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Data Science (CDA)

Practical 3:
Visualisation using qplot()/ggplot()

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Keratoconus is a disorder that affects the cornea through an abnormal growth of collagen fibres. This makes the cornea become conical with an important vision loss. There are many possible treatments, but one common solution is the insertion of intrastromal corneal ring segments, such that the cornea is flattened.

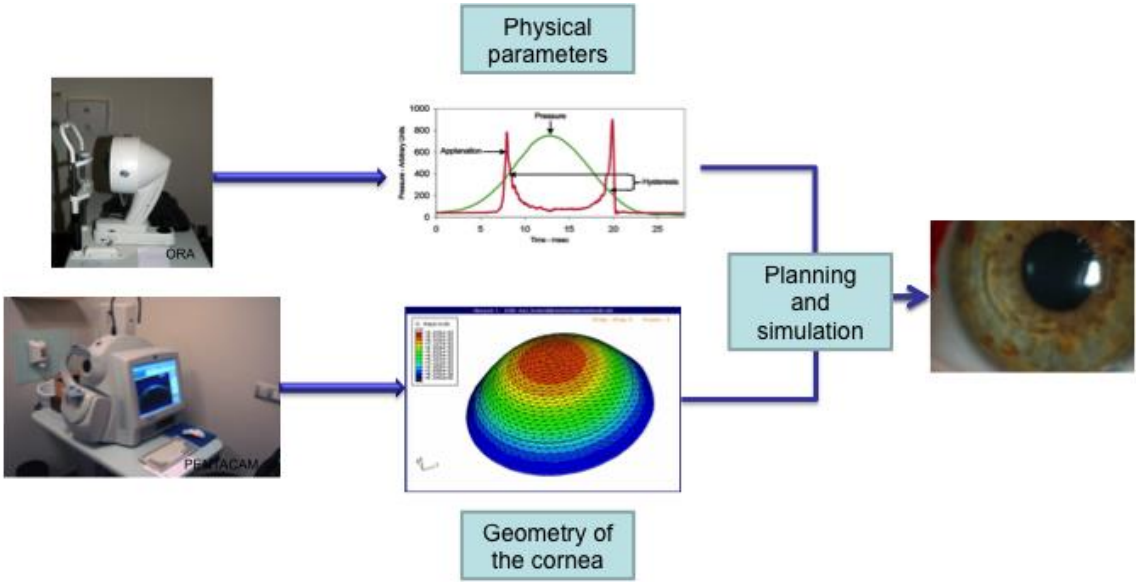

Figure 1.- Process of planning and placement of a intrastromal corneal ring.

The file "queratocono.csv" includes information about 394 patients with Keratoconus who were treated with ring placement. The variables that were recorded are:

1. K1: keratometry or main corneal curvature.
2. K2: perpendicular curvature to K1.
3. Ch: corneal hysteresis.
4. Na: number of rings (1 or 2).
5. Incision: angle in which the cornea is cut.
6. Prof: depth of the incision.
7. Diam: diameter of the incision.
8. Grosor: Incision thickness.
9. Longitud1: Angle of placement of the first ring (surgical parameter).
10. Longitud2: Angle of placement of the second ring (surgical parameter).
11. grosor1: Thickness of the first ring.
12. grosor2: Thickness of the first ring.
13. long1: arc length of the first ring.
14. long2: arc length of the second ring.
15. K1.salida: keratometry or main corneal curvature after the placement of the ring(s).
16. Astig: astigmatism curvature after the placement of the ring(s) (K1.salida – K2.salida).

In order to analyse the information in a visual way:

1. Study the relation between **K1** and **K2** with smoother (by default and using linear regression). The plots should look like those shown in Figure 1.

2. Study the relation between **K1** and **K2** distinguishing by factor **na**, according to what is shown in Figure 2 (note the title).

3. Study the relation between **K1** and **K1.salida** (see Figure 3).

4. Build a histogram in terms of **grosor** (note that **grosor** should be taken as a factor) of the inserted ring (see Figure 4).

