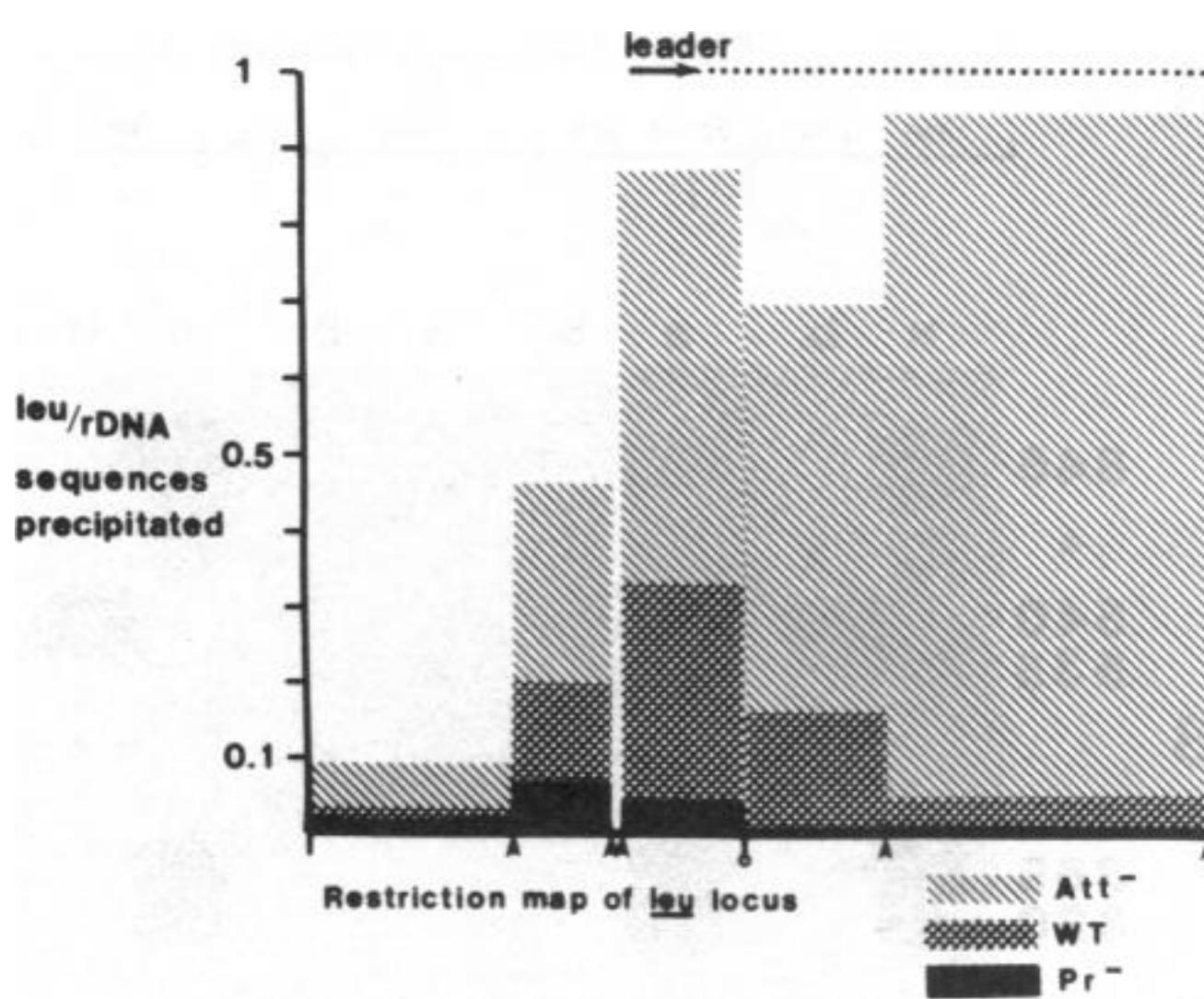


Data Visualization

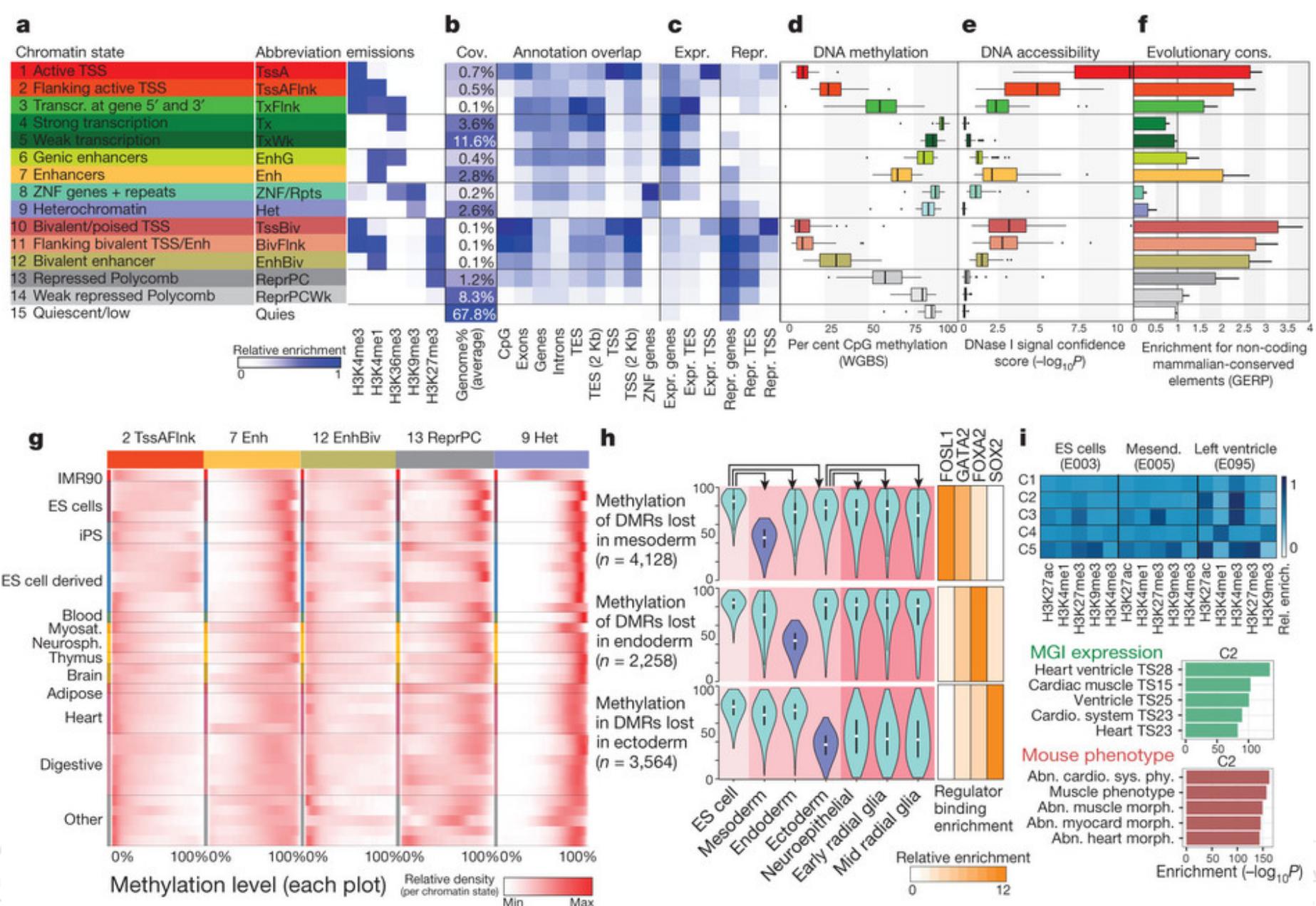
Simon van Heeringen
February 24 2016

From 1984

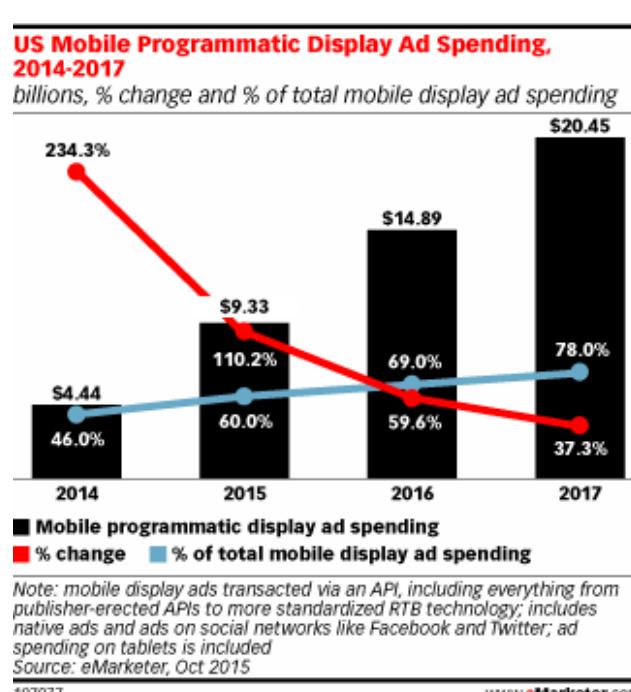


Gilmour & Lis, 1984

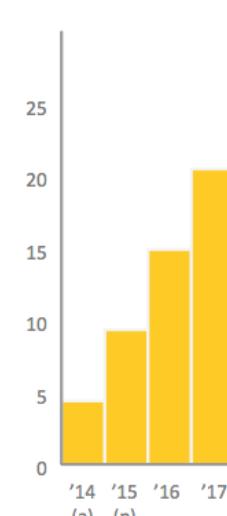
To 2015



Visualization matters...



