For our club meeting today we were going to summarize the [Demystifying Data Science](https://www.thisismetis.com/demystifying-data-science) conference but we forgot that the videos are not released yet.

Oops, we'll have to postpone our blog post. We didn't read the fine print that talk recordings will be available sometime next week. Sorry about that!

— LIBD rstats club (@LIBDrstats) [July 27, 2018](https://twitter.com/LIBDrstats/status/1022862435869450240?ref_src=twsrc%5Etfw)

So we adjusted plans and decided to continue our work on the [*UpSetR*](https://cran.r-project.org/package=UpSetR) ([Gehlenborg, 2016](http://github.com/hms-dbmi/UpSetR" \t "_blank)) package by [Nils Gehlenborg](https://twitter.com/ngehlenborg).

Yesterday we discussed various options for visualizing large numbers of overlapping groups. We explored uses of the [#venneuler](https://twitter.com/hashtag/venneuler?src=hash&ref_src=twsrc%5Etfw) package from Lee Wilkinson and Simon Urbanek and the [#UpSetR](https://twitter.com/hashtag/UpSetR?src=hash&ref_src=twsrc%5Etfw) package from Jake Conway, Alexander Lex, and [@ngehlenborg](https://twitter.com/ngehlenborg?ref_src=twsrc%5Etfw). [#rstats](https://twitter.com/hashtag/rstats?src=hash&ref_src=twsrc%5Etfw) [pic.twitter.com/k55YfihmiP](https://t.co/k55YfihmiP)

— LIBD rstats club (@LIBDrstats) [June 16, 2018](https://twitter.com/LIBDrstats/status/1007992479159812101?ref_src=twsrc%5Etfw)

**What you can currently do**

First, let’s install the version we used for this post:

devtools::install\_github('hms-dbmi/UpSetR@fe2812c')

Our ultimate goal is to submit a pull request that enables UpSetR users to specify a color by row for the dots instead of the actual rows. We had already identified an example that we could work with.

library('UpSetR')

movies <- read.csv( system.file("extdata", "movies.csv", package = "UpSetR"),

header=T, sep=";" )

require(ggplot2); require(plyr); require(gridExtra); require(grid);

## Loading required package: ggplot2

## Loading required package: plyr

## Loading required package: gridExtra

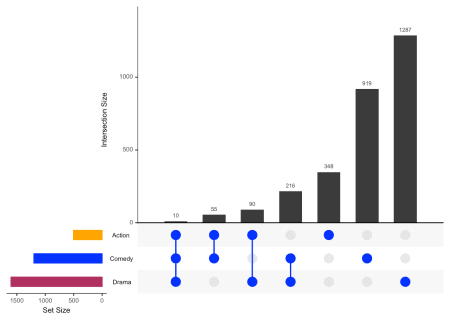
## Loading required package: grid

upset(movies,

sets = c("Action", "Comedy", "Drama"),

order.by="degree", matrix.color="blue", point.size=5,

sets.bar.color=c("maroon","blue","orange"))



We also explored the [set metadata vignette](https://cran.rstudio.com/web/packages/UpSetR/vignettes/set.metadata.plots.html) that includes examples such as the following one.

set.seed(20180727)

## Create the metadata object first

sets <- names(movies[3:19])

avgRottenTomatoesScore <- round(runif(17, min = 0, max = 90))

metadata <- as.data.frame(cbind(sets, avgRottenTomatoesScore))

names(metadata) <- c("sets", "avgRottenTomatoesScore")

metadata$avgRottenTomatoesScore <- as.numeric(as.character(metadata$avgRottenTomatoesScore))

Cities <- sample(c("Boston", "NYC", "LA"), 17, replace = T)

metadata <- cbind(metadata, Cities)

metadata$Cities <- as.character(metadata$Cities)

metadata[which(metadata$sets %in% c("Drama", "Comedy", "Action", "Thriller",

"Romance")), ]

## sets avgRottenTomatoesScore Cities

## 1 Action 68 Boston

## 4 Comedy 40 NYC

## 7 Drama 48 LA

## 13 Romance 77 Boston

## 15 Thriller 19 NYC

accepted <- round(runif(17, min = 0, max = 1))

metadata <- cbind(metadata, accepted)

metadata[which(metadata$sets %in% c("Drama", "Comedy", "Action", "Thriller",

"Romance")), ]

