999   8     auto(l4)   4  14
## 33   33    chevrolet               malibu   2.4 1999   4     auto(l4)   f  19
## 34   34    chevrolet               malibu   2.4 2008   4     auto(l4)   f  22
## 35   35    chevrolet               malibu   3.1 1999   6     auto(l4)   f  18
## 36   36    chevrolet               malibu   3.5 2008   6     auto(l4)   f  18
## 37   37    chevrolet               malibu   3.6 2008   6     auto(s6)   f  17
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## 38 38      dodge        caravan 2wd 2.4 1999 4   auto(l3) f 18
## 39 39      dodge        caravan 2wd 3.0 1999 6   auto(14) f 17
## 40 40      dodge        caravan 2wd 3.3 1999 6   auto(14) f 16
## 41 41      dodge        caravan 2wd 3.3 1999 6   auto(14) f 16
## 42 42      dodge        caravan 2wd 3.3 2008 6   auto(14) f 17
## 43 43      dodge        caravan 2wd 3.3 2008 6   auto(14) f 17
## 44 44      dodge        caravan 2wd 3.3 2008 6   auto(14) f 11
## 45 45      dodge        caravan 2wd 3.8 1999 6   auto(14) f 15
## 46 46      dodge        caravan 2wd 3.8 1999 6   auto(14) f 15
## 47 47      dodge        caravan 2wd 3.8 2008 6   auto(16) f 16
## 48 48      dodge        caravan 2wd 4.0 2008 6   auto(16) f 16
## 49 49      dodge  dakota pickup 4wd 3.7 2008 6 manual(m6) 4 15
## 50 50      dodge  dakota pickup 4wd 3.7 2008 6   auto(14) 4 14
## 51 51      dodge  dakota pickup 4wd 3.9 1999 6   auto(14) 4 13
## 52 52      dodge  dakota pickup 4wd 3.9 1999 6 manual(m5) 4 14
## 53 53      dodge  dakota pickup 4wd 4.7 2008 8   auto(15) 4 14
## 54 54      dodge  dakota pickup 4wd 4.7 2008 8   auto(15) 4 14
## 55 55      dodge  dakota pickup 4wd 4.7 2008 8   auto(15) 4  9
## 56 56      dodge  dakota pickup 4wd 5.2 1999 8 manual(m5) 4 11
## 57 57      dodge  dakota pickup 4wd 5.2 1999 8   auto(14) 4 11
## 58 58      dodge        durango 4wd 3.9 1999 6   auto(14) 4 13
## 59 59      dodge        durango 4wd 4.7 2008 8   auto(15) 4 13
## 60 60      dodge        durango 4wd 4.7 2008 8   auto(15) 4  9
## 61 61      dodge        durango 4wd 4.7 2008 8   auto(15) 4 13
## 62 62      dodge        durango 4wd 5.2 1999 8   auto(14) 4 11
## 63 63      dodge        durango 4wd 5.7 2008 8   auto(15) 4 13
## 64 64      dodge        durango 4wd 5.9 1999 8   auto(14) 4 11
## 65 65      dodge ram 1500 pickup 4wd 4.7 2008 8 manual(m6) 4 12
## 66 66      dodge ram 1500 pickup 4wd 4.7 2008 8   auto(15) 4  9
## 67 67      dodge ram 1500 pickup 4wd 4.7 2008 8   auto(15) 4 13
## 68 68      dodge ram 1500 pickup 4wd 4.7 2008 8   auto(15) 4 13
## 69 69      dodge ram 1500 pickup 4wd 4.7 2008 8 manual(m6) 4 12
## 70 70      dodge ram 1500 pickup 4wd 4.7 2008 8 manual(m6) 4  9
## 71 71      dodge ram 1500 pickup 4wd 5.2 1999 8   auto(14) 4 11
## 72 72      dodge ram 1500 pickup 4wd 5.2 1999 8 manual(m5) 4 11
## 73 73      dodge ram 1500 pickup 4wd 5.7 2008 8   auto(15) 4 13
## 74 74      dodge ram 1500 pickup 4wd 5.9 1999 8   auto(14) 4 11
## 75 75       ford     expedition 2wd 4.6 1999 8   auto(14) r 11
## 76 76       ford     expedition 2wd 5.4 1999 8   auto(14) r 11
## 77 77       ford     expedition 2wd 5.4 2008 8   auto(16) r 12
## 78 78       ford       explorer 4wd 4.0 1999 6   auto(15) 4 14
## 79 79       ford       explorer 4wd 4.0 1999 6 manual(m5) 4 15
## 80 80       ford       explorer 4wd 4.0 1999 6   auto(15) 4 14
## 81 81       ford       explorer 4wd 4.0 2008 6   auto(15) 4 13
## 82 82       ford       explorer 4wd 4.6 2008 8   auto(16) 4 13
## 83 83       ford       explorer 4wd 5.0 1999 8   auto(14) 4 13
## 84 84       ford    f150 pickup 4wd 4.2 1999 6   auto(14) 4 14
## 85 85       ford    f150 pickup 4wd 4.2 1999 6 manual(m5) 4 14
## 86 86       ford    f150 pickup 4wd 4.6 1999 8 manual(m5) 4 13
## 87 87       ford    f150 pickup 4wd 4.6 1999 8   auto(14) 4 13
## 88 88       ford    f150 pickup 4wd 4.6 2008 8   auto(14) 4 13
## 89 89       ford    f150 pickup 4wd 5.4 1999 8   auto(14) 4 11
## 90 90       ford    f150 pickup 4wd 5.4 2008 8   auto(14) 4 13
## 91 91       ford            mustang 3.8 1999 6 manual(m5) r 18
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## 92   92         ford               mustang 3.8 1999  6   auto(l4)  r  18
## 93   93         ford               mustang 4.0 2008  6 manual(m5)  r  17
## 94   94         ford               mustang 4.0 2008  6   auto(l5)  r  16
## 95   95         ford               mustang 4.6 1999  8   auto(l4)  r  15
## 96   96         ford               mustang 4.6 1999  8 manual(m5)  r  15
## 97   97         ford               mustang 4.6 2008  8 manual(m5)  r  15
## 98   98         ford               mustang 4.6 2008  8   auto(l5)  r  15
## 99   99         ford               mustang 5.4 2008  8 manual(m6)  r  14
## 100 100        honda                 civic 1.6 1999  4 manual(m5)  f  28
## 101 101        honda                 civic 1.6 1999  4   auto(l4)  f  24
## 102 102        honda                 civic 1.6 1999  4 manual(m5)  f  25
## 103 103        honda                 civic 1.6 1999  4 manual(m5)  f  23
## 104 104        honda                 civic 1.6 1999  4   auto(l4)  f  24
## 105 105        honda                 civic 1.8 2008  4 manual(m5)  f  26
## 106 106        honda                 civic 1.8 2008  4   auto(l5)  f  25
## 107 107        honda                 civic 1.8 2008  4   auto(l5)  f  24
## 108 108        honda                 civic 2.0 2008  4 manual(m6)  f  21
## 109 109      hyundai                sonata 2.4 1999  4   auto(l4)  f  18
## 110 110      hyundai                sonata 2.4 1999  4 manual(m5)  f  18
## 111 111      hyundai                sonata 2.4 2008  4   auto(l4)  f  21
## 112 112      hyundai                sonata 2.4 2008  4 manual(m5)  f  21
## 113 113      hyundai                sonata 2.5 1999  6   auto(l4)  f  18
## 114 114      hyundai                sonata 2.5 1999  6 manual(m5)  f  18
## 115 115      hyundai                sonata 3.3 2008  6   auto(l5)  f  19
## 116 116      hyundai               tiburon 2.0 1999  4   auto(l4)  f  19
## 117 117      hyundai               tiburon 2.0 1999  4 manual(m5)  f  19
## 118 118      hyundai               tiburon 2.0 2008  4 manual(m5)  f  20
## 119 119      hyundai               tiburon 2.0 2008  4   auto(l4)  f  20
## 120 120      hyundai               tiburon 2.7 2008  6   auto(l4)  f  17
## 121 121      hyundai               tiburon 2.7 2008  6 manual(m6)  f  16
## 122 122      hyundai               tiburon 2.7 2008  6 manual(m5)  f  17
## 123 123         jeep     grand cherokee 4wd 3.0 2008  6   auto(l5)  4  17
## 124 124         jeep     grand cherokee 4wd 3.7 2008  6   auto(l5)  4  15
## 125 125         jeep     grand cherokee 4wd 4.0 1999  6   auto(l4)  4  15
## 126 126         jeep     grand cherokee 4wd 4.7 1999  8   auto(l4)  4  14
## 127 127         jeep     grand cherokee 4wd 4.7 2008  8   auto(l5)  4   9
## 128 128         jeep     grand cherokee 4wd 4.7 2008  8   auto(l5)  4  14
## 129 129         jeep     grand cherokee 4wd 5.7 2008  8   auto(l5)  4  13
## 130 130         jeep     grand cherokee 4wd 6.1 2008  8   auto(l5)  4  11
## 131 131   land rover           range rover 4.0 1999  8   auto(l4)  4  11
## 132 132   land rover           range rover 4.2 2008  8   auto(s6)  4  12
## 133 133   land rover           range rover 4.4 2008  8   auto(s6)  4  12
## 134 134   land rover           range rover 4.6 1999  8   auto(l4)  4  11
## 135 135      lincoln          navigator 2wd 5.4 1999  8   auto(l4)  r  11
## 136 136      lincoln          navigator 2wd 5.4 1999  8   auto(l4)  r  11
## 137 137      lincoln          navigator 2wd 5.4 2008  8   auto(l6)  r  12
## 138 138      mercury       mountaineer 4wd 4.0 1999  6   auto(l5)  4  14
## 139 139      mercury       mountaineer 4wd 4.0 2008  6   auto(l5)  4  13
## 140 140      mercury       mountaineer 4wd 4.6 2008  8   auto(l6)  4  13
## 141 141      mercury       mountaineer 4wd 5.0 1999  8   auto(l4)  4  13
## 142 142       nissan                altima 2.4 1999  4 manual(m5)  f  21
## 143 143       nissan                altima 2.4 1999  4   auto(l4)  f  19
## 144 144       nissan                altima 2.5 2008  4   auto(av)  f  23
## 145 145       nissan                altima 2.5 2008  4 manual(m6)  f  23
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## 146 146         nissan                altima 3.5 2008  6 manual(m6) f 19
## 147 147         nissan                altima 3.5 2008  6   auto(av) f 19
## 148 148         nissan                maxima 3.0 1999  6   auto(14) f 18
## 149 149         nissan                maxima 3.0 1999  6 manual(m5) f 19
## 150 150         nissan                maxima 3.5 2008  6   auto(av) f 19
## 151 151         nissan         pathfinder 4wd 3.3 1999  6   auto(14) 4 14
## 152 152         nissan         pathfinder 4wd 3.3 1999  6 manual(m5) 4 15
## 153 153         nissan         pathfinder 4wd 4.0 2008  6   auto(15) 4 14
## 154 154         nissan         pathfinder 4wd 5.6 2008  8   auto(s5) 4 12
## 155 155        pontiac            grand prix 3.1 1999  6   auto(14) f 18
## 156 156        pontiac            grand prix 3.8 1999  6   auto(14) f 16
## 157 157        pontiac            grand prix 3.8 1999  6   auto(14) f 17
## 158 158        pontiac            grand prix 3.8 2008  6   auto(14) f 18
## 159 159        pontiac            grand prix 5.3 2008  8   auto(s4) f 16
## 160 160         subaru          forester awd 2.5 1999  4 manual(m5) 4 18
## 161 161         subaru          forester awd 2.5 1999  4   auto(14) 4 18
## 162 162         subaru          forester awd 2.5 2008  4 manual(m5) 4 20
## 163 163         subaru          forester awd 2.5 2008  4 manual(m5) 4 19
## 164 164         subaru          forester awd 2.5 2008  4   auto(14) 4 20
## 165 165         subaru          forester awd 2.5 2008  4   auto(14) 4 18
## 166 166         subaru           impreza awd 2.2 1999  4   auto(14) 4 21
## 167 167         subaru           impreza awd 2.2 1999  4 manual(m5) 4 19
## 168 168         subaru           impreza awd 2.5 1999  4 manual(m5) 4 19
## 169 169         subaru           impreza awd 2.5 1999  4   auto(14) 4 19
## 170 170         subaru           impreza awd 2.5 2008  4   auto(s4) 4 20
## 171 171         subaru           impreza awd 2.5 2008  4   auto(s4) 4 20
## 172 172         subaru           impreza awd 2.5 2008  4 manual(m5) 4 19
## 173 173         subaru           impreza awd 2.5 2008  4 manual(m5) 4 20
## 174 174         toyota           4runner 4wd 2.7 1999  4 manual(m5) 4 15
## 175 175         toyota           4runner 4wd 2.7 1999  4   auto(14) 4 16
## 176 176         toyota           4runner 4wd 3.4 1999  6   auto(14) 4 15
## 177 177         toyota           4runner 4wd 3.4 1999  6 manual(m5) 4 15
## 178 178         toyota           4runner 4wd 4.0 2008  6   auto(15) 4 16
## 179 179         toyota           4runner 4wd 4.7 2008  8   auto(15) 4 14
## 180 180         toyota                 camry 2.2 1999  4 manual(m5) f 21
## 181 181         toyota                 camry 2.2 1999  4   auto(14) f 21
## 182 182         toyota                 camry 2.4 2008  4 manual(m5) f 21
## 183 183         toyota                 camry 2.4 2008  4   auto(15) f 21
## 184 184         toyota                 camry 3.0 1999  6   auto(14) f 18
## 185 185         toyota                 camry 3.0 1999  6 manual(m5) f 18
## 186 186         toyota                 camry 3.5 2008  6   auto(s6) f 19
## 187 187         toyota          camry solara 2.2 1999  4   auto(14) f 21
## 188 188         toyota          camry solara 2.2 1999  4 manual(m5) f 21
## 189 189         toyota          camry solara 2.4 2008  4 manual(m5) f 21
## 190 190         toyota          camry solara 2.4 2008  4   auto(s5) f 22
## 191 191         toyota          camry solara 3.0 1999  6   auto(14) f 18
## 192 192         toyota          camry solara 3.0 1999  6 manual(m5) f 18
## 193 193         toyota          camry solara 3.3 2008  6   auto(s5) f 18
## 194 194         toyota               corolla 1.8 1999  4   auto(13) f 24
## 195 195         toyota               corolla 1.8 1999  4   auto(14) f 24
## 196 196         toyota               corolla 1.8 1999  4 manual(m5) f 26
## 197 197         toyota               corolla 1.8 2008  4 manual(m5) f 28
## 198 198         toyota               corolla 1.8 2008  4   auto(14) f 26
## 199 199         toyota land cruiser wagon 4wd 4.7 1999  8   auto(14) 4 11
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## 200 200            toyota land cruiser wagon 4wd  5.7 2008  8   auto(s6)  4 13
## 201 201        toyota      toyota tacoma 4wd  2.7 1999  4 manual(m5)  4 15
## 202 202        toyota      toyota tacoma 4wd  2.7 1999  4   auto(14)  4 16
## 203 203        toyota      toyota tacoma 4wd  2.7 2008  4 manual(m5)  4 17
## 204 204        toyota      toyota tacoma 4wd  3.4 1999  6 manual(m5)  4 15
## 205 205        toyota      toyota tacoma 4wd  3.4 1999  6   auto(14)  4 15
## 206 206        toyota      toyota tacoma 4wd  4.0 2008  6 manual(m6)  4 15
## 207 207        toyota      toyota tacoma 4wd  4.0 2008  6   auto(15)  4 16
## 208 208 volkswagen                     gti  2.0 1999  4 manual(m5)  f 21
## 209 209 volkswagen                     gti  2.0 1999  4   auto(14)  f 19
## 210 210 volkswagen                     gti  2.0 2008  4 manual(m6)  f 21
## 211 211 volkswagen                     gti  2.0 2008  4   auto(s6)  f 22
## 212 212 volkswagen                     gti  2.8 1999  6 manual(m5)  f 17
## 213 213 volkswagen                   jetta  1.9 1999  4 manual(m5)  f 33
## 214 214 volkswagen                   jetta  2.0 1999  4 manual(m5)  f 21
## 215 215 volkswagen                   jetta  2.0 1999  4   auto(14)  f 19
## 216 216 volkswagen                   jetta  2.0 2008  4   auto(s6)  f 22
## 217 217 volkswagen                   jetta  2.0 2008  4 manual(m6)  f 21
## 218 218 volkswagen                   jetta  2.5 2008  5   auto(s6)  f 21
## 219 219 volkswagen                   jetta  2.5 2008  5 manual(m5)  f 21
## 220 220 volkswagen                   jetta  2.8 1999  6   auto(14)  f 16
## 221 221 volkswagen                   jetta  2.8 1999  6 manual(m5)  f 17
## 222 222 volkswagen              new beetle  1.9 1999  4 manual(m5)  f 35
## 223 223 volkswagen              new beetle  1.9 1999  4   auto(14)  f 29
## 224 224 volkswagen              new beetle  2.0 1999  4 manual(m5)  f 21
## 225 225 volkswagen              new beetle  2.0 1999  4   auto(14)  f 19
## 226 226 volkswagen              new beetle  2.5 2008  5 manual(m5)  f 20
## 227 227 volkswagen              new beetle  2.5 2008  5   auto(s6)  f 20
## 228 228 volkswagen                  passat  1.8 1999  4 manual(m5)  f 21
## 229 229 volkswagen                  passat  1.8 1999  4   auto(15)  f 18
## 230 230 volkswagen                  passat  2.0 2008  4   auto(s6)  f 19
## 231 231 volkswagen                  passat  2.0 2008  4 manual(m6)  f 21
## 232 232 volkswagen                  passat  2.8 1999  6   auto(15)  f 16
## 233 233 volkswagen                  passat  2.8 1999  6 manual(m5)  f 18
## 234 234 volkswagen                  passat  3.6 2008  6   auto(s6)  f 17
##     hwy fl    class
## 1    29  p  compact
## 2    29  p  compact
## 3    31  p  compact
## 4    30  p  compact
## 5    26  p  compact
## 6    26  p  compact
## 7    27  p  compact
## 8    26  p  compact
## 9    25  p  compact
## 10   28  p  compact
## 11   27  p  compact
## 12   25  p  compact
## 13   25  p  compact
## 14   25  p  compact
## 15   25  p  compact
## 16   24  p  midsize
## 17   25  p  midsize
## 18   23  p  midsize
```

