

# Welcome to **instats**

**The Session Will Begin Shortly**

# START



# Spatial Data Analysis and Visualization in R

Session 5: Exploring Colour Palettes with the R Package  
cols4all

**instats**

# Introduction to cols4all

# Key Features

- **Comprehensive Palette Collection:** Includes a wide range of palettes from popular sources like ColorBrewer, viridis, and scico, as well as custom and user-defined palettes.
- **Palette Classification:** Organizes palettes into types such as categorical, sequential, diverging, cyclic, and bivariate.
- **Dashboard for exploration and analysis:**
  - **Colorblind-Friendliness**
  - **Contrast**
  - **Fairness**
  - **HCL Analysis**
- **Interactive Dashboard:** Launch with `c4a_gui()`.
- **Integration:** Works with `ggplot2` and `tmap`.



# Evaluation Metrics

- **Colorblind-Friendliness:** Uses distance metrics to assess distinguishability under different types of color vision deficiencies.
- **Contrast Ratios:** Ensures readability by calculating contrast between colors and backgrounds.
- **Fairness Metric:** A novel metric assessing visual balance so no color dominates.

# Links

- Documentation
- GitHub repo



# Dashboard

Overview

Color Blind Friendliness

HCL Analysis

Contrast

3D Blues

Naming

Application

☐ Dark mode



Palette type

☒ Categorical

☐ Sequential

☐ Diverging

☐ Cyclic

☐ Bivariate

Number of colors

2

7

36

☐ Color for missing values

Sort colors

☒ Original

☐ Hue

☐ Chroma

☐ Luminance

Sort palettes

Name

☐ Reverse sorting

Filter

☐ Only n = nmax (categorical only)

☐ Colorblind-friendly

☐ Fair

☐ Good contrast ratio with white

☐ Good contrast ratio with black

☐ Nameability

Palette series

☒ brewer

☒ carto

☒ cols4all

☒ hcl

☒ kovesi

☒ matplotlib

☒ met

☒ misc

☒ parks

☒ poly

☒ powerbi

☒ scico

☒ seaborn

☒ stevens

☒ tableau

☒ tol

☒ wes

Color vision

☒ Normal

☐ Deutan (red-green blind)

☐ Protan (also red-green blind)

☐ Tritan (blue-yellow)

Text

☒ None

☐ Hex

☐ RGB

☐ HCL

Underlying scores











































































































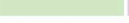





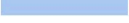



















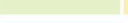



























☐ Show scores

All

None

Overview

# Categorical palette table

Series	Name	Max number	Colorblind-friendly	Fair	Hues	Vivid	Contrast wt	bk	eq.	3D Blues	Naming	1	2	3	4	5	6	7	References
tol	light	9		♡				🚩	🌀										 Bib JS R
parks	crater_lake	7		♡		✳️			🌀										 Bib JS R
seaborn	muted	10		♡				🚩	🌀										 Bib JS R
tableau	classic10light	10		♡				🚩	🌀										 Bib JS R
hcl	dark3	36		♡	🌈			🚩	🌀										 Bib JS R
seaborn	deep	10		♡				🚩	🌀										 Bib JS R
hcl	set3	36	👁️👁️	♡	🌈	✳️		🚩	🌀										 Bib JS R
hcl	dynamic	36	👁️👁️	♡	🌈	✳️		🚩	🌀										 Bib JS R
tableau	classic_cyclic	13	👁️👁️	♡		🕶️		🚩	🌀										 Bib JS R
brewer	set2	8	👁️👁️	♡				🚩	🌀										 Bib JS R
tableau	hue_circle	19	👁️👁️	♡				🚩	🌀										 Bib JS R
hcl	dark2	36	👁️👁️	♡	🌈	✳️	🚩	🚩	🌀										 Bib JS R
hcl	set2	36	👁️👁️	♡	🌈	✳️		🚩	🌀										 Bib JS R
brewer	pastel1	9	👁️👁️	♡		✳️		🚩	🌀										 Bib JS R
seaborn	pastel	10	👁️👁️	♡				🚩	🌀										 Bib JS R
hcl	harmonic	36	👁️👁️	♡		✳️		🚩	🌀										 Bib JS R
brewer	pastel2	8	👁️👁️	♡		✳️		🚩	🌀										 Bib JS R
hcl	cold	36	👁️👁️	♡		✳️		🚩	🌀										 Bib JS R
hcl	pastel1	36	👁️👁️	♡	🌈	✳️		🚩	🌀										 Bib JS R
hcl	warm	36	👁️👁️	♡		✳️		🚩	🌀										 Bib JS R