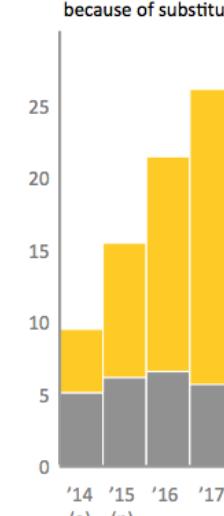
Programmatic Spend is projected to grow steadily



The rest of the market will peak in 2016 and then shrink



Total market growth is lower than the growth of programmatic spend because of substitution



Junkcharts

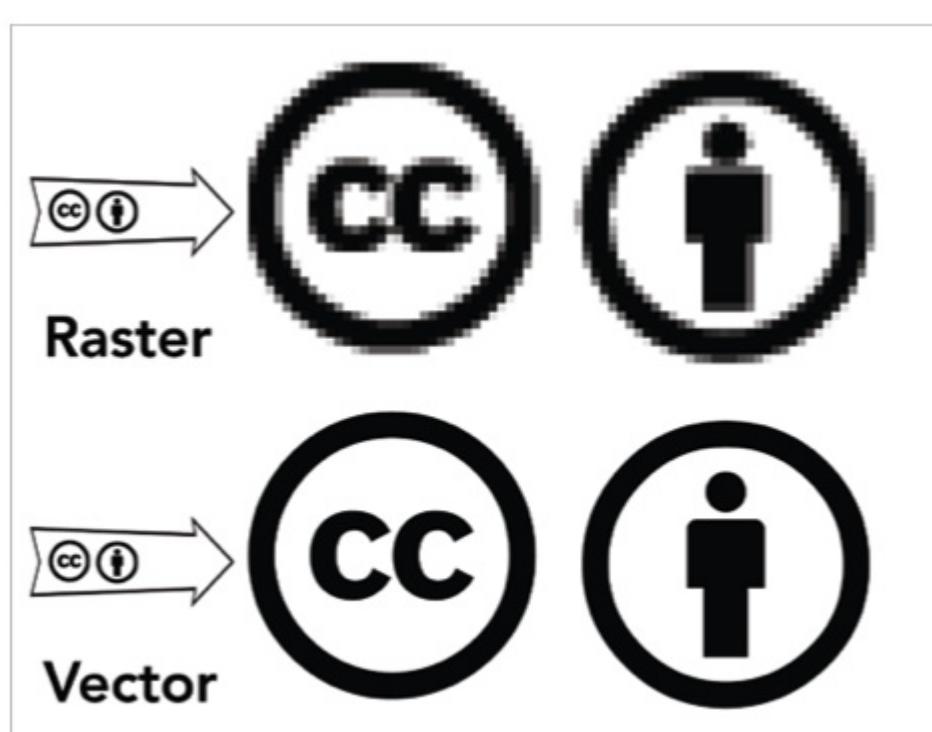
www.junkcharts.com

10 simple rules

- Know your audience
- Identify your message
- Adapt the figure to the medium
- Captions are not optional
- Do not trust the defaults
- Use color effectively
- Do not mislead the reader
- Avoid chartjunk
- Message trumps beauty
- Choose the right tool

Rougier et al., 2014

vector vs. raster(bitmap)



The “right tool”



The Free & Open Source Image Editor

This is the official website of the GNU Image Manipulation Program (GIMP).

GIMP is a cross-platform image editor available for GNU/Linux, OS X, Windows and more operating systems. It is [free software](#), you can change its [source code](#) and [distribute](#) your changes.

Whether you are a graphic designer, photographer, illustrator, or scientist, GIMP provides you with sophisticated tools to get your job done. You can further enhance your productivity with GIMP thanks to many customization options and 3rd party plugins.

Recent News

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[2016-01-28](#)

[Libre Graphics Meeting 2016](#)
[2016-01-12](#)

[GIMP and GEGL in 2015](#)
[2015-12-31](#)

[Libre Graphics Meeting 2016 Calls For Participation](#) 2015-12-31 00:00:00+01:00
[2015-12-03](#)

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The “right tool”



INKSCAPE

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Eisvogel by Prudentity

Inkscape is a professional vector graphics editor for Windows, Mac OS X and Linux. It's free and open source.

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Current stable version: 0.91

Draw Freely.

Overview

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Features

Find out what Inkscape is capable of

Gallery

Showcase of creations from the community

Learning Resources

Resources to help you get the most out of Inkscape

Users

A powerful, free design tool

Whether you are an illustrator, designer, web designer or just someone who needs to create some vector imagery, Inkscape is for you!

- Flexible drawing tools
- Broad file format compatibility
- Powerful text tool
- Bezier and spiro curves

Want to find out more about how Inkscape can help you? Look at a full set of [features](#) or [try it out!](#)

Developers

Google Summer of Code 2014

This is Inkscape's 10th year mentoring in Google's Summer of Code. Students, please see our [Summer of Code wiki page](#) for directions. Find an idea that interests you, and [let us know!](#)

[Join our thriving community](#)

We can always use help from more people. If you can write code, you may be able to help with development; if you can't, there are still lots of things we can use help with. For more information, take a look at our

Recent News

FOSSASIA and Openclipart T-shirt Design Contest

Feb. 18, 2016

FOSSASIA and Openclipart are launching a contest for International students, artists and designers to design a T-shirt graphic representing "The Internet of Things For Me." 1st place winner of the contest will win a FiftyThree Pencil and final design placement on the official FOSSASIA 2016 T-shirt. Second and third place winners' graphics will be used as design elements at the conference main party on the second day of the event.

[Read more...](#)

New Website Features to bring the Community together

Scientific Visualization

Current trends / where is it going?

My view on the important trends

- Increase of medium-to-big data
 - Increase of complexity
 - Methods of analysis and aggregation become very important
- On-line publishing
 - No hard limits on number of images and size
 - Interactivity
- Reproducibility

ENCODE @ nature.com

The screenshot displays the ENCODE explorer interface on the nature.com website. The interface is divided into two main sections: "THREADS" on the left and "PAPERS" on the right.

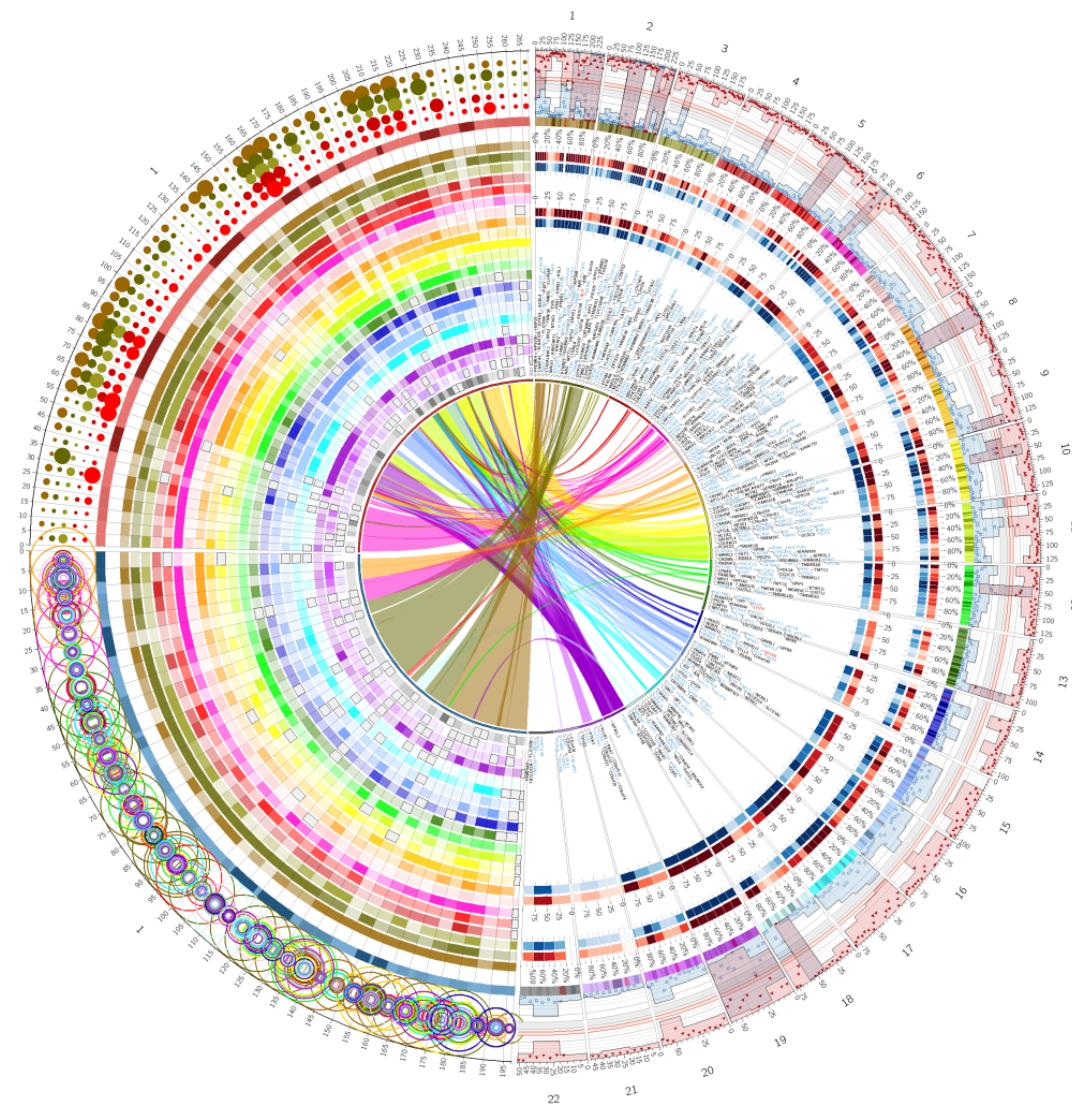
THREADS: A circular navigation menu where each circle represents a different thread. Thread 02 is highlighted in purple, while others are in various shades of grey. A callout box provides a "THREAD OVERVIEW" stating: "Chromatin patterns at transcription factor binding sites. Both chromatin accessibility and histone modifications have different patterns around different transcription factor binding sites." A red button labeled "Read Thread" is located below the overview text.