```
## 19   20   r      suv
## 20   15   e      suv
## 21   20   r      suv
## 22   17   r      suv
## 23   17   r      suv
## 24   26   p   2seater
## 25   23   p   2seater
## 26   26   p   2seater
## 27   25   p   2seater
## 28   24   p   2seater
## 29   19   r      suv
## 30   14   e      suv
## 31   15   r      suv
## 32   17   d      suv
## 33   27   r   midsize
## 34   30   r   midsize
## 35   26   r   midsize
## 36   29   r   midsize
## 37   26   r   midsize
## 38   24   r   minivan
## 39   24   r   minivan
## 40   22   r   minivan
## 41   22   r   minivan
## 42   24   r   minivan
## 43   24   r   minivan
## 44   17   e   minivan
## 45   22   r   minivan
## 46   21   r   minivan
## 47   23   r   minivan
## 48   23   r   minivan
## 49   19   r    pickup
## 50   18   r    pickup
## 51   17   r    pickup
## 52   17   r    pickup
## 53   19   r    pickup
## 54   19   r    pickup
## 55   12   e    pickup
## 56   17   r    pickup
## 57   15   r    pickup
## 58   17   r      suv
## 59   17   r      suv
## 60   12   e      suv
## 61   17   r      suv
## 62   16   r      suv
## 63   18   r      suv
## 64   15   r      suv
## 65   16   r    pickup
## 66   12   e    pickup
## 67   17   r    pickup
## 68   17   r    pickup
## 69   16   r    pickup
## 70   12   e    pickup
## 71   15   r    pickup
## 72   16   r    pickup
```

```
## 73    17   r     pickup
## 74    15   r     pickup
## 75    17   r        suv
## 76    17   r        suv
## 77    18   r        suv
## 78    17   r        suv
## 79    19   r        suv
## 80    17   r        suv
## 81    19   r        suv
## 82    19   r        suv
## 83    17   r        suv
## 84    17   r     pickup
## 85    17   r     pickup
## 86    16   r     pickup
## 87    16   r     pickup
## 88    17   r     pickup
## 89    15   r     pickup
## 90    17   r     pickup
## 91    26   r subcompact
## 92    25   r subcompact
## 93    26   r subcompact
## 94    24   r subcompact
## 95    21   r subcompact
## 96    22   r subcompact
## 97    23   r subcompact
## 98    22   r subcompact
## 99    20   p subcompact
## 100   33   r subcompact
## 101   32   r subcompact
## 102   32   r subcompact
## 103   29   p subcompact
## 104   32   r subcompact
## 105   34   r subcompact
## 106   36   r subcompact
## 107   36   c subcompact
## 108   29   p subcompact
## 109   26   r    midsize
## 110   27   r    midsize
## 111   30   r    midsize
## 112   31   r    midsize
## 113   26   r    midsize
## 114   26   r    midsize
## 115   28   r    midsize
## 116   26   r subcompact
## 117   29   r subcompact
## 118   28   r subcompact
## 119   27   r subcompact
## 120   24   r subcompact
## 121   24   r subcompact
## 122   24   r subcompact
## 123   22   d        suv
## 124   19   r        suv
## 125   20   r        suv
## 126   17   r        suv
```

```
## 127 12 e          suv
## 128 19 r          suv
## 129 18 r          suv
## 130 14 p          suv
## 131 15 p          suv
## 132 18 r          suv
## 133 18 r          suv
## 134 15 p          suv
## 135 17 r          suv
## 136 16 p          suv
## 137 18 r          suv
## 138 17 r          suv
## 139 19 r          suv
## 140 19 r          suv
## 141 17 r          suv
## 142 29 r      compact
## 143 27 r      compact
## 144 31 r      midsize
## 145 32 r      midsize
## 146 27 p      midsize
## 147 26 p      midsize
## 148 26 r      midsize
## 149 25 r      midsize
## 150 25 p      midsize
## 151 17 r          suv
## 152 17 r          suv
## 153 20 p          suv
## 154 18 p          suv
## 155 26 r      midsize
## 156 26 p      midsize
## 157 27 r      midsize
## 158 28 r      midsize
## 159 25 p      midsize
## 160 25 r          suv
## 161 24 r          suv
## 162 27 r          suv
## 163 25 p          suv
## 164 26 r          suv
## 165 23 p          suv
## 166 26 r subcompact
## 167 26 r subcompact
## 168 26 r subcompact
## 169 26 r subcompact
## 170 25 p      compact
## 171 27 r      compact
## 172 25 p      compact
## 173 27 r      compact
## 174 20 r          suv
## 175 20 r          suv
## 176 19 r          suv
## 177 17 r          suv
## 178 20 r          suv
## 179 17 r          suv
## 180 29 r      midsize
```