# Diverging table

Series	Name	Colorblind-friendly	Fair	Vivid	Hues	Contrast wt	3D Blues	1	2	3	4	5	6	7	References	
matplotlib	pl_yg	☺			🌓											Bib JS R
hcl	red_green	☺			🌓											Bib JS R
scico	bam	☺	♥	✱	🌓											Bib JS R
scico	vanimo	☺		✱	🌓											Bib JS R
hcl	purple_green	☺	♥	✱	🌓											Bib JS R
brewer	prgn	☺	♥	✱	🌓											Bib JS R
tol	pu_gn	☺	♥	✱	🌓											Bib JS R
matplotlib	prgn	☺	♥	✱	🌓											Bib JS R
met	cassatt2	☺	♥	✱	🌓											Bib JS R
parks	acadia	☺	✖	🕶	🌓											Bib JS R
hcl	purple_brown	☺	♥	✱	🌓											Bib JS R
kovesi	bu_gy_yl	☺			🌓											Bib JS R
matplotlib	seismic	☺	✖	🕶	🌓		🔵									Bib JS R
kovesi	bu_wh_rd	☺	✖	🕶	🌓											Bib JS R
kovesi	bu_wh_rd2	☺	✖	🕶	🌓											Bib JS R
matplotlib	coolwarm	☺	✖	🕶	🌓											Bib JS R
kovesi	bu_bk_rd	☺	✖	🕶	🌓											Bib JS R
kovesi	bu_bk_br	☺	✖	🕶	🌓											Bib JS R
scico	lisbon	☺	♥	✱	🌓											Bib JS R
seaborn	icefire	☺	✖	🕶	🌓											Bib JS R
parks	arches	☺			🌓											Bib JS R
powerbi	temperature	☺		🕶	🌓											Bib JS R
scico	broc	☺	♥	✱	🌓											Bib JS R
scico	vik	☺			🌓											Bib JS R
scico	berlin	☺	♥	✱	🌓											Bib JS R
tol	bu_rd	☺	✖	🕶	🌓											Bib JS R
tol	sunset	☺	✖	🕶	🌓											Bib JS R
tol	nightfall	☺	✖	🕶	🌓											Bib JS R
kovesi	gn_wh_pu	☺			🌓											Bib JS R
scico	roma	☺	♥		🌓											Bib JS R
met	isfahan1	☺	♥	✱	🌓											Bib JS R
brewer	pu_or	☺			🌓											Bib JS R
met	hiroshige	☺			🌓											Bib JS R
brewer	rd_yl_bu	☺	✖	🕶	🌓											Bib JS R
tableau	orange_blue_white_diverging	☺	✖	🕶	🌓											Bib JS R
met	homer1	☺		🕶	🌓		🌈									Bib JS R
scico	managua	☺	♥		🌓											Bib JS R
matplotlib	rd_yl_bu	☺	✖	🕶	🌓											Bib JS R
tableau	orange_blue_diverging	☺	✖	🕶	🌓											Bib JS R
tableau	classic_orange_white_blue	☺	✖	🕶	🌓											Bib JS R
brewer	rd_bu	☺	✖	🕶	🌓											Bib JS R
tableau	classic_orange_blue	☺	✖	🕶	🌓											Bib JS R
met	okeeffe1	☺			🌓											Bib JS R
matplotlib	rd_bu	☺	✖	🕶	🌓											Bib JS R
met	troy	☺	♥	✱	🌓											Bib JS R
met	cassatt1	☺	♥	✱	🌓											Bib JS R
tableau	red_blue_white_diverging	☺	✖	🕶	🌓											Bib JS R
tableau	classic_red_blue	☺	✖	🕶	🌓											Bib JS R
tableau	red_blue_diverging	☺	✖	🕶	🌓											Bib JS R

