MYPlotSpec Documentation

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INTRODUCTION

MYPlotSpec is a Python package used to design matplotlib-based figures using the simple text format YAML.

MYPlotSpec may be used to rapidly write programs for plotting particular types of data while retaining detailed control over plot configuration. The minimal 'quick & dirty' code needed to plot a certain type of data should be very close to the polished code used to produce publication-quality figures featuring precisely chosen proportions, ticks, colors, and fonts. MYPlotSpec accomplishes this by offering a system for routing arguments provided in YAML format to matplotlib's existing formatting functions. Settings may be applied globally or routed to specific figures, subplots, and datasets. MYPlotSpec should have no conflict with existing matplotlibrc settings, instead offering a level of specific control on top of them. MyPlotSpec supports a system of defaults and presets that make it easy to prepare multiple versions of plots without changing code, such as for a lab notebook, printout, or presentation.

1.1 Dependencies

myplotspec supports Python 2.7 and 3.4, and requires the following packages:

- matplotlib
- numpy
- six
- yaml

This package has been tested with Anaconda python 2.1.0 on Arch Linux, OSX Yosemite, and Windows 8.1.

1.2 Installation

Put in your `$PYTHONPATH`:

```
export PYTHONPATH=/path/to/my/python/modules:$PYTHONPATH
```

where `/path/to/my/python/modules` contains `myplotspec`.

1.3 Authorship

MYPlotSpec is developed by Karl T. Debiec, a graduate student at the University of Pittsburgh advised by Professors Lillian T. Chong and Angela M. Gronenborn.

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USAGE

2.1 Getting Started

2.1.1 Basic Usage

MYPlotSpec prepares matplotlib figures to specifications provided in a YAML file. At the most basic level the YAML file may specify simply an outfile and the dataset infiles to plot on it:

```
figures:
    0:
        outfile:    examples/example_1.png
        subplots:
            0:
                datasets:
                    0:
                        infile: examples/dataset_1.txt
                    1:
                        infile: examples/dataset_2.txt
                    2:
                        infile: examples/dataset_3.txt
```
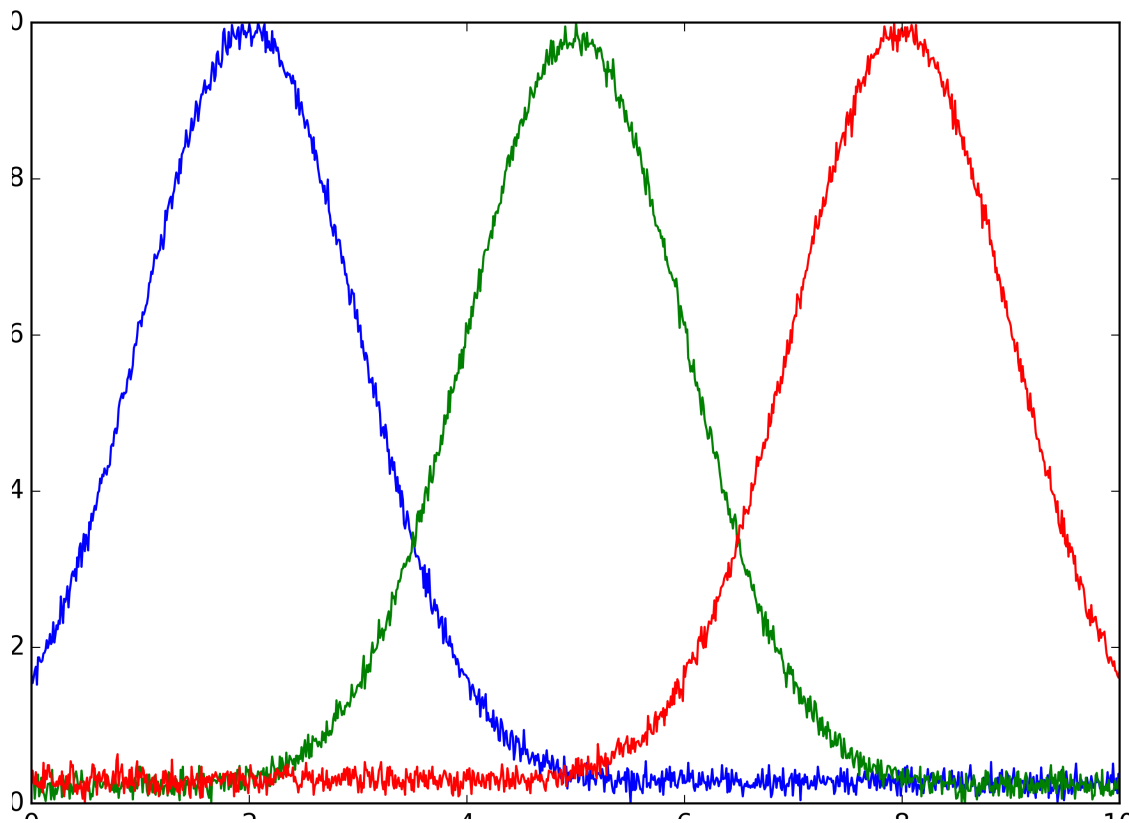
The resulting plot uses matplotlib's rcParams (i.e. defaults) for all settings, yielding a poorly-formatted figure. We could use matplotlib's functions to adjust the formatting, but we will instead specify adjustments in the YAML file, allowing MYPlotSpec to handle matplotlib for us.