```
## 181 27  r    midsize
## 182 31  r    midsize
## 183 31  r    midsize
## 184 26  r    midsize
## 185 26  r    midsize
## 186 28  r    midsize
## 187 27  r    compact
## 188 29  r    compact
## 189 31  r    compact
## 190 31  r    compact
## 191 26  r    compact
## 192 26  r    compact
## 193 27  r    compact
## 194 30  r    compact
## 195 33  r    compact
## 196 35  r    compact
## 197 37  r    compact
## 198 35  r    compact
## 199 15  r       suv
## 200 18  r       suv
## 201 20  r    pickup
## 202 20  r    pickup
## 203 22  r    pickup
## 204 17  r    pickup
## 205 19  r    pickup
## 206 18  r    pickup
## 207 20  r    pickup
## 208 29  r    compact
## 209 26  r    compact
## 210 29  p    compact
## 211 29  p    compact
## 212 24  r    compact
## 213 44  d    compact
## 214 29  r    compact
## 215 26  r    compact
## 216 29  p    compact
## 217 29  p    compact
## 218 29  r    compact
## 219 29  r    compact
## 220 23  r    compact
## 221 24  r    compact
## 222 44  d subcompact
## 223 41  d subcompact
## 224 29  r subcompact
## 225 26  r subcompact
## 226 28  r subcompact
## 227 29  r subcompact
## 228 29  p    midsize
## 229 29  p    midsize
## 230 28  p    midsize
## 231 29  p    midsize
## 232 26  p    midsize
## 233 26  p    midsize
## 234 26  p    midsize
```

```r
#install.packages(ggplot2)
library(ggplot2)
data(mpg)
str(mpg)
```

```
## tibble [234 x 11] (S3: tbl_df/tbl/data.frame)
##  $ manufacturer: chr [1:234] "audi" "audi" "audi" "audi" ...
##  $ model       : chr [1:234] "a4" "a4" "a4" "a4" ...
##  $ displ       : num [1:234] 1.8 1.8 2 2 2.8 2.8 3.1 1.8 1.8 2 ...
##  $ year        : int [1:234] 1999 1999 2008 2008 1999 1999 2008 1999 1999 2008 ...
##  $ cyl         : int [1:234] 4 4 4 4 6 6 6 4 4 4 ...
##  $ trans       : chr [1:234] "auto(l5)" "manual(m5)" "manual(m6)" "auto(av)" ...
##  $ drv         : chr [1:234] "f" "f" "f" "f" ...
##  $ cty         : int [1:234] 18 21 20 21 16 18 18 18 16 20 ...
##  $ hwy         : int [1:234] 29 29 31 30 26 26 27 26 25 28 ...
##  $ fl          : chr [1:234] "p" "p" "p" "p" ...
##  $ class       : chr [1:234] "compact" "compact" "compact" "compact" ...
```

```r
#"manufacturer", "model", "trans", "drv", "fl", "class"
```

```r
#"displ," "year," "cyl," "cty,", "hwy"
```

#2.

```r
manu_Models <- names(sort(table(mpg$manufacturer), decreasing = TRUE))[1]
manu_Models
```

```
## [1] "dodge"
```

```r
model_variations <- names(sort(table(mpg$model), decreasing = TRUE))[1]
model_variations
```

```
## [1] "caravan 2wd"
```

```r
cat("Manufacturer with the most models:", manu_Models, "\n")
```

```
## Manufacturer with the most models: dodge
```

```r
cat("Model with the most variations:", model_variations, "\n")
```

```
## Model with the most variations: caravan 2wd
```

```r
data("mpg")
manu_modelCount<-table(mpg$manufacturer, mpg$model)
manu_modelCount
```

```
## 
##                4runner 4wd a4 a4 quattro a6 quattro altima c1500 suburban 2wd
##    audi              0   7  8          8          3      0                   0
##    chevrolet         0   0  0          0          0      0                   5
##    dodge             0   0  0          0          0      0                   0
##    ford              0   0  0          0          0      0                   0
##    honda             0   0  0          0          0      0                   0
##    hyundai           0   0  0          0          0      0                   0
##    jeep              0   0  0          0          0      0                   0
##    land rover        0   0  0          0          0      0                   0
##    lincoln           0   0  0          0          0      0                   0
##    mercury           0   0  0          0          0      0                   0
##    nissan            0   0  0          0          0      6                   0
```

```
##    pontiac                0 0          0          0       0                 0
##    subaru                 0 0          0          0       0                 0
##    toyota                 6 0          0          0       0                 0
##    volkswagen             0 0          0          0       0                 0
##
##               camry camry solara caravan 2wd civic corolla corvette
##    audi            0            0           0     0       0        0
##    chevrolet       0            0           0     0       0        5
##    dodge           0            0          11     0       0        0
##    ford            0            0           0     0       0        0
##    honda           0            0           0     9       0        0
##    hyundai         0            0           0     0       0        0
##    jeep            0            0           0     0       0        0
##    land rover      0            0           0     0       0        0
##    lincoln         0            0           0     0       0        0
##    mercury         0            0           0     0       0        0
##    nissan          0            0           0     0       0        0
##    pontiac         0            0           0     0       0        0
##    subaru          0            0           0     0       0        0
##    toyota          7            7           0     0       5        0
##    volkswagen      0            0           0     0       0        0
##
##               dakota pickup 4wd durango 4wd expedition 2wd explorer 4wd
##    audi                     0           0              0            0
##    chevrolet                0           0              0            0
##    dodge                    9           7              0            0
##    ford                     0           0              3            6
##    honda                    0           0              0            0
##    hyundai                  0           0              0            0
##    jeep                     0           0              0            0
##    land rover               0           0              0            0
##    lincoln                  0           0              0            0
##    mercury                  0           0              0            0
##    nissan                   0           0              0            0
##    pontiac                  0           0              0            0
##    subaru                   0           0              0            0
##    toyota                   0           0              0            0
##    volkswagen               0           0              0            0
##
##               f150 pickup 4wd forester awd grand cherokee 4wd grand prix gti
##    audi                   0            0                  0          0   0
##    chevrolet              0            0                  0          0   0
##    dodge                  0            0                  0          0   0
##    ford                   7            0                  0          0   0
##    honda                  0            0                  0          0   0
##    hyundai                0            0                  0          0   0
##    jeep                   0            0                  8          0   0
##    land rover             0            0                  0          0   0
##    lincoln                0            0                  0          0   0
##    mercury                0            0                  0          0   0
##    nissan                 0            0                  0          0   0
##    pontiac                0            0                  0          5   0
##    subaru                 0            6                  0          0   0
##    toyota                 0            0                  0          0   0
```

```
## volkswagen                 0           0                   0          0   5
## 
##              impreza awd jetta k1500 tahoe 4wd land cruiser wagon 4wd malibu
## audi                   0     0            0                        0      0
## chevrolet              0     0            4                        0      5
## dodge                  0     0            0                        0      0
## ford                   0     0            0                        0      0
## honda                  0     0            0                        0      0
## hyundai                0     0            0                        0      0
## jeep                   0     0            0                        0      0
## land rover             0     0            0                        0      0
## lincoln                0     0            0                        0      0
## mercury                0     0            0                        0      0
## nissan                 0     0            0                        0      0
## pontiac                0     0            0                        0      0
## subaru                 8     0            0                        0      0
## toyota                 0     0            0                        2      0
## volkswagen             0     9            0                        0      0
## 
##            maxima mountaineer 4wd mustang navigator 2wd new beetle passat
## audi            0               0       0              0          0      0
## chevrolet       0               0       0              0          0      0
## dodge           0               0       0              0          0      0
## ford            0               0       9              0          0      0
## honda           0               0       0              0          0      0
## hyundai         0               0       0              0          0      0
## jeep            0               0       0              0          0      0
## land rover      0               0       0              0          0      0
## lincoln         0               0       0              3          0      0
## mercury         0               4       0              0          0      0
## nissan          3               0       0              0          0      0
## pontiac         0               0       0              0          0      0
## subaru          0               0       0              0          0      0
## toyota          0               0       0              0          0      0
## volkswagen      0               0       0              0          6      7
## 
##            pathfinder 4wd ram 1500 pickup 4wd range rover sonata tiburon
## audi                    0                0            0      0       0
## chevrolet               0                0            0      0       0
## dodge                   0               10            0      0       0
## ford                    0                0            0      0       0
## honda                   0                0            0      0       0
## hyundai                 0                0            0      7       7
## jeep                    0                0            0      0       0
## land rover              0                0            4      0       0
## lincoln                 0                0            0      0       0
## mercury                 0                0            0      0       0
## nissan                  4                0            0      0       0
## pontiac                 0                0            0      0       0
## subaru                  0                0            0      0       0
## toyota                  0                0            0      0       0
## volkswagen              0                0            0      0       0
## 
##            toyota tacoma 4wd
```

```
##   audi                   0
##   chevrolet              0
##   dodge                  0
##   ford                   0
##   honda                  0
##   hyundai                0
##   jeep                   0
##   land rover             0
##   lincoln                0
##   mercury                0
##   nissan                 0
##   pontiac                0
##   subaru                 0
##   toyota                 7
##   volkswagen             0
```

```r
manuUniq.model<-sapply(rownames(manu_modelCount), function(manufacturer) {
  uniqModels <- names(which(manu_modelCount[manufacturer,] > 0))
  return(data.frame(manufacturer = manufacturer, uniqModels = length(uniqModels)))
})
manuUniq.model
```

```
##              audi    chevrolet   dodge    ford    honda    hyundai    jeep
## manufacturer "audi"  "chevrolet" "dodge"  "ford"  "honda"  "hyundai"  "jeep"
## uniqModels   3       4           4        4       1        2          1
##              land rover    lincoln    mercury    nissan    pontiac    subaru
## manufacturer "land rover"  "lincoln"  "mercury"  "nissan"  "pontiac"  "subaru"
## uniqModels   1             1          1          3         1          2
##              toyota    volkswagen
## manufacturer "toyota"  "volkswagen"
## uniqModels   6         4
```

```r
data("mpg")
manu_modelCount<- table(mpg$manufacturer, mpg$model)
manuUniq.model<-sapply(rownames(manu_modelCount), function(manufacturer) {
  uniqModels <- names(which(manu_modelCount[manufacturer,] > 0))
  return( length(uniqModels))
})
manuUniq.model
```

```
##       audi   chevrolet     dodge      ford     honda     hyundai       jeep
##          3           4         4         4         1           2          1
## land rover     lincoln   mercury    nissan   pontiac      subaru     toyota
##          1           1         1         3         1           2          6
## volkswagen
##          4
```

```r
outputDF<- data.frame(manufacturer = names(manuUniq.model), uniqModels = manuUniq.model)
outputDF
```

```
##             manufacturer uniqModels
## audi                audi          3
## chevrolet      chevrolet          4
## dodge              dodge          4
## ford                ford          4
## honda              honda          1
```

```
## hyundai       hyundai        2
## jeep             jeep        1
## land rover   land rover      1
## lincoln       lincoln        1
## mercury       mercury        1
## nissan         nissan        3
## pontiac       pontiac        1
## subaru         subaru        2
## toyota         toyota        6
## volkswagen   volkswagen      4
```