PAPERS: A circular diagram showing the relationship between threads and research papers. A specific paper by Neph et al. is highlighted in red, while others are in grey. A callout box for this paper states: "Neph, S., Vierstra, J. , Stergachis, A. B. and Reynolds, A. P. et al. An expansive human regulatory lexicon encoded in transcription factor footprints. Nature doi: 10.1038/nature11212 (2012)". A link "Leave explorer & read full paper" is provided.

Bottom Navigation: Three buttons at the bottom of the interface are: "What is ENCODE?", "Threads: a new approach", and "Guide to the ENCODE explorer".

Production Information: The interface is "PRODUCED WITH SUPPORT FROM illumina".

Circos



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Shiny web-apps

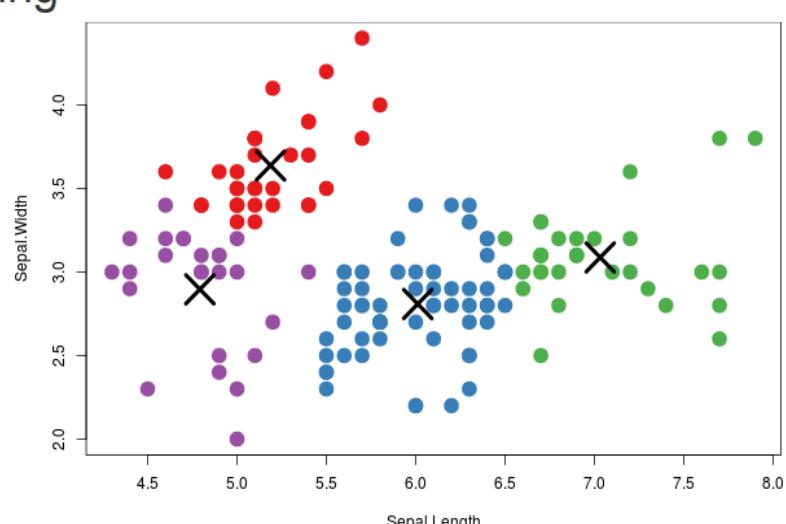
Shiny by RStudio [BACK TO GALLERY](#)

Iris k-means clustering

X Variable

Y Variable

Cluster count



server.R ui.R

```
palette(c("#E41A1C", "#377EB8", "#4DAF4A", "#984EA3",
          "#FF7F00", "#FFFF33", "#A65628", "#F781BF", "#999999"))

shinyServer(function(input, output, session) {

  # Combine the selected variables into a new data frame
  selectedData <- reactive({
    iris[, c(input$xcol, input$ycol)]
  })

  clusters <- reactive({
    kmeans(selectedData(), input$clusters)
  })

  output$plot1 <- renderPlot({
    par(mar = c(5.1, 4.1, 0, 1))
    plot(selectedData(),
         col = clusters()$cluster,
         pch = 20, cex = 3)
    points(clusters()$centers, pch = 4, cex = 4, lwd = 4)
  })
})
```

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CCCC
ACAG
CCAC

Shiny web-apps

Shiny by RStudio [BACK TO GALLERY](#)

Iris k-means clustering

X Variable
Sepal.Length

Y Variable
Sepal.Width

Cluster count
3

A scatter plot showing Sepal.Length on the x-axis (ranging from 4.5 to 8.0) and Sepal.Width on the y-axis (ranging from 2.0 to 4.0). The data points are colored by cluster: green (Iris-setosa), blue (Iris-versicolor), and red (Iris-virginica). Three black 'X' marks represent the centroids of each cluster. The green cluster is centered around (5.0, 3.0), the blue cluster around (6.0, 2.8), and the red cluster around (7.0, 3.0).

server.R ui.R

```
palette(c("#E41A1C", "#377EB8", "#4DAF4A", "#984EA3",
  "#FF7F00", "#FFF333", "#A65628", "#F781BF", "#999999"))

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    plot(selectedData(),
      col = clusters()$cluster,
      pch = 20, cex = 3)
    points(clusters()$centers, pch = 4, cex = 4, lwd = 4)
  })
})
```

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D3.js



Data-Driven Documents



D3.js

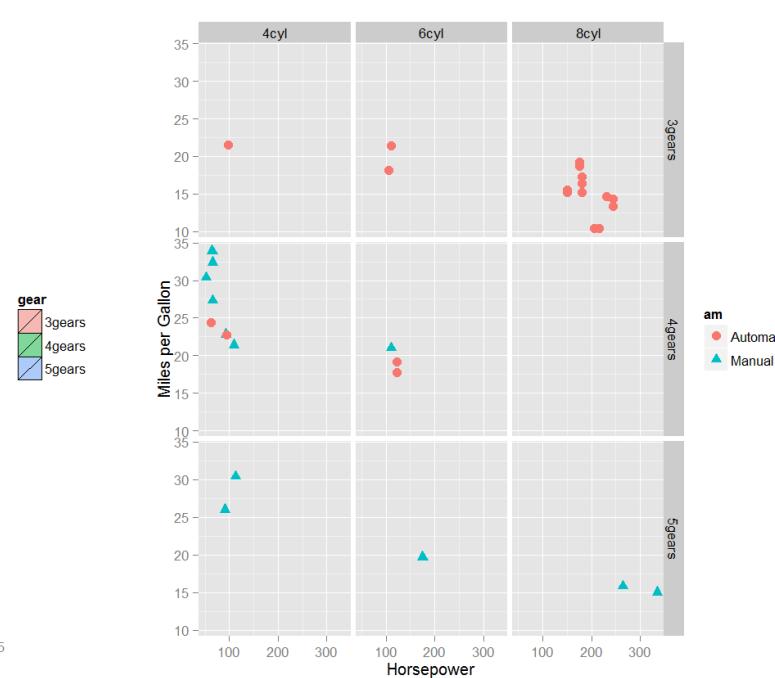
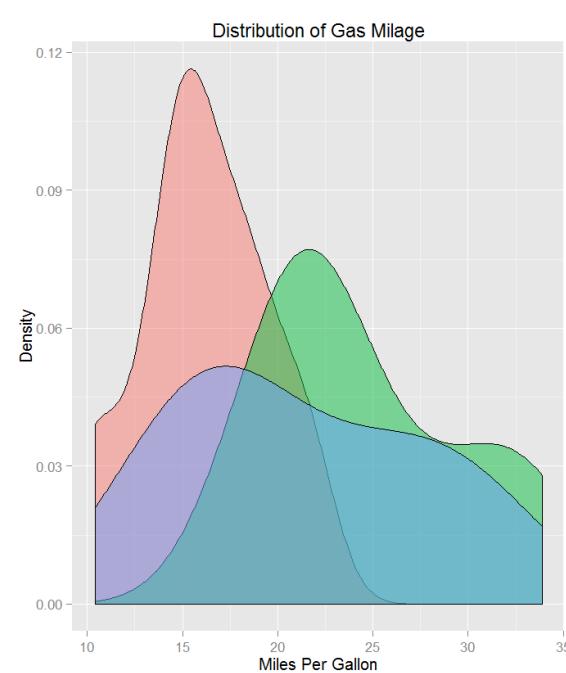
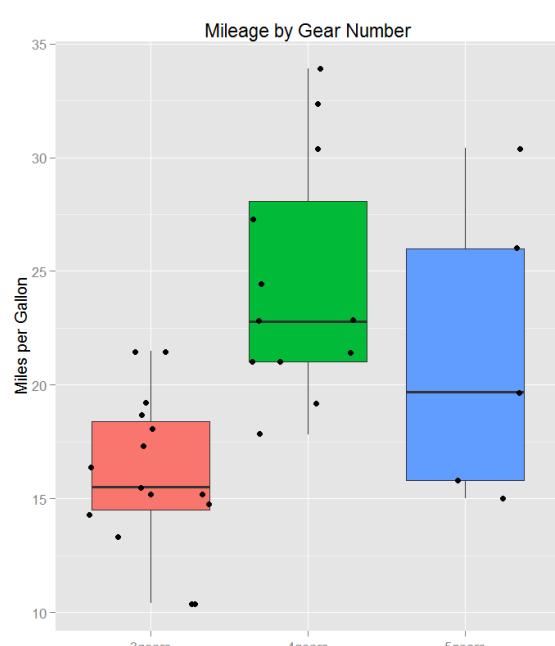
- <https://bost.ocks.org/mike/nations/>
 - Hans Rosling / Mike Bostock
- <http://www.nytimes.com/interactive/2013/02/19/movies/awardsseason/oscar-trailers.html>
 - Shan Carter / Amanda Cox / Mike Bostock