## sets avgRottenTomatoesScore Cities accepted

## 1 Action 68 Boston 0

## 4 Comedy 40 NYC 1

## 7 Drama 48 LA 0

## 13 Romance 77 Boston 1

## 15 Thriller 19 NYC 0

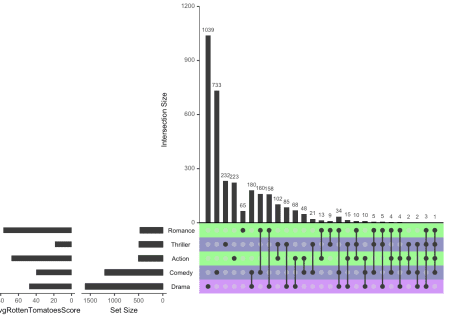
## Now make the plot

upset(movies, set.metadata = list(data = metadata, plots = list(list(type = "hist",

column = "avgRottenTomatoesScore", assign = 20), list(type = "matrix\_rows",

column = "Cities", colors = c(Boston = "green", NYC = "navy", LA = "purple"),

alpha = 0.5))))



**Hacking our way**

Using the metadata looked complicated to us and hopefully not necessary for what we are trying to accomplish. That is, we really wanted to change the colors of the circles in each row, not the rows themselves. So we found the GitHub repo with [the code](https://github.com/hms-dbmi/UpSetR), plugged a laptop to a TV and started exploring as a group. We went the rabbit hole to see how the matrix.color argument got used. To actually hack our way through, we downloaded the latest version of the code using git.

git clone git@github.com:hms-dbmi/UpSetR.git

cd UpSetR

Next, we created the objects that match the default arguments of upset() by finding and replacing commas by semi-colons. Well, not all of the commas. Also, for inputs that specified a vector (mostly 2 options), we chose the first one to match the default R behavior. This way we could execute them and have them in our session.

## Default upset() arguments

nsets = 5; nintersects = 40; sets = NULL; keep.order = F; set.metadata = NULL; intersections = NULL;

matrix.color = "gray23"; main.bar.color = "gray23"; mainbar.y.label = "Intersection Size"; mainbar.y.max = NULL;

sets.bar.color = "gray23"; sets.x.label = "Set Size"; point.size = 2.2; line.size = 0.7;

mb.ratio = c(0.70,0.30); expression = NULL; att.pos = NULL; att.color = main.bar.color; order.by = 'freq';

decreasing = T; show.numbers = "yes"; number.angles = 0; group.by = "degree";cutoff = NULL;

queries = NULL; query.legend = "none"; shade.color = "gray88"; shade.alpha = 0.25; matrix.dot.alpha =0.5;

empty.intersections = NULL; color.pal = 1; boxplot.summary = NULL; attribute.plots = NULL; scale.intersections = "identity";

scale.sets = "identity"; text.scale = 1; set\_size.angles = 0 ; set\_size.show = FALSE

Next, we did the same (commas to semicolons) for the inputs of the first example.

## Initial inputs on the first example

movies <- read.csv( system.file("extdata", "movies.csv", package = "UpSetR"),

header=T, sep=";" )

## comma -> semicolon

data = movies; sets = c("Action", "Comedy", "Drama");

order.by="degree"; matrix.color="blue"; point.size=5;

sets.bar.color=c("maroon","blue","orange")

Now we were ready to start modifying some of the internal [*UpSetR*](https://cran.r-project.org/package=UpSetR) ([Gehlenborg, 2016](http://github.com/hms-dbmi/UpSetR" \t "_blank)) code.

**Hacking internals**

The function upset() is pretty long and uses many un-exported functions from the package itself. In order to test thing quickly we added UpSetR::: calls before the un-exported functions. Here’s our modified version where we added a piece of code to modify the Matrix\_layout object and add some colors.

## Piece of code we introduced

for(i in 1:3) {

j <- which(Matrix\_layout$y == i & Matrix\_layout$value == 1)

if(length(j) > 0) Matrix\_layout$color[j] <- c("maroon","blue","orange")[i]

}

Ok, here’s the full modified upset() function.

