# REPRESENTACIÓN DE DATOS CON GRÁFICOS 2D Y 3D USANDO GRAPHER

(Curso **Virtual** de Formación de Profesorado Universitario, 2 ECTS)

Create descriptive and comprehensive graphs ready for publication
Analyze and understand complex data sets
*Highlight all important aspects of your data*

For teachers, scientists, engineers, business professionals, and anyone needing to graphically display data

Rise of New Marketing Techniques as a Percentage of Total Sales
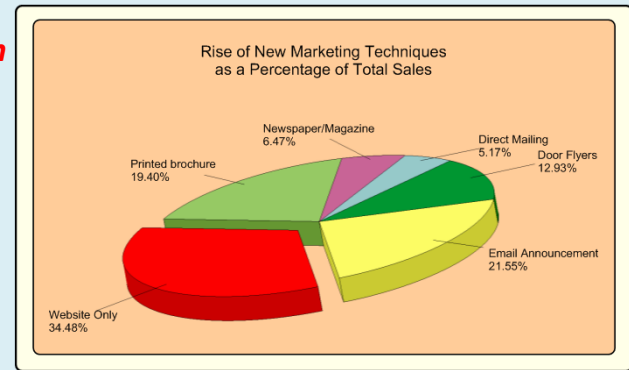
2D and 3D vector plots. Create line, scatter, or bubble ternary diagrams. Display high-low-close or candlestick specialty plots. Create statistical graphs including histograms, box-whisker, pie charts, and Q-Q plots.
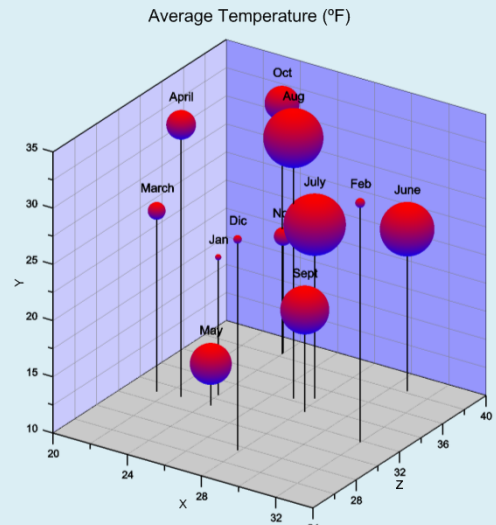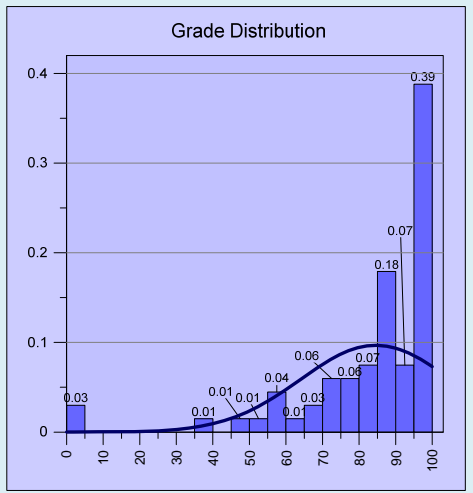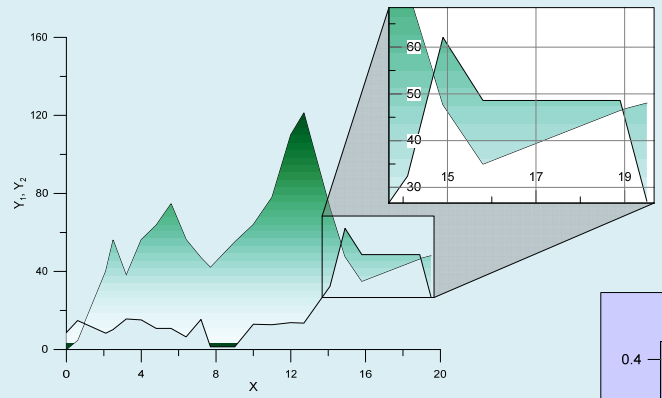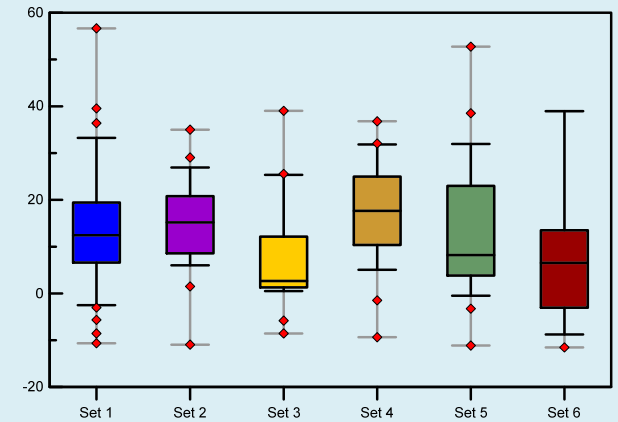
2D or 3D linear or logarithmic line, scatter, function, class scatter, bubble, bar charts, and floating bar chart graphs. Create line, bar, rose, wind, and radar polar plots.
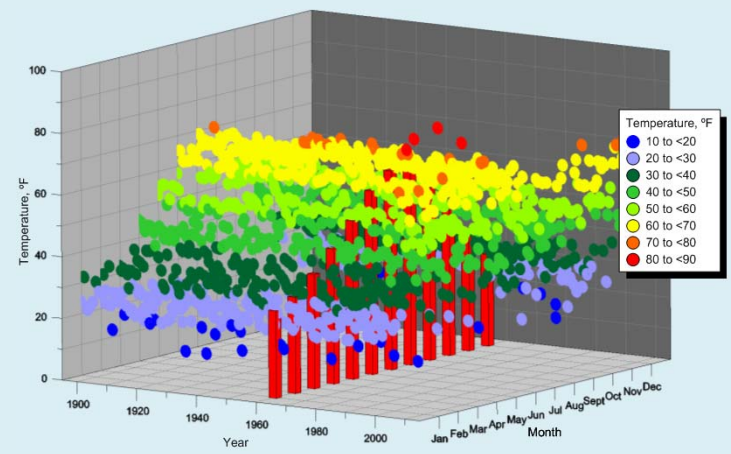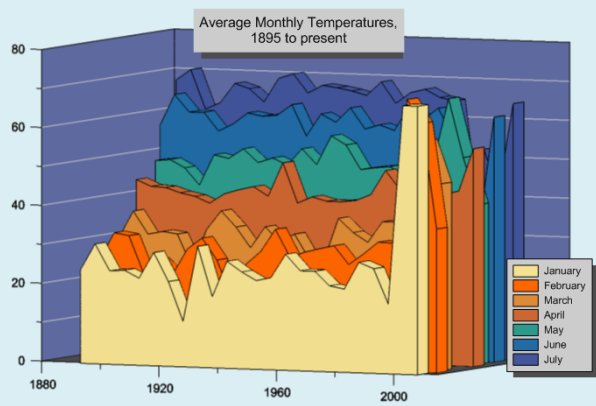
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• **Curso:**