the grammar of graphics



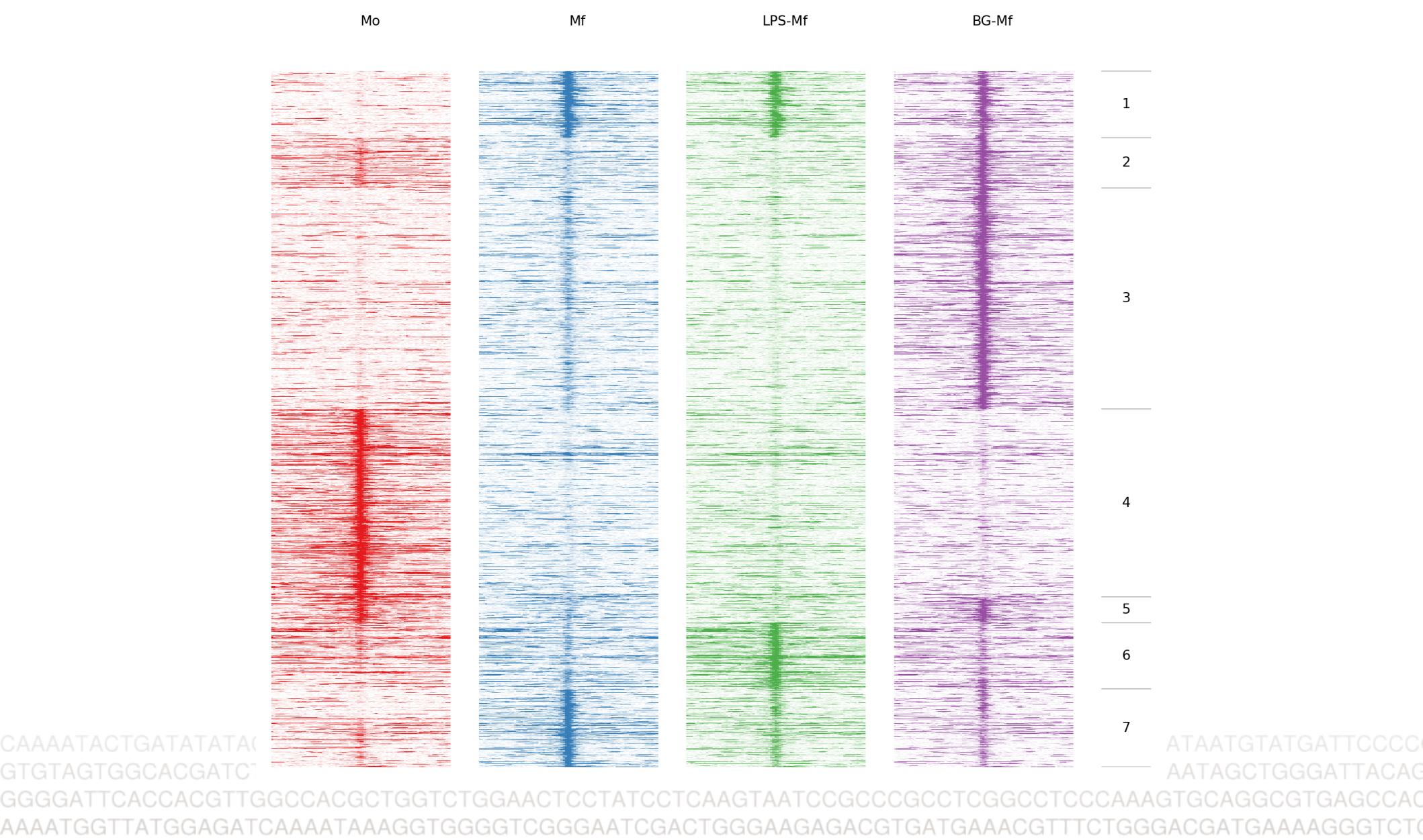
www.science-craft.com

ggplot (R library)

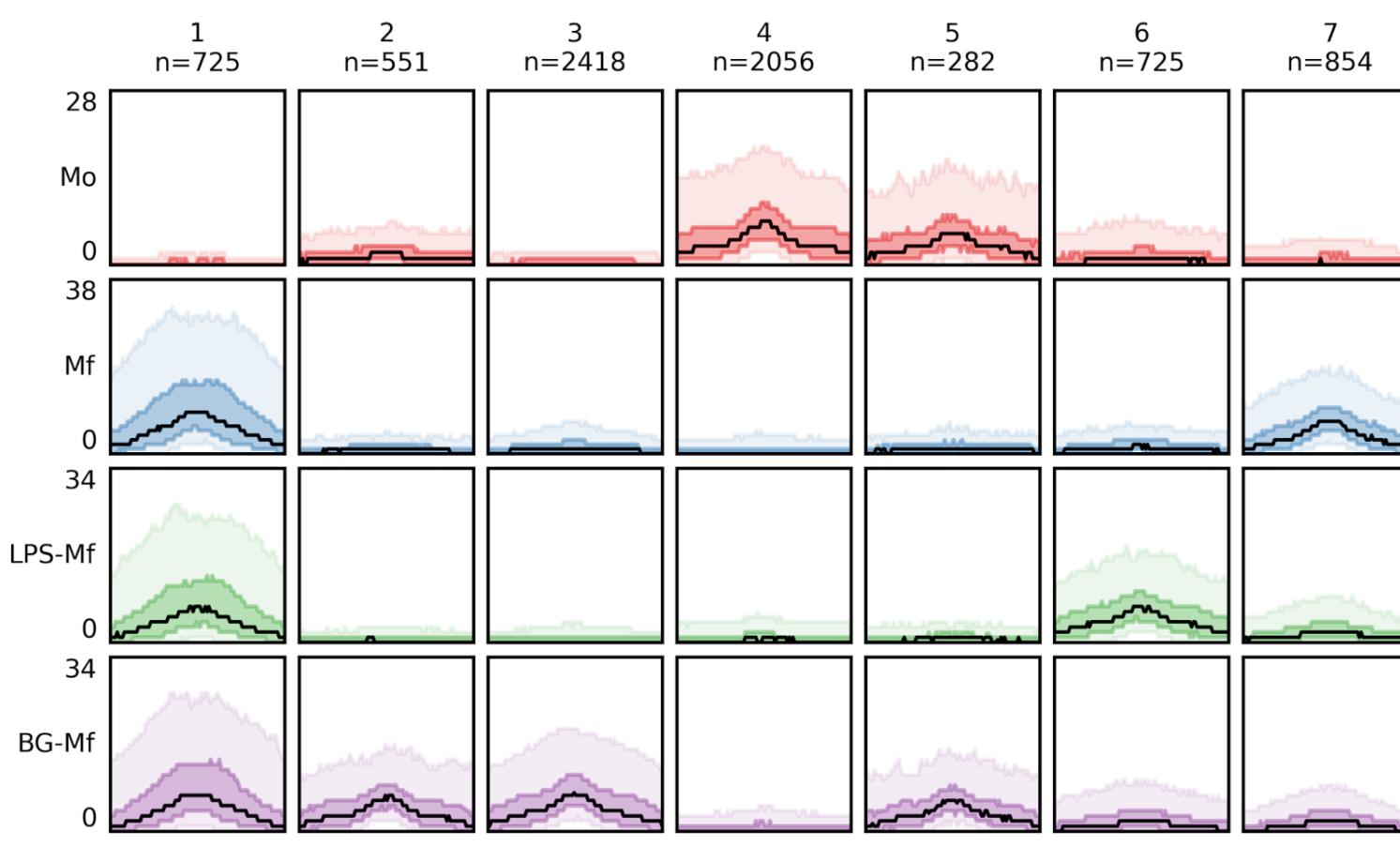


www.statsmethods.net

H3K27ac (active enhancers)

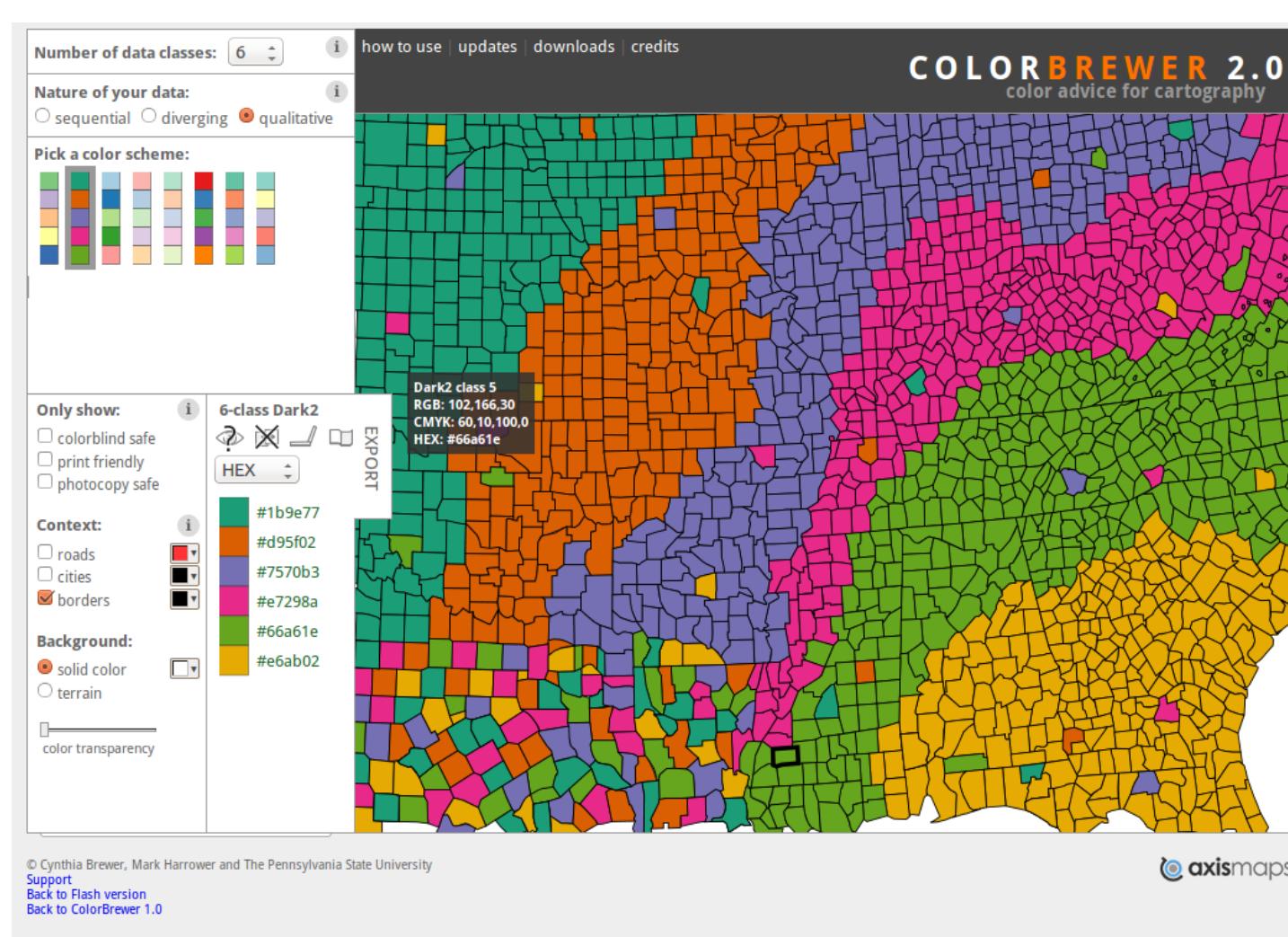


H3K27ac (active enhancers)



