

# The *plottingtools* Library

## Preface

This is the documentation to a library of plotting functions which I have been developing for some time now. The library is mostly a collection of wrapper functions around the matplotlib library for Python. Its main purpose is the reduction of boilerplate code required for day-to-day tasks, as well as providing some aesthetically pleasing default parameter choices. Hence, the library is not a plotting library on its own, but a collection of functions intended to make data visualisation (such as for exploratory analysis and the communication of results) just a little bit easier :).

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- TBD

## Changing the general Aesthetics

**plottingtools.lightmode([foreground = “0”, background = “1.0”])**

- Description
  - Switch to light theme.
- Required parameters
  - None.
- Optional parameters
  - *foreground* String specifying the foreground colour. Default: “0”, i.e. pure black.
  - *background* String specifying the background colour. Default: “1.0”, i.e. pure white.
- Return
  - None.

**plottingtools.darkmode([foreground = “0.85”, background = “0.15”])**

- Description
  - Switch to dark theme.
- Required parameters
  - None.
- Optional parameters
  - *foreground* String specifying the foreground colour. Default: “0.85”, i.e. light grey.
  - *background* String specifying the background colour. Default: “0.15”, i.e. dark grey.
- Return
  - None.

**plottingtools.texon()**

- Description

- Switch on TeX-rendering of texts and numbers in plots.
- Required parameters
  - None.
- Optional parameters
  - None.
- Return
  - None.

### **plottingtools.texoff()**

- Description
  - Switch off TeX-rendering of texts and numbers in plots.
- Required parameters
  - None.
- Optional parameters
  - None.
- Return
  - None.

## Making a new Figure

### **plottingtools.singleplot([size = (10, 7)])**

- Description
  - Generate a new plot with one figure.
- Required parameters
  - None.
- Optional parameters
  - *size* 2-Tuple of numbers, containing the figure's width and height. Default: (10, 7)
- Return
  - 2-tuple (matplotlib.figure.Figure, matplotlib.pyplot.Axes)

### **plottingtools.multiplot(nrows, ncols, size)**

- Description
  - Returns a figure with nrows by ncols subplots
- Required parameters
  - *nrows* integer, the number of rows of plots
  - *ncols* integer, the number of columns of plots
  - *size\_xy* 2-tuple of numbers, containing the figure's width and height
- Optional parameters
  - None.
- Return
  - Tuple (matplotlib.figure.Figure, matplotlib.pyplot.Axes)

## **Standard plots**

WIP

## Plots unique to plottingtools

### **plottingtools.similarity\_heatmap(ax, list\_of\_lists, method)**

- Description
  - Generate a heatmap, showing the similarity of a list of lists of elements. Note that double entries are not taken into account.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object where the heatmap will be plotted.
  - *list\_of\_lists* A list of lists of elements, for which the similarities will be calculated and plotted.
  - *method* Either a string or a function specifying the method for calculating the similarity between the lists. Possible choices:
    - “jaccard”: Pairwise Jaccard similarity.
    - A callable function taking two parameters *list1*, *list2*, returning the similarity between *list1* and *list2*.
- Optional parameters
  - None.
- Return
  - None.

### **plottingtools.correlations\_heatmap(ax, list\_of\_lists, method)**

- Description
  - Generate a heatmap, showing the correlations of a list of equal-length lists of numerical elements.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object where the heatmap will be plotted.
  - *list\_of\_lists* A list of equal-length lists of numerical elements, for which the correlations will be calculated and plotted.
  - *method* Either a string or a function specifying the method for calculating the correlation between the lists. Possible choices:
    - “pearson”: Pearson product-moment correlation coefficient.
    - “spearman”: Spearman’s rank correlation coefficient.
    - “kendall”: Kendall rank correlation coefficient.

- A callable function taking two parameters *list1*, *list2*, returning the desired correlation between *list1* and *list2*.
- Optional parameters
  - None.
- Return
  - None.