2.1.2 Figure Settings

We may specify the margins and subplot dimensions of the figure:

```
figures:
    ...
    1:
        outfile:    examples/example_2.png
        left:       0.6
        sub_width:  3.0
        right:      0.2
        bottom:     0.5
        sub_height: 2.0
        top:        0.4
        subplots:
            0:
                datasets:
                    0:
                        infile: examples/dataset_1.txt
                    1:
```

```
                    infile: examples/dataset_2.txt
            2:
                    infile: examples/dataset_3.txt
```


This yields a much better-proportioned figure.

2.1.3 Subplot Settings

We may further adjust the subplot formatting, adding a title and axis labels, and applying specific formatting to the ticks:
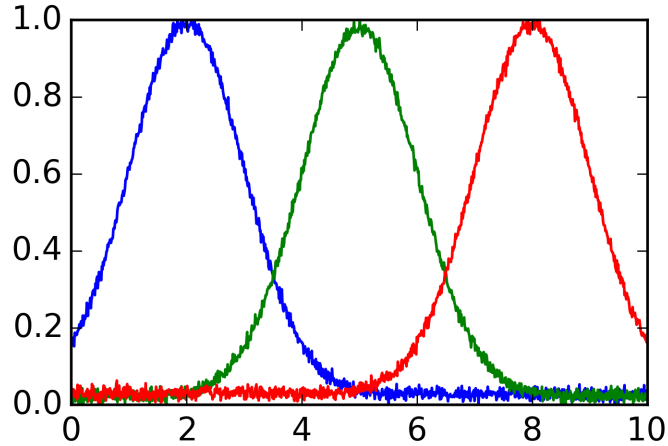
```
figures:
    ...
    2:
        outfile:    examples/example_3.png
        left:       0.6
        sub_width:  3.0
        right:      0.2
        bottom:     0.5
        sub_height: 2.0
        top:        0.4
        subplot_kw:
            autoscale_on: False
        subplots:
            0:
                title:       Subplot Title
                xlabel:      X Axis
                ylabel:      Y Axis
                xticks:      [0, 2, 4, 6, 8, 10]
                xticklabels: ["zero", "two", "four", "six", "eight", "ten"]
                yticks:      [0.0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6]
                title_fp:    10b
                label_fp:    10b
                tick_fp:     10r
                tick_params:
                    width:      1
```
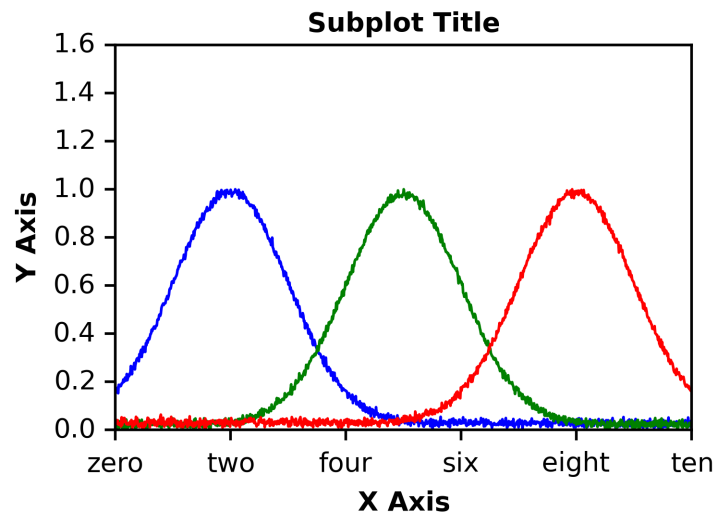
```
                   direction: out
               top:        off
               right:      off
           datasets:
               0:
                   infile: examples/dataset_1.txt
               1:
                   infile: examples/dataset_2.txt
               2:
                   infile: examples/dataset_3.txt
```


Note the setting `subplot_kw:  autoscale_on:  False`, this stops matplotlib from changing the bounds of the x and y axis automatically to fit the plotted data; MYPlotSpec will instead set them based on the x and y ticks. Note also how font styles may be set using a string '##L', which '##' is the font size and 'L' is 'r' for regular and 'b' for bold.

