Week 6: Types of Viz and Choosing Colors

Fall 2017

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Broadcasting

go.ischool.illinois.edu/meet2

http://www.vijayp.ca/movies/new_page.html

Where You Should Be

- Loading simple datasets
- Filtering
  - Relationship filtering
  - Sampling and subsampling
  - Binning
- Mutation
  - Transforming a column
- Functions and Classes
  - Designing for reusability
  - Emitting new instances of classes
- Visualizing data
  - Line, scatter, histogramming and binning
  - Modifying axes
  - Styling plots manually and automatically
  - Simple image plots

Today

- Catching Up
  - Data formats and their relevance
  - Transformations
  - Homework
- Types of Visualizations: Part I
  - “If this, then that…”
  - Relationships
  - Distributions
- Understanding Color
  - How do eyes work?
  - What are colors?
  - Colormaps and palettes

CSV

Column 1	Column 2	Column 3	Column 4	Column 5
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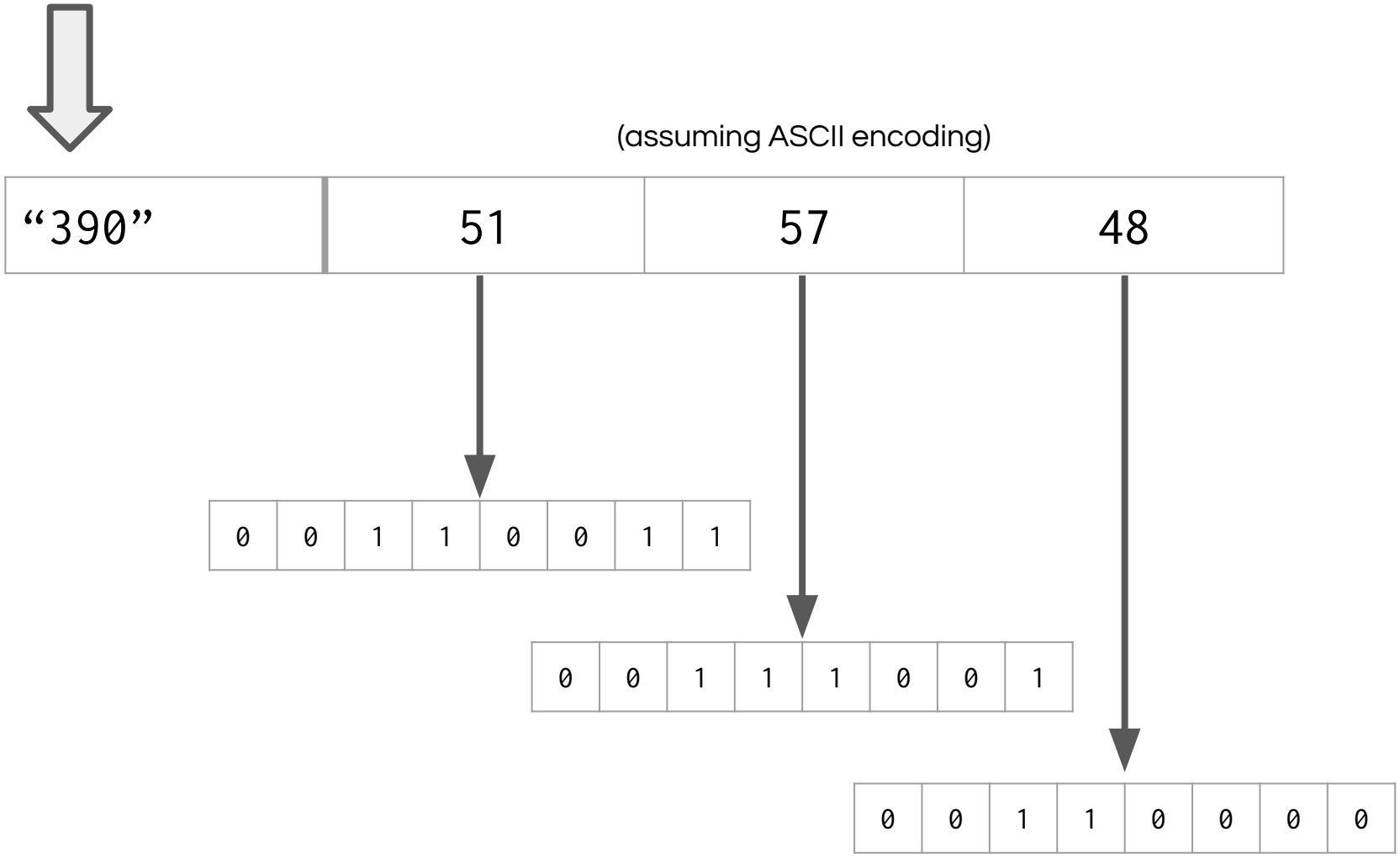
- Lowest-common denominator format
- Flexible delimiters
- Ad hoc comments and headers
- Row-oriented
- Row-size can vary: no implicit indexing

390,1.83970e-003,-4.53930e-004,1.21520e-002



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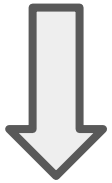
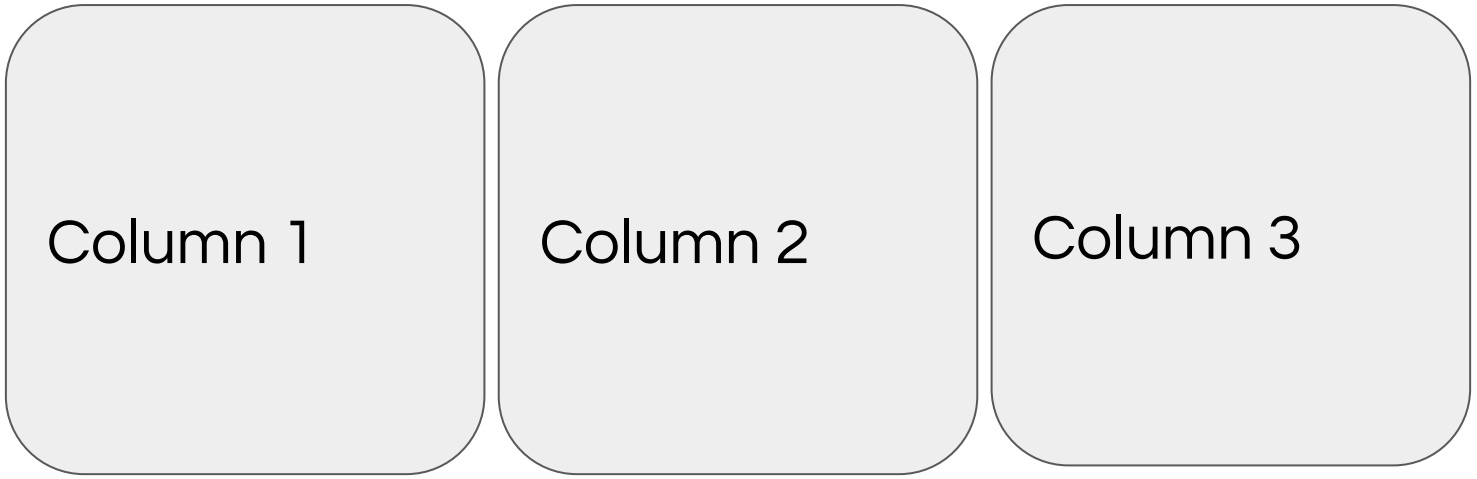


(assuming ASCII encoding)

“390”	51	57	48

390.0		0	0	0	0	0	96	120	64

HDF5



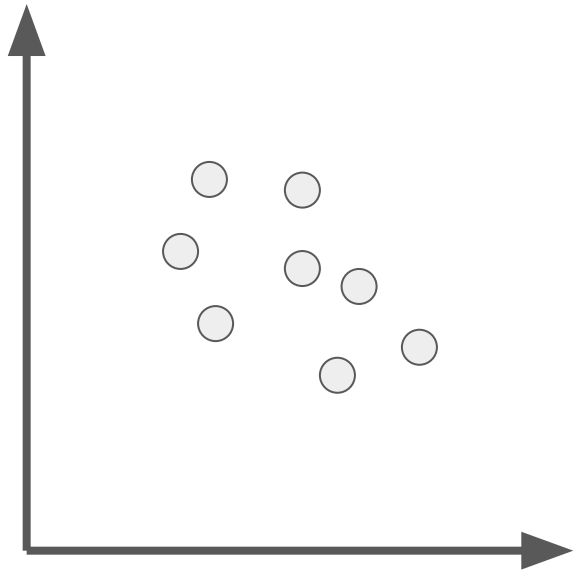
- Columnar store
- Chunking
- Can be extended
- Flexible data types in-memory and on-disk
- Hyperslab and boolean indexing

- Numeric
- Fixed-length strings
- Variable strings
- Groups & hierarchies
- Fine-grained key/val metadata