5. Build a scatter plot of the relation between **K1 and K2** with "faceting" in terms of the parameters **diam** and **na**, by assigning different colours to the points according to the thickness (**grosor**) of the ring. In order to visualise all points correctly use a transparency of value 1/3 (see Figure 5).

6. Create two boxplots that show a summary of the distributions of **K1** and **K2** (separately) with respect to the thickness (**grosor**) as shown Figure 6.

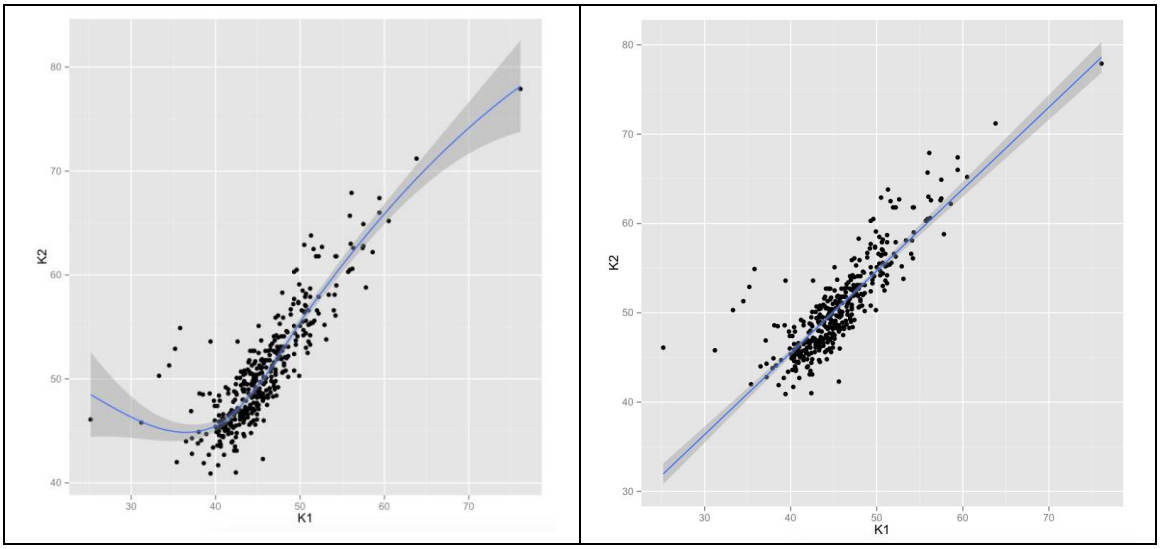

Figure 1

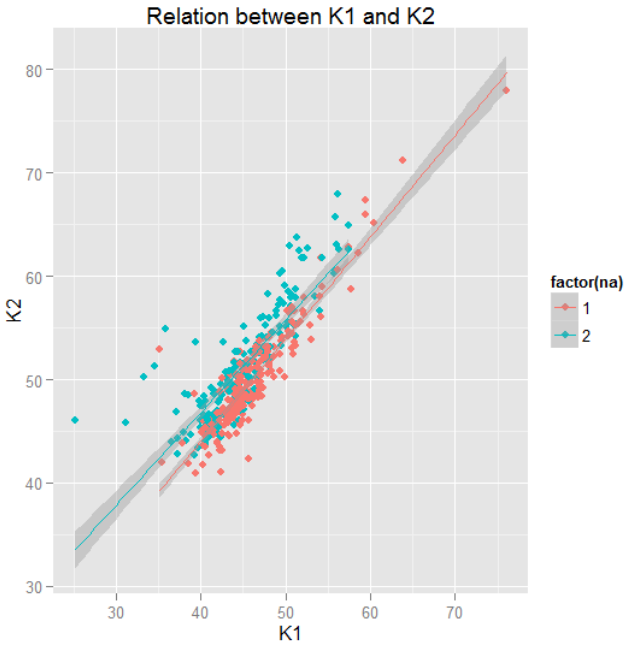

Figure 2

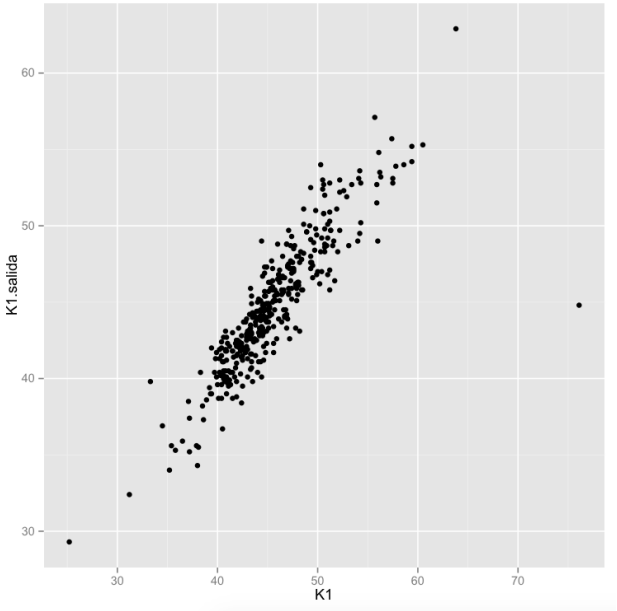