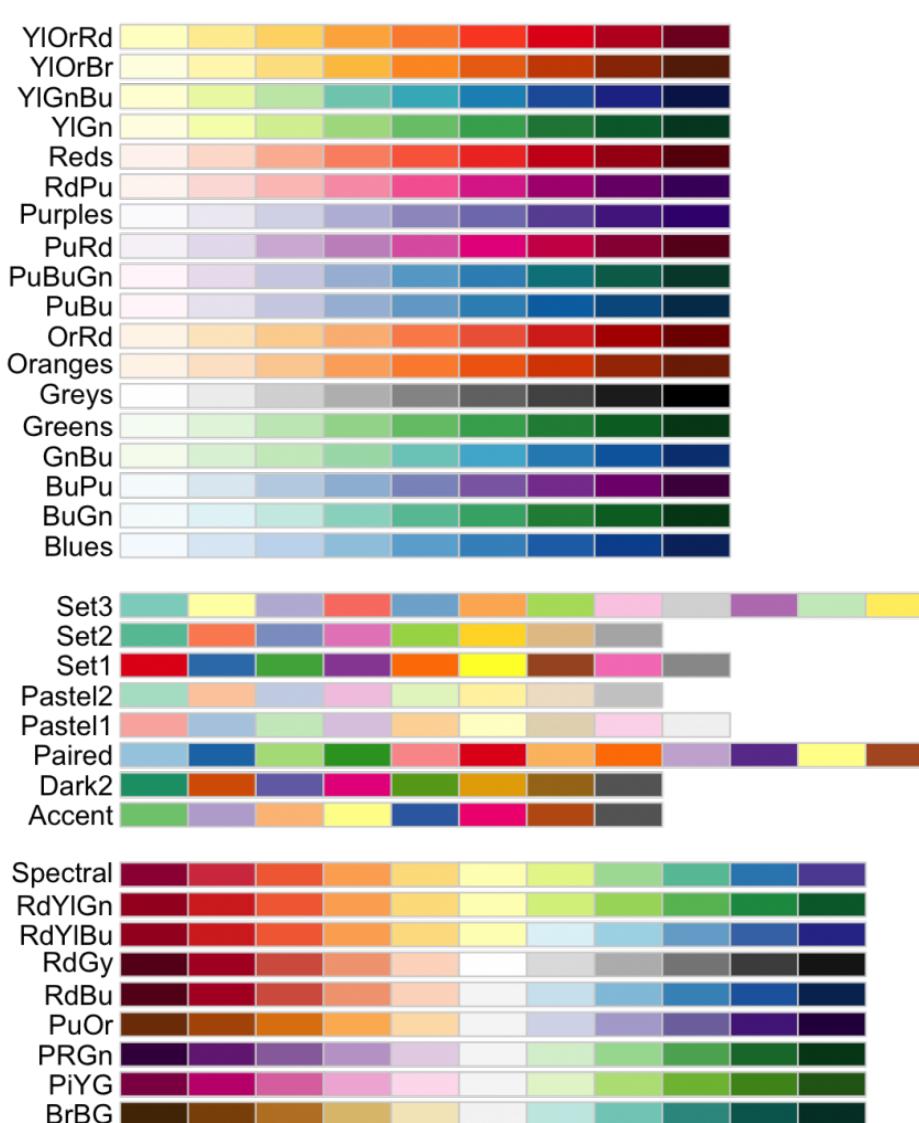
On color...

Colorbrewer



<http://colorbrewer2.org>

Colorbrewer palettes

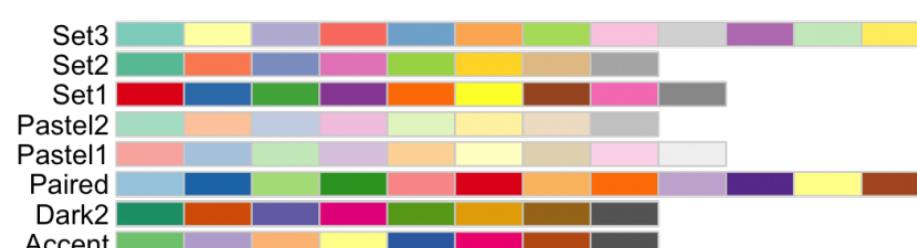


Colorbrewer palettes

sequential



qualitative



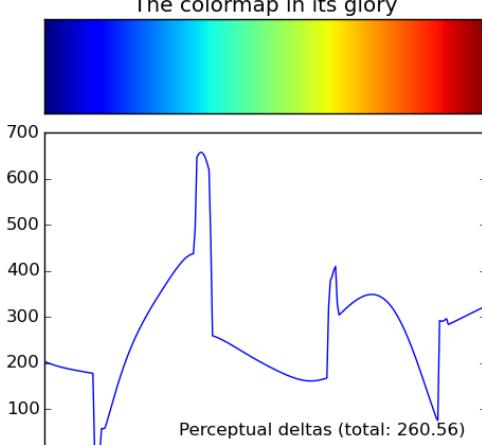
diverging



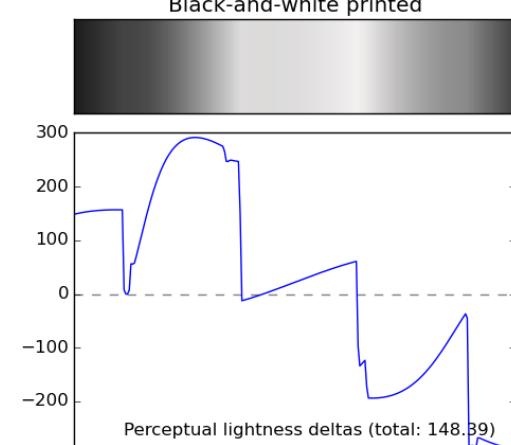
Jet (rainbow)

Colormap evaluation: jet

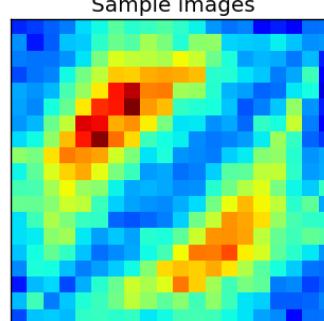
The colormap in its glory



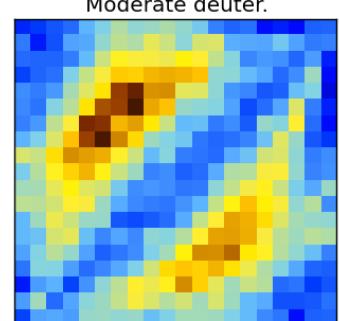
Black-and-white printed



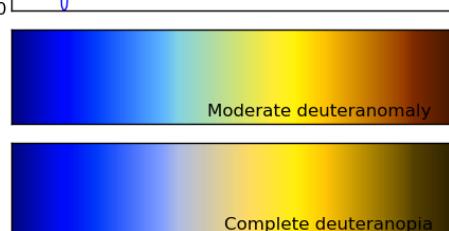
Sample images



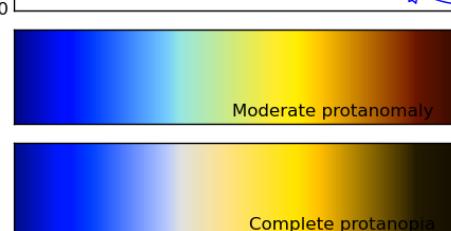
Moderate deuter.



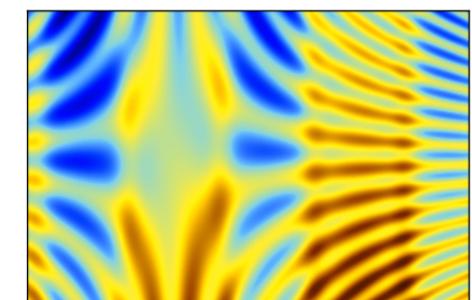
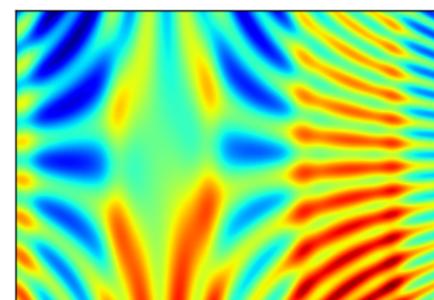
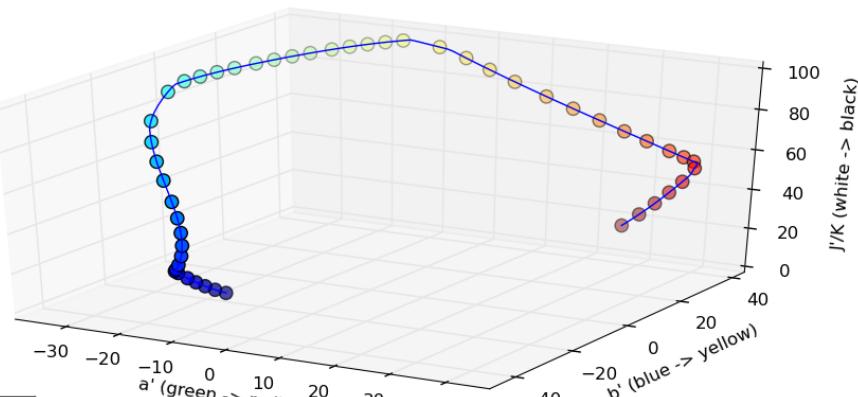
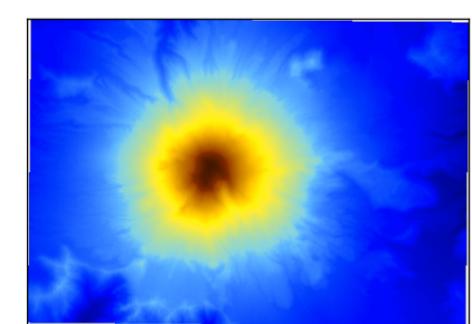
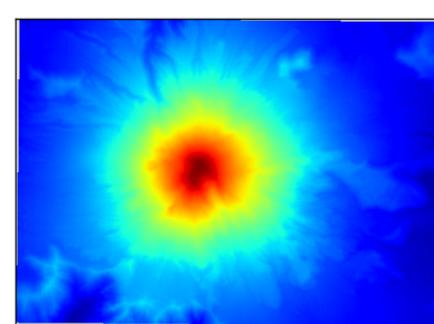
Moderate deuteranomaly