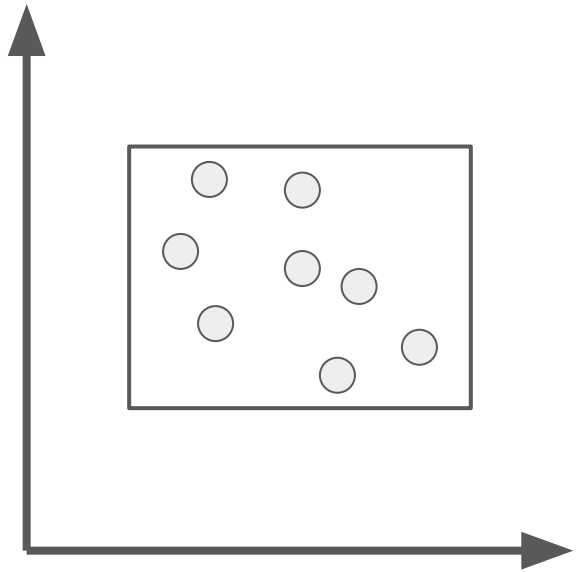
Transformations

- Affine
  - Parallel lines remain parallel
  - Defined by offset and scale matrices
- Functional transformations
  - Continuous
  - Invertible
  - Log, log2, sqrt(), etc
- Dimensionality Reduction

Affine

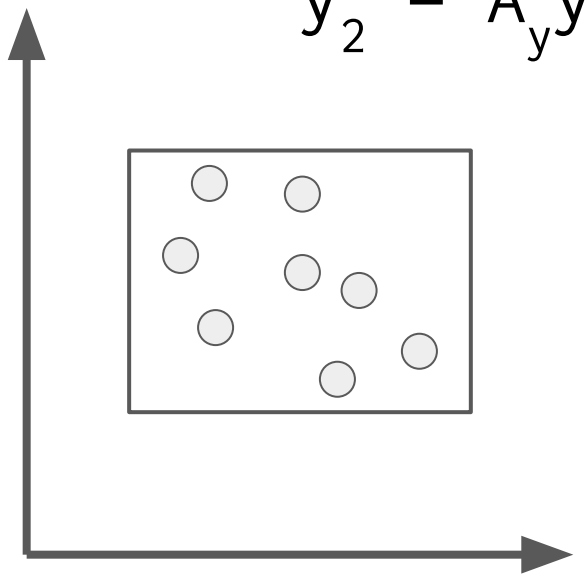


Affine



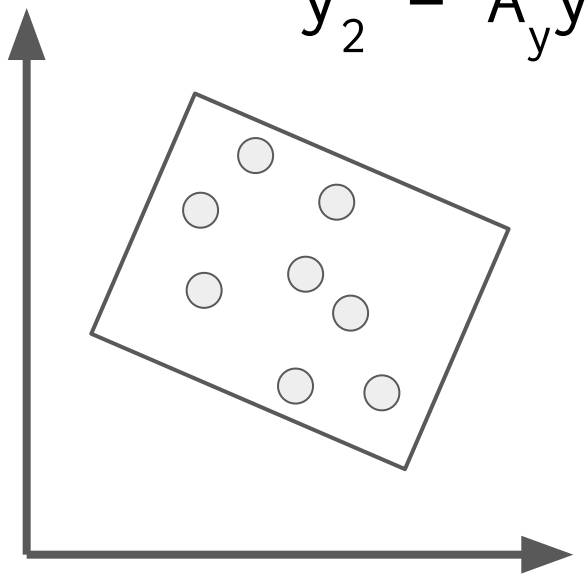
Affine

$$x_2 = A_x x_1 + b_x$$
$$y_2 = A_y y_1 + b_y$$



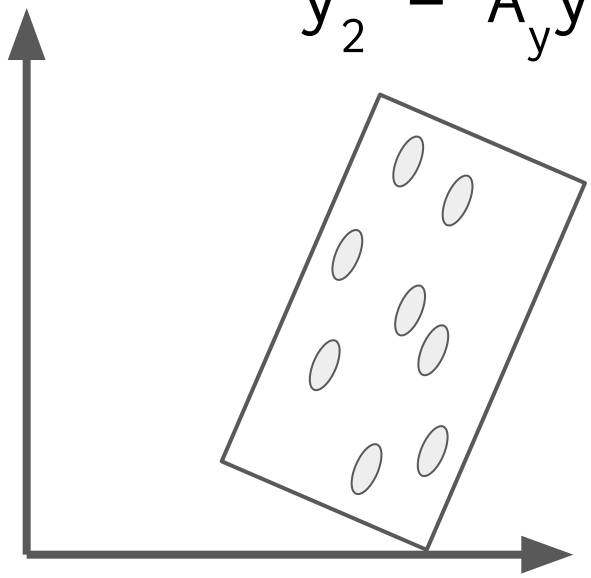
Affine

$$x_2 = A_x x_1 + b_x$$
$$y_2 = A_y y_1 + b_y$$



Affine

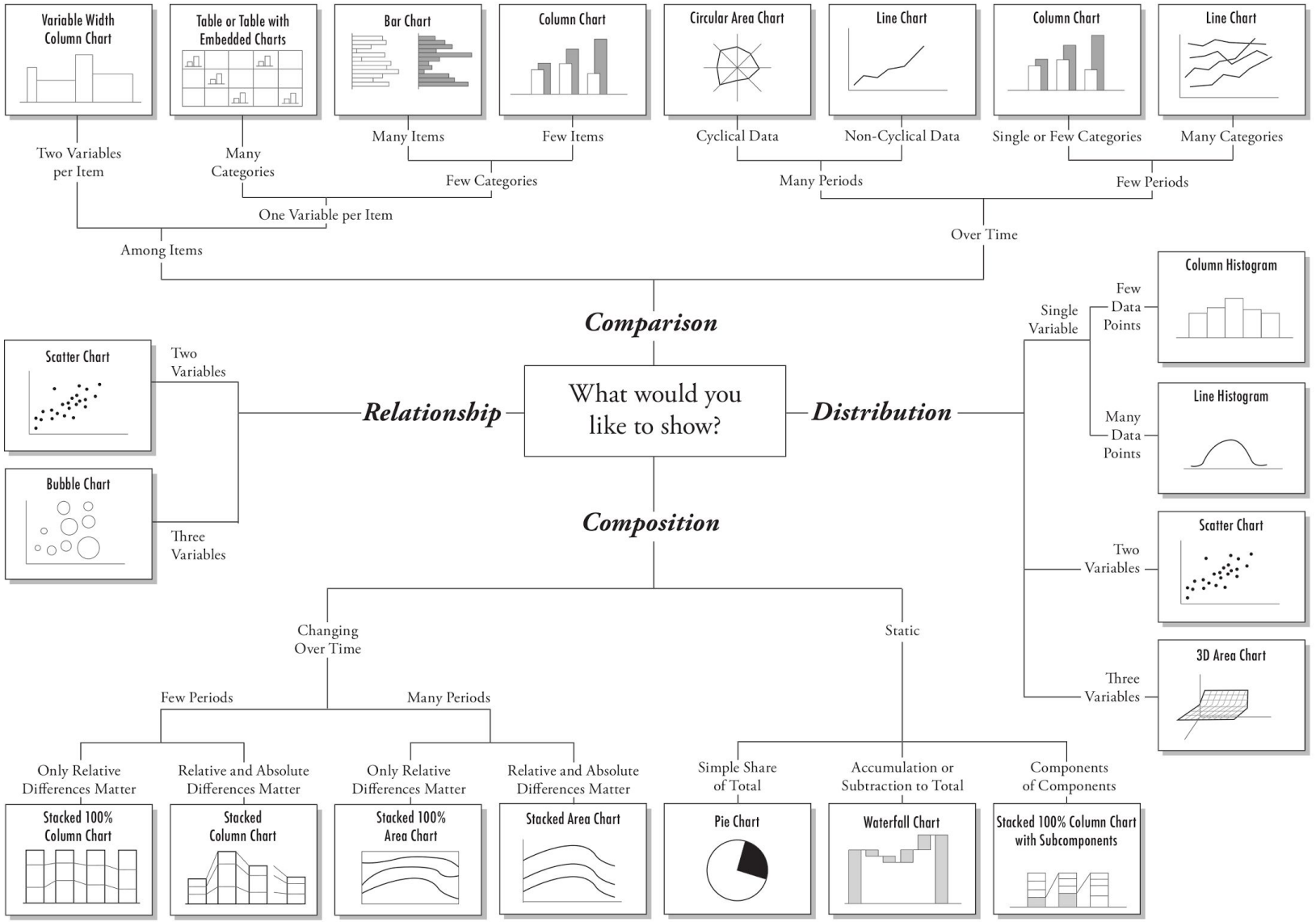
$$x_2 = A_x x_1 + b_x$$
$$y_2 = A_y y_1 + b_y$$



Choosing Your Visualization

- Do you understand the type of data you are examining?
- What types of relationships do you want to explore?