2.1.4 Dataset Settings

We may further adjust the dataset formatting, and add a legend:

```
figures:
    ...
    3:
        outfile:    examples/example_4.png
        left:       0.6
        sub_width:  3.0
        right:      0.2
        bottom:     0.5
        sub_height: 2.0
        top:        0.4
        subplot_kw:
            autoscale_on: False
        subplots:
            0:
                title:      Subplot Title
                xlabel:     X Axis
```
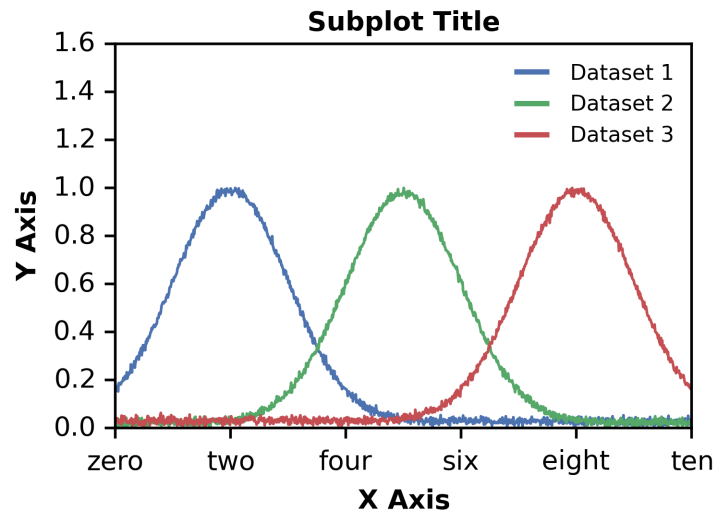
```
ylabel:      Y Axis
xticks:      [0, 2, 4, 6, 8, 10]
xticklabels: ["zero", "two", "four", "six", "eight", "ten"]
yticks:      [0.0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6]
title_fp:    10b
label_fp:    10b
tick_fp:     10r
tick_params:
    width:     1
    direction: out
    top:       off
    right:     off
legend_fp: 8r
legend:    True
legend_lw: 2
legend_kw:
    frameon: False
datasets:
    0:
        label:  Dataset 1
        infile: examples/dataset_1.txt
        color:  blue
    1:
        label:  Dataset 2
        infile: examples/dataset_2.txt
        color:  green
    2:
        label:  Dataset 3
        infile: examples/dataset_3.txt
        color:  red
```


2.1.5 Presets

MYPlotSpec includes a system of presets that make it easy to switch between different plot settings without changing many settings manually. We may use the 'notebook' preset to handle to font settings for us:

```
figures:
    ...
    4:
        preset:     notebook
        outfile:    examples/example_5.png
        left:       0.6
        sub_width:  3.0
        right:      0.2
        bottom:     0.5
        sub_height: 2.0
        top:        0.4
        subplot_kw:
            autoscale_on: False
        subplots:
            0:
                title:      Subplot Title
                xlabel:     X Axis
                ylabel:     Y Axis
                xticks:     [0, 2, 4, 6, 8, 10]
                xticklabels: ["zero", "two", "four", "six", "eight", "ten"]
                yticks:     [0.0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6]
                tick_params:
                    width:     1
                    direction: out
                    top:       off
                    right:     off
                legend:     True
                legend_lw:  2
                legend_kw:
                    frameon: False
                datasets:
                    0:
                        label:  Dataset 1
                        infile: examples/dataset_1.txt
                        color:  blue
                    1:
                        label:  Dataset 2
                        infile: examples/dataset_2.txt
                        color:  green
                    2:
                        label:  Dataset 3
                        infile: examples/dataset_3.txt
                        color:  red
```
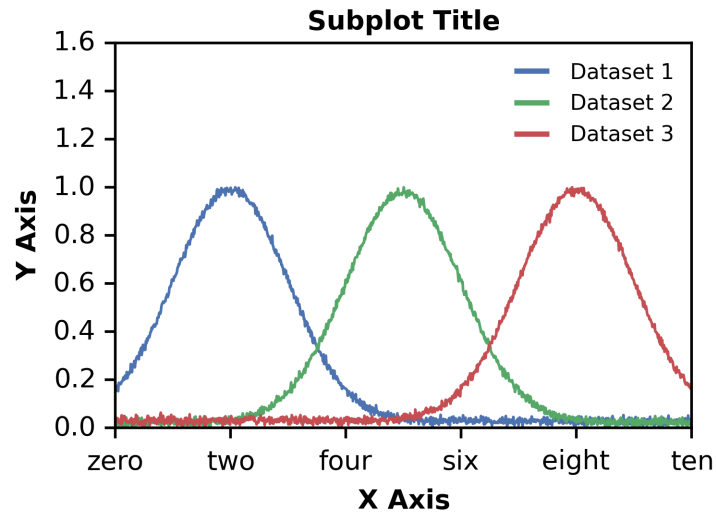
In practice, most of the settings listed above would be moved into a preset, keeping the actual information needed in each YAML file small.

2.2 Subclassing FigureManager

Once the examples above are understood, the next step towards using MYPlotSpec is typically to write a subclass of `FigureManager` for the specific type of dataset in use. Generally, only the function `draw_dataset()` needs to be overridden, in addition to the attributes `defaults` and `presets`. Example subclasses of `FigureManager` will be available soon.

CODE

3.1 Command-Line Tools

3.1.1 FigureManager

Generates one or more figures to specifications provided in a YAML file.

class `myplotspec.FigureManager.`**`FigureManager`**

    Manages the generation of figures using matplotlib.

    `defaults`

        str, dict

        Default arguments to `draw_report()`, `draw_figure()`, `draw_subplot()`, and `draw_dataset()` functions, in yaml format. Outer level (of indentation or keys) provides function names, and inner level provides default arguments to each function:

```
defaults = """
    method_1:
      method_1_arg_1: 1000
      method_1_arg_2: abcd
    method_2
      method_2_arg_1: 2000
      method_2_arg_2: efgh
    ...
"""
```

    `presets`

        str, dict

        Available sets of preset arguments to `draw_report()`, `draw_figure()`, `draw_subplot()`, and `draw_dataset()` functions, in yaml format. Outer level (of indentation or keys) provides preset names, middle level provides function names, and inner level provides arguments to pass to each function when preset is active:

```
presets = """
  preset_1:
    method_1:
      method_1_arg_1: 1001
      method_1_arg_2: abcde
    method_2
      method_2_arg_1: 2001
      method_2_arg_2: efghi
  preset_2:
```

```
        method_1:
          method_1_arg_1: 1002
          method_1_arg_2: abcdef
        method_2
          method_2_arg_1: 2002
          method_2_arg_2: efghij
    """
```

FigureManager.**draw_report**(...)