```r
barplot(outputDF$uniqModels,
        names.arg = outputDF$manufacturer,
        col = "maroon",
        xlab = "Manufacturer",
        ylab = "Number of Unique Models",
        main = "Number of Unique Models by Manufacturer",
        cex.names = 0.8)
```

Number of Unique Models by Manufacturer
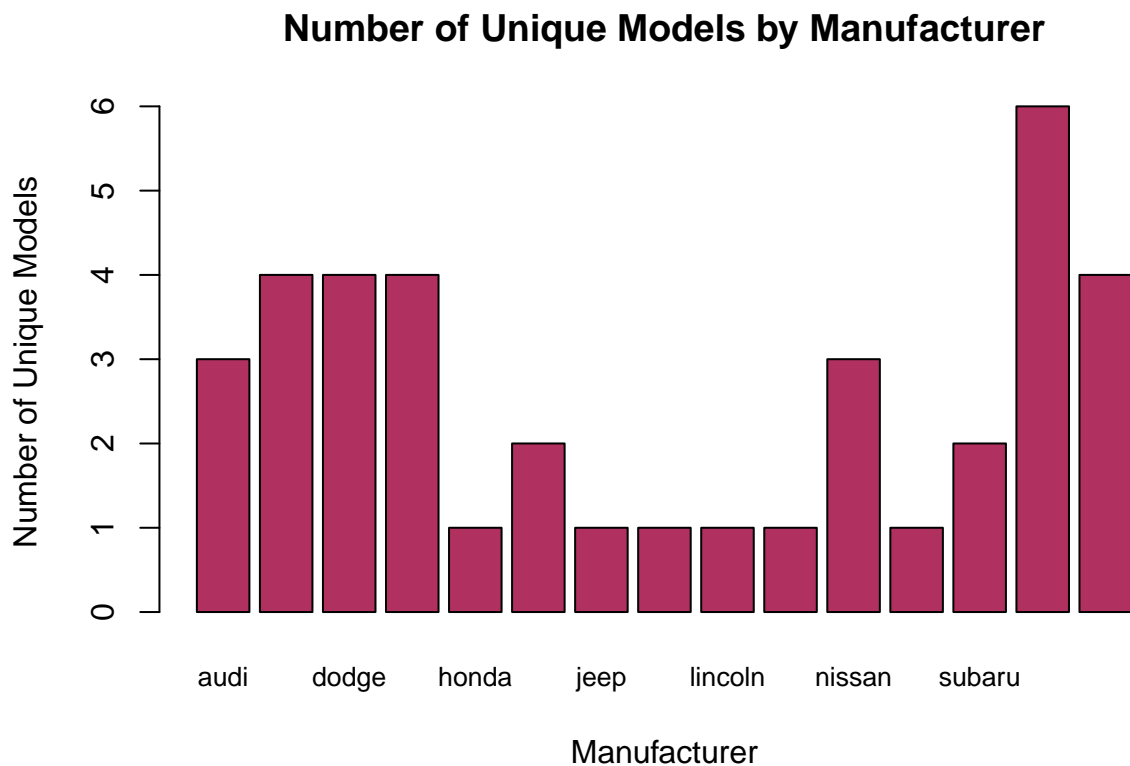

```r
data("mpg")

manu_modelCount<- table(mpg$manufacturer, mpg$model)
manuUniq.models <- sapply(rownames(manu_modelCount), function(manufacturer) {
  uniqModels <- names(which(manu_modelCount[manufacturer, ] > 0))
  return(length(uniqModels))
})
outputDF<- data.frame(manufacturer = names(manuUniq.model), uniqModels = manuUniq.model)
ggplot(data = outputDF, aes(x = manufacturer, y = uniqModels))+geom_bar(stat = "identity", fill = "pink
  labs(x = "Manufacturer", y = "Number of Unique Models",
       title = "Number of Unique Models by Manufacturer") +
```

```
theme_minimal() +
theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Number of Unique Models by Manufacturer
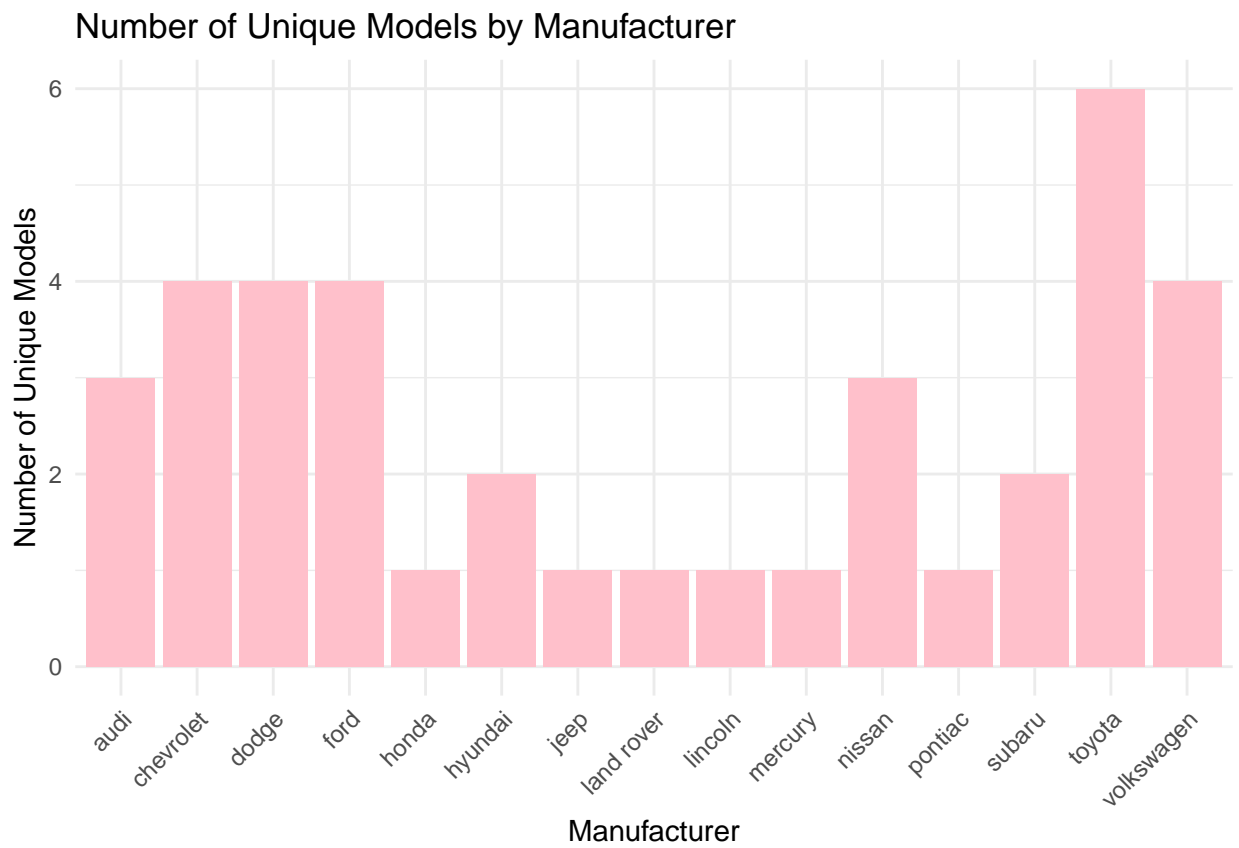

```
ggplot(mpg, aes(model, manufacturer)) + geom_point()
```

```
#the code uses ggplot2 in R to create a scatterplot with the x-axis displaying car models and the y-axi

#by adding a little bit of color you can make it more informative and much clearer.
ggplot(mpg, aes(model, manufacturer, color = class)) + geom_point()
```
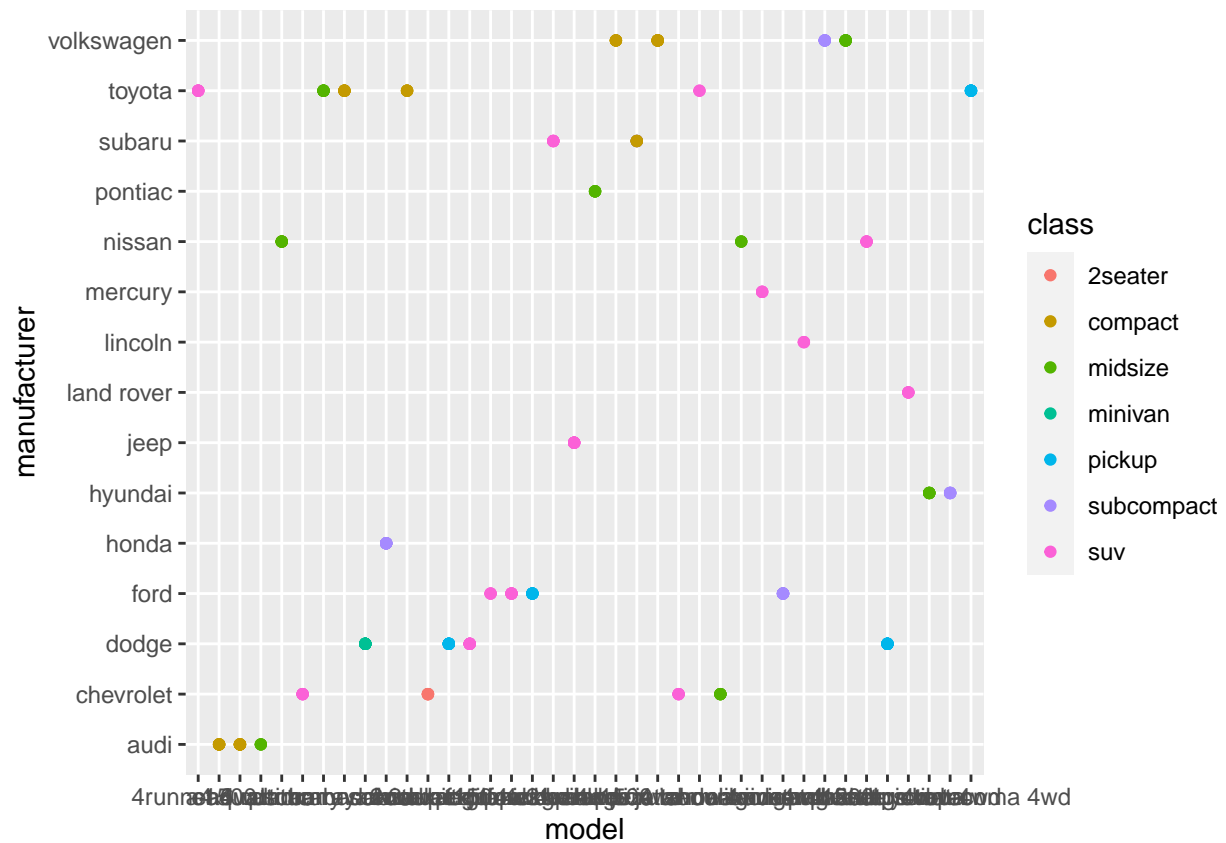
```
data("mpg")

top20 <- head(mpg, 20)

ggplot(top20, aes(x = model, y = year)) +
  geom_point() +
  labs(x = "Car Model", y = "Year", title = "Top 20 Observations: Model vs. Year") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Top 20 Observations: Model vs. Year
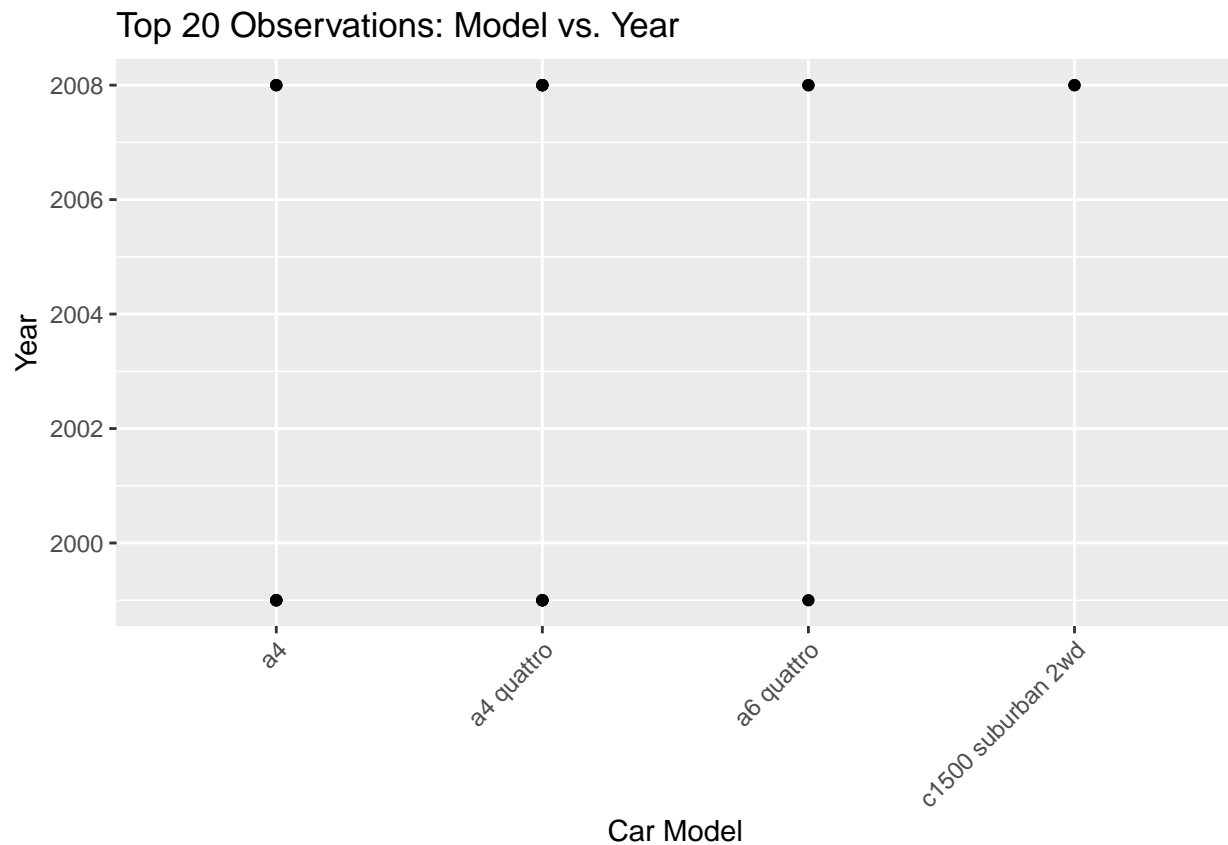