Chart Suggestions—A Thought-Starter



www.ExtremePresentation.com
© 2009 A. Abela — a.v.abela@gmail.com

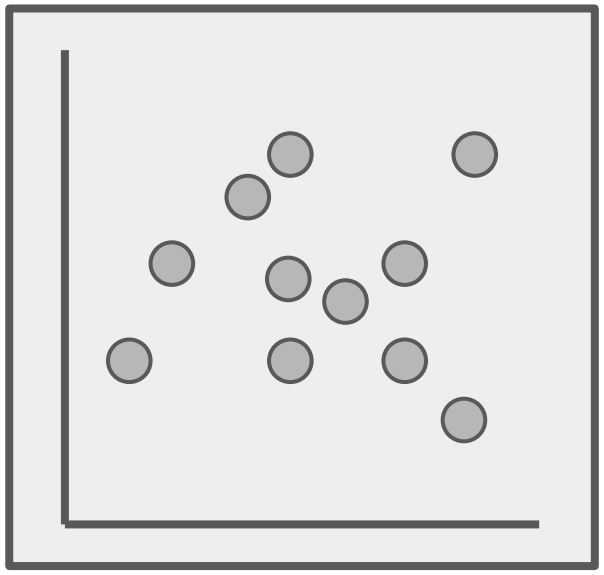
Credit: Andrew Abela

Choosing Your Visualization

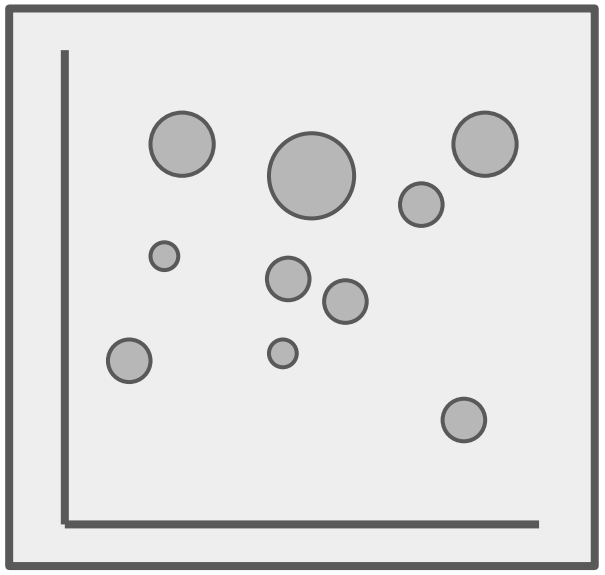
Abela's Categories:

- Relationship
- Comparison
- Distribution
- Composition

Relationship



Two Variables
(Scatter)



Three Variables
(Bubble)

- Latitude & Longitude
- Diameter
- Tree Species
- Number of Trunks
- Location Type
- Common Name

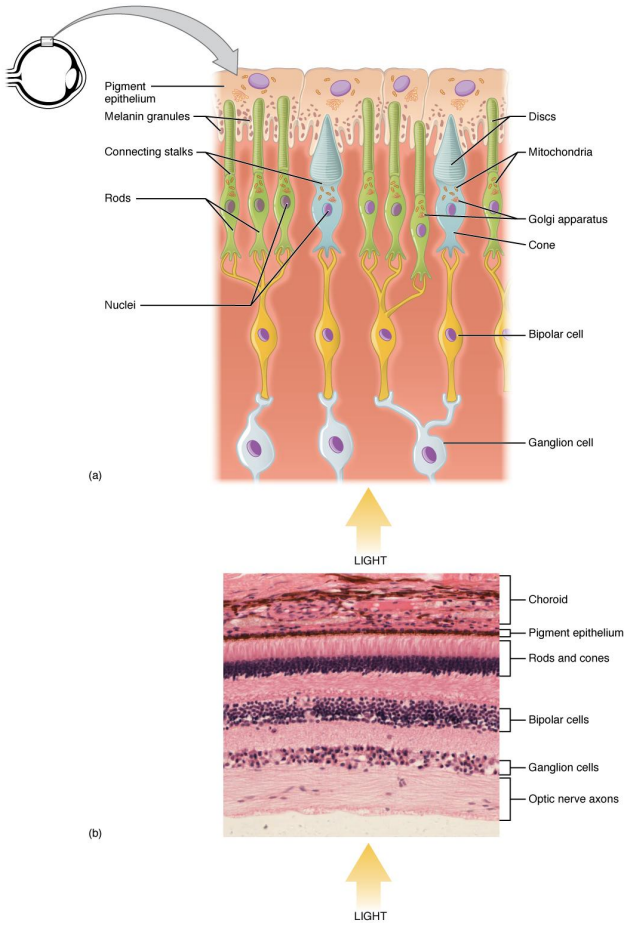
- Project Description
- Project Cost
- Square Feet Added
- Parcel Number
- Permit Number
- Building Type
- Year
- City

Comparison

- Among items
  - One variable per item
  - Two variables per item
- Over time
  - Many periods
    - Cyclical
    - Non-Cyclical
  - Few periods
    - Single or few categories
    - Many categories

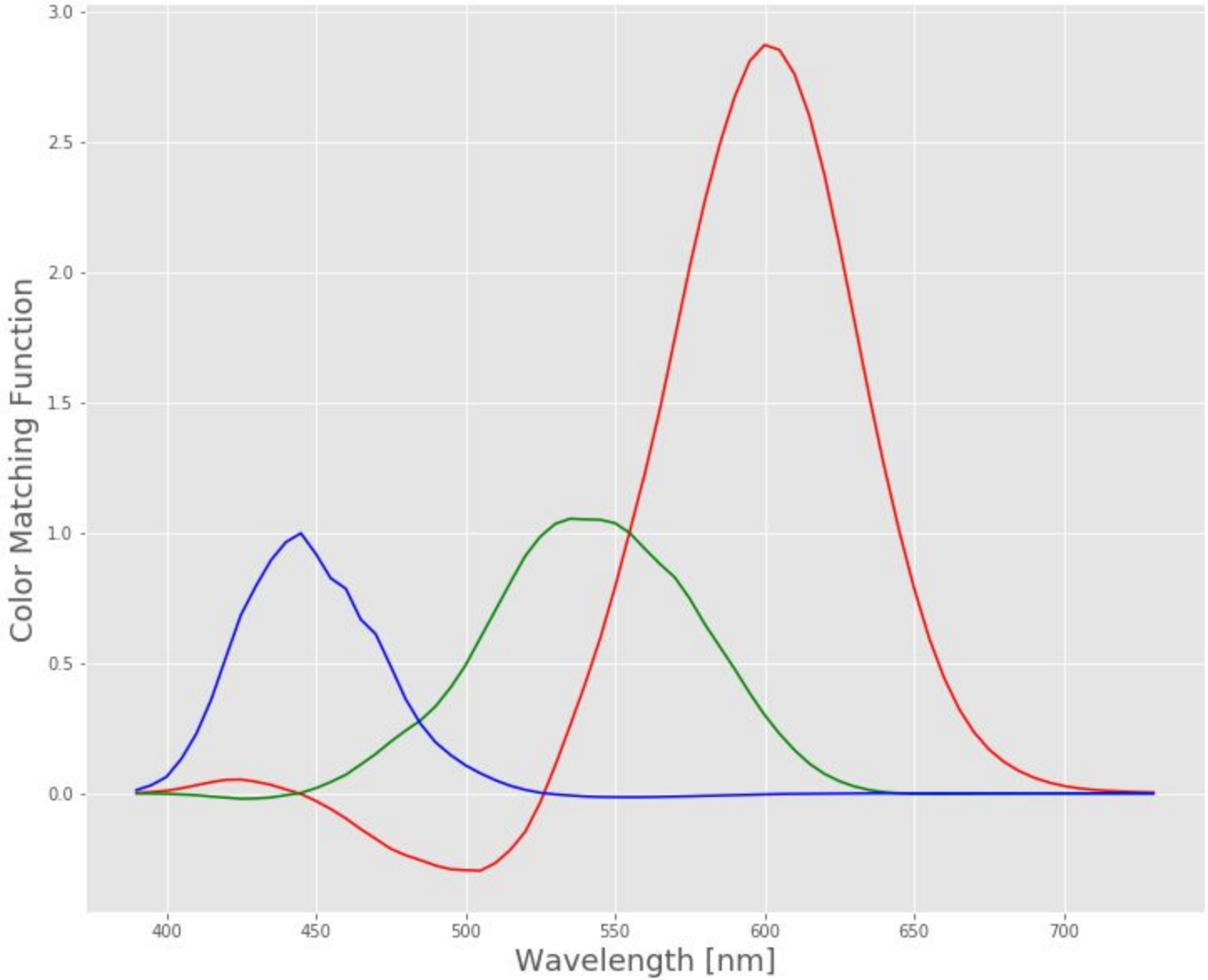
Color

Rods (low-light) and cones (color) mediate vision. Humans have about 20 times as many rods (120 million) as cones (6 million).