Draws a series of figures based on provided specifications.

Figure specifications are provided in a dict structured as follows:

```
figures = {
    'all': {
        'shared_xlabel': 'Time',
        'shared_ylabel': 'Measurement',
        'shared_legend': True,
        ...
    },
    '0': {
        'title': 'Trial 1',
        'subplots': {
            ...
        },
        ...
    },
    '1': {
        'title': 'Trial 2',
        'subplots': {
            ...
        },
        ...
    },
    '2': {
        'title': 'Trial 3',
        'subplots': {
            ...
        },
        ...
    },
    ...
}
```

The values stored at each (0-indexed) integer key provide the arguments to be passed to `draw_figure()` for each of a series of figures. Values stored at 'all' are passed to each figure, but overridden by values specific to that figure.

> **Parameters**
>
> - **figures** (*dict*) – Figure specifications
>
> - **in_kwargs** (*dict*) – Additional keyword arguments

Note: This function is one of two responsible for managing the output of figures to pdf files, if specified. While other output formats are single-page, pdf files may be multi-page. In order to allow multiple figures to be output to multiple pdfs, this function maintains a dict outfiles containing references to a PdfPages object for each specified pdf outfile. `draw_figure()`'s decorator `manage_output` adds new PdfPages objects as

requested, or adds pages to existing ones. Once all figures have been drawn, this function closes each PdfPages.

FigureManager.**draw_figure**(...)
> Draws a figure.

> Figure will typically contain one or more subplots, whose specifications are provided in a dict structured as follows:

```
subplots = {
    'all': {
        'legend': True,
        ...
    },
    '0': {
        'title':    'Subplot 1',
        'datasets': {
            ...
        },
        ...
    },
    '1': {
        'title':    'Subplot 2',
        'datasets': {
            ...
        },
        ...
    },
    '2': {
        'title':    'Subplot 3',
        'datasets': {
            ...
        },
        ...
    },
    ...
}
```

> The values stored at each integer key (0-indexed) provide the arguments to be passed to `draw_subplot()` for each of a series of subplots. Values stored at 'all' are passed to each subplot, but overridden by values specific to that subplot.

> Figure may be annotated by drawing a title, shared x axis label, shared y axis label, or shared legend. Title and shared axis labels are (by default) centered on all subplots present on the figure, Shared legend is drawn on an additional subplot created after those specified in subplots, using the arguments provided in shared_legend.

> **Parameters**

> > - **outfile** (*str*) – Output filename
> > - **subplots** (*dict*) – Subplot specifications
> > - **title** (*str, optional*) – Figure title
> > - **shared_xlabel** (*str, optional*) – X label to be shared among subplots
> > - **shared_ylabel** (*str, optional*) – Y label to be shared among subplots
> > - **shared_legend** (*dict, optional*) – Keyword arguments used to generate a legend shared among subplots, if provided
> > - **in_kwargs** (*dict*) – Additional keyword arguments

Returns *(Figure)*: Figure

`FigureManager.`**`draw_subplot`**`(...)`

Draws a subplot.

Subplot will typically plot one or more datasets, whose specifications are provided in a dict structured as follows:

```
datasets = {
    'all': {
        'lw': 2,
        ...
    },
    '0': {
        'label':  'Dataset 1',
        'infile': '/path/to/dataset_1.txt',
        'color':  'red',
        ...
    },
    '1': {
        'label':  'Dataset 2',
        'infile': '/path/to/dataset_2.txt',
        'color':  'green',
        ...
    },
    '2': {
        'label':  'Dataset 3',
        'infile': '/path/to/dataset_3.txt',
        'color':  'blue',
        ...
    },
    ...
}
```

The values stored at each integer key (0-indexed) provide the arguments to be passed to `draw_dataset()` for each of a series of datasets. Values stored at 'all' are passed to each dataset, but overridden by values specific to that dataset.

Subplot may be formatted by adjusting or labeling the x and y axes, or drawing a title or a legend.

Parameters

- **`subplot`** *(Axes)* – Axes on which to act

- **`datasets`** *(dict)* – Dataset specifications

- **`title`** *(str, optional)* – Subplot title

- **`legend`** *(bool, optional)* – Draw legend on subplot

- **`shared_handles`** *(OrderedDict, optional)* – Nascent OrderedDict of [labels]:handles shared among subplots of host figure; used to draw shared legend

- **`in_kwargs`** *(dict)* – Additional keyword arguments

`FigureManager.`**`draw_dataset`**`(...)`

Draws a dataset.