## Modified internal upset() code

startend <- UpSetR:::FindStartEnd(data)

first.col <- startend[1]

last.col <- startend[2]

if(color.pal == 1){

palette <- c("#1F77B4", "#FF7F0E", "#2CA02C", "#D62728", "#9467BD", "#8C564B", "#E377C2",

"#7F7F7F", "#BCBD22", "#17BECF")

} else{

palette <- c("#E69F00", "#56B4E9", "#009E73", "#F0E442", "#0072B2", "#D55E00",

"#CC79A7")

}

if(is.null(intersections) == F){

Set\_names <- unique((unlist(intersections)))

Sets\_to\_remove <- UpSetR:::Remove(data, first.col, last.col, Set\_names)

New\_data <- UpSetR:::Wanted(data, Sets\_to\_remove)

Num\_of\_set <- UpSetR:::Number\_of\_sets(Set\_names)

if(keep.order == F){

Set\_names <- UpSetR:::order\_sets(New\_data, Set\_names)

}

All\_Freqs <- UpSetR:::specific\_intersections(data, first.col, last.col, intersections, order.by, group.by, decreasing,

cutoff, main.bar.color, Set\_names)

} else if(is.null(intersections) == T){

Set\_names <- sets

if(is.null(Set\_names) == T || length(Set\_names) == 0 ){

Set\_names <- UpSetR:::FindMostFreq(data, first.col, last.col, nsets)

}

Sets\_to\_remove <- UpSetR:::Remove(data, first.col, last.col, Set\_names)

New\_data <- UpSetR:::Wanted(data, Sets\_to\_remove)

Num\_of\_set <- UpSetR:::Number\_of\_sets(Set\_names)

if(keep.order == F){

Set\_names <- UpSetR:::order\_sets(New\_data, Set\_names)

}

All\_Freqs <- UpSetR:::Counter(New\_data, Num\_of\_set, first.col, Set\_names, nintersects, main.bar.color,

order.by, group.by, cutoff, empty.intersections, decreasing)

}

Matrix\_setup <- UpSetR:::Create\_matrix(All\_Freqs)

labels <- UpSetR:::Make\_labels(Matrix\_setup)

#Chose NA to represent NULL case as result of NA being inserted when at least one contained both x and y

#i.e. if one custom plot had both x and y, and others had only x, the y's for the other plots were NA

#if I decided to make the NULL case (all x and no y, or vice versa), there would have been alot more if/else statements

#NA can be indexed so that we still get the non NA y aesthetics on correct plot. NULL cant be indexed.

att.x <- c(); att.y <- c();

if(is.null(attribute.plots) == F){

for(i in seq\_along(attribute.plots$plots)){

if(length(attribute.plots$plots[[i]]$x) != 0){

att.x[i] <- attribute.plots$plots[[i]]$x

}

else if(length(attribute.plots$plots[[i]]$x) == 0){

att.x[i] <- NA

}

if(length(attribute.plots$plots[[i]]$y) != 0){

att.y[i] <- attribute.plots$plots[[i]]$y

}

else if(length(attribute.plots$plots[[i]]$y) == 0){

att.y[i] <- NA

}

}

}

BoxPlots <- NULL

if(is.null(boxplot.summary) == F){

BoxData <- UpSetR:::IntersectionBoxPlot(All\_Freqs, New\_data, first.col, Set\_names)

BoxPlots <- list()

for(i in seq\_along(boxplot.summary)){

BoxPlots[[i]] <- UpSetR:::BoxPlotsPlot(BoxData, boxplot.summary[i], att.color)

}

}

customAttDat <- NULL

customQBar <- NULL

Intersection <- NULL

Element <- NULL

legend <- NULL

EBar\_data <- NULL

if(is.null(queries) == F){

custom.queries <- UpSetR:::SeperateQueries(queries, 2, palette)

customDat <- UpSetR:::customQueries(New\_data, custom.queries, Set\_names)

legend <- UpSetR:::GuideGenerator(queries, palette)

legend <- UpSetR:::Make\_legend(legend)

if(is.null(att.x) == F && is.null(customDat) == F){

customAttDat <- UpSetR:::CustomAttData(customDat, Set\_names)

}

customQBar <- UpSetR:::customQueriesBar(customDat, Set\_names, All\_Freqs, custom.queries)