https://upload.wikimedia.org/wikipedia/commons/e/e8/1414_Rods_and_Cones.jpg
By OpenStax College [CC BY 3.0 (http://creativecommons.org/licenses/by/3.0)], via Wikimedia Commons

http://enchroma.com/test/instructions/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3.0
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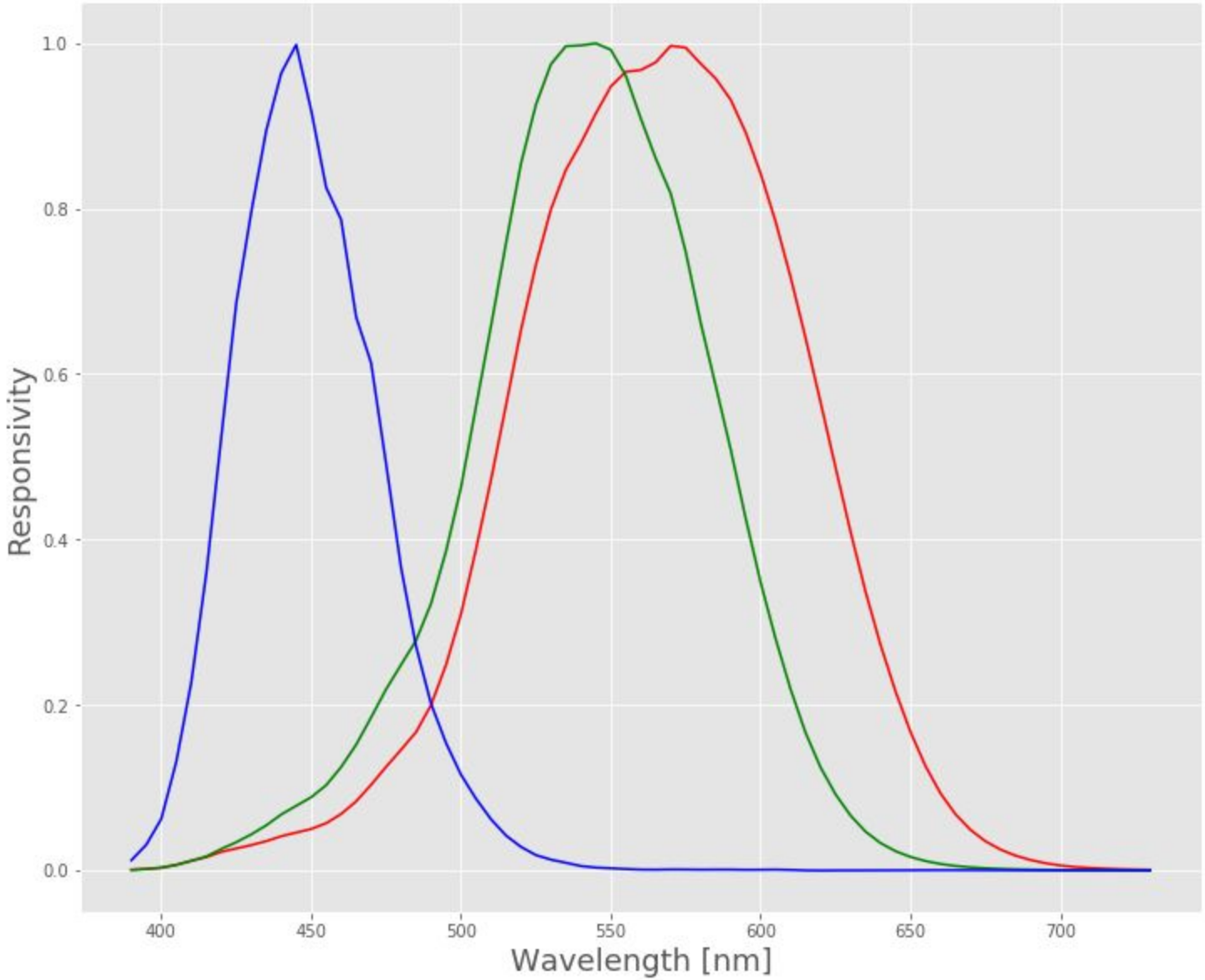
400
450
500
550
600
650
700
Wavelength [nm]


Responsivity
1.0
0.8
0.6
0.4
0.2
0.0
400
450
500
550
600
650
700
Wavelength [nm]

Color Palettes

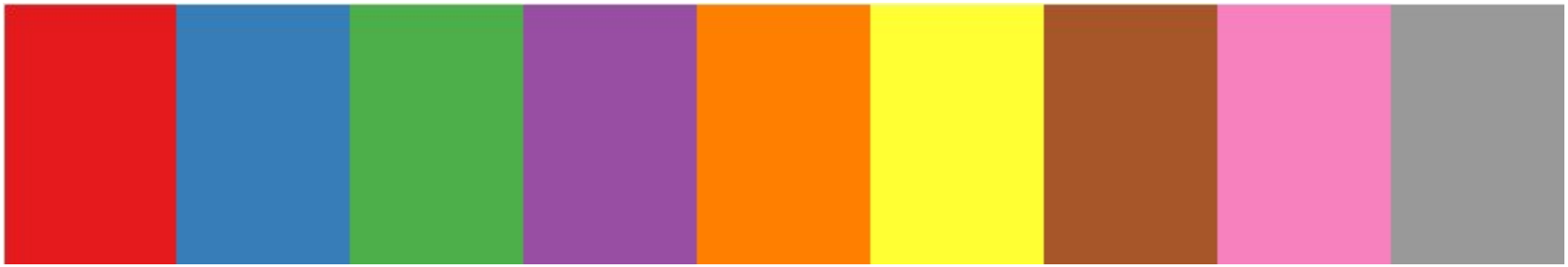
Colorbrewer Categories

- Sequential
- Diverging
- Qualitative

Resources:

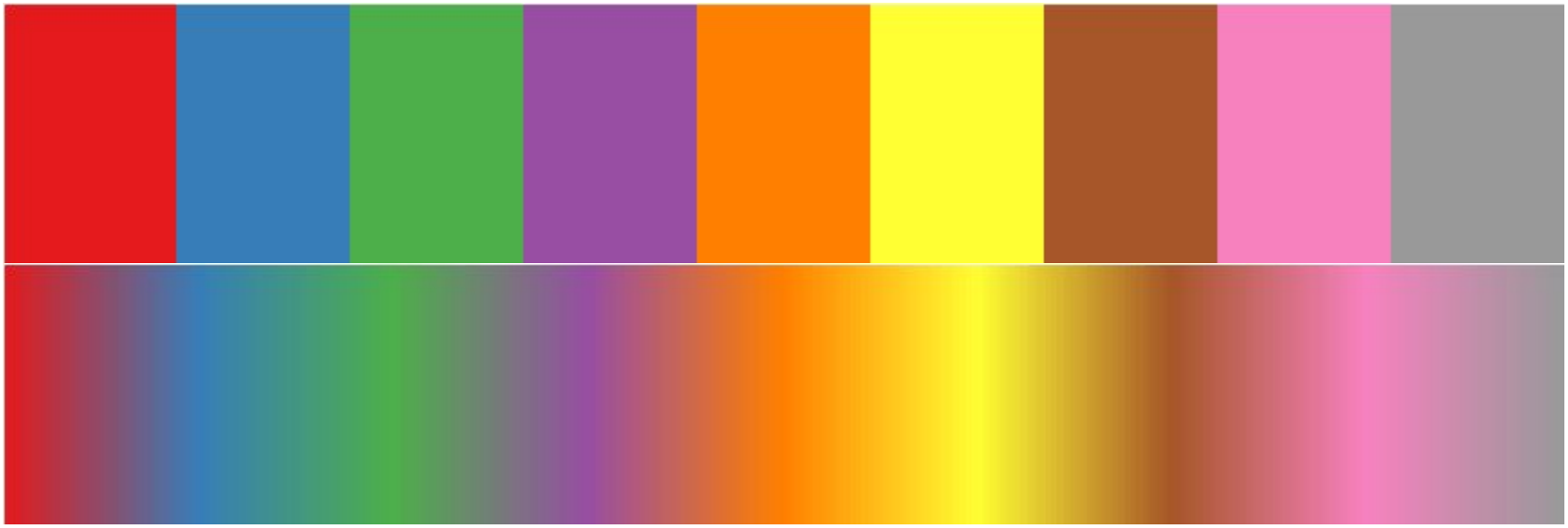
- colorbrewer.org
- palettable (package)