Parameters

- **`subplot`** *(Axes)* – Axes on which to draw

- **`infile`** *(str)* – Path to input text file; first column is x, second is y

---

- **label** (*str, optional*) – Dataset label

- **color** (*str, list, ndarray, float, optional*) – Dataset color

- **plot_kw** (*dict, optional*) – Additional keyword arguments passed to subplot.plot()

- **handles** (*OrderedDict, optional*) – Nascent OrderedDict of [labels]: handles on subplot

- **kwargs** (*dict*) – Additional keyword arguments

3.2 Decorators

Note: MyPlotSpec's decorator classes all support arguments provided at decoration (e.g. `@decorator(foo = bar)`). These use a different syntax from decorator classes without arguments. When the wrapped function is declared, __init__ and __call__ from the decorator are called sequentially. __init__ receives the arguments, while __call__ receives the function. __init__ should store the values of the arguments, while __call__ should prepare and return a wrapped function using their values. Subsequent calls will go to the wrapped function. For decorator classes without arguments, __init__ is called when the function is declared, and should store the reference to the function; __call__ is called when the function is called, and should carry out the pre-function decorator logic, run the function, and carry out the post-function decorator logic.

Note: MyPlotSpec's decorator classes manage_kwargs, manage_output, and debug_arguments may be used to wrap either functions or methods. This is enabled by restricting the arguments of their wrapped_function to *args and **kwargs, and accessing any arguments needed by the decorator using kwargs.pop() or kwargs.get(). If a method is wrapped, the first argument is the host object of the method (self), shifting the positions of other named arguments.

3.2.1 manage_defaults_presets

Decorator to manage the passage of defaults and presets to a method.

class myplotspec.manage_defaults_presets.**manage_defaults_presets**(*verbose=False*, *debug=False*)

Decorator to manage the passage of defaults and presets to a method.

This decorator is a partner to manage_kwargs, desiged to allows its use for methods of objects containg central defaults and presets attributes. It obtains available defaults and presets for the wrapped method from their central location in the host object, and passes on those applicable to the wrapped method. manage_kwargs then selects arguments to pass from among the provided defaults, available and selected presets, YAML file, and arguments provided at call time.

Defaults are accessed from the host object's instance (or class) variable self.defaults, and may be a dict, a path to a YAML file, or a YAML string. Outer level (of indentation or keys) provides function names, and inner level provides default arguments to each function:

```
defaults = """
    method_1:
        method_1_arg_1: 1000
        method_1_arg_2: abcd
    method_2
        method_2_arg_1: 2000
        method_2_arg_2: efgh
```

```
        ...
    """
```

Presets are accessed from the host objects's instance (or class) variable `self.presets`, in formats analagous to `self.defaults`. Presets contain an outer level of keys providing the names of available presets:

```
presets = """
    preset_1:
        method_1:
            method_1_arg_1: 1001
            method_1_arg_2: abcde
        method_2
            method_2_arg_1: 2001
            method_2_arg_2: efghi
    preset_2:
        method_1:
            method_1_arg_1: 1002
            method_1_arg_2: abcdef
        method_2
            method_2_arg_1: 2002
        method_2_arg_2: efghij
"""
```

When this decorator is used to wrap a method of a class, it adds to the arguments being passed `defaults`, containing the defaults specified for the method, and `presets`, containing only the presets applicable to the method:

```
@manage_defaults_presets()
def method_1(*args, **kwargs):
    print(kwargs)
    ...

{
    'defaults': {
        'method_1_argument_1': 1000,
        'method_1_argument_2': 'asdf'
    },
    'presets': {
        'preset_1': {
            'method_1_argument_1': 1001,
            'method_1_argument_2': 'asde'
        },
        'preset_1': {
            'method_1_argument_1': 1002,
            'method_1_argument_2': 'asdef'
        }
    },
    ...
}
```

verbose
> *bool*

> Enable verbose output

debug
> *bool*

Enable debug output

3.2.2 manage_kwargs

Decorator to manage the passage of keyword arguments to function or method.

class `myplotspec.manage_kwargs.`**`manage_kwargs`**(*verbose=False*, *debug=False*)

Decorator to manage the passage of keyword arguments to function or method.

Accumulates keyword arguments from several sources, in order of increasing priority:

1. Defaults

   Obtained from the argument `defaults`, which may be a dict, a path to a YAML file, or a YAML string:

   ```
   my_function(
       defaults = {
           'fig_width':  5.0
           'fig_height': 5.0
       },
       ...
   )
   ```

2. Presets

   Available presets are obtained from the argument `presets`, which may be a dict, a path to a YAML file, or a YAML string. Selected presets are obtained from the argument `preset`, which may be a string or list of strings:

   ```
   my_function(
       preset = 'letter',
       presets = {
           'letter': {
               'fig_width':   8.5
               'fig_height': 11.0
           },
           'legal': {
               'fig_width':   8.5
               'fig_height': 14.0
           }
       },
       ...
   )
   ```

3. YAML file

   YAML file is obtained from the keyword argument `yaml_dict`, which may be a dict, a path to a YAML file, or a YAML string. Selected keys within the YAML file from which to load arguments are obtained from the argument `yaml_keys`, which is a list of lists in order of increasing priority:

   ```
   my_function(
       yaml_dict = {
           'figures': {
               'all': {
   ```

```
                'fig_width':  11.0,
                'fig_height': 17.0,
                'outfile':    'plot.pdf'
            },
            '0': {
                'fig_width':  12.0
            }
        }
    },
    yaml_keys = [['figures', 'all'], ['figures', '0']],
    ...
)
```

If `yaml_keys` is omitted, the complete yaml file will be used.