}

if(is.null(queries) == F){

Intersection <- UpSetR:::SeperateQueries(queries, 1, palette)

Matrix\_col <- UpSetR:::intersects(QuerieInterData, Intersection, New\_data, first.col, Num\_of\_set,

All\_Freqs, expression, Set\_names, palette)

Element <- UpSetR:::SeperateQueries(queries, 1, palette)

EBar\_data <-UpSetR:::ElemBarDat(Element, New\_data, first.col, expression, Set\_names,palette, All\_Freqs)

} else{

Matrix\_col <- NULL

}

Matrix\_layout <- UpSetR:::Create\_layout(Matrix\_setup, matrix.color, Matrix\_col, matrix.dot.alpha)

As a little pause in upset(), let’s check what actually Matrix\_layout looks.

Matrix\_layout

## y x value color alpha Intersection

## 1 1 1 1 blue 1.0 1yes

## 2 2 1 1 blue 1.0 1yes

## 3 3 1 1 blue 1.0 1yes

## 4 1 2 0 gray83 0.5 4No

## 5 2 2 1 blue 1.0 2yes

## 6 3 2 1 blue 1.0 2yes

## 7 1 3 1 blue 1.0 3yes

## 8 2 3 0 gray83 0.5 8No

## 9 3 3 1 blue 1.0 3yes

## 10 1 4 1 blue 1.0 4yes

## 11 2 4 1 blue 1.0 4yes

## 12 3 4 0 gray83 0.5 12No

## 13 1 5 0 gray83 0.5 13No

## 14 2 5 0 gray83 0.5 14No

## 15 3 5 1 blue 1.0 5yes

## 16 1 6 0 gray83 0.5 16No

## 17 2 6 1 blue 1.0 6yes

## 18 3 6 0 gray83 0.5 18No

## 19 1 7 1 blue 1.0 7yes

## 20 2 7 0 gray83 0.5 20No

## 21 3 7 0 gray83 0.5 21No

We figured out that we had to change the colors only the rows with value = 1 and that y was the row grouping variable.

## our modification

for(i in 1:3) {

j <- which(Matrix\_layout$y == i & Matrix\_layout$value == 1)

if(length(j) > 0) Matrix\_layout$color[j] <- c("maroon","blue","orange")[i]

}

Here’s our modified Matrix\_layout:

Matrix\_layout

## y x value color alpha Intersection

## 1 1 1 1 maroon 1.0 1yes

## 2 2 1 1 blue 1.0 1yes

## 3 3 1 1 orange 1.0 1yes

## 4 1 2 0 gray83 0.5 4No

## 5 2 2 1 blue 1.0 2yes

## 6 3 2 1 orange 1.0 2yes

## 7 1 3 1 maroon 1.0 3yes

## 8 2 3 0 gray83 0.5 8No

## 9 3 3 1 orange 1.0 3yes

## 10 1 4 1 maroon 1.0 4yes

## 11 2 4 1 blue 1.0 4yes

## 12 3 4 0 gray83 0.5 12No

## 13 1 5 0 gray83 0.5 13No

## 14 2 5 0 gray83 0.5 14No

## 15 3 5 1 orange 1.0 5yes

## 16 1 6 0 gray83 0.5 16No

## 17 2 6 1 blue 1.0 6yes

## 18 3 6 0 gray83 0.5 18No

## 19 1 7 1 maroon 1.0 7yes

## 20 2 7 0 gray83 0.5 20No

## 21 3 7 0 gray83 0.5 21No

Ok, let’s continue with the rest of upset().

## continuing with upset()

Set\_sizes <- UpSetR:::FindSetFreqs(New\_data, first.col, Num\_of\_set, Set\_names, keep.order)

Bar\_Q <- NULL

if(is.null(queries) == F){

Bar\_Q <- UpSetR:::intersects(QuerieInterBar, Intersection, New\_data, first.col, Num\_of\_set, All\_Freqs, expression, Set\_names, palette)

}

QInter\_att\_data <- NULL

QElem\_att\_data <- NULL

if((is.null(queries) == F) & (is.null(att.x) == F)){

QInter\_att\_data <- UpSetR:::intersects(QuerieInterAtt, Intersection, New\_data, first.col, Num\_of\_set, att.x, att.y,

expression, Set\_names, palette)