Qualitative



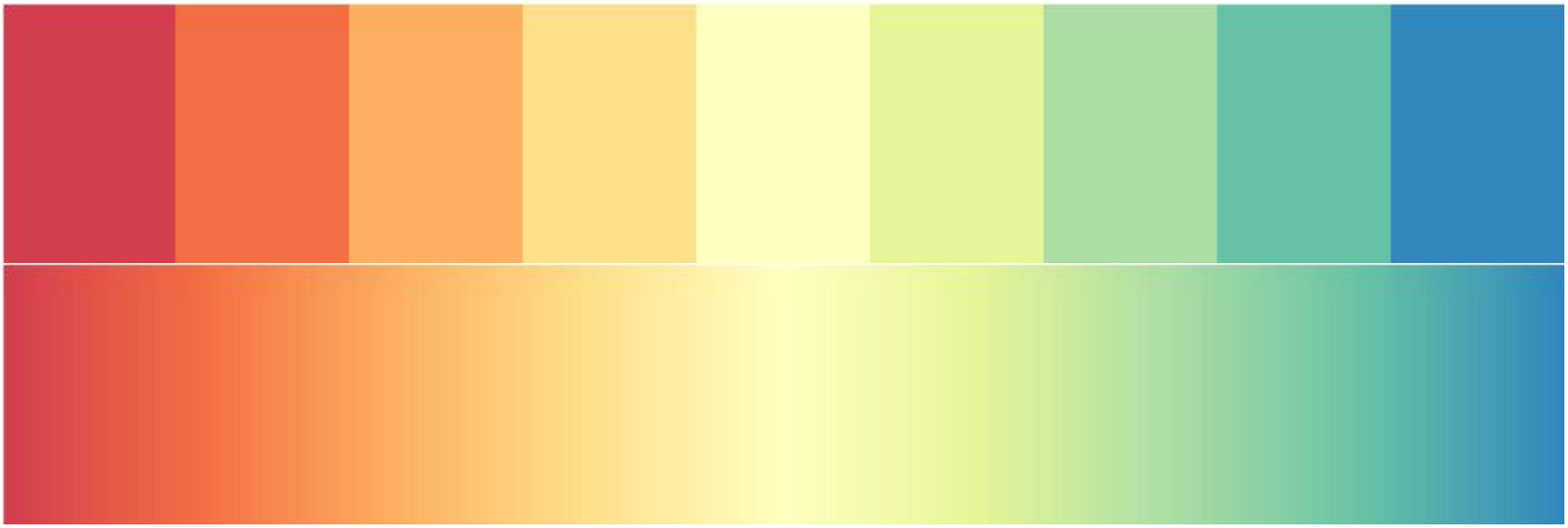
Colorbrewer Set1

Qualitative



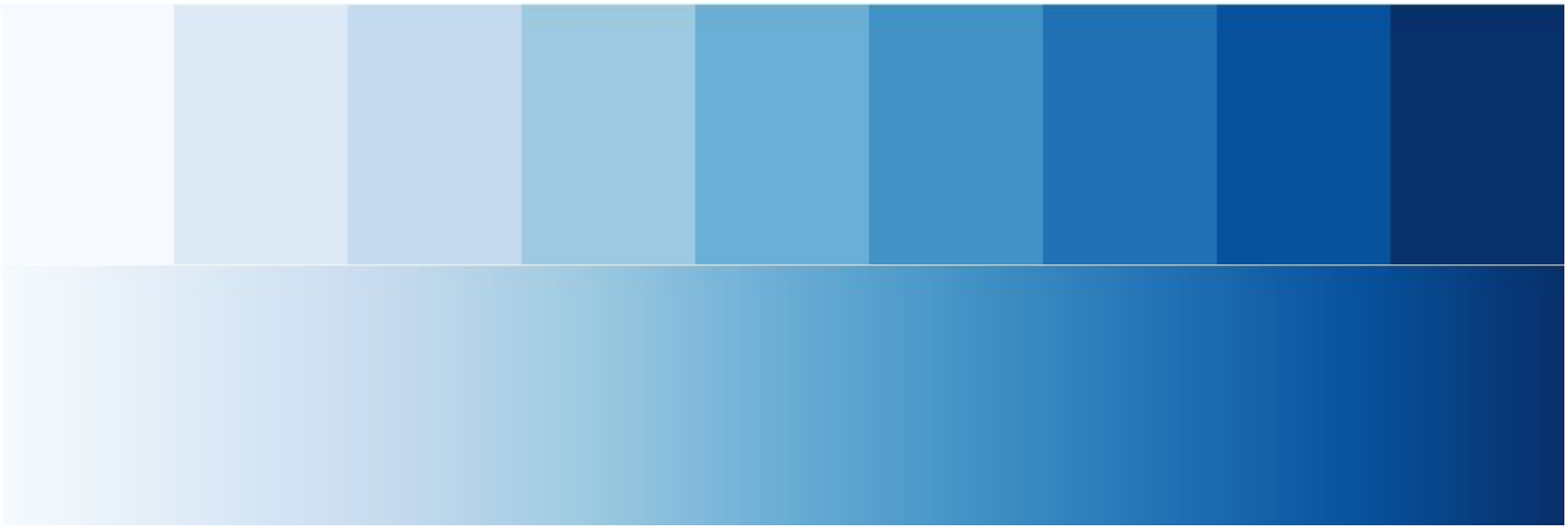
Colorbrewer Set1

Diverging



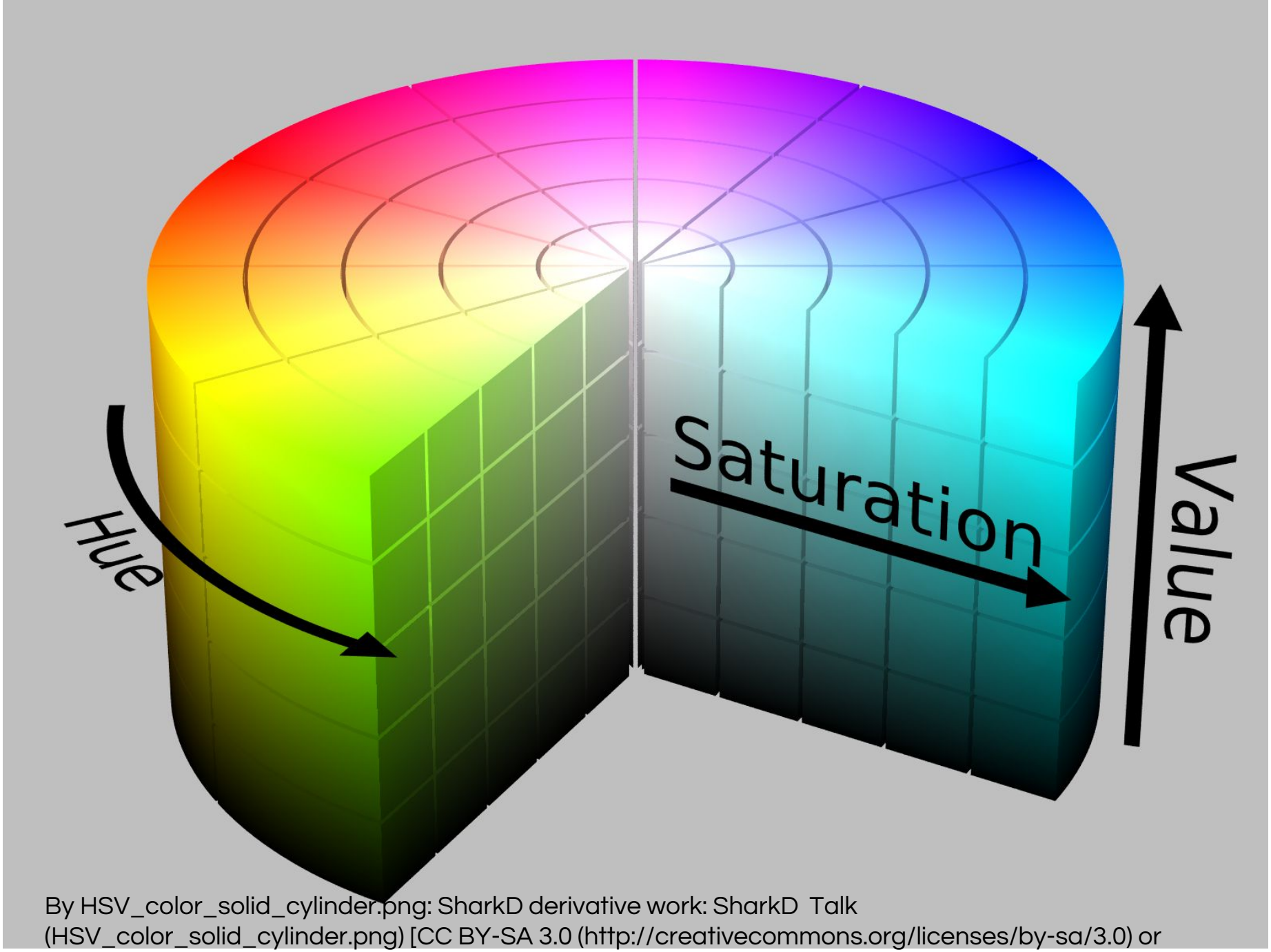
Colorbrewer Spectral

Sequential



Colorbrewer Blues

https://commons.wikimedia.org/wiki/File:16777216colors.png



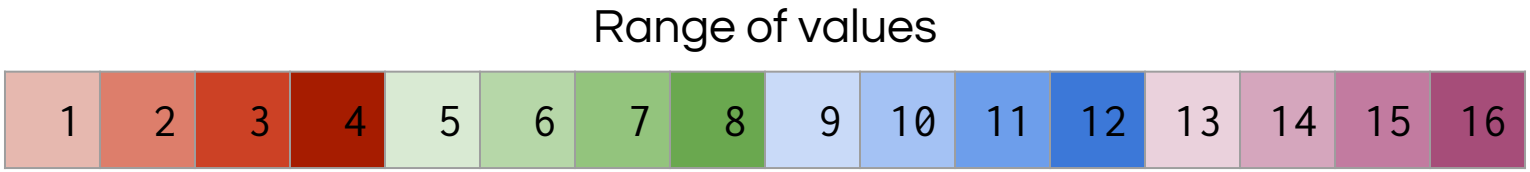
By HSV_color_solid_cylinder.png: SharkD derivative work: SharkD Talk (HSV_color_solid_cylinder.png) [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or GFDL (http://www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons

Palette Mapping

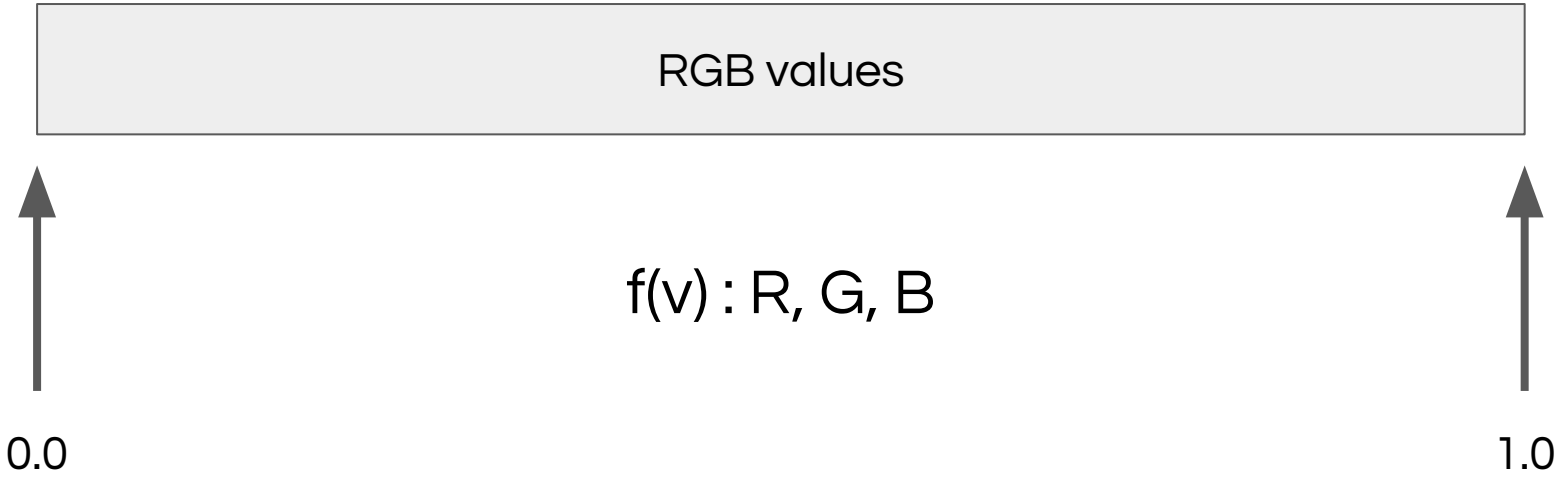
Range of values

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

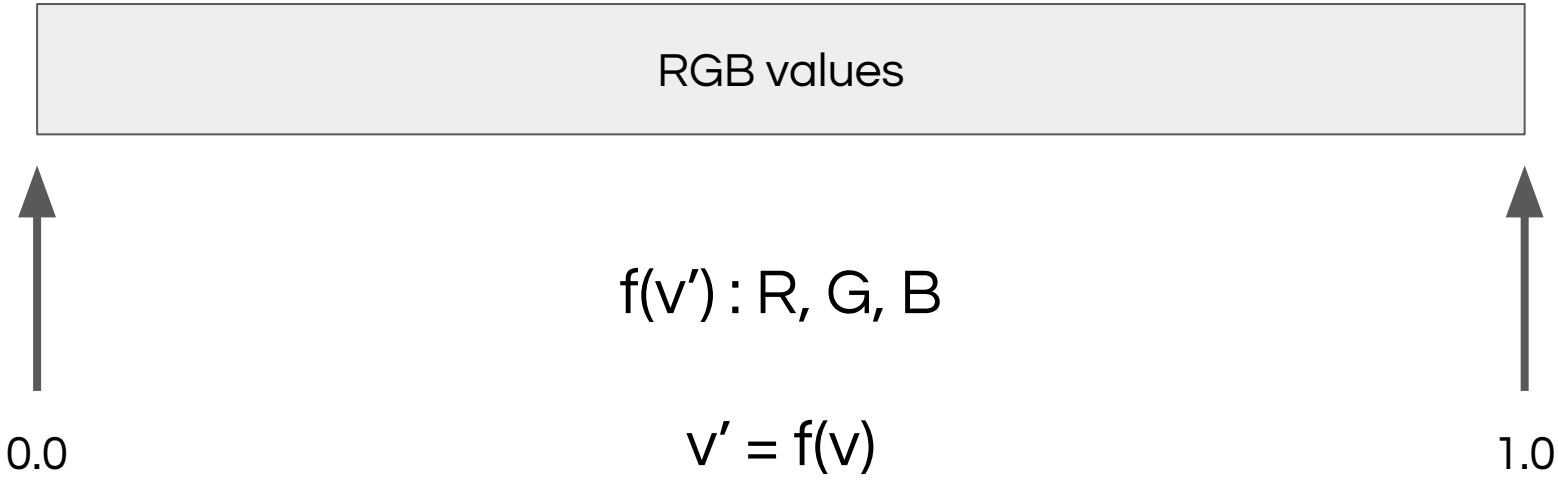
Palette Mapping



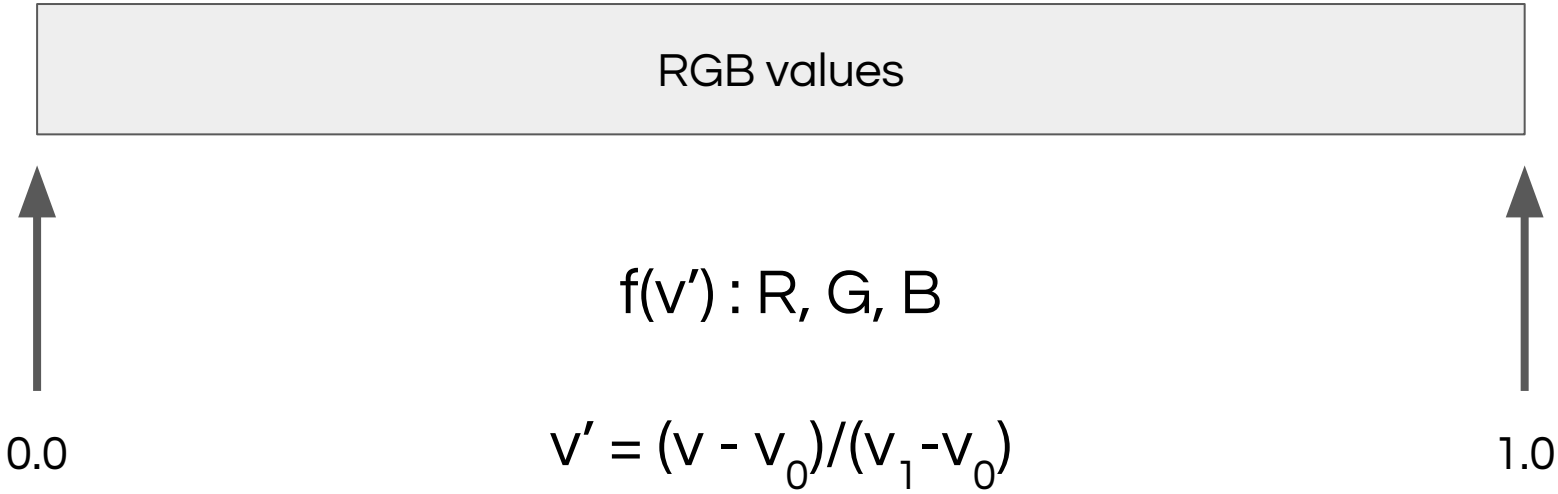
Color Mapping



