

durhamcolours.py

Durham University Color Palette Consistent Styling for Scientific Visualizations

ElecSus Library Documentation

Abstract

This document provides documentation for `durhamcolours.py`, which defines a consistent color palette based on Durham University's corporate colors. The module provides RGB color specifications for use in matplotlib and other plotting libraries, ensuring professional and visually consistent scientific figures.

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1 Theoretical Foundation

1.1 Color Theory for Scientific Visualization

Axiom 1 (Visual Distinction). *Effective data visualization requires colors that are:*

1. *Distinguishable from each other*
2. *Accessible to colorblind viewers*
3. *Consistent across different media (print, screen)*

Definition 1 (RGB Color Model). *Colors are specified as triples (R, G, B) where each component is in $[0, 1]$:*

$$\text{Color} = R \cdot \hat{r} + G \cdot \hat{g} + B \cdot \hat{b} \quad (1)$$

Conversion from 8-bit values: $c_{\text{norm}} = c_{\text{8bit}} / 255$.

Theorem 1 (PANTONE to RGB Mapping). *Corporate color standards (PANTONE) are converted to RGB for digital display:*

$$(R, G, B)_{\text{RGB}} = f_{\text{display}}(\text{PANTONE code}) \quad (2)$$

This conversion is display-dependent but standardized for consistency.

1.2 Design Principles

Definition 2 (Color Harmony). *The Durham palette includes:*

- Primary colors: Purple, Blue
- Secondary colors: Red, Pink, Olive
- Neutral colors: Grey, Black, Light Grey
- Accent colors: Yellow, Light Blue, Light Purple

2 Color Definitions

2.1 Primary Palette

```
1 d_purple=[126.0/255.0,49.0/255.0,123.0/255.0] # Palatinate Purple 255C
2 d_blue = [0,99.0/255.0,136.0/255.0] # Blue 634C
```

Color	Variable	RGB (0-255)	PANTONE	Preview
Palatinate Purple	d_purple	(126, 49, 123)	255C	
Blue	d_blue	(0, 99, 136)	634C	

Table 1: Primary Durham colors

2.2 Secondary Palette

```
1 d_red    =[170.0/255.0,43.0/255.0,74.0/255.0] # Red 201C
2 d_pink   =[196.0/255.0,59.0/255.0,142.0/255.0] # Pink 675C
3 d_olive  =[159.0/255.0,161.0/255.0,97.0/255.0] # Olive Green 5835C
```

Color	Variable	RGB (0-255)	PANTONE	Preview
Red	d_red	(170, 43, 74)	201C	
Pink	d_pink	(196, 59, 142)	675C	
Olive	d_olive	(159, 161, 97)	5835C	

Table 2: Secondary Durham colors

2.3 Light Accent Colors

```

1 d_lightpurple=[216.0/255.0,172.0/255.0,244.0/255.0]      # 257C
2 d_midblue     =[145./255,184.0/255.0,189.0/255.0]        # 5493C
3 d_lightblue   =[196./255,229.0/255.0,250.0/255.0]       # 290C
4 d_yellow      =[232.0/255.0,227.0/255.0,145.0/255.0]     # 459C

```

Color	Variable	RGB (0-255)	PANTONE	Preview
Light Purple	d_lightpurple	(216, 172, 244)	257C	
Mid Blue	d_midblue	(145, 184, 189)	5493C	
Light Blue	d_lightblue	(196, 229, 250)	290C	
Yellow	d_yellow	(232, 227, 145)	459C	

Table 3: Light accent colors

2.4 Neutral Colors

```

1 d_grey      =[150./255,142./255,133./255]          # Warm Grey 8C
2 d_black     =[35./255,31./255,32./255]           # Black C
3 d_lightgrey=[207./255,218./255,209./255]         # Near White 5655C
4 d_midgrey   =[110./255, 100./255, 100./255]

```

Color	Variable	RGB (0-255)	PANTONE	Preview
Grey	d_grey	(150, 142, 133)	8C	
Black	d_black	(35, 31, 32)	BlackC	
Light Grey	d_lightgrey	(207, 218, 209)	5655C	

Table 4: Neutral colors

3 Code Structure

3.1 Color Lists

```

1 cols = [d_purple,d_blue,d_lightpurple,d_midblue,d_olive,
2      d_red,d_yellow,d_lightblue,d_grey,d_black,d_lightgrey,d_pink]
3
4 colname = ['d_purple', 'd_blue', 'd_lightpurple', 'd_midblue', 'd_olive',
5      ,
6      'd_red', 'd_yellow', 'd_lightblue', 'd_grey', 'd_black',
7      'd_lightgrey', 'd_pink']

```

Lists for programmatic access to all colors and their names.

3.2 Help Function

```
1 def help_dcols():
2     """ Show a plot demonstrating all the colours """
3     from pylab import figure,clf,subplots,show
4     from matplotlib.patches import Rectangle
5     fig, axes = subplots(4,3)
6     # ... creates visual palette display
7     fig.savefig('durhamcolors.png')
8     fig.savefig('durhamcolors.pdf')
9     show()
```

Generates a visual reference showing all colors with their names.

4 Usage Examples

4.1 Basic Plot

```
1 from durhamcolours import *
2 import matplotlib.pyplot as plt
3
4 plt.plot(x, y1, color=d_purple, label='Data_1')
5 plt.plot(x, y2, color=d_blue, label='Data_2')
6 plt.plot(x, y3, color=d_red, label='Data_3')
7 plt.legend()
8 plt.show()
```

4.2 Cycling Through Colors

```
1 from durhamcolours import cols
2
3 for i, dataset in enumerate(datasets):
4     plt.plot(x, dataset, color=cols[i % len(cols)])
```

4.3 Spectroscopy Application

```
1 # Plot Rb D2 spectrum with theory and experiment
2 plt.plot(detuning, experiment, 'o', color=d_blue,
3           markersize=2, label='Experiment')
4 plt.plot(detuning, theory, color=d_red,
5           linewidth=1.5, label='Theory')
6 plt.fill_between(detuning, 0, transmission,
7                  color=d_lightblue, alpha=0.3)
```

5 Color Accessibility

5.1 Colorblind Considerations

The Durham palette includes colors that may be difficult to distinguish for colorblind viewers. Recommendations:

- Use d_blue vs d_yellow for maximum contrast

- Combine color with line style (solid, dashed, dotted)
- Add markers to distinguish data series

5.2 Print Considerations

Colors are designed to work in both color and grayscale print. The palette includes sufficient luminance variation for grayscale reproduction.

6 Summary

The `durhamcolours.py` module provides:

1. 12 named color variables for direct use in plotting
2. `cols` list for programmatic iteration
3. `colname` list for labels and legends
4. `help_dcols()` function for visual reference

Import methods:

```

1 # Method 1: Import all colors
2 from durhamcolours import *
3
4 # Method 2: Import specific colors
5 from durhamcolours import d_purple, d_blue, d_red
6
7 # Method 3: Import module
8 import durhamcolours as dc
9 plt.plot(x, y, color=dc.d_purple)

```

The palette ensures consistent, professional styling across all ElecSus visualizations and publications.