QElem\_att\_data <- UpSetR:::elements(QuerieElemAtt, Element, New\_data, first.col, expression, Set\_names, att.x, att.y,

palette)

}

AllQueryData <- UpSetR:::combineQueriesData(QInter\_att\_data, QElem\_att\_data, customAttDat, att.x, att.y)

ShadingData <- NULL

if(is.null(set.metadata) == F){

ShadingData <- get\_shade\_groups(set.metadata, Set\_names, Matrix\_layout, shade.alpha)

output <- Make\_set\_metadata\_plot(set.metadata, Set\_names)

set.metadata.plots <- output[[1]]

set.metadata <- output[[2]]

if(is.null(ShadingData) == FALSE){

shade.alpha <- unique(ShadingData$alpha)

}

} else {

set.metadata.plots <- NULL

}

if(is.null(ShadingData) == TRUE){

ShadingData <- UpSetR:::MakeShading(Matrix\_layout, shade.color)

}

Main\_bar <- suppressMessages(UpSetR:::Make\_main\_bar(All\_Freqs, Bar\_Q, show.numbers, mb.ratio, customQBar, number.angles, EBar\_data, mainbar.y.label,

mainbar.y.max, scale.intersections, text.scale, attribute.plots))

Matrix <- UpSetR:::Make\_matrix\_plot(Matrix\_layout, Set\_sizes, All\_Freqs, point.size, line.size,

text.scale, labels, ShadingData, shade.alpha)

Sizes <- UpSetR:::Make\_size\_plot(Set\_sizes, sets.bar.color, mb.ratio, sets.x.label, scale.sets, text.scale, set\_size.angles,set\_size.show)

# Make\_base\_plot(Main\_bar, Matrix, Sizes, labels, mb.ratio, att.x, att.y, New\_data,

# expression, att.pos, first.col, att.color, AllQueryData, attribute.plots,

# legend, query.legend, BoxPlots, Set\_names, set.metadata, set.metadata.plots)

structure(class = "upset",

.Data=list(

Main\_bar = Main\_bar,

Matrix = Matrix,

Sizes = Sizes,

labels = labels,

mb.ratio = mb.ratio,

att.x = att.x,

att.y = att.y,

New\_data = New\_data,

expression = expression,

att.pos = att.pos,

first.col = first.col,

att.color = att.color,

AllQueryData = AllQueryData,

attribute.plots = attribute.plots,

legend = legend,

query.legend = query.legend,

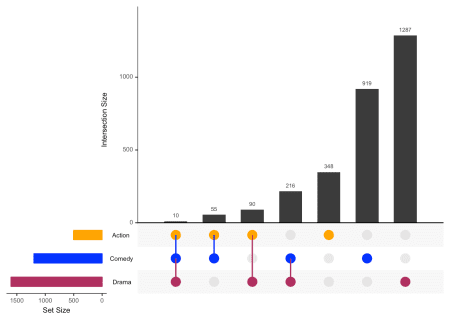
BoxPlots = BoxPlots,

Set\_names = Set\_names,

set.metadata = set.metadata,

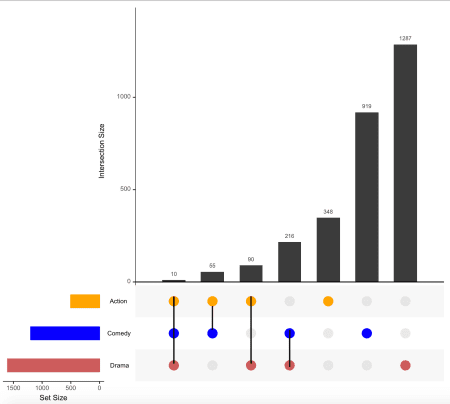
set.metadata.plots = set.metadata.plots)

)



**Line colors**

Ok, that’s great but we have a problem with the lines. The color is no longer black, so we went deeper into the rabbit hole and found that the internal Make\_matrix\_plot() function is where the lines are made. We made some edits but got a plot where the lines were on top of the circles as shown in this screenshot.



Our club session was out of time, so we decided to continue our project another day and ask for help on twitter. And yay, we got help super fast!