Complete deutanopia



Complete protanopia

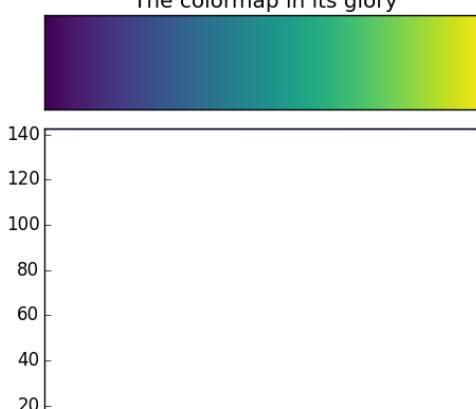


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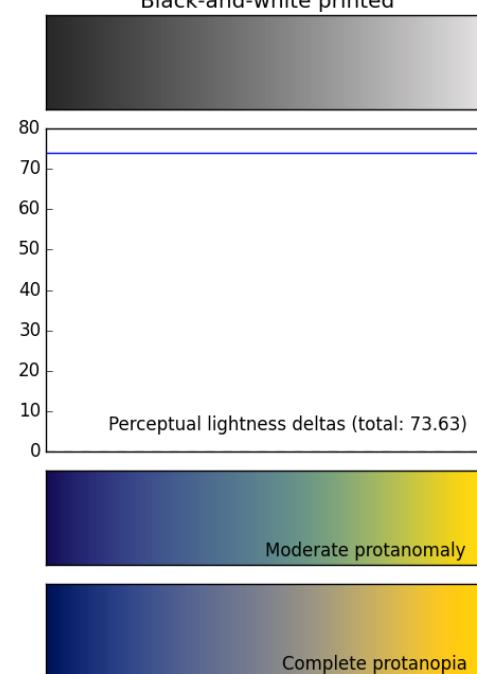
Viridis

Colormap evaluation: option_d.py

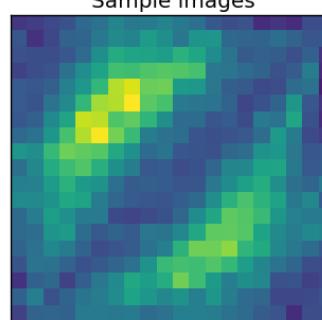
The colormap in its glory



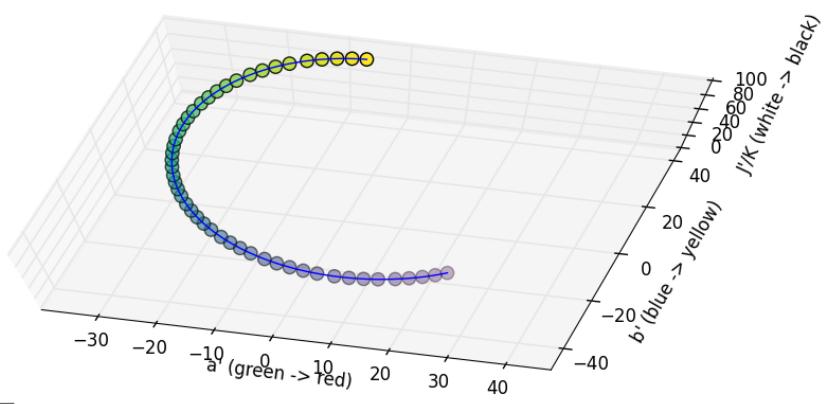
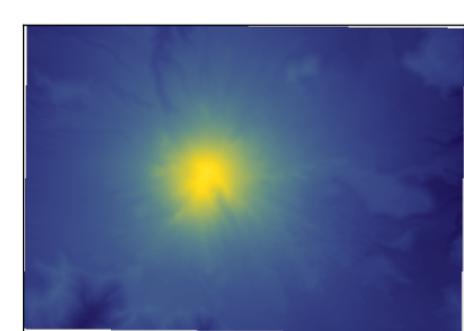
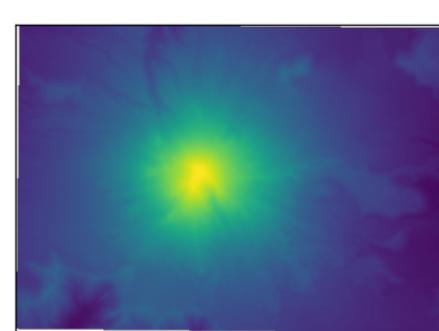
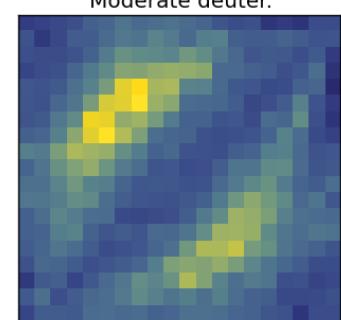
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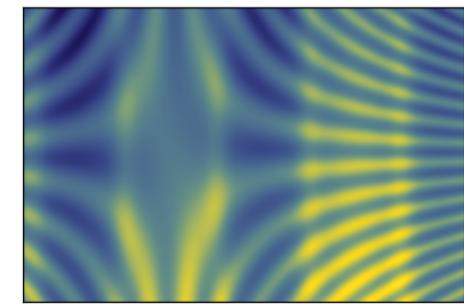
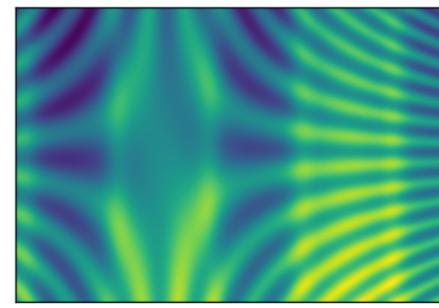
Sample images



Moderate deuter.

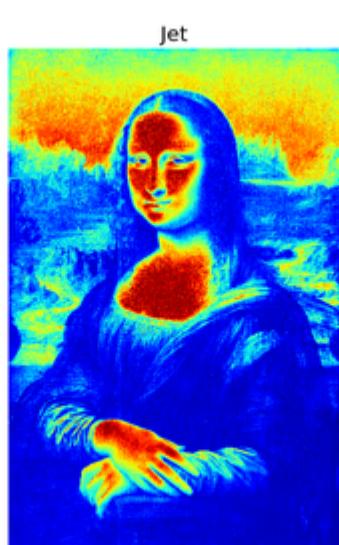


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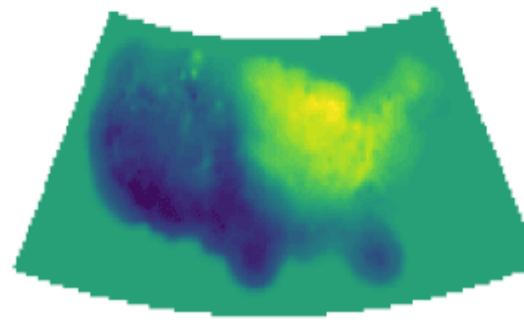
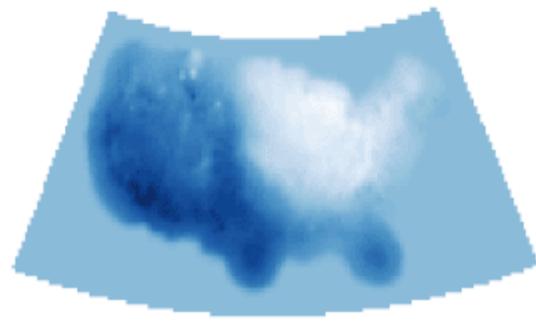
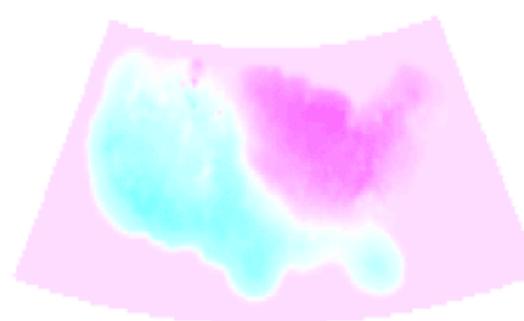
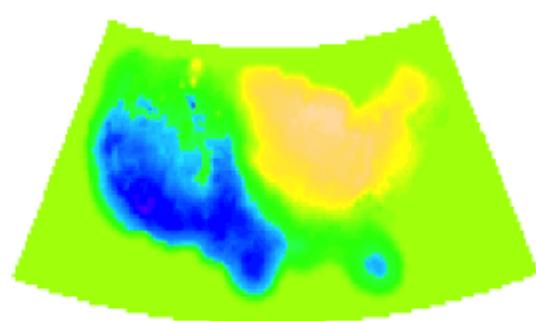
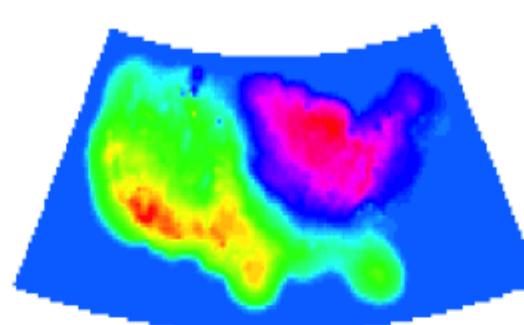
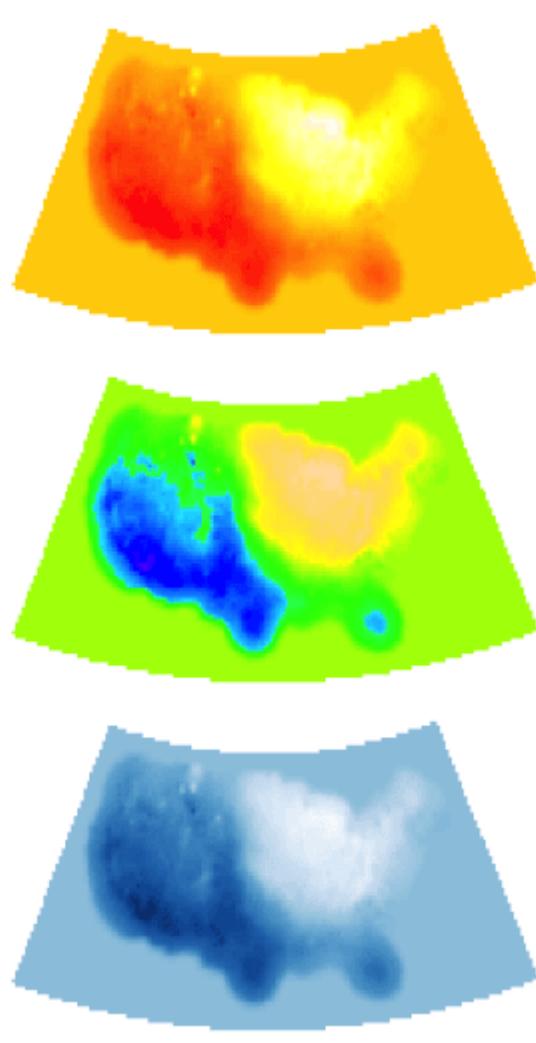