Figure 3

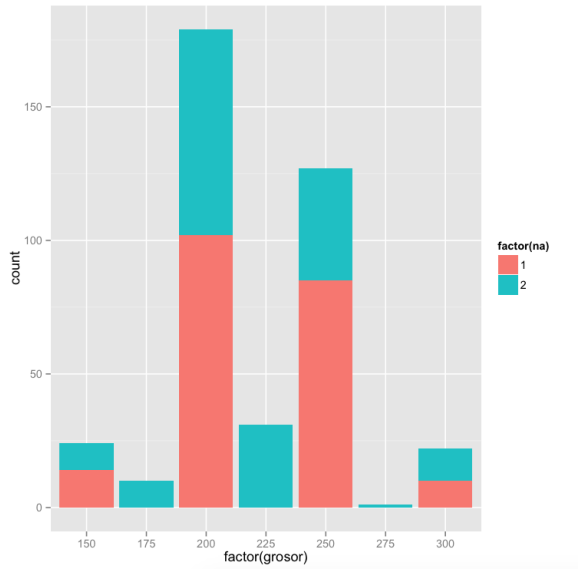

Figure 4

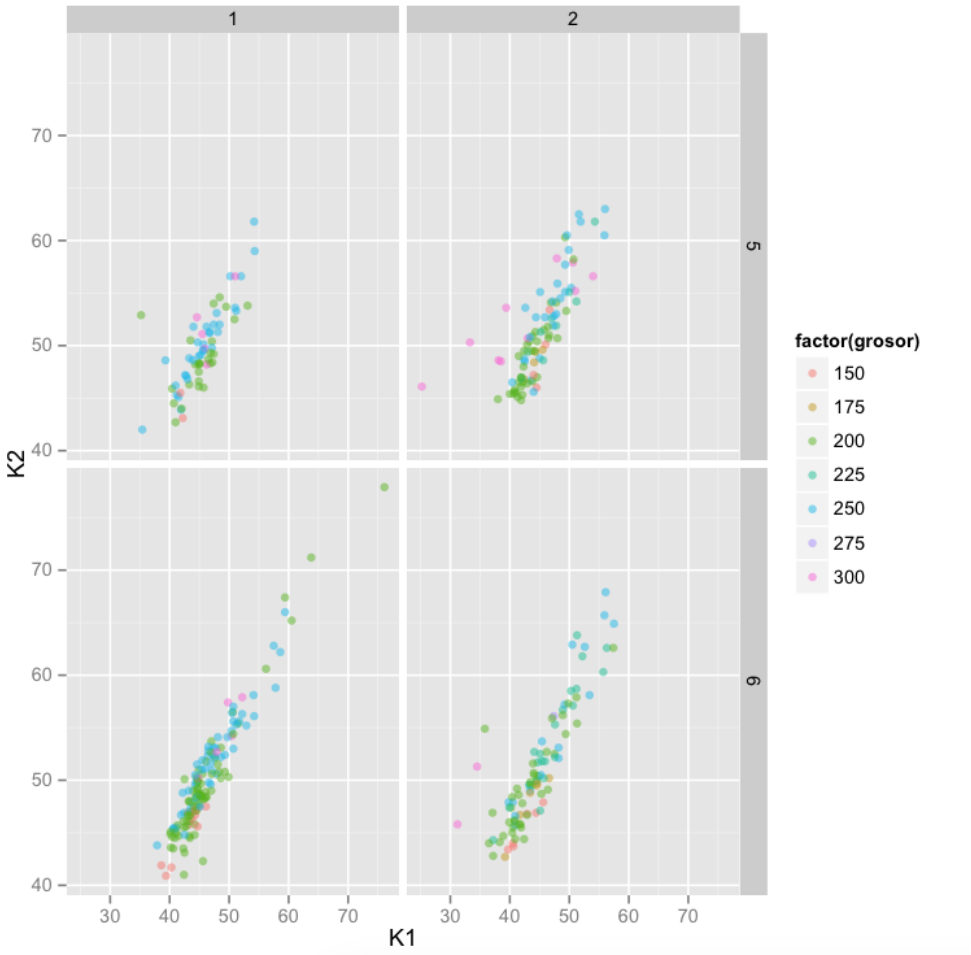

Figure 5

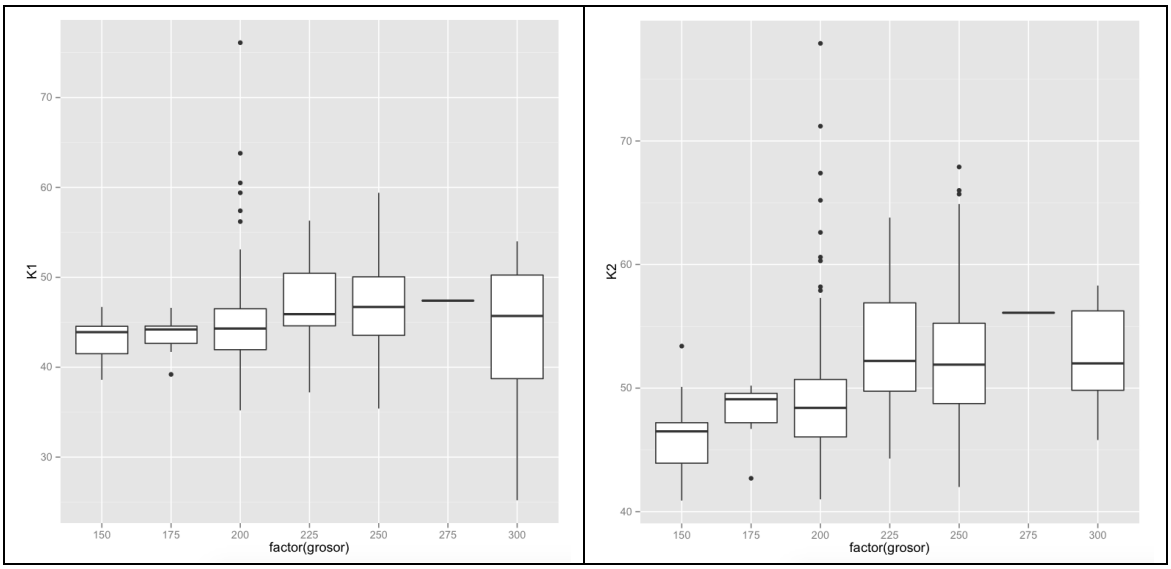
K1
70
60
50
40
30
150
175
200
225
250
275
300
factor(grosor)
K2
70
60
50
40
150
175
200
225
250
275
300
factor(grosor)

Figure 6