4. Function call

Arguments provided at function call:

```
my_wrapped_function(
    fig_width  = 6.0,
    fig_height = 6.0,
    ...
)
```

All of the above will override defaults provided in the function declaration itself.

verbose
> *bool*

> Enable verbose output

debug
> *bool*

> Enable debug output

3.2.3 manage_output

Decorator to manage the output of matplotlib figures.

class myplotspec.manage_output.**manage_output**(*verbose=False*, *debug=False*)
> Decorator to manage the output of matplotlib figures.

> Saves figure returned by wrapped function to a file named `outfile`; passing additional keyword arguments `savefig_kw` to `Figure.savefig()`. For pdf output, additional argument `outfiles` may be provided; containing a dictionary whose keys are the paths to output pdf files, and whose values are open PdfPages objects representing those files. The purpose of this is to allow figures output from multiple calls to the wrapped function to be output to sequential pages of the same pdf file. Typically `outfiles` will be initialized before calling this wrapped function; and once calls to the function is complete the `PdfPages.close()` method of each outfile in `outfiles` is called.

3.3 Functions

3.3.1 General

General functions.

myplotspec.**get_yaml**(*input*)

Generates a data structure from YAML input.

If `input` is a string, tests whether or not it is a path to a YAML file. If it is, the file is loaded using yaml; if it is not, the string itself is loaded using YAML. If `input` is a dict, it is returned without modification.

> **Parameters input** (*str, dict*) – YAML input
>
> **Returns** (*dict*): Data structure specified by input
>
> **Raises** `TypeError` – Input file type not understood.

myplotspec.**merge_dicts**(*dict_1*, *dict_2*)

Recursively merges two dictionaries.

> **Parameters**
>
> - **dict_1** (*dict*) – First dictionary
>
> - **dict_2** (*dict*) – Second dictionary; values for keys shared by both dictionaries are drawn from dict_2
>
> **Returns** (*dict*): Merged dictionary

myplotspec.**multi_kw**(*keys*, *dictionary*)

Scans dict for keys; returns first value and deletes others.

> **Parameters**
>
> - **keys** (*list*) – Acceptable keys in order of decreasing priority
>
> - **dictionary** (*dict*) – dict to be tested
>
> **Returns** Value from first matching key; or None if not found

myplotspec.**pad_zero**(*ticks*, *digits=None*, ***kwargs*)

Prepares list of tick labels, each with the same precision.

> **Parameters**
>
> - **ticks** (*list, ndarray*) – ticks
>
> - **digits** (*int, optional*) – Precision; by default uses largest provided
>
> **Returns** (*list*): Tick labels, each with the same number of digits after the decimal

3.3.2 matplotlib

General

myplotspec.**get_color**(*color*)

Generates a color.

If color is a str, may be of form 'pastel.red', 'dark.blue', etc. corresponding to a color set and color; if no set is specified the 'default' set is used. If list or ndarray, should contain three floating point numbers corresponding to red, green, and blue values If float, should correspond to a grayscale shade.

> **Parameters color** (*str, list, ndarray, float*) – color
>
> **Returns** (*list*): [red, green, blue] on interval 0.0-1.0

myplotspec.**get_edges**(*figure_or_subplots*, ***kwargs*)
> Finds the outermost edges of a set of subplots on a figure.
>
> > **Parameters figure_or_subplots** (*Figure, list, dict*) – Axes whose edges to get; if Figure, use all Axes
> >
> > **Returns** (*dict*): Edges; keys are 'left', 'right', 'top', and 'bottom'

myplotspec.**get_figure_subplots**(*figure=None*, *subplots=None*, *nrows=None*, *ncols=None*, *nsubplots=None*, *left=None*, *sub_width=None*, *wspace=None*, *right=None*, *bottom=None*, *sub_height=None*, *hspace=None*, *top=None*, *fig_width=None*, *fig_height=None*, *figsize=None*, *verbose=False*, *debug=False*, ***kwargs*)
> Generates a figure and subplots to provided specifications.
>
> **Differs from matplotlib's built-in functions in that it:**
>
> - Accepts subplot dimensions is inches rather than proportional figure coordinates
> - Optionally calculates figure dimensions from provided subplot dimensions, rather than the reverse
> - Returns subplots in an OrderedDict
> - Smoothly adds additional subplots to a previously-generated figure (i.e. can be called multiple times)
>
> **Parameters**
>
> - **figure** (*Figure, optional*) – Figure, if adding subplots to a preexisting Figure
> - **subplots** (*OrderedDict, optional*) – Subplots, if adding subplots to a prevexisting Figure
> - **nrows** (*int*) – Number of rows of subplots to add
> - **ncols** (*int*) – Number of columns of subplots to add
> - **nsubplots** (*int, optional*) – Number of subplots to add; if less than nrows*ncols (e.g. 2 cols and 2 rows but only three subplots)
> - **sub_width** (*float*) – Width of subplot(s)
> - **sub_height** (*float*) – Height of subplot(s)
> - **left** (*float*) – Margin between left side of figure and leftmost subplot
> - **right** (*float*) – Margin between right side of figure and rightmost subplot
> - **top** (*float*) – Margin between top of figure and topmost subplot
> - **bottom** (*float*) – Margin between bottom of figure and bottommost subplot
> - **wspace** (*float*) – Horizontal margin between adjacent subplots
> - **hspace** (*float*) – Vertical margin between adjacent subplots
> - **fig_width** (*float*) – Width of figure; by default calculated from left, sub_width, wspace, right, and ncols
> - **fig_height** (*float*) – Height of figure, by default calculated from bottom, sub_height, hspace, top, and nrows
> - **figsize** (*list*) – Equivalent to [`fig_width`, `fig_height`]
> - **figure_kw** (*dict*) – Additional keyword arguments passed to figure()