REPRESENTACIÓN DE DATOS CON GRÁFICOS 2D Y 3D USANDO GRAPHER

• **Profesores:**
EDUARDO GUTIÉRREZ DE RAVÉ AGÜERA
FRANCISCO JOSÉ JIMÉNEZ HORNERO

• **Número de créditos/horas:**
2 ECTS (50 horas virtuales)

• **Precio de matrícula:**
30 €

• **Periodo de matriculación:**
Del 01/12/2015 al 18/01/2016

• **Calendario:**
Del 1al 12 de Febrero de 2016. (2 semanas)

• **Justificación:**
La importancia de la información gráfica como complemento y, a veces, como sustituta de la información escrita es patente en el mundo actual. Esta circunstancia es una generalidad que afecta a todos los sectores involucrados en la investigación, innovación y empresa. Por tanto, es aconsejable que los profesores universitarios y profesionales tengan una mínima formación en la realización de gráficos que permita exponer de manera eficiente sus datos y resultados. En este marco, desde el año 1986 el programa GRAPHER (Golden Software) es uno de los más usados para este fin, gracias a las sucesivas mejoras que se han ido introduciendo en el mismo haciendo sencillo su uso.

Como ejemplo de su aceptación mundial indicar que la compañía propietaria del software ha vendido alrededor de 250.000 licencias en 185 países. Sin duda, su difusión se ha visto favorecida por la versión demo gratuita que la compañía ofrece de este software en su página web, circunstancia que lo convierte en idóneo para los potenciales alumnos de este curso.

El profesorado de este curso tiene una amplia experiencia en el manejo y en la docencia del programa GRAPHER. El primero de ellos avalado por los gráficos realizados para más de 40 artículos científicos publicados en revistas indexadas en JCR y la segunda refrendada por impartir durante más de un lustro una asignatura transversal dirigida a alumnos de máster y doctorado en la Universidad de Córdoba y un curso de formación de profesorado universitario.