```r
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
data("mpg")

carsPermodel <- mpg %>%
  group_by(model) %>%
  summarize(numberOfcars = n())

print(carsPermodel)
```

```
## # A tibble: 38 x 2
##    model           numberOfcars
##    <chr>                  <int>
##  1 4runner 4wd                6
##  2 a4                        7
##  3 a4 quattro                8
##  4 a6 quattro                3
##  5 altima                    6
```

```
##  6 c1500 suburban 2wd          5
##  7 camry                       7
##  8 camry solara                7
##  9 caravan 2wd                11
## 10 civic                       9
## # i 28 more rows
```

```r
library(ggplot2)

data(mpg)

top20 <- head(mpg, 20)

ggplot(top20, aes(x = model)) +
  geom_bar(fill = "green", color = "black") +
  labs(
    title = "Top 20 Cars: Number of Observations by Model",
    x = "Car Model",
    y = "Number of Observations"
  ) +
  theme_minimal()
```
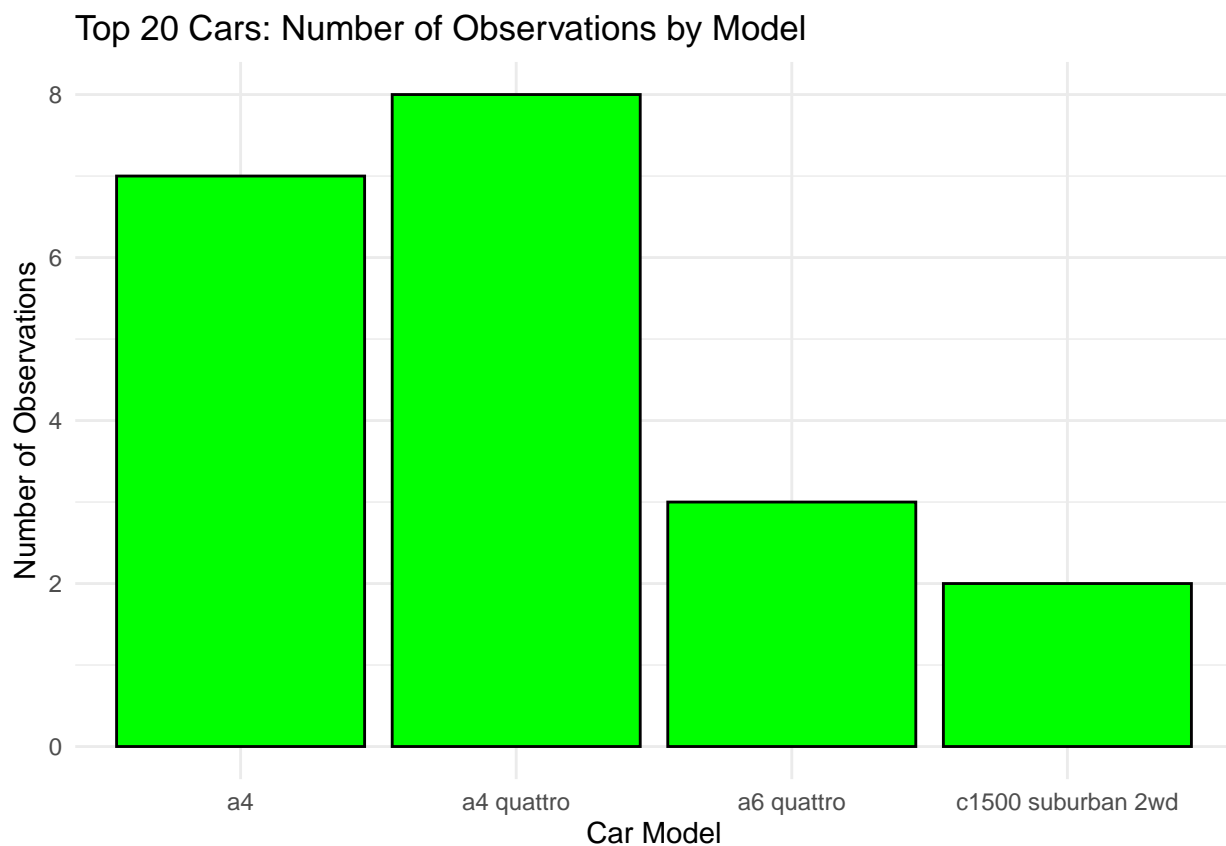

Top 20 Cars: Number of Observations by Model

```r
data(mpg)

top20 <- head(mpg, 20)

ggplot(top20, aes(x = model)) +
  geom_bar(fill = "green", color = "black") +
```

```
  labs(
    title = "Top 20 Cars: Number of Observations by Model",
    x = "Number of Observations",
    y = "Car Model"
  ) +
  theme_minimal() +
  coord_flip()
```

Top 20 Cars: Number of Observations by Model


```
data(mpg)

ggplot(mpg, aes(x = cyl, y = displ, color = displ)) +
  geom_point() +
  labs(
    title = "Relationship between Number of Cylinders and Engine Displacement",
    x = "Number of Cylinders",
    y = "Engine Displacement"
  ) +
  scale_color_continuous(name = "Engine Displacement") +
  theme_minimal()
```

Relationship between Number of Cylinders and Engine Displacement

```r
data(mpg)

ggplot(mpg, aes(x = cyl, y = displ, color = displ)) +
  geom_point() +
  labs(
    title = "Relationship between number of Cylinders and Engine Displacement",
    x = "Number of Cylinders",
    y = "Engine Displacement"
  ) +
  scale_color_continuous(name = "Engine Displacement") +
  theme_minimal()
```
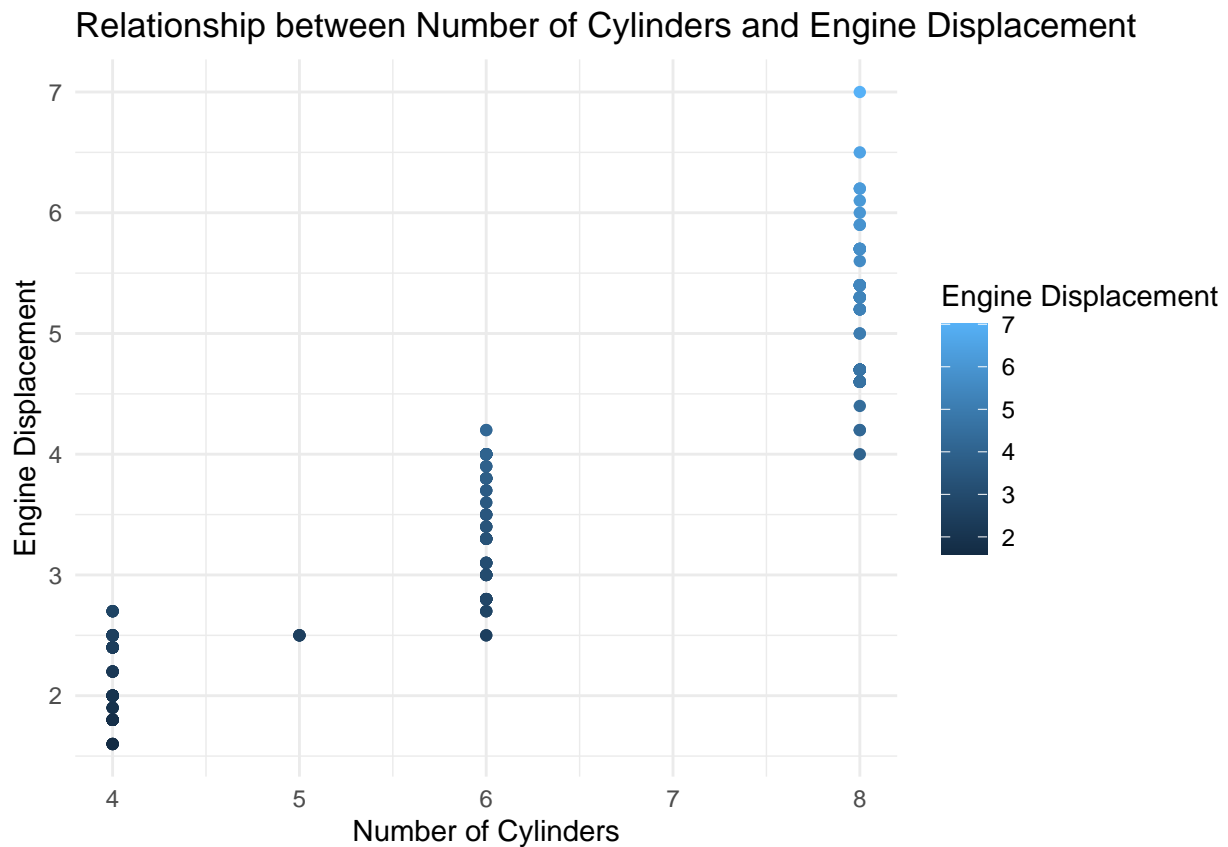
Relationship between number of Cylinders and Engine Displacement


```r
correlation <- cor(mpg$cyl, mpg$displ)
cat("Correlation Coefficient:", correlation, "\n")
```

```
## Correlation Coefficient: 0.9302271
```

```r
data(mpg)

ggplot(mpg, aes(x = displ, y = hwy, color = year)) +
  geom_point() +
  labs(
    title = "Relationship between Engine Displacement and Highway MPG",
    x = "Engine Displacement",
    y = "Highway MPG"
  ) +
  scale_color_continuous(name = "Year") +
  theme_minimal()
```

Relationship between Engine Displacement and Highway MPG

#6
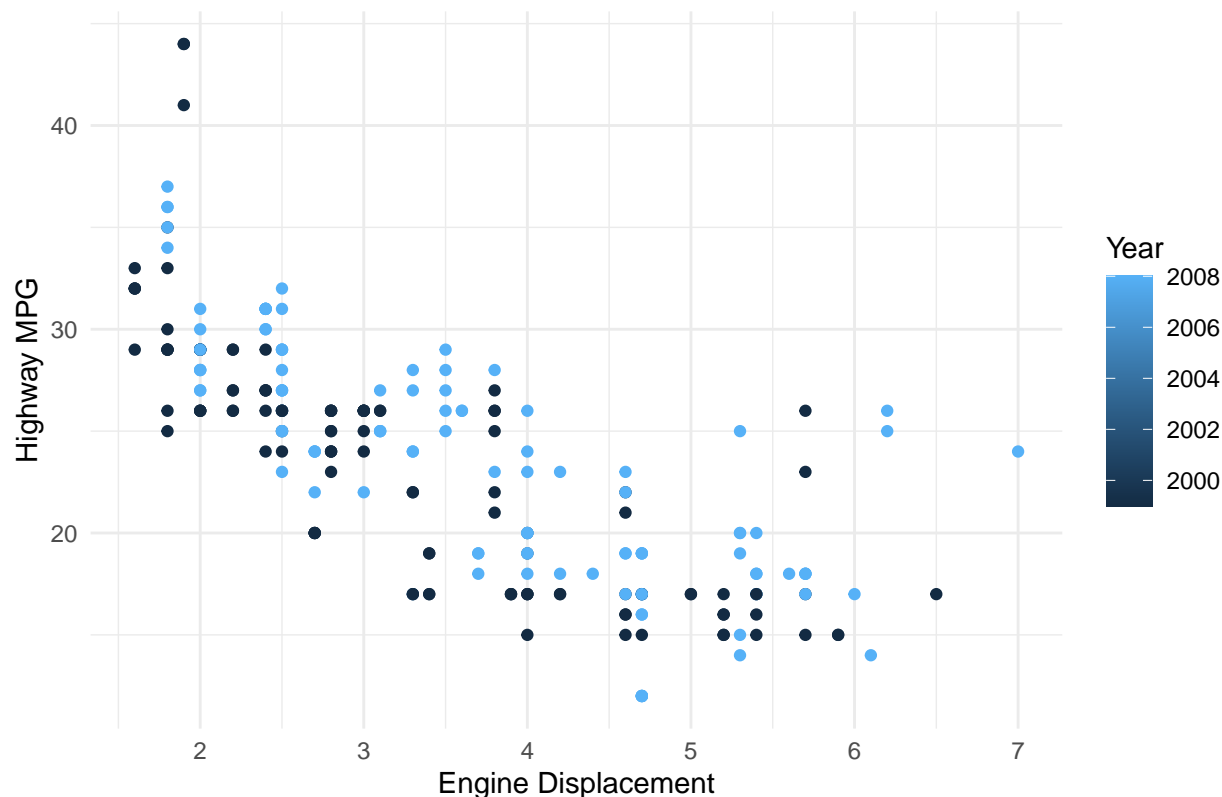
```r
library(readr)
traffic <- read_csv("traffic.csv")
```

```
## Rows: 48120 Columns: 4
## -- Column specification -----------------------------------------------------
## Delimiter: ","
## dbl  (3): Junction, Vehicles, ID
## dttm (1): DateTime
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
traffic
```

```
## # A tibble: 48,120 x 4
##    DateTime            Junction Vehicles          ID
##    <dttm>                 <dbl>    <dbl>       <dbl>
##  1 2015-11-01 00:00:00        1       15 20151101001
##  2 2015-11-01 01:00:00        1       13 20151101011
##  3 2015-11-01 02:00:00        1       10 20151101021
##  4 2015-11-01 03:00:00        1        7 20151101031
##  5 2015-11-01 04:00:00        1        9 20151101041
##  6 2015-11-01 05:00:00        1        6 20151101051
##  7 2015-11-01 06:00:00        1        9 20151101061
##  8 2015-11-01 07:00:00        1        8 20151101071
##  9 2015-11-01 08:00:00        1       11 20151101081
## 10 2015-11-01 09:00:00        1       12 20151101091
```

23

```
## # i 48,110 more rows
```

```
no.observations <- read.csv("traffic.csv")
```

```
nrow(no.observations)
```

```
## [1] 48120
```

```
junction1 <- subset(traffic, Junction ==1)
junction1
```

```
## # A tibble: 14,592 x 4
##     DateTime            Junction Vehicles         ID
##     <dttm>                 <dbl>    <dbl>      <dbl>
##  1 2015-11-01 00:00:00         1       15 20151101001
##  2 2015-11-01 01:00:00         1       13 20151101011
##  3 2015-11-01 02:00:00         1       10 20151101021
##  4 2015-11-01 03:00:00         1        7 20151101031
##  5 2015-11-01 04:00:00         1        9 20151101041
##  6 2015-11-01 05:00:00         1        6 20151101051
##  7 2015-11-01 06:00:00         1        9 20151101061
##  8 2015-11-01 07:00:00         1        8 20151101071
##  9 2015-11-01 08:00:00         1       11 20151101081
## 10 2015-11-01 09:00:00         1       12 20151101091
## # i 14,582 more rows
```

```
junction2 <- subset(traffic, Junction ==2)
junction2
```

```
## # A tibble: 14,592 x 4
##     DateTime            Junction Vehicles         ID
##     <dttm>                 <dbl>    <dbl>      <dbl>
##  1 2015-11-01 00:00:00         2        6 20151101002
##  2 2015-11-01 01:00:00         2        6 20151101012
##  3 2015-11-01 02:00:00         2        5 20151101022
##  4 2015-11-01 03:00:00         2        6 20151101032
##  5 2015-11-01 04:00:00         2        7 20151101042
##  6 2015-11-01 05:00:00         2        2 20151101052
##  7 2015-11-01 06:00:00         2        4 20151101062
##  8 2015-11-01 07:00:00         2        4 20151101072
##  9 2015-11-01 08:00:00         2        3 20151101082
## 10 2015-11-01 09:00:00         2        3 20151101092
## # i 14,582 more rows
```

```
junction3 <- subset(traffic, Junction ==3)
junction3
```

```
## # A tibble: 14,592 x 4
##     DateTime            Junction Vehicles         ID
##     <dttm>                 <dbl>    <dbl>      <dbl>
##  1 2015-11-01 00:00:00         3        9 20151101003
##  2 2015-11-01 01:00:00         3        7 20151101013
##  3 2015-11-01 02:00:00         3        5 20151101023
##  4 2015-11-01 03:00:00         3        1 20151101033
##  5 2015-11-01 04:00:00         3        2 20151101043
##  6 2015-11-01 05:00:00         3        2 20151101053
##  7 2015-11-01 06:00:00         3        3 20151101063
```

```
##  8 2015-11-01 07:00:00          3          4 20151101073
##  9 2015-11-01 08:00:00          3          3 20151101083
## 10 2015-11-01 09:00:00          3          6 20151101093
## # i 14,582 more rows
```

```
junction4 <- subset(traffic, Junction ==4)
junction4
```

```
## # A tibble: 4,344 x 4
##    DateTime            Junction Vehicles         ID
##    <dttm>                 <dbl>    <dbl>      <dbl>
##  1 2017-01-01 00:00:00        4        3 20170101004
##  2 2017-01-01 01:00:00        4        1 20170101014
##  3 2017-01-01 02:00:00        4        4 20170101024
##  4 2017-01-01 03:00:00        4        4 20170101034
##  5 2017-01-01 04:00:00        4        2 20170101044
##  6 2017-01-01 05:00:00        4        1 20170101054
##  7 2017-01-01 06:00:00        4        1 20170101064
##  8 2017-01-01 07:00:00        4        4 20170101074
##  9 2017-01-01 08:00:00        4        4 20170101084
## 10 2017-01-01 09:00:00        4        2 20170101094
## # i 4,334 more rows
```

```r
# Assuming 'traffic' is your dataset
library(ggplot2)

# Plot each junction using geom_line()
ggplot(traffic, aes(x = seq_along(Junction), y = DateTime, group = Junction, color = factor(Junction)))
  geom_line() +
  labs(title = "Plots in each Junction",
       x = "Observation",
       y = "Date&Time") +
  scale_color_discrete(name = "Junction")
```

Plots in each Junction
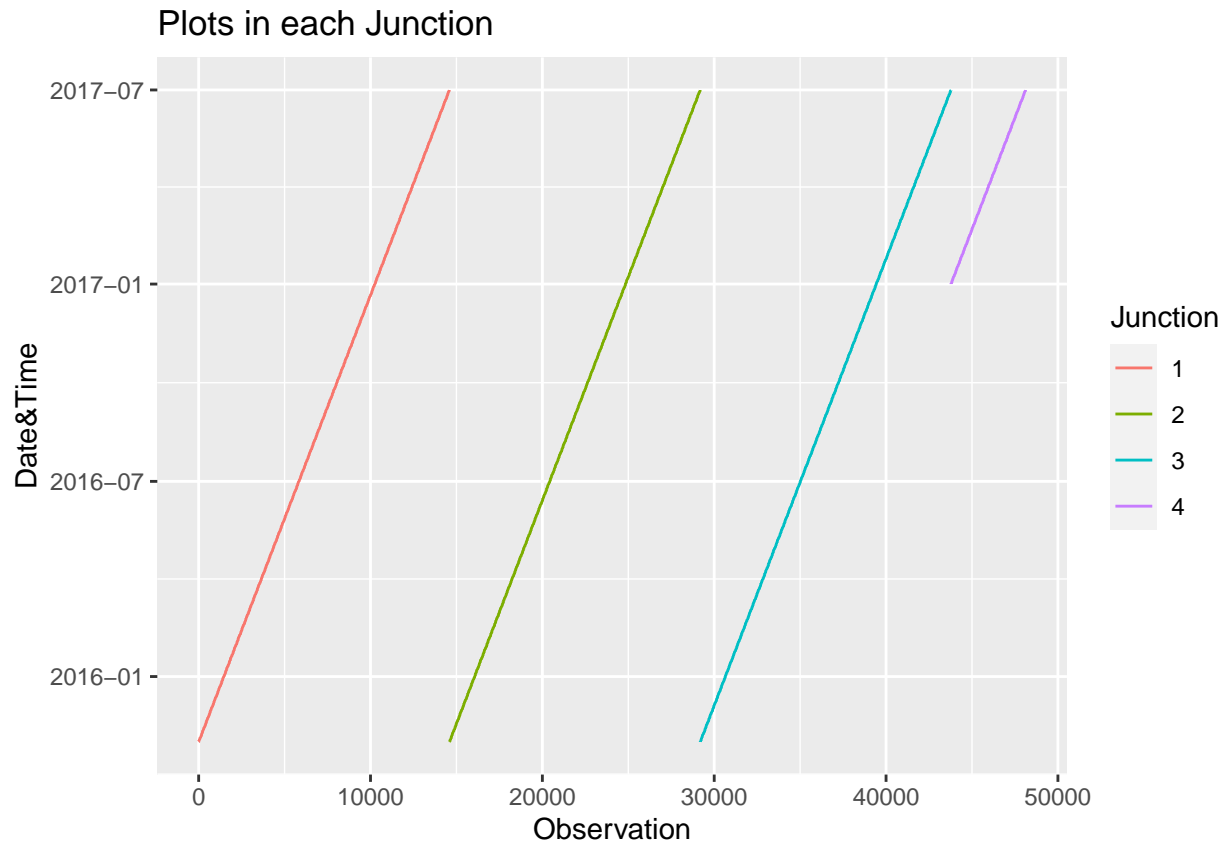

```r
#install.packages("readxl")
library(readxl)
Alexafile <- read_excel("alexa_file.xlsx")
Alexafile
```

```
## # A tibble: 3,150 x 5
##    rating date                variation         verified_reviews    feedback
##     <dbl> <dttm>              <chr>             <chr>                  <dbl>
## 1       5 2018-07-31 00:00:00 Charcoal Fabric   Love my Echo!              1
## 2       5 2018-07-31 00:00:00 Charcoal Fabric   Loved it!                  1
## 3       4 2018-07-31 00:00:00 Walnut Finish     Sometimes while play~      1
## 4       5 2018-07-31 00:00:00 Charcoal Fabric   I have had a lot of ~      1
## 5       5 2018-07-31 00:00:00 Charcoal Fabric   Music                      1
## 6       5 2018-07-31 00:00:00 Heather Gray Fabric I received the echo ~    1
## 7       3 2018-07-31 00:00:00 Sandstone Fabric  Without having a cel~      1
## 8       5 2018-07-31 00:00:00 Charcoal Fabric   I think this is the ~      1
## 9       5 2018-07-30 00:00:00 Heather Gray Fabric looks great              1
## 10      5 2018-07-30 00:00:00 Heather Gray Fabric Love it! I've listen~    1
## # i 3,140 more rows
```

```r
num_rows <- nrow(Alexafile)
num_columns <- ncol(Alexafile)
num_rows
```

```
## [1] 3150
```

```r
num_columns
```

```
## [1] 5
```

```r
library(dplyr)

output <- Alexafile %>%
  group_by(variation) %>%
  summarize(total_count = n())

print(output)
```

```
## # A tibble: 16 x 2
##    variation                 total_count
##    <chr>                           <int>
##  1 Black                             261
##  2 Black   Dot                       516
##  3 Black   Plus                      270
##  4 Black   Show                      265
##  5 Black   Spot                      241
##  6 Charcoal Fabric                   430
##  7 Configuration: Fire TV Stick      350
##  8 Heather Gray Fabric               157
##  9 Oak Finish                         14
## 10 Sandstone Fabric                   90
## 11 Walnut Finish                       9
## 12 White                              91
## 13 White   Dot                       184
## 14 White   Plus                       78
## 15 White   Show                       85
## 16 White   Spot                      109
```

```r
library(ggplot2)

ggplot(Alexafile, aes(x = variation)) +
  geom_bar() +
  labs(title = "Distribution of Variations", x = "Variation", y = "Count") +
  theme_minimal()
```

Distribution of Variations
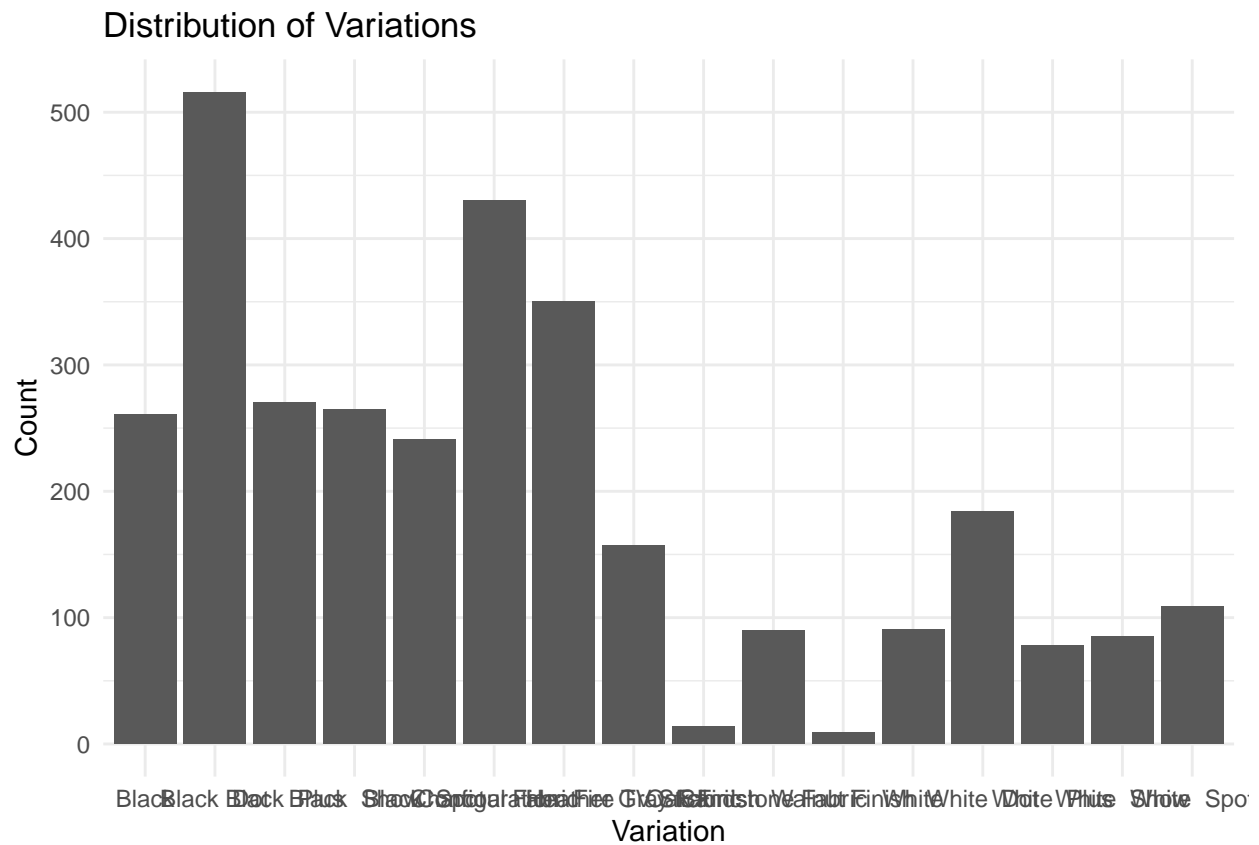

```r
library(ggplot2)

Alexafile$date <- as.Date(Alexafile$date)

ggplot(Alexafile, aes(x = date, y= rating)) +
  geom_line(color= "darkseagreen") +
  labs (title = "Date and the number of verified reviews",
        x = "Date",
        y = "Rating")
```

Date and the number of verified reviews
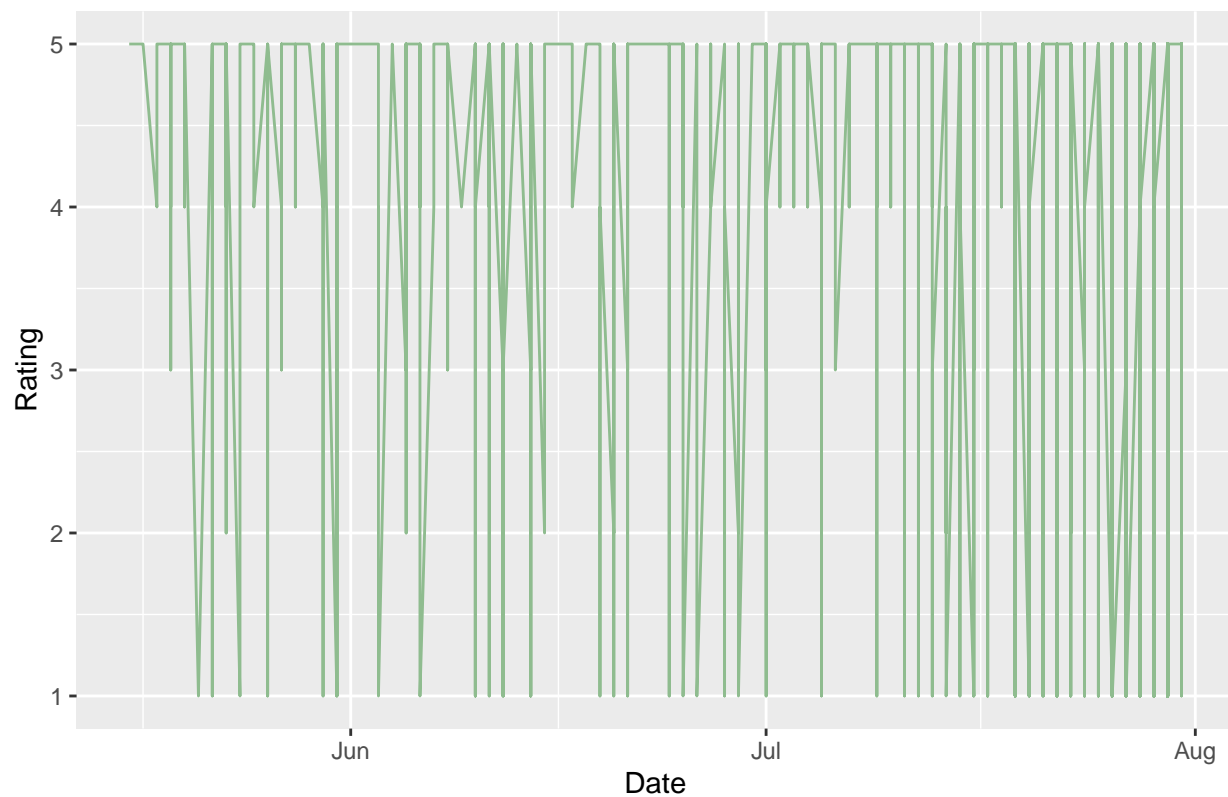

```
theme_minimal()
```

```
## List of 97
##  $ line                      :List of 6
##   ..$ colour       : chr "black"
##   ..$ linewidth    : num 0.5
##   ..$ linetype     : num 1
##   ..$ lineend      : chr "butt"
##   ..$ arrow        : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_line" "element"
##  $ rect                      :List of 5
##   ..$ fill         : chr "white"
##   ..$ colour       : chr "black"
##   ..$ linewidth    : num 0.5
##   ..$ linetype     : num 1
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_rect" "element"
##  $ text                      :List of 11
##   ..$ family       : chr ""
##   ..$ face         : chr "plain"
##   ..$ colour       : chr "black"
##   ..$ size         : num 11
##   ..$ hjust        : num 0.5
##   ..$ vjust        : num 0.5
##   ..$ angle        : num 0
##   ..$ lineheight   : num 0.9
```