- **subplot_kw** (*dict*) – Additional keyword arguments passed to Axes()

- **axes_kw** (*dict*) – Alias to `subplot_kw`

- **verbose** (*bool*) – Enable verbose output

- **debug** (*bool*) – Enable debug output

   Returns (*Figure*, *OrderedDict*): Figure and subplots

myplotspec.**get_font**(*fp=None*, ***kwargs*)
   Generates font based on provided specification.

   fp may be a string of form '##L' in which '##' is the font size and L is 'r' for regular or 'b' for bold. fp may
   also be a dict of keyword arguments to pass to FontProperties. fp may also be a FontProperties, in which case it
   is returned without modification

   Parameters **fp** (*str, dict, FontProperties*) – Font specifications

   Returns (*FontProperties*): Font with given specifications

Axes

Functions for formatting axes.

myplotspec.axes.**set_xaxis**(*subplot*, *xticks=None*, *xtick_kw=None*, *xticklabels=None*,
                              xtick_fp=None, *tick_fp=None*, *xticklabel_fp=None*, *ticklabel_fp=None*,
                              xticklabel_kw=None, *xlabel=None*, *xlabel_fp=None*, *label_fp=None*,
                              xlabel_kw=None, *xtick_params=None*, *tick_params=None*,
                              xtick_pad=None, *tick_pad=None*, *xlw=None*, *lw=None*, ***kwargs*)
   Formats the x axis of a subplot using provided keyword arguments.

   Parameters

- **subplot** (*Axes*) – Axes to format

- **xticks** (*list or ndarray*) – Ticks; first and last are used as upper and lower boundaries

- **xtick_kw** (*dict*) – Keyword arguments passed to subplot.set_xticks()

- **xticklabels** – Tick label text

- **xticklabel_kw** (*dict*) – Keyword arguments passed to subplot.set_xticklabels()

- **xlabel** (*str*) – Label text

- **xlabel_kw** – Keyword arguments passed to subplot.set_xlabel()

- **kwargs** (*dict*) – Additional keyword arguments

myplotspec.axes.**set_yaxis**(*subplot*, *yticks=None*, *ytick_kw=None*, *yticklabels=None*, *yt-*
                              ick_fp=None, *tick_fp=None*, *yticklabel_fp=None*, *ticklabel_fp=None*,
                              yticklabel_kw=None, *ylabel=None*, *ylabel_fp=None*, *label_fp=None*,
                              ylabel_kw=None, *ytick_params=None*, *tick_params=None*, *yt-*
                              ick_pad=None, *tick_pad=None*, *ylw=None*, *lw=None*, ***kwargs*)
   Formats the y axis of a subplot using provided keyword arguments.

   Parameters

- **subplot** (*Axes*) – Axes to format

- **yticks** (*list or ndarray*) – Ticks; first and last are used as upper and lower boundaries

- **ytick_kw** (*dict*) – Keyword arguments passed to subplot.set_yticks()

- **yticklabels** (*list*) – Tick label text

- **yticklabel_kw** (*dict*) – Keyword arguments passed to subplot.set_yticklabels()

- **ylabel** (*str*) – Label text

- **ylabel_kw** – Keyword arguments passed to subplot.set_ylabel()

- **kwargs** (*dict*) – Additional keyword arguments

Text

Functions for formatting text.

myplotspec.text.**set_title**(*figure_or_subplot*, *title=None*, *title_fp=None*, **args*, ***kwargs*)
    Draws a title on a Figure or subplot.

        Parameters

- **figure_or_subplot** (*Figure, Axes*) – Object on which to draw title

- **title** (*str*) – Title text

- **title_fp** (*str, dict, FontProperties*) – Title font

- **top** (*float*) – Distance between top of figure and title (inches); Figure title only

- **title_kw** (*dict*) – Keyword arguments passed to Figure.suptitle() or Axes.set_title()

        Returns (*Text*): Title

myplotspec.text.**set_shared_xlabel**(*figure_or_subplots*, *xlabel=None*, *xlabel_fp=None*, *label_fp=None*, **args*, ***kwargs*)
    Draws an x axis label shared by multiple subplots.

    The horizontal position of the shared x label is (by default) the center of the selected subplots, and the vertical position is a specified distance from the bottom of the figure.