• Objetivos:

Dada la importancia de la representación gráfica de datos y resultados en las diferentes áreas del conocimiento, este curso tiene como objetivos primordiales los siguientes:

1. Instruir en la realización de gráficos en 2 y 3 dimensiones con el programa GRAPHER.
2. Capacitar para seleccionar el gráfico adecuado para transmitir la información de la manera más eficiente.
3. Conocer la nomenclatura inglesa de los gráficos usuales en ámbito docente e investigador universitario

• Contenidos:

1) Basic plots and Graph features (Gráficos básicos y sus complementos)

Basic plots

Line plot : The line plot graph displays the data points connected by a line

Scatter plot: The scatter plot graph displays the data points as a group of symbols scattered across the graph.

Step plot: The step plot graph displays the data points in a manner very similar to line/scatter plots. In line/scatter plots, the connecting line is drawn directly between adjacent points using the shortest path. In a step plot, the connecting lines are always drawn parallel or perpendicular to the axes.

Bubble plot: The 2D bubble plot graph displays two variables on a scatter-type plot. The diameter of each bubble varies in size, providing a way to represent an additional dimension of data.

Function plots: Explicit $Y = f(X)$ and Parametric $X = F(T)$, $Y = G(T)$

Class scatter plot: The class scatter plot graph displays data as a group of symbols scattered across the graph.

3D Ribbon wall plot: The 3D wall plot graph displays data as a 3D line plot with a filled area, known as the wall.

3D Ribbon step plot: The 3D step line plot graph displays data as a 3D line plot in a manner very similar to 3D ribbon plots. In 3D ribbon plots, the connecting line is drawn directly between adjacent points using the shortest path. In a 3D step line plot, the connecting lines are always drawn parallel or perpendicular to the axes.

3D XYZ line-scatter plot: The 3D XYZ line/scatter plot graph displays data as a 3D XYZ line plot.

3D Bubble plot: The 3D XYZ bubble plot graph displays three variables on a 3D XYZ scatter-type plot. The diameter of each bubble varies in size, providing a way to represent an additional dimension of data.

3D Function plot: The 3D function plot graph displays mathematical functions on a graph.

3D XYZ class scatter plot: The XYZ class scatter plot graph displays data as a group of symbols scattered across the 3D XYZ graph. Data are separated into classes or bins. Each class or bin represents a range of values and has its own distinct symbol.

Graph features
Graph magnifier: For adding a graph magnifier to an existing 2D graph, you have to drag a rectangle around the area you want to magnify.
Digitize plots: It allows you to write graph Cartesian or logarithmic coordinates to a data file.
Some available curve fits: Linear, Power and Polynomial.
Custom curve fit: It displays the equation defined by the user to fit data.
Import/Export graphs as image files

2) Bar Charts and Statistical plots (gráficos de barras y estadísticos)

Bar Charts
Vertical / Horizontal Bar Chart: The vertical / horizontal bar chart graph displays the data points as a series of vertical / horizontal bars drawn from a base value to the data value recorded in the worksheet
Vertical / Horizontal Floating Bar Chart: The vertical /horizontal floating bar chart graph displays the difference between two sets of Y/X values. For each X/Y value, the length of each floating bar is drawn from the minimum Y/X value to the maximum Y/X value.
3D Vertical / Horizontal Bar Chart: The 3D vertical / horizontal bar chart graph displays the data points as a series of 3D vertical / horizontal bars drawn from a base value to the data value recorded in the worksheet.
Vertical / Horizontal Category Bar Chart: The vertical / horizontal category bar chart graph displays the data points as a series of vertical / horizontal bars drawn from a base value to the data value recorded in the worksheet. Category bar charts can use a text column (category) and a numeric column to create a graph.
3D Vertical / Horizontal Floating Bar Chart: The 3D vertical / horizontal floating bar chart graph displays the difference between two sets of Y/X values in 3D. For each X/Y value, the length of each floating bar is drawn from the minimum Y/X value to the maximum Y/X value.
3D XYZ Vertical / Horizontal Bar Chart: It displays data as bars drawn from a base value to the Y data value and positioned according to a Z value. If more than one variable is used (multiple Y values for each X, Z value), the bars can be stacked on top of one another or they can be adjacent to each other.
3D XYZ Vertical / Horizontal Floating Bar Chart: It shows the difference between two variables with respect to a third variable. Floating bar charts can be displayed either vertically or horizontally.

