# Generating 3d Graphs in SPSS and R

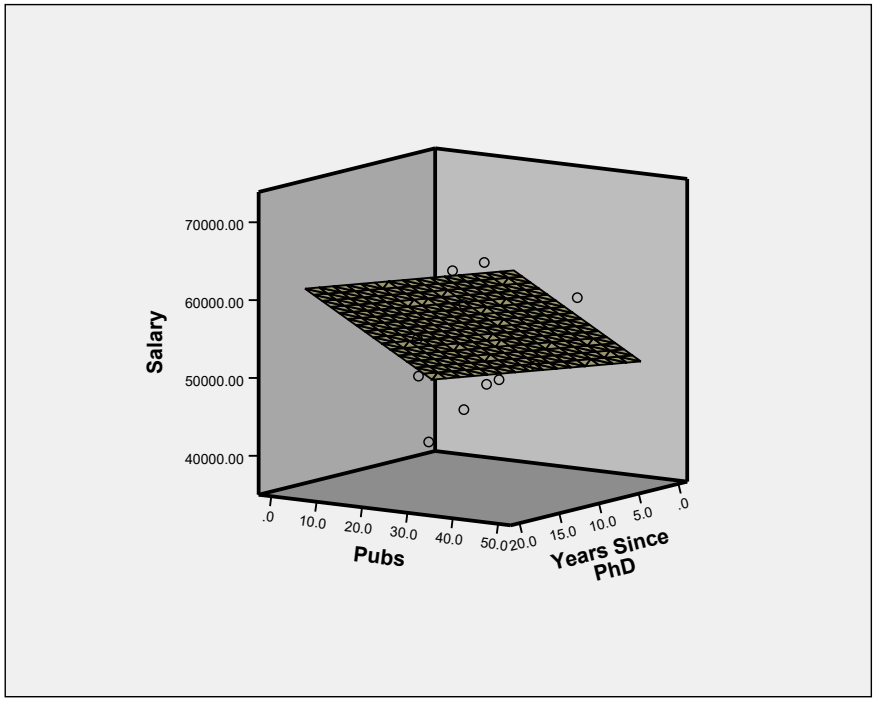
Three-dimensional graphs are rarely used in practice except for didactic purposes. They are kind of cool though and especially helpful for visualizing the idea of the regression plane in a two-predictor multiple regression. Good luck visualizing a four-dimensional graph for three predictors, however! The 3d orientation of the plots for the various plotting methods below seems to vary considerably. I like the orientation used on the R `scatterplot3d` package the best.

## SPSS

This plot was created in SPSS Version 27.

The GGRAPH command is used and there are a number of options for appearances that I did not employ. The order of the dimensions under the GUIDE statements is dimension 1 (x-width), dimension 2 (y-depth), and dimension 3 (z-height). The dependent variables is typically put on the vertical axis (z dimension). The name "graphdataset" appearing on the NAME keyword is an arbitrary name and it can be any name you choose. It names the data set read out and used in the later SOURCE command, so these two names must match exactly. Note that the Years Since PhD axis values are descending rather than ascending.

```
GGRAPH
/GRAPHDATASET NAME="graphdataset" VARIABLES=pubs time salary MISSING=LISTWISE
REPORTMISSING=NO
/GRAPHSPEC SOURCE=INLINE.
BEGIN GPL
SOURCE: s=userSource(id("graphdataset"))
DATA: pubs=col(source(s), name("pubs"))
DATA: time=col(source(s), name("time"))
DATA: salary=col(source(s), name("salary"))
COORD: rect(dim(1,2,3))
GUIDE: axis(dim(1), label("Pubs"))
GUIDE: axis(dim(2), label("Years Since PhD"))
GUIDE: axis(dim(3), label("Salary"))
ELEMENT: point(position(pubs*time*salary))
ELEMENT: line(position(smooth.linear(pubs*time*salary)))
END GPL.
```



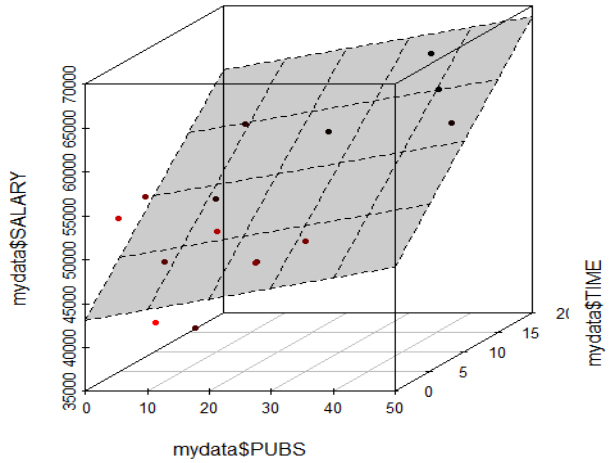
## R

I found two ways to generate 3d scatterplots in R. The first uses the `scatterplot3d` package and is a more traditional looking 3-dimensional scatter plot with a regression plane. You can change colors and make other appearance modifications, including use of type = "h" that draws vertical lines under each point (which can help with visualizing the position of the points). A scatterplot is requested first and then the plane is added using values from the regression model using the `lm` function.

```
library(scatterplot3d)

#order of variables in scatterplot3d function are x1 (width), x2 (depth), and y (height)
s3d <- scatterplot3d(d$PUBS,d$TIME,d$SALARY, type = "p",highlight.3d = TRUE, pch = 20)

# Add regression plane
mod <- lm(SALARY ~ PUBS + TIME, data=d)
s3d$plane3d(mod,draw_polygon = TRUE, draw_lines = TRUE)
```




The second method is available within the `car` package using the `scatter3d` function. You do not need to run a separate regression model using the `lm` function first. `id.n=3` labels the ID for three most extreme points and is not necessary. The `rglwidget()` function was need to generate the plot this time. Once generated, the can be rotated in RStudio.

```
library(car)
library(rgl)
scatter3d(SALARY ~ PUBS + TIME, id.n=3, data=d)
#scatter3d was not working unitl rglwidget was called
rglwidget()
```