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Rainbow is bad



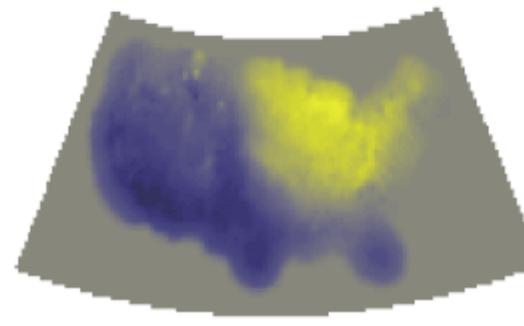
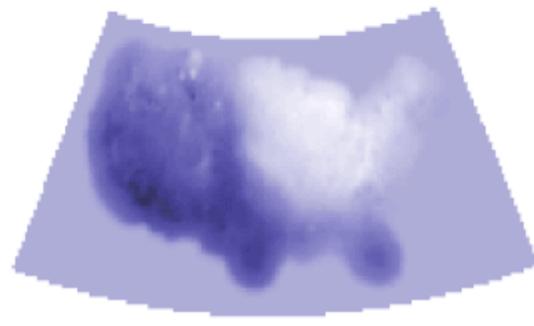
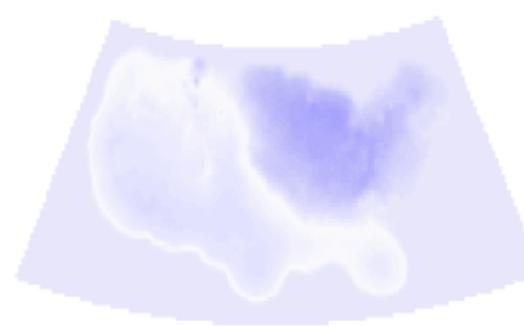
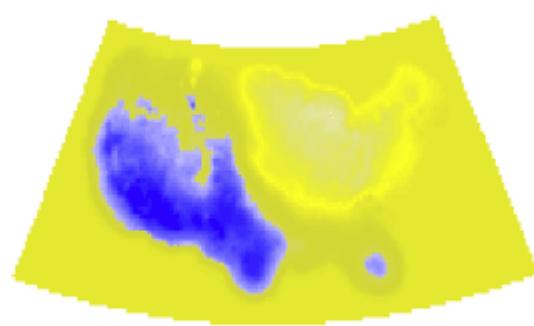
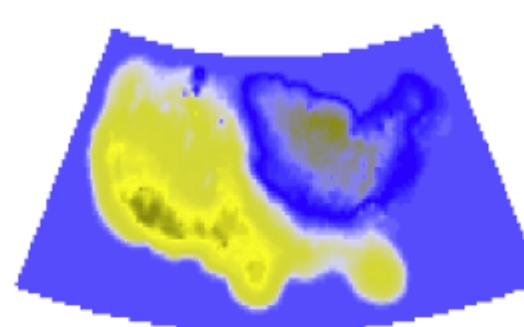
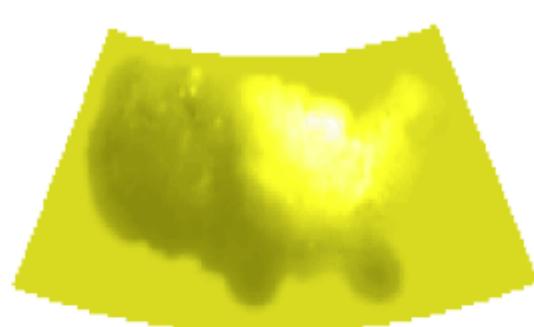
Difference in color schemes



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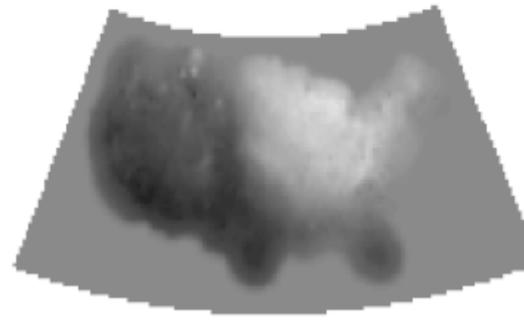
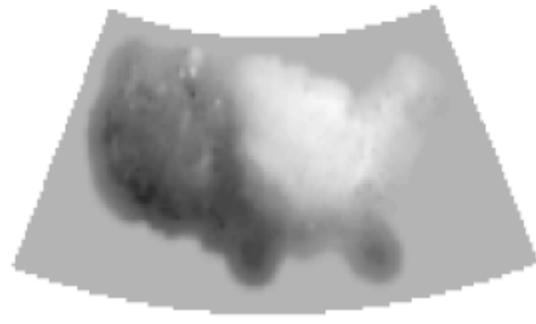
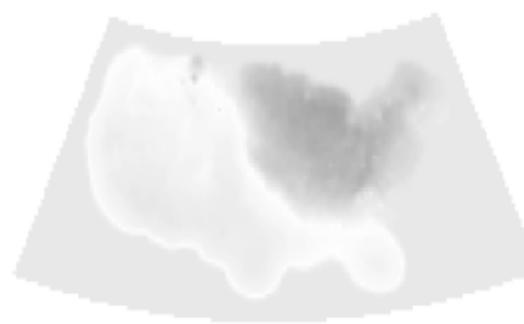
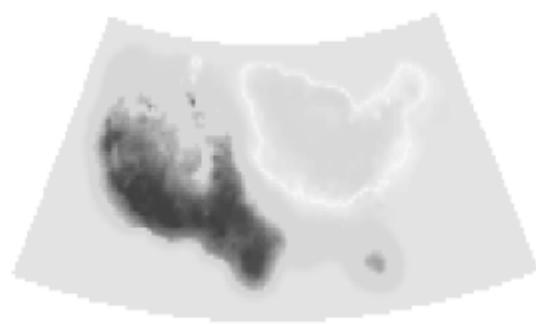
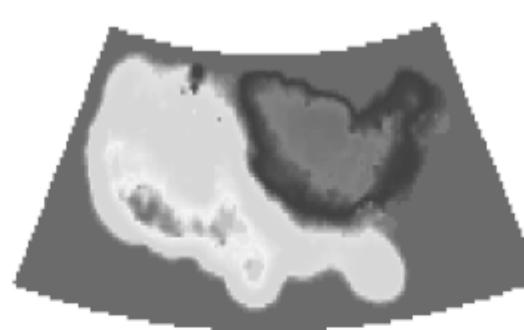
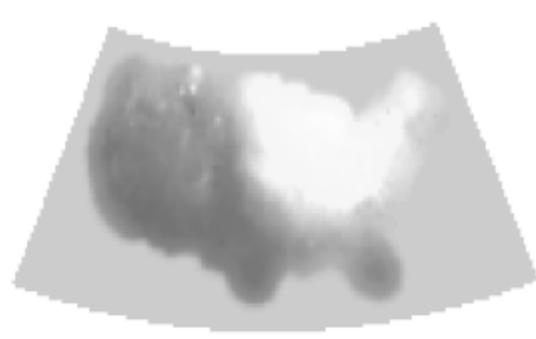
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Difference in color schemes