Statistical plots
Vertical Histogram: It displays the data as a series of vertical bars. Each bar represents a range of X axis values. The height of the bar represents the number of data points that fall within the range.
Vertical 3D Histogram: It displays the data as a series of 3D vertical bars. Each bar represents a range of X axis values. The height of the bar represents the number of data points that fall within the range.
Box-Whisker: This graph displays the minimum, maximum, median, lower quartile, and upper quartile for a particular X group. The caps at the end of each box indicate the extreme values (minimum and maximum), the box is defined by the lower and upper quartiles, and the line in the center of the box is the median. The values are sorted before referencing.
Notched Box-Whisker: This graph displays a box-whisker plot with notches. The notches indicate an approximate 95% confidence level for the median.

Pie Chart: The 2D pie chart displays data as proportional slices of a circle. Each data value is divided by the sum of all the data to determine the size of the slice. The data with the largest proportions appear as the largest slices

Pie Chart 3D: The 3D pie chart displays data as proportional slices of a 3D circle. Each data value is divided by the sum of all the data to determine the size of the slice. The data with the largest proportions appear as the largest slices.

Q-Q Plot: The Q-Q plot graph displays two data columns. Each column's data points are sorted and binned into percentiles. The percentiles are then interpolated and plotted against the other data set. Each point represents the same percentile in each data column.

Normal Q-Q Plot: The normal Q-Q plot graph displays one data column. The column's data points are sorted and binned into percentiles. The percentiles are then interpolated and plotted against the normal distribution. Each point represents the same percentile in the data column and the normal distribution

3) Polar and Specialty plots (gráficos polares y singulares)

Polar plots

Polar Class Scatter: The polar class scatter plot graph displays data as a group of symbols scattered across the polar graph. Symbols vary based on the third Class column. Data are separated into classes or bins. Each class or bin represents a range of values and has its own distinct symbol

Rose: The polar rose diagram displays data in groups or bins on a polar plot, similar to 2D histograms. Each bar represents a range of angles. The length of the bar represents the number of occurrences that fall within the angular region defined by the bin size.

Wind Chart: The wind chart displays data in groups or bins on a polar plot, similar to rose diagrams. Each bin represents a range of angles. The total length of the bin shows the number of times wind flows from a given direction. The total length is divided into speed bins and each directional bin can contain multiple wind speeds. The length of the individual speed bin bars represents the number of occurrences that fall within the angular region defined by the bin size and that fall within the defined speed.

Polar Line/scatter: The polar scatter plot graph displays degree, radian, or grad data as a group of symbols scattered across the graph. The symbols are connected by a line. The data are plotted in the order in which they appear in the data file.

Polar Function Plot: R = F(A) and R = F(T), A = G(T). The polar function plot graph displays mathematical functions on a polar graph. Data files are not required for this type of plot.

Polar Bar Chart: The polar bar chart graph displays data as bars drawn from the center of an angle axis to a data value.

Radar Chart: The radar graph displays multiple variables on a polar-like graph. Each variable has its own axis. Rows in the same column are drawn with a line between each variable. Radar plots are often used in decision making processes or to show relative importance of variables as they relate to each other.

Specialty plots

High-Low-Close Candlestick: The high-low-close candlestick graph displays a range of Y values at each X value. This plot is often used to display daily high, low, opening, and closing stock values. It can be used for other data types, as well. A box is drawn between the opening and closing values. The color of the box indicates a positive or negative gain that day. The high and low values extend as lines above and below the box.

Ternary Scatter: The ternary scatter plot diagram displays data as a group of symbols scattered across the graph. Data are plotted as relative percentages on the three component system. Ternary diagrams are frequently used in chemistry and earth sciences

X/Y/Angle/Magnitude Vector: The X,Y, Angle, Magnitude vector plot displays vectors as lines going from the starting XY location to the Angle direction with a length of the Magnitude. Vector plots have arrows at the end of the line.

High-Low-Close: It displays a range of Y values at each X value. This plot is commonly used to display the daily high, low, opening, and closing stock values, although it can be used for other data types.

• Metodología:

El uso del aula virtual, mediante la realización de tareas y el planteamiento de consultas y dudas en los foros que facilita esta herramienta, está enfocado a que el alumno alcance las siguientes competencias:

1. Aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.
2. Adquirir la habilidad para obtener información, diseñar experimentos e interpretar los resultados de los mismos mediante gráficos de tipo básico y sus complementos.

• Evaluación:

El alumno debe entregar en tiempo y forma determinada los casos y supuestos prácticos así como los problemas que se propongan usando la plataforma de enseñanza virtual.

Los pesos de cada uno de los elementos de evaluación antes descritos en la nota final son los siguientes: "Casos y supuestos prácticos" (25%) y "Resolución de problemas" (75%)

• Referencias básicas:

Grapher 11. Quick Start Guide. 2D and 3D Graphing Software for Scientists, Engineers, & Business. Professionals (2014). Golden Software, Inc. (http://www.goldensoftware.com/)