        Parameters

- **figure_or_subplots** (*Figure, OrderedDict*) – Subplots to use to calculate label horizontal position; if Figure, all subplots present on figure are used

- **xlabel** (*str*) – Label text

- **xlabel_kw** (*dict*) – Keyword arguments passed to set_text()

- **bottom** (*float*) – Distance between bottom of figure and label (inches); if negative, distance between bottommost plot and label

- **top** (*float*) – Distance between top of figure and label; if negative, distance between topmost subplot and label; overrides bottom

- **x** (*float*) – X position within figure (proportion 0.0-1.0); default = center of selected subplots

- **y** (*float*) – Y position within figure (proportion 0.0-1.0); overrides bottom and top

        Returns (*Text*): X axis label

myplotspec.text.**set_shared_ylabel**(*figure_or_subplots*, *ylabel=None*, *ylabel_fp=None*, *label_fp=None*, **args*, ***kwargs*)
    Draws a y-axis label shared by multiple subplots.

    The vertical position of the shared y label is (by default) the center of the selected subplots, and the horizontal position is a specified distance from the left edge of the figure.

Parameters

- **figure_or_subplots** (*Figure, OrderedDict*) – Subplots to use to calculate label vertical position; if Figure, all subplots present on figure are used

- **ylabel** (*str*) – Label text

- **ylabel_kw** (*dict*) – Keyword arguments passed to `set_text()`

- **left** (*float*) – Distance between left side of figure and label; if negative, distance between leftmost plot and label

- **right** (*float*) – Distance between right side of figure and label; if negative, distance between rightmost plot and label; overrides `left`

- **x** (*float*) – X position within figure (proportion 0.0-1.0); overrides `left` and `right`

- **y** (*float*) – Y position within figure (proportion 0.0-1.0); default = center of selected subplots

Returns (*Text*): Y axis label

myplotspec.text.**set_inset** (*subplot*, *inset=None*, *inset_fp=None*, **args*, ***kwargs*)
Draws a text inset on a subplot.

Parameters

- **subplot** (*Axes*) – Subplot on which to draw inset

- **inset** (*str*) – Inset text

- **inset_fp** (*str, dict, FontProperties*) – Inset font

- **inset_kw** (*dict*) – Keyword arguments passed to `set_text()`

- **xpro** (*float*) – X position within subplot (proportion 0.0-1.0)

- **ypro** (*float*) – Y position within subplot (proportion 0.0-1.0)

- **x** (*float*) – X position within subplot (subplot coordinate); overrides `xpro`

- **y** (*float*) – Y position within subplot (subplot coordinate), overrides `ypro`

Returns (*Text*): Inset text

myplotspec.text.**set_text** (*figure_or_subplot*, *s=None*, *text=None*, *text_fp=None*, **args*, ***kwargs*)
Prints text on a figure or subplot.

Parameters

- **figure_or_subplot** (*Figure, Axes*) – Object on which to draw

- **text** (*str*) – Text

- **text_fp** (*str, dict, FontProperties*) – Text font

- **text_kw** (*dict*) – Keyword arguments passed to `text()`

Returns (*Text*): Text

Legend

Functions for formatting legends.

Note: Acceptable values of `loc` and their meanings, for reference:

```
0 = Best
+--------+
|2   9   1|
|6  10   7|
|3   8   4|
+--------+
```

---

myplotspec.legend.**set_legend**(*subplot*,   *handles=None*,   *legend_lw=None*,   *legend_fp=None*,
                                                **kwargs)
  Draws and formats a legend on a subplot.

  Parameters

  - **subplot** (*Axes*) – Subplot to which to add legend

  - **handles** (*OrderedDict*) – Collection of [labels]: handles for datasets to be plotted on
    legend; by default all available datasets are included

  - **legend_lw** (*float*) – Legend handle linewidth

  - **legend_fp** (*str, dict, FontProperties*) – Legend font

  - **legend_kw** (*dict*) – Keyword arguments passed to subplot.legend()

  Returns (*Legend*): Legend

myplotspec.legend.**set_shared_legend**(*figure*, *subplots*, ***kwargs*)
  Draws a legend on a figure, shared by multiple subplots.

  Useful when several plots on the same figure share the same description and plot style.

  Parameters

  - **figure** (*Figure*) – Figure to which to add shared legend

  - **subplots** (*OrderedDict*) – Collection of subplots to which to append new subplot for
    shared legend

  Returns (*Legend*): Legend

3.4 Debug

Classes and functions for debugging.

3.4.1 Decorators

class myplotspec.debug.**debug_arguments**(*debug=False*)
  Decorator to debug argument passage to a function or method.

  Provides more verbose output if a TypeError is encountered at function call

  debug
      bool

      Enable debug output

3.4.2 Output functions

myplotspec.debug.**db_s**(*string*, *indent=0*)
    Prints debug output.

> **Parameters**
>
> - **string** (*str*) – Content of debug output
>
> - **indent** (*int, optional*) – Indentation level; multiple of 4

myplotspec.debug.**db_kv**(*key*, *value*, *indent=0*, *flag=u' '*)
    Prints debug output for a key:value pair, truncated to 80 columns.

> **Parameters**
>
> - **key** (*str*) – key
>
> - **value** (*str*) – value
>
> - **indent** (*int, optional*) – Indentation level; multiple of 4
>
> - **flag** (*str, optional*) – Single-character flag describing pair

3.4.3 Formatting Functions

myplotspec.debug.**identify**(*subplots*, ***kwargs*)
    Identifies key of each subplot with inset text.

> **Parameters subplots** (*OrderedDict*) – subplots