### **plottingtools.masked\_heatmap(ax, data, mask)**

- Description
  - Plots a 2d heatmap applying a mask, so that only a certain part of the heatmap is actually plotted. Four options are possible: Plotting the lower, upper, lower-diagonal, or upper-diagonal part.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object where the heatmap will be plotted.
  - *data* A two-dimensional numpy.ndarray containing the data to be plotted.
  - *mask* A string specifying which mask to apply. Possible choices:
    - “upperdiag”: Plotting the upper part plus the diagonal elements of the matrix.
    - “upper”: Plotting only the upper part of the matrix without the diagonal elements.
    - “lowerdiag”: Plotting the lower part plus the diagonal elements of the matrix.
    - “lower”: Plotting only the lower part of the matrix without the diagonal elements.
- Optional parameters
  - None.
- Return
  - None.



## Adding elements to an existing plot

**plottingtools.title(ax, title, [fontsize = 40, pad = 20])**

- Description
  - Adds or changes a title to/of an existing matplotlib.pyplot.Axes object.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object.
  - *title* String containing the title.
- Optional parameters
  - *fontsize* The font size of the title. Defaults to 40.
  - *pad* The padding between the title and the actual plot. Defaults to 20.
- Return
  - None.

**plottingtools.labels(ax, xlabel, ylabel, [fontsize = 30, pad = 15])**

- Description
  - Adds or changes the x and y axis labels of an matplotlib.pyplot.Axes object. To only change one of the labels, pass None to the respective other parameter.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object.
  - *xlabel* String containing the new x-axis label, or None to leave the x-axis label unchanged.
  - *ylabel* String containing the new y-axis label, or None to leave the y-axis label unchanged.
- Optional parameters
  - *fontsize* The font size of the labels. Defaults to 30.
  - *pad* The padding between the axis labels and the axes. Defaults to 15.
- Return
  - None.

**plottingtools.diagonal(ax, [colour = “black”, alpha = 0.3, linestyle = “-”, linewidth = 2])**

- Description
  - Add a 1:1 diagonal to an existing matplotlib.pyplot.Axes object.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object.
- Optional parameters
  - *colour* A string specifying the colour of the diagonal. Defaults to “black”.
  - *alpha* Numerical value between 0 and 1, specifying the transparency of the diagonal. Defaults to 0.3.
  - *linestyle* String specifying the line style of the diagonal. Defaults to “-”, i.e. a continuous line.
  - *linewidth* Numerical value specifying the width of the diagonal. Defaults to 2.
- Return
  - None.

**plottingtools.rectangle(ax, x1, y1, x2, y2, [colour = “red”, linewidth = 3, linestyle = “-”, fill = False])**

- Description
  - Add a rectangle to an existing matplotlib.pyplot.Axes object.
- Required parameters
  - *x1* x-coordinate of the lower-left point of the rectangle.
  - *y1* y-coordinate of the lower-left point of the rectangle.
  - *x2* x-coordinate of the upper-right point of the rectangle.
  - *y2* y-coordinate of the upper-right point of the rectangle.
- Optional parameters
  - *colour* String specifying the colour of the rectangle’s border. Defaults to red.
  - *linewidth* Numerical value specifying the width of the rectangle’s border. Defaults to 3.
  - *linestyle* String specifying the line style of the rectangle. Defaults to “-”, i.e. a continuous line.
  - *fill* Boolean specifying whether to fill the rectangle. Defaults to False, i.e. no filling.

- Return
  - None.

**plottingtools.star(ax, x, y, [colour = “red”, fontsize = 50])**

- Description
  - Add an asterisk to an existing matplotlib.pyplot.Axes object, e.g. as a marker of statistical significance or to denote special points of interest.
- Required parameters
  - *x* x-coordinate of the asterisk.
  - *y* y-coordinate of the asterisk.
- Optional parameters
  - *colour* String specifying the colour of the asterisk. Defaults to red.
  - *fontsize* Numerical value specifying the font size of the star. Defaults to 50.
- Return
  - None.