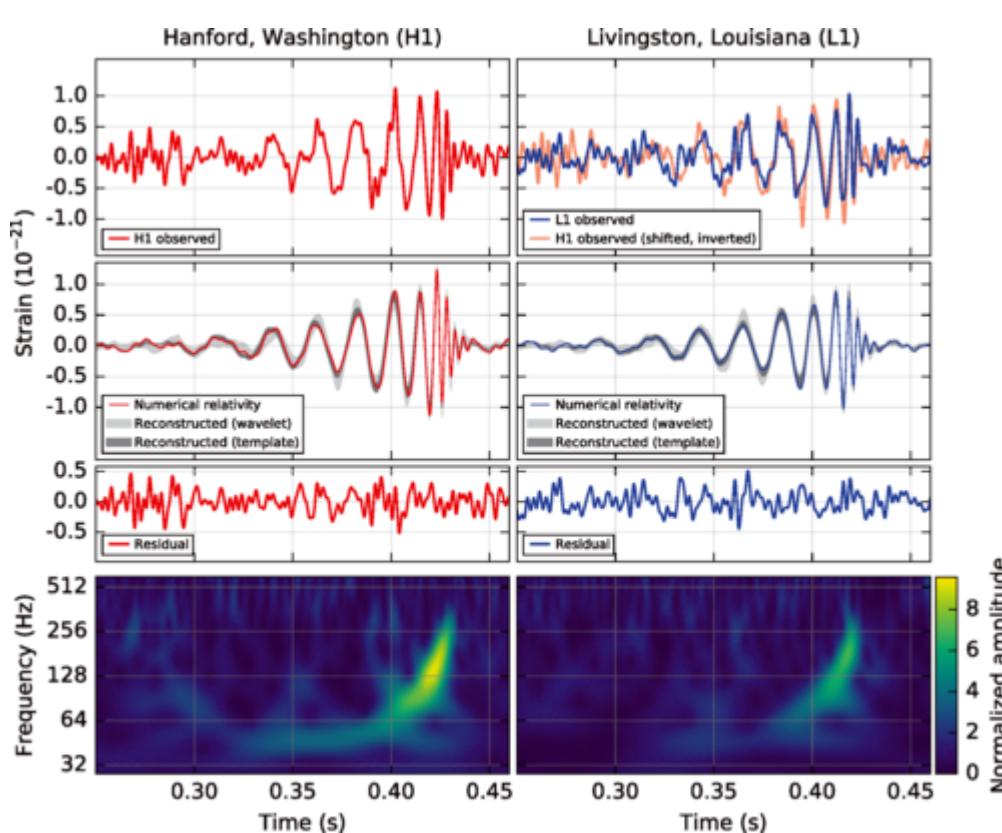
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100001011011100110100001100101011001011100100111011001010110111001000000011011100110001101101101011011100

Difference in color schemes



00010110011101101000011101000010000000101000011000110010100100000001100100011000000111001001011010011001000110000001100
011011101101110001000000111011001100010110111001000001001000011001010110010101110010010110111001100101011011100
100001011011100110100001100101011001011100100111011001010110111001000000011011100110001101101101011011100

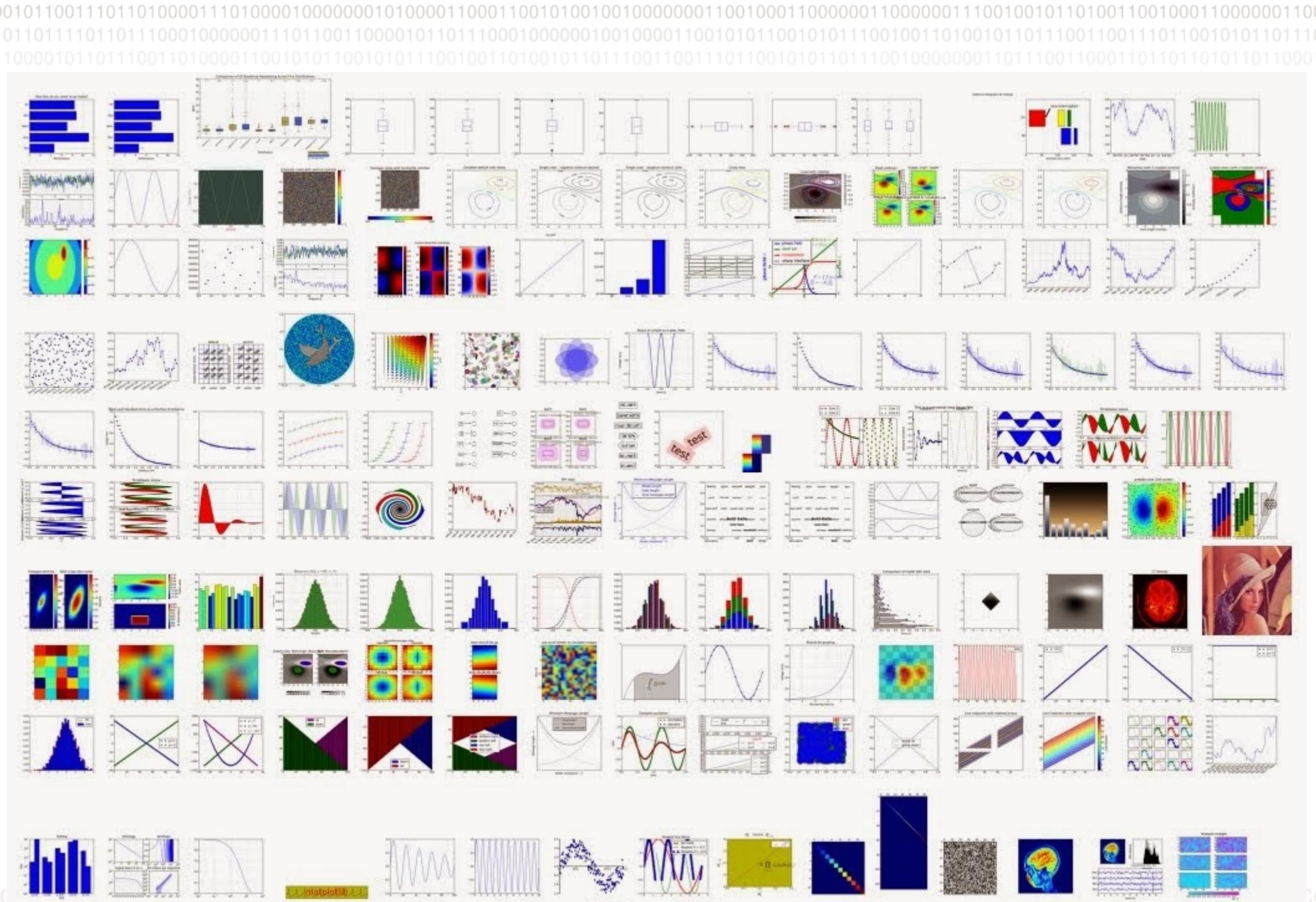
And this is how viridis looks



Abbott et al., 2016

on to plotting!

matplotlib



GTGTAGTGGCACGATCTGGCTCACTGCAACCTCTGCCCTCCGGGTTCAAGCGATTCTCCTGCCTCACCCCTCCCGAATAGCTGGGATTACAG
GGGGATTCAACCACGTTGGCCACGCTGGTCTGGAACTCCTATCCTCAAGTAATCCGCCCGCCTGGCCTCCCAAGTCAAGTGAGGACGTGATGAAACGTTCTGGGACGATGAAAAGGGTCT
AAAAATGGTTATGGAGATCAAAATAAGGTGGGGTCGGGAATCGACTGGGAAGAGACGTGATGAAACGTTCTGGGACGATGAAAAGGGTCT

Catalin George Festila

Other packages to watch



0.11.1 ▾

INSTALLATION

USER GUIDE

GALLERY

REFERENCE

RELEASES

DEVELOPER GUIDE

Welcome to Bokeh

Bokeh is a Python interactive visualization library that targets modern web browsers for presentation. Its goal is to provide elegant, concise construction of novel graphics in the style of D3.js, and to extend this capability with high-performance interactivity over very large or streaming datasets. Bokeh can help anyone who would like to quickly and easily create interactive plots, dashboards, and data applications.

To get started using Bokeh to make your visualizations, see the [User Guide](#).

To see examples of how you might use Bokeh with your own data, check out the [Gallery](#).

A complete API reference of Bokeh is at [Reference Guide](#).

If you are interested in contributing to Bokeh, or extending the library, see the [Developer Guide](#).



CAAAATACTGATATACACATGAACGAATGTCAGACAGTACATTGAAGGGACAGAAGGCCGACAAAAATGAGCACATAATGTATGATTCCCC
GTGTAGTGGCACGATCTTGGCTCACTGCAACCTCTGCCTCCGGTTCAAGCGATTCTCCTGCCTCACCCCTCCGAATAGCTGGGATTACAG
GGGGATTCAACCACGTTGGCCACGCTGGACTCCTATCCTCAAGTAATCCGCCCGCTGGCCTCCAAAGTGCAGGCGTGAGCCAC
AAAAATGGTTATGGAGATCAAAATAAGGTGGGGTGGGAATCGACTGGGAAGAGACGTGATGAAACGTTCTGGGACGATGAAAAGGGTCT

Other packages to watch

The image shows the mpld3 logo at the top left, consisting of the letters 'm', 'p', 'l', 'd', and '3' in a stylized font with colored squares above them. To the right of the logo is the text "Bringing Matplotlib to the Browser" and "MPLD3". Below the logo is a horizontal navigation bar with links for "Contents", "Quick Start Guide", and "»". Below the navigation bar are seven small square thumbnails showing various data visualizations: a scatter plot with colored dots, a bubble chart, a scatter plot with a large red heart shape, a scatter plot with blue dots, a multi-panel plot showing different types of data, a heatmap with a color gradient, and a radial chart.

let's get to work

http://github.com/simonvh/devcomvis

simonvh / devcomvis

Code Issues 0 Pull requests 0 Wiki Pulse Graphs Settings

Visualization practical for DevCom — Edit

8 commits 1 branch 0 releases 1 contributor

Branch: master New pull request New file Upload files Find file HTTPS https://github.com/sim Download ZIP

simonvh TPM expression table Latest commit a6b8e73 6 days ago Dismiss

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| | | |
|------------------------------|-------------------------------|------------|
| data | TPM expression table | 6 days ago |
| README.md | add initial advanced tutorial | 6 days ago |
| advanced_visualization.ipynb | add initial advanced tutorial | 6 days ago |
| graphs_in_python.ipynb | update | 6 days ago |