Thank you and [@thatdnaguy](https://twitter.com/thatdnaguy?ref_src=twsrc%5Etfw), that did it! [pic.twitter.com/tzQvhKFXgR](https://t.co/tzQvhKFXgR)

— LIBD rstats club (@LIBDrstats) [July 27, 2018](https://twitter.com/LIBDrstats/status/1022903971416088577?ref_src=twsrc%5Etfw)

So here’s our modified version of Make\_matrix\_plot() that keeps the lines black.

Make\_matrix\_plot <- function(Mat\_data,Set\_size\_data, Main\_bar\_data, point\_size, line\_size, text\_scale, labels,

shading\_data, shade\_alpha){

if(length(text\_scale) == 1){

name\_size\_scale <- text\_scale

}

if(length(text\_scale) > 1 && length(text\_scale) <= 6){

name\_size\_scale <- text\_scale[5]

}

Mat\_data$line\_col <- 'black'

Matrix\_plot <- (ggplot()

+ theme(panel.background = element\_rect(fill = "white"),

plot.margin=unit(c(-0.2,0.5,0.5,0.5), "lines"),

axis.text.x = element\_blank(),

axis.ticks.x = element\_blank(),

axis.ticks.y = element\_blank(),

axis.text.y = element\_text(colour = "gray0",

size = 7\*name\_size\_scale, hjust = 0.4),

panel.grid.major = element\_blank(),

panel.grid.minor = element\_blank())

+ xlab(NULL) + ylab(" ")

+ scale\_y\_continuous(breaks = c(1:nrow(Set\_size\_data)),

limits = c(0.5,(nrow(Set\_size\_data) +0.5)),

labels = labels, expand = c(0,0))

+ scale\_x\_continuous(limits = c(0,(nrow(Main\_bar\_data)+1 )), expand = c(0,0))

+ geom\_rect(data = shading\_data, aes\_string(xmin = "min", xmax = "max",

ymin = "y\_min", ymax = "y\_max"),

fill = shading\_data$shade\_color, alpha = shade\_alpha)

+ geom\_line(data= Mat\_data, aes\_string(group = "Intersection", x="x", y="y",

colour = "line\_col"), size = line\_size)

+ geom\_point(data= Mat\_data, aes\_string(x= "x", y= "y"), colour = Mat\_data$color,

size= point\_size, alpha = Mat\_data$alpha, shape=16)

+ scale\_color\_identity())

Matrix\_plot <- ggplot\_gtable(ggplot\_build(Matrix\_plot))

return(Matrix\_plot)

}

Using that modified version we can then run the code again (note that we are not using UpSetR::: before Make\_matrix\_plot) and get the plot we wanted.

Matrix <- Make\_matrix\_plot(Matrix\_layout, Set\_sizes, All\_Freqs, point.size, line.size,

text.scale, labels, ShadingData, shade.alpha)

Sizes <- UpSetR:::Make\_size\_plot(Set\_sizes, sets.bar.color, mb.ratio, sets.x.label, scale.sets, text.scale, set\_size.angles,set\_size.show)

# Make\_base\_plot(Main\_bar, Matrix, Sizes, labels, mb.ratio, att.x, att.y, New\_data,

# expression, att.pos, first.col, att.color, AllQueryData, attribute.plots,

# legend, query.legend, BoxPlots, Set\_names, set.metadata, set.metadata.plots)

structure(class = "upset",

.Data=list(

Main\_bar = Main\_bar,

Matrix = Matrix,

Sizes = Sizes,

labels = labels,

mb.ratio = mb.ratio,

att.x = att.x,

att.y = att.y,

New\_data = New\_data,

expression = expression,

att.pos = att.pos,

first.col = first.col,

att.color = att.color,

AllQueryData = AllQueryData,

attribute.plots = attribute.plots,

legend = legend,

query.legend = query.legend,

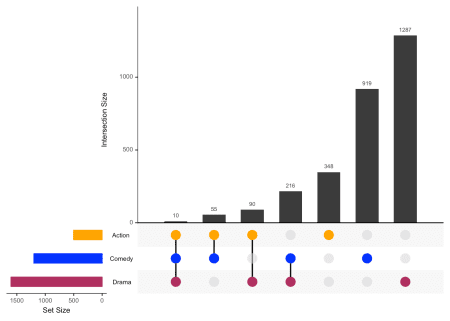
BoxPlots = BoxPlots,

Set\_names = Set\_names,

set.metadata = set.metadata,

set.metadata.plots = set.metadata.plots)