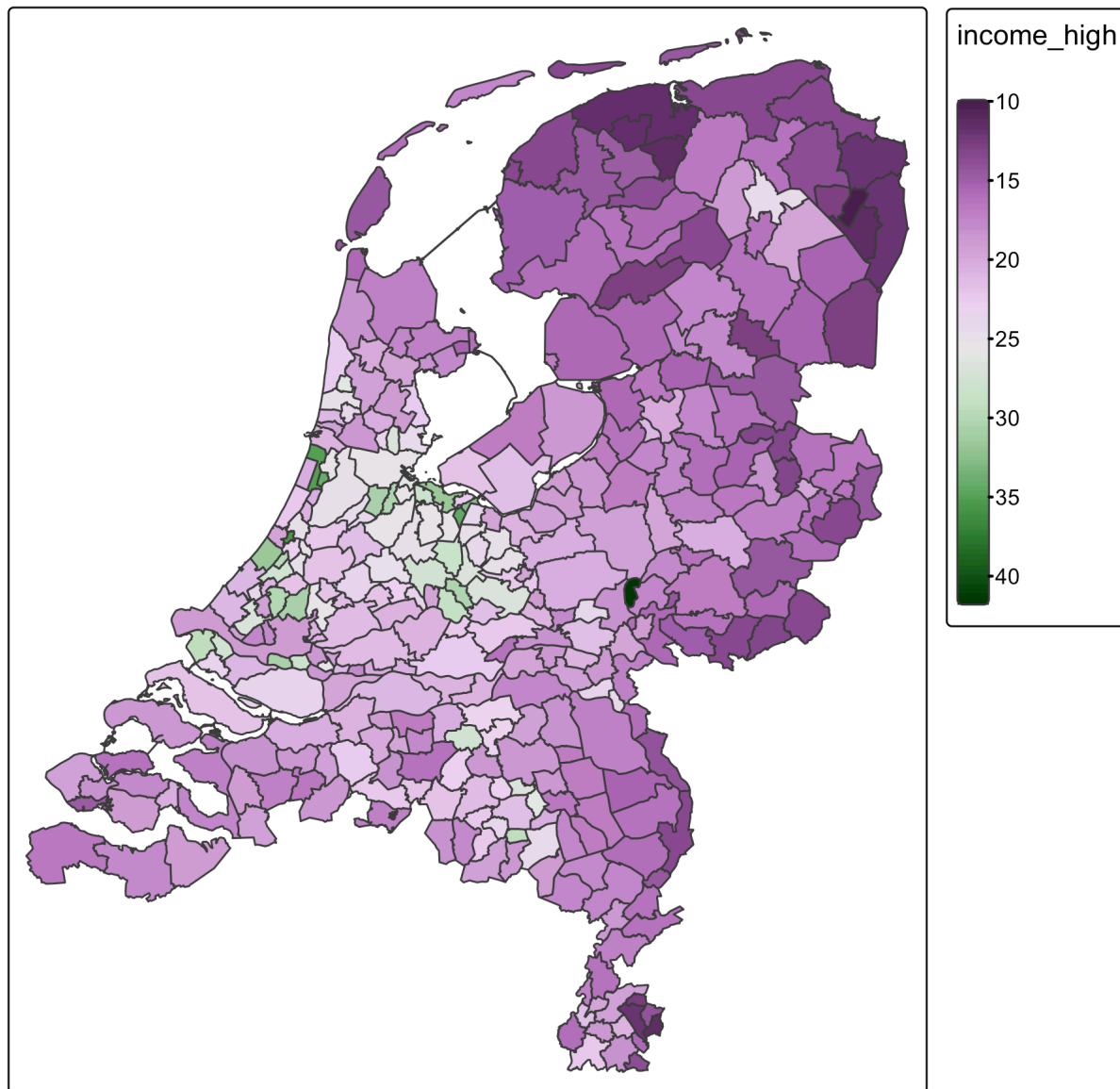
# New cols4all palettes

Series	Name	Max number	Colorblind-friendly	Fair	Hues	Vivid	Contrast			3D Blues	Naming	1	2	3	4	5	6	7	References
cols4all	area7	7	😊	♡	🌈			⬛	🌀										📖 Bib JS R
cols4all	area7d	7	😊	♡		✱		🚩	🌀										📖 Bib JS R
cols4all	area8	8		♡				⬛	🌀										📖 Bib JS R
cols4all	area8d	8	😊	♡		✱		🚩	🌀										📖 Bib JS R
cols4all	area9	9		♡				⬛	🌀										📖 Bib JS R
cols4all	area9d	9		♡				🚩	🌀										📖 Bib JS R
cols4all	friendly11	11	😊			🕶		⬛	🌀										📖 Bib JS R
cols4all	friendly13	13	😊			🕶		⬛	🌀										📖 Bib JS R
cols4all	friendly7	7	😊😊	✖	🌈	🕶			🌀										📖 Bib JS R
cols4all	friendly9	9	😊😊	✖	🌈	🕶			🌀										📖 Bib JS R
cols4all	line7	7	😊			🕶		🚩	⬛	🌀									📖 Bib JS R
cols4all	line8	8		✖		🕶		🚩	⬛	🌀									📖 Bib JS R
cols4all	line9	9				🕶		🚩	⬛	🌀									📖 Bib JS R

# Integration with tmap and ggplot2

# Palettes in tmap

```
tm_shape(NLD_muni) +  
  tm_polygons(fill = "income_high",  
              fill.scale = tm_scale_continuous(values = "cols4all.pu_gn_div"))
```



# Palettes in ggplot2

```
data("diamonds")
diam_exp = diamonds[diamonds$price >= 15000, ]
diam_exp$clarity[1:500] = NA

# continuous diverging scale
ggplot(diam_exp, aes(x = carat, y = depth, color = price)) +
  geom_point(size = 2) +
  scale_color_continuous_c4a_div("cols4all.pu_gn_div", mid = mean(diam_exp$price)) +
  theme_light()
```





# Recap

- **cols4all** is a handy R package for color palette exploration
- [Main source of documentation](#)



**STOP**