Color Mapping



Color Mapping



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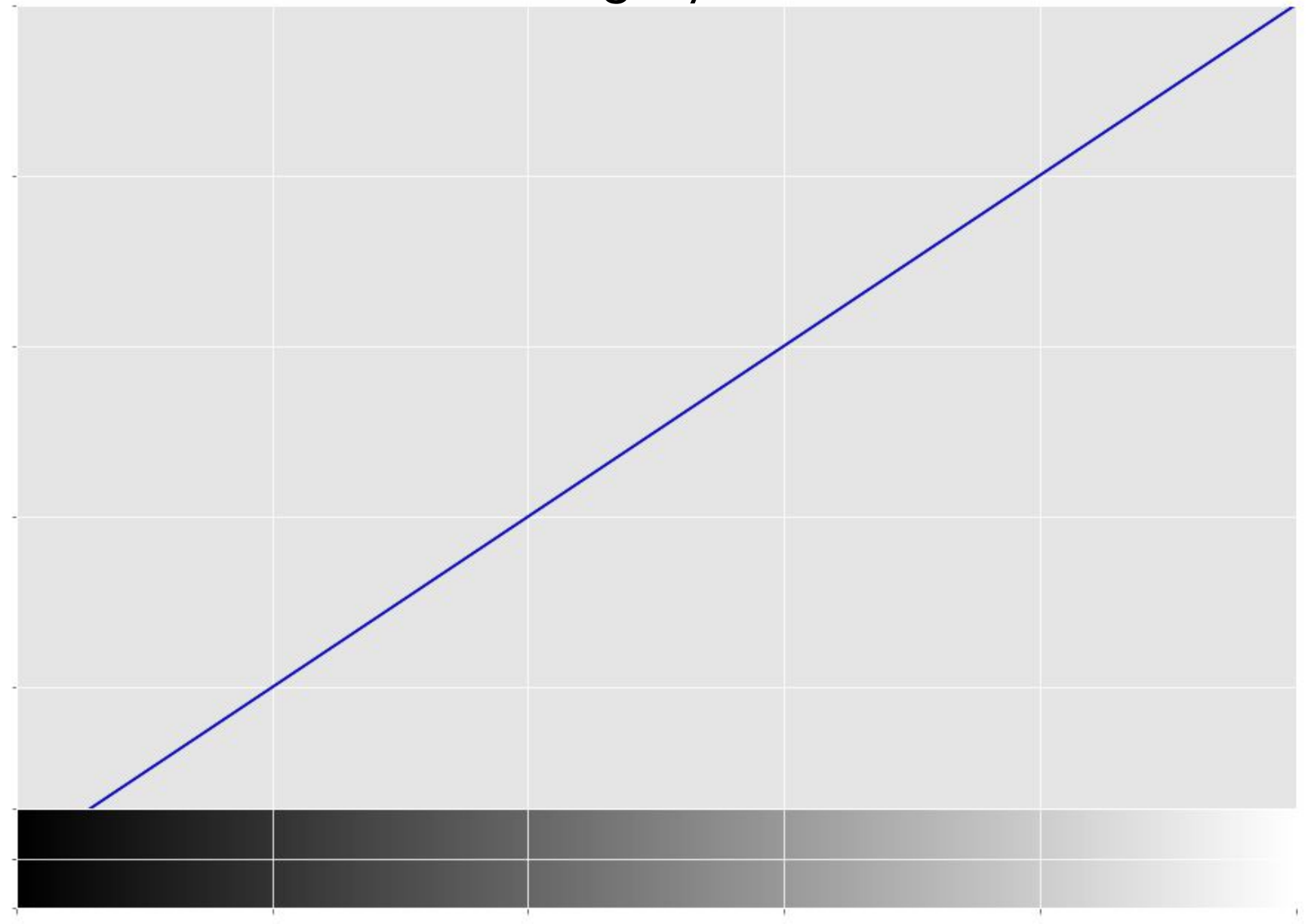
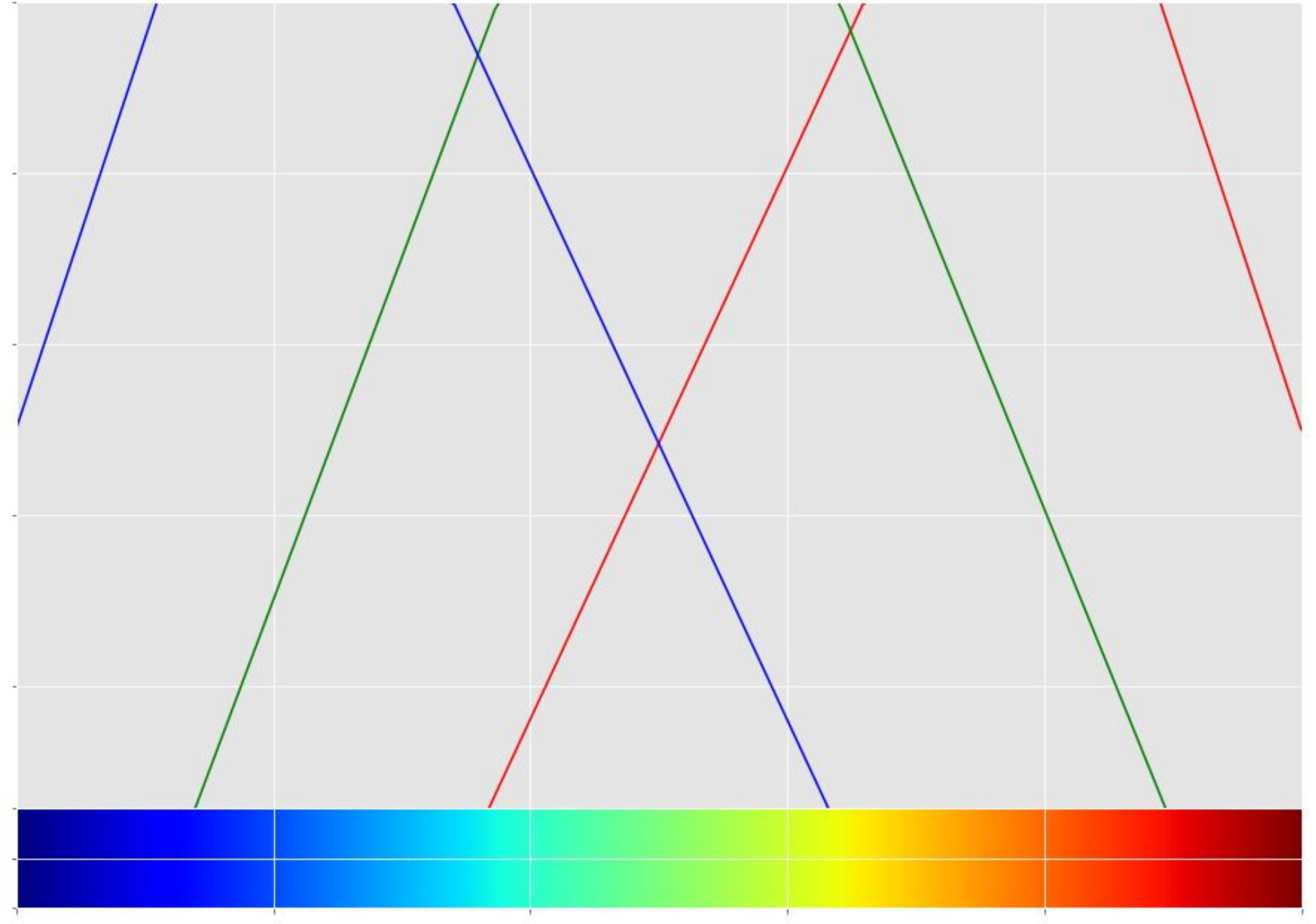
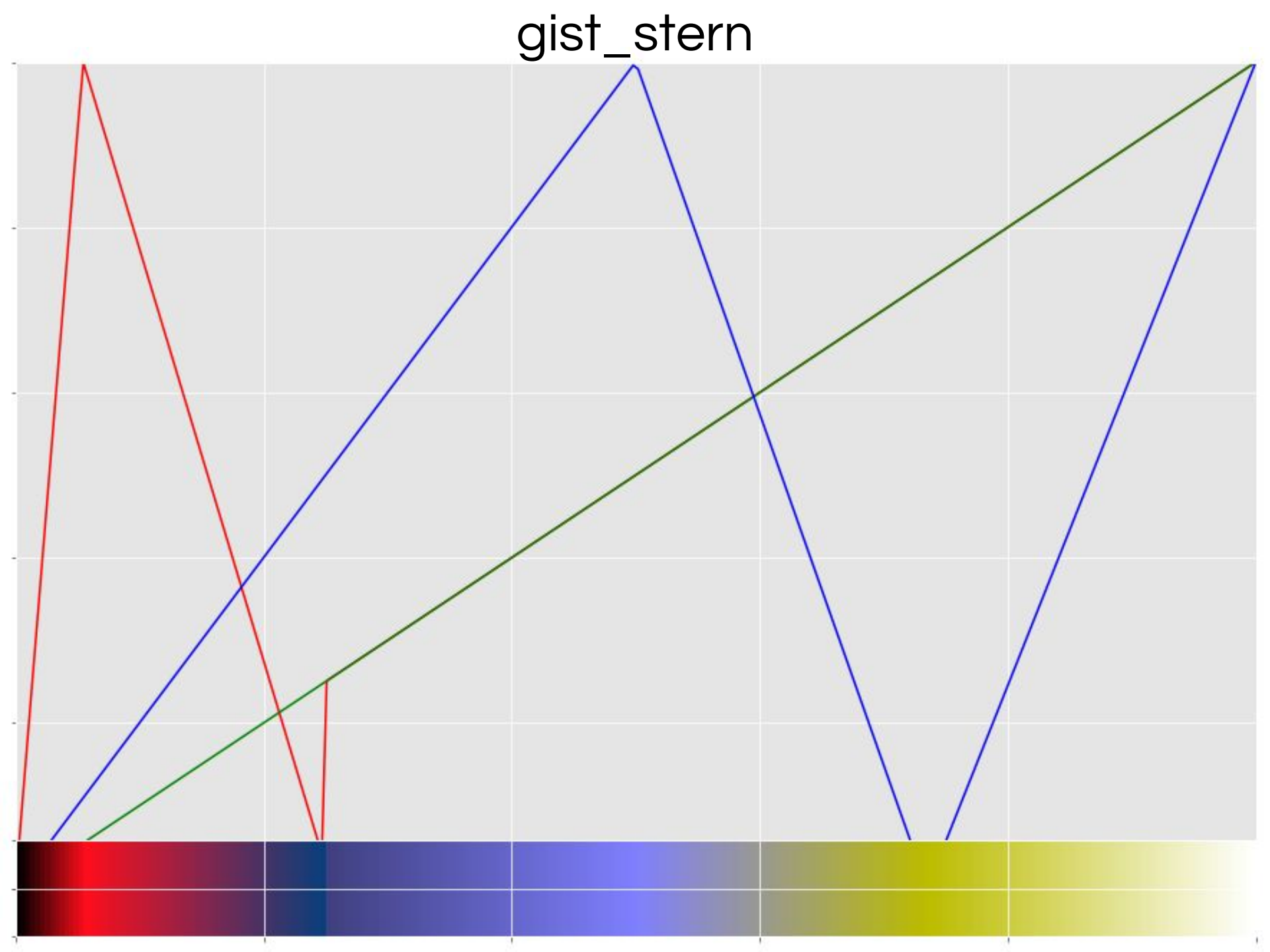
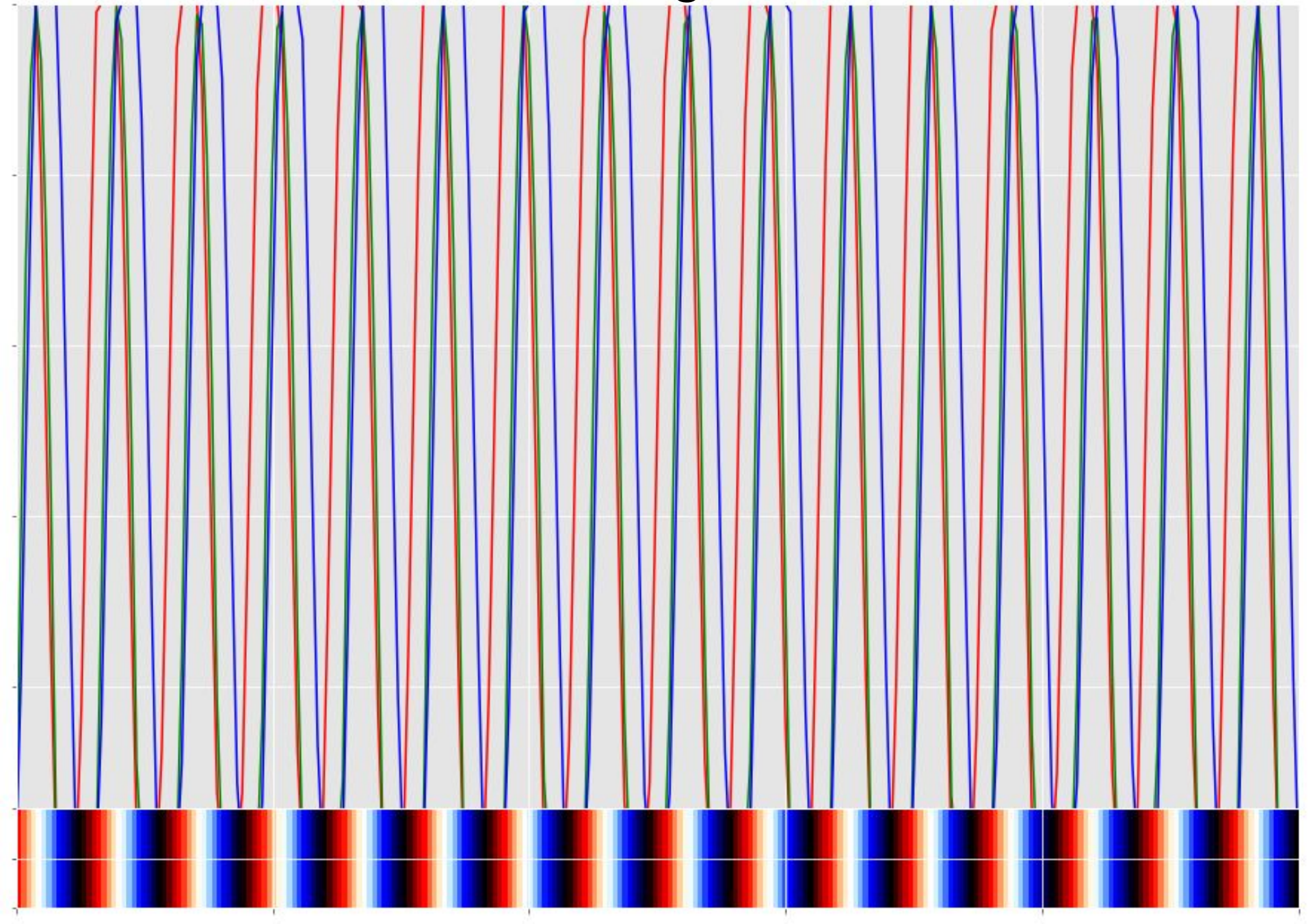


Jet

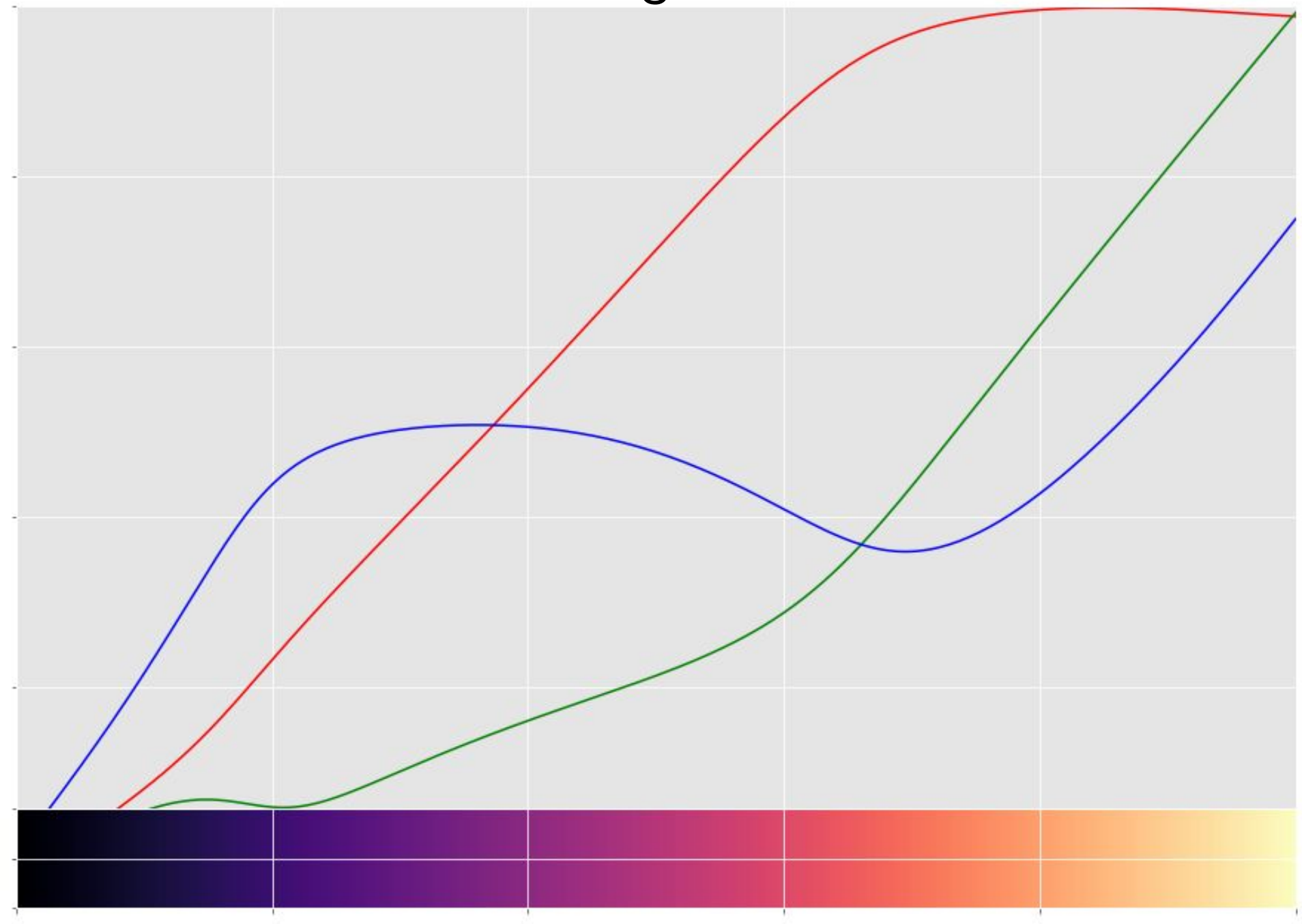



gist_stern