**plottingtools.lines(ax, which, pos, [colour = “black”, alpha = 0.3, linestyle = “-”, linewidth = 2, zorder = -100])**

- Function will be reworked soon. Don’t use for now.

## Changing elements of an existing plot

### **plottingtools.despine(ax, [which = ['top', 'right']])**

- Description
  - Remove spines of a matplotlib.pyplot.Axes plot.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object to remove spines from.
- Optional parameters
  - *which* Array of strings specifying which spines to remove. Possible choices are “top”, “right”, “left”, “bottom”. Defaults to [“top”, “right”].
- Return
  - None.

### **plottingtools.ticklabelsize(ax, [which = “both”, size = 20])**

- Description
  - Change the size of the tick labels of a matplotlib.pyplot.Axes plot.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object.
- Optional parameters
  - *which* String which denotes the axis of which the tick label size will be changed. Can be “x”, “y”, or “both” (default).
  - *size* Numerical value with the new font size of the tick labels
- Return
  - None.

### **plottingtools.limits(ax, xlims, ylims)**

- Description
  - Change the x- and y-axis limits of a matplotlib.pyplot.Axes plot.
- Required parameters

- *ax* The matplotlib.pyplot.Axes object.
- Optional parameters
  - *xlimits* Tuple or list of two numerical values, denoting lower and upper limit of the x-axis. Can also be None, in which case the limits of the x-axis remain unchanged.
  - *ylimits* Tuple or list of two numerical values, denoting lower and upper limit of the y-axis. Can also be None, in which case the limits of the y-axis remain unchanged.
- Return
  - None.

### **plottingtools.ticks\_and\_labels(ax, which, ticks, labels)**

- Description
  - Set tick positions and labels of an axis of a matplotlib.pyplot.Axes object.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object.
  - *which* String which denotes the axis of which the tick positions and labels will be changed. Can be “x”, or “y”.
  - *ticks* List of numerical values specifying the tick positions.
  - *labels* List of strings containing the labels associated with the *ticks*.
- Optional parameters
  - None.
- Return
  - None.

### **plottingtools.rotate\_ticklabels(ax, which, rotation)**

- Description
  - Set the rotation of the tick labels of an axis of a matplotlib.pyplot.Axes object.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object.
  - *which* String which denotes the axis of which the tick labels will be rotated. Can be “x”, or “y”.

- *rotation* Numerical value specifying the new angle of the tick labels.
- Optional parameters
  - None.
- Return
  - None.

### **plottingtools.align\_ticklabels(ax, which, horizontal, vertical)**

- Description
  - Set the aligement of the tick labels of an axis of a matplotlib.pyplot.Axes object.
- Required parameters
  - *ax* The matplotlib.pyplot.Axes object.
  - *which* String which denotes the axis of which the tick labels will be aligned. Can be “x”, or “y”.
  - *horizontal* String specifying the kind of horizontal alignment. Can be “center”, “right”, or “left”.
  - *vertical* String specifying the kind of horizontal alignment. Can be “center”, “top”, “bottom”, or “baseline”.
- Optional parameters
  - None.
- Return
  - None.

## Saving the current figure to a file

### **plottingtools.save\_png(filename, [dpi = 300])**

- Description
  - Save the current plot as PNG file.
- Required parameters
  - *filename* string with the file name to export to.
- Optional parameters
  - *dpi* The resolution, in dpi. Default: 300
- Return
  - None.

### **plottingtools.save\_svg(filename)**

- Description
  - Save the current plot as SVG file.
- Required parameters
  - *filename* string with the file name to export to.
- Optional parameters
  - None
- Return
  - None.

### **plottingtools.save\_pdf(filename)**

- Description
  - Save the current plot as PDF file.
- Required parameters
  - *filename* string with the file name to export to.

- Optional parameters

- None.

- Return

- None.



**Collections of default parameters for matplotlib plots (documentation of this section is WIP)**