```
##    ..$ margin        : 'margin' num [1:4] 0points 0points 0points 0points
##    .. ..- attr(*, "unit")= int 8
##    ..$ debug         : logi FALSE
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ title                 : NULL
##  $ aspect.ratio          : NULL
##  $ axis.title            : NULL
##  $ axis.title.x          :List of 11
##    ..$ family      : NULL
##    ..$ face        : NULL
##    ..$ colour      : NULL
##    ..$ size        : NULL
##    ..$ hjust       : NULL
##    ..$ vjust       : num 1
##    ..$ angle       : NULL
##    ..$ lineheight  : NULL
##    ..$ margin      : 'margin' num [1:4] 2.75points 0points 0points 0points
##    .. ..- attr(*, "unit")= int 8
##    ..$ debug       : NULL
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.title.x.top      :List of 11
##    ..$ family      : NULL
##    ..$ face        : NULL
##    ..$ colour      : NULL
##    ..$ size        : NULL
##    ..$ hjust       : NULL
##    ..$ vjust       : num 0
##    ..$ angle       : NULL
##    ..$ lineheight  : NULL
##    ..$ margin      : 'margin' num [1:4] 0points 0points 2.75points 0points
##    .. ..- attr(*, "unit")= int 8
##    ..$ debug       : NULL
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.title.x.bottom   : NULL
##  $ axis.title.y          :List of 11
##    ..$ family      : NULL
##    ..$ face        : NULL
##    ..$ colour      : NULL
##    ..$ size        : NULL
##    ..$ hjust       : NULL
##    ..$ vjust       : num 1
##    ..$ angle       : num 90
##    ..$ lineheight  : NULL
##    ..$ margin      : 'margin' num [1:4] 0points 2.75points 0points 0points
##    .. ..- attr(*, "unit")= int 8
##    ..$ debug       : NULL
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.title.y.left     : NULL
##  $ axis.title.y.right    :List of 11
##    ..$ family      : NULL
```

```
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size        : NULL
##   ..$ hjust       : NULL
##   ..$ vjust       : num 0
##   ..$ angle       : num -90
##   ..$ lineheight  : NULL
##   ..$ margin      : 'margin' num [1:4] 0points 0points 0points 2.75points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug       : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text               :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : chr "grey30"
##   ..$ size        : 'rel' num 0.8
##   ..$ hjust       : NULL
##   ..$ vjust       : NULL
##   ..$ angle       : NULL
##   ..$ lineheight  : NULL
##   ..$ margin      : NULL
##   ..$ debug       : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.x             :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size        : NULL
##   ..$ hjust       : NULL
##   ..$ vjust       : num 1
##   ..$ angle       : NULL
##   ..$ lineheight  : NULL
##   ..$ margin      : 'margin' num [1:4] 2.2points 0points 0points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug       : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.x.top         :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size        : NULL
##   ..$ hjust       : NULL
##   ..$ vjust       : num 0
##   ..$ angle       : NULL
##   ..$ lineheight  : NULL
##   ..$ margin      : 'margin' num [1:4] 0points 0points 2.2points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug       : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.x.bottom      : NULL
```

```
##  $ axis.text.y               :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : num 1
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 2.2points 0points 0points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.text.y.left          : NULL
##  $ axis.text.y.right         :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : num 0
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.2points
##   .. ..- attr(*, "unit")= int 8
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ axis.ticks                : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ axis.ticks.x              : NULL
##  $ axis.ticks.x.top          : NULL
##  $ axis.ticks.x.bottom       : NULL
##  $ axis.ticks.y              : NULL
##  $ axis.ticks.y.left         : NULL
##  $ axis.ticks.y.right        : NULL
##  $ axis.ticks.length         : 'simpleUnit' num 2.75points
##   ..- attr(*, "unit")= int 8
##  $ axis.ticks.length.x       : NULL
##  $ axis.ticks.length.x.top   : NULL
##  $ axis.ticks.length.x.bottom: NULL
##  $ axis.ticks.length.y       : NULL
##  $ axis.ticks.length.y.left  : NULL
##  $ axis.ticks.length.y.right : NULL
##  $ axis.line                 : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ axis.line.x               : NULL
##  $ axis.line.x.top           : NULL
##  $ axis.line.x.bottom        : NULL
##  $ axis.line.y               : NULL
##  $ axis.line.y.left          : NULL
##  $ axis.line.y.right         : NULL
##  $ legend.background         : list()
```

```
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ legend.margin            : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
##   ..- attr(*, "unit")= int 8
## $ legend.spacing           : 'simpleUnit' num 11points
##   ..- attr(*, "unit")= int 8
## $ legend.spacing.x         : NULL
## $ legend.spacing.y         : NULL
## $ legend.key               : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ legend.key.size          : 'simpleUnit' num 1.2lines
##   ..- attr(*, "unit")= int 3
## $ legend.key.height        : NULL
## $ legend.key.width         : NULL
## $ legend.text              :List of 11
##   ..$ family     : NULL
##   ..$ face       : NULL
##   ..$ colour     : NULL
##   ..$ size       : 'rel' num 0.8
##   ..$ hjust      : NULL
##   ..$ vjust      : NULL
##   ..$ angle      : NULL
##   ..$ lineheight : NULL
##   ..$ margin     : NULL
##   ..$ debug      : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ legend.text.align        : NULL
## $ legend.title             :List of 11
##   ..$ family     : NULL
##   ..$ face       : NULL
##   ..$ colour     : NULL
##   ..$ size       : NULL
##   ..$ hjust      : num 0
##   ..$ vjust      : NULL
##   ..$ angle      : NULL
##   ..$ lineheight : NULL
##   ..$ margin     : NULL
##   ..$ debug      : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ legend.title.align       : NULL
## $ legend.position          : chr "right"
## $ legend.direction         : NULL
## $ legend.justification     : chr "center"
## $ legend.box               : NULL
## $ legend.box.just          : NULL
## $ legend.box.margin        : 'margin' num [1:4] 0cm 0cm 0cm 0cm
##   ..- attr(*, "unit")= int 1
## $ legend.box.background     : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ legend.box.spacing       : 'simpleUnit' num 11points
##   ..- attr(*, "unit")= int 8
## $ panel.background          : list()
##   ..- attr(*, "class")= chr [1:2] "element_blank" "element"
```

```
## $ panel.border              : list()
##  ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ panel.spacing             : 'simpleUnit' num 5.5points
##  ..- attr(*, "unit")= int 8
## $ panel.spacing.x          : NULL
## $ panel.spacing.y          : NULL
## $ panel.grid               :List of 6
##  ..$ colour      : chr "grey92"
##  ..$ linewidth   : NULL
##  ..$ linetype    : NULL
##  ..$ lineend     : NULL
##  ..$ arrow       : logi FALSE
##  ..$ inherit.blank: logi TRUE
##  ..- attr(*, "class")= chr [1:2] "element_line" "element"
## $ panel.grid.major        : NULL
## $ panel.grid.minor        :List of 6
##  ..$ colour      : NULL
##  ..$ linewidth   : 'rel' num 0.5
##  ..$ linetype    : NULL
##  ..$ lineend     : NULL
##  ..$ arrow       : logi FALSE
##  ..$ inherit.blank: logi TRUE
##  ..- attr(*, "class")= chr [1:2] "element_line" "element"
## $ panel.grid.major.x      : NULL
## $ panel.grid.major.y      : NULL
## $ panel.grid.minor.x      : NULL
## $ panel.grid.minor.y      : NULL
## $ panel.ontop             : logi FALSE
## $ plot.background         : list()
##  ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ plot.title              :List of 11
##  ..$ family      : NULL
##  ..$ face        : NULL
##  ..$ colour      : NULL
##  ..$ size        : 'rel' num 1.2
##  ..$ hjust       : num 0
##  ..$ vjust       : num 1
##  ..$ angle       : NULL
##  ..$ lineheight  : NULL
##  ..$ margin      : 'margin' num [1:4] 0points 0points 5.5points 0points
##  .. ..- attr(*, "unit")= int 8
##  ..$ debug       : NULL
##  ..$ inherit.blank: logi TRUE
##  ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ plot.title.position     : chr "panel"
## $ plot.subtitle           :List of 11
##  ..$ family      : NULL
##  ..$ face        : NULL
##  ..$ colour      : NULL
##  ..$ size        : NULL
##  ..$ hjust       : num 0
##  ..$ vjust       : num 1
##  ..$ angle       : NULL
##  ..$ lineheight  : NULL
```

```
##    ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
##    .. ..- attr(*, "unit")= int 8
##    ..$ debug        : NULL
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ plot.caption            :List of 11
##    ..$ family       : NULL
##    ..$ face         : NULL
##    ..$ colour       : NULL
##    ..$ size         : 'rel' num 0.8
##    ..$ hjust        : num 1
##    ..$ vjust        : num 1
##    ..$ angle        : NULL
##    ..$ lineheight   : NULL
##    ..$ margin       : 'margin' num [1:4] 5.5points 0points 0points 0points
##    .. ..- attr(*, "unit")= int 8
##    ..$ debug        : NULL
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ plot.caption.position   : chr "panel"
##  $ plot.tag                :List of 11
##    ..$ family       : NULL
##    ..$ face         : NULL
##    ..$ colour       : NULL
##    ..$ size         : 'rel' num 1.2
##    ..$ hjust        : num 0.5
##    ..$ vjust        : num 0.5
##    ..$ angle        : NULL
##    ..$ lineheight   : NULL
##    ..$ margin       : NULL
##    ..$ debug        : NULL
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ plot.tag.position       : chr "topleft"
##  $ plot.margin             : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
##    ..- attr(*, "unit")= int 8
##  $ strip.background        : list()
##    ..- attr(*, "class")= chr [1:2] "element_blank" "element"
##  $ strip.background.x      : NULL
##  $ strip.background.y      : NULL
##  $ strip.clip              : chr "inherit"
##  $ strip.placement         : chr "inside"
##  $ strip.text              :List of 11
##    ..$ family       : NULL
##    ..$ face         : NULL
##    ..$ colour       : chr "grey10"
##    ..$ size         : 'rel' num 0.8
##    ..$ hjust        : NULL
##    ..$ vjust        : NULL
##    ..$ angle        : NULL
##    ..$ lineheight   : NULL
##    ..$ margin       : 'margin' num [1:4] 4.4points 4.4points 4.4points 4.4points
##    .. ..- attr(*, "unit")= int 8
##    ..$ debug        : NULL
```

```
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ strip.text.x             : NULL
##  $ strip.text.x.bottom      : NULL
##  $ strip.text.x.top         : NULL
##  $ strip.text.y             :List of 11
##    ..$ family       : NULL
##    ..$ face         : NULL
##    ..$ colour       : NULL
##    ..$ size         : NULL
##    ..$ hjust        : NULL
##    ..$ vjust        : NULL
##    ..$ angle        : num -90
##    ..$ lineheight   : NULL
##    ..$ margin       : NULL
##    ..$ debug        : NULL
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ strip.text.y.left        :List of 11
##    ..$ family       : NULL
##    ..$ face         : NULL
##    ..$ colour       : NULL
##    ..$ size         : NULL
##    ..$ hjust        : NULL
##    ..$ vjust        : NULL
##    ..$ angle        : num 90
##    ..$ lineheight   : NULL
##    ..$ margin       : NULL
##    ..$ debug        : NULL
##    ..$ inherit.blank: logi TRUE
##    ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ strip.text.y.right       : NULL
##  $ strip.switch.pad.grid    : 'simpleUnit' num 2.75points
##    ..- attr(*, "unit")= int 8
##  $ strip.switch.pad.wrap    : 'simpleUnit' num 2.75points
##    ..- attr(*, "unit")= int 8
##  - attr(*, "class")= chr [1:2] "theme" "gg"
##  - attr(*, "complete")= logi TRUE
##  - attr(*, "validate")= logi TRUE
```

```r
library(ggplot2)

ggplot(Alexafile, aes(x = variation, y = rating, fill = variation)) +
  geom_boxplot() +
  labs(title = "Relationship Between Variations and Ratings",
       x = "Variation",
       y = "Rating") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Relationship Between Variations and Ratings