)



We have quite a bit more to do in order to complete our pull request. We are also curious if you would have used a different approach to hack your way through [*UpSetR*](https://cran.r-project.org/package=UpSetR) ([Gehlenborg, 2016](http://github.com/hms-dbmi/UpSetR" \t "_blank)). For example, maybe some functions from [*devtools*](https://cran.r-project.org/package=devtools) ([Wickham, Hester, and Chang, 2018](https://cran.r-project.org/package=devtools)) would have enabled to do this equally fast without having to introduce UpSetR::: calls.

Thanks for reading!

**Acknowledgements**

This blog post was made possible thanks to:

* [*BiocStyle*](http://bioconductor.org/packages/BiocStyle) ([Oleś, Morgan, and Huber, 2018](https://github.com/Bioconductor/BiocStyle))
* [*blogdown*](https://cran.r-project.org/package=blogdown) ([Xie, Hill, and Thomas, 2017](https://github.com/rstudio/blogdown))
* [*devtools*](https://cran.r-project.org/package=devtools) ([Wickham, Hester, and Chang, 2018](https://cran.r-project.org/package=devtools))
* [*knitcitations*](https://cran.r-project.org/package=knitcitations) ([Boettiger, 2017](https://cran.r-project.org/package=knitcitations))

**References**

[[1]](http://feedproxy.google.com/~r/LIBDrstats/~3/8ZYTyu4yFIE/#cite-Boettiger_2017) *C. Boettiger. knitcitations: Citations for ‘Knitr’ Markdown Files. R package version 1.0.8. 2017. URL:* [*https://CRAN.R-project.org/package=knitcitations*](https://cran.r-project.org/package=knitcitations)*.*

[[2]](http://feedproxy.google.com/~r/LIBDrstats/~3/8ZYTyu4yFIE/#cite-Gehlenborg_2016) *N. Gehlenborg. UpSetR: A More Scalable Alternative to Venn and Euler Diagrams for Visualizing Intersecting Sets. R package version 1.4.0. 2016. URL:* [*http://github.com/hms-dbmi/UpSetR*](http://github.com/hms-dbmi/UpSetR)*.*

[[3]](http://feedproxy.google.com/~r/LIBDrstats/~3/8ZYTyu4yFIE/#cite-Oles_2018) *A. Oleś, M. Morgan and W. Huber. BiocStyle: Standard styles for vignettes and other Bioconductor documents. R package version 2.8.2. 2018. URL:* [*https://github.com/Bioconductor/BiocStyle*](https://github.com/Bioconductor/BiocStyle)*.*

[[4]](http://feedproxy.google.com/~r/LIBDrstats/~3/8ZYTyu4yFIE/#cite-Wickham_2018) *H. Wickham, J. Hester and W. Chang. devtools: Tools to Make Developing R Packages Easier. R package version 1.13.6. 2018. URL:* [*https://CRAN.R-project.org/package=devtools*](https://cran.r-project.org/package=devtools)*.*

[[5]](http://feedproxy.google.com/~r/LIBDrstats/~3/8ZYTyu4yFIE/#cite-Xie_2017) *Y. Xie, A. P. Hill and A. Thomas. blogdown: Creating Websites with R Markdown. ISBN 978-0815363729. Boca Raton, Florida: Chapman and Hall/CRC, 2017. URL:* [*https://github.com/rstudio/blogdown*](https://github.com/rstudio/blogdown)*.*

**Reproducibility**

## Session info ----------------------------------------------------------------------------------------------------------

## setting value

## version R version 3.5.1 (2018-07-02)

## system x86\_64, darwin15.6.0

## ui X11

## language (EN)

## collate en\_US.UTF-8

## tz America/New\_York

## date 2018-07-27

## Packages --------------------------------------------------------------------------------------------------------------

## package \* version date source

## assertthat 0.2.0 2017-04-11 cran (@0.2.0)

## backports 1.1.2 2017-12-13 cran (@1.1.2)

## base \* 3.5.1 2018-07-05 local

## bibtex 0.4.2 2017-06-30 CRAN (R 3.5.0)

## bindr 0.1.1 2018-03-13 cran (@0.1.1)

## bindrcpp 0.2.2 2018-03-29 cran (@0.2.2)

## BiocStyle \* 2.8.2 2018-05-30 Bioconductor

## blogdown 0.8 2018-07-15 CRAN (R 3.5.0)

## bookdown 0.7 2018-02-18 CRAN (R 3.5.0)

## colorout \* 1.2-0 2018-05-03 Github (jalvesaq/colorout@c42088d)

## colorspace 1.3-2 2016-12-14 cran (@1.3-2)

## compiler 3.5.1 2018-07-05 local

## crayon 1.3.4 2017-09-16 cran (@1.3.4)

## datasets \* 3.5.1 2018-07-05 local

## devtools \* 1.13.6 2018-06-27 cran (@1.13.6)

## digest 0.6.15 2018-01-28 CRAN (R 3.5.0)

## dplyr 0.7.6 2018-06-29 CRAN (R 3.5.1)

## evaluate 0.11 2018-07-17 CRAN (R 3.5.0)

## ggplot2 \* 3.0.0 2018-07-03 CRAN (R 3.5.0)

## glue 1.3.0 2018-07-17 CRAN (R 3.5.0)

## graphics \* 3.5.1 2018-07-05 local

## grDevices \* 3.5.1 2018-07-05 local

## grid \* 3.5.1 2018-07-05 local

## gridExtra \* 2.3 2017-09-09 CRAN (R 3.5.0)

## gtable 0.2.0 2016-02-26 CRAN (R 3.5.0)

## htmltools 0.3.6 2017-04-28 cran (@0.3.6)

## httr 1.3.1 2017-08-20 CRAN (R 3.5.0)

## jsonlite 1.5 2017-06-01 CRAN (R 3.5.0)

## knitcitations \* 1.0.8 2017-07-04 CRAN (R 3.5.0)

## knitr 1.20 2018-02-20 cran (@1.20)

## labeling 0.3 2014-08-23 cran (@0.3)

## lazyeval 0.2.1 2017-10-29 CRAN (R 3.5.0)

## lubridate 1.7.4 2018-04-11 CRAN (R 3.5.0)

## magrittr 1.5 2014-11-22 cran (@1.5)

## memoise 1.1.0 2017-04-21 CRAN (R 3.5.0)

## methods \* 3.5.1 2018-07-05 local

## munsell 0.5.0 2018-06-12 CRAN (R 3.5.0)

## pillar 1.3.0 2018-07-14 CRAN (R 3.5.0)

## pkgconfig 2.0.1 2017-03-21 cran (@2.0.1)

## plyr \* 1.8.4 2016-06-08 cran (@1.8.4)

## purrr 0.2.5 2018-05-29 cran (@0.2.5)

## R6 2.2.2 2017-06-17 CRAN (R 3.5.0)

## Rcpp 0.12.18 2018-07-23 CRAN (R 3.5.1)

## RefManageR 1.2.0 2018-04-25 CRAN (R 3.5.0)

## rlang 0.2.1 2018-05-30 cran (@0.2.1)

## rmarkdown 1.10 2018-06-11 CRAN (R 3.5.0)

## rprojroot 1.3-2 2018-01-03 cran (@1.3-2)

## scales 0.5.0 2017-08-24 cran (@0.5.0)

## stats \* 3.5.1 2018-07-05 local

## stringi 1.2.4 2018-07-20 CRAN (R 3.5.0)

## stringr 1.3.1 2018-05-10 CRAN (R 3.5.0)

## tibble 1.4.2 2018-01-22 cran (@1.4.2)

## tidyselect 0.2.4 2018-02-26 cran (@0.2.4)

## tools 3.5.1 2018-07-05 local

## UpSetR \* 1.4.0 2018-07-27 Github (hms-dbmi/UpSetR@fe2812c)

## utils \* 3.5.1 2018-07-05 local

## withr 2.1.2 2018-03-15 CRAN (R 3.5.0)

## xfun 0.3 2018-07-06 CRAN (R 3.5.0)

## xml2 1.2.0 2018-01-24 CRAN (R 3.5.0)

## yaml 2.1.19 2018-05-01 CRAN (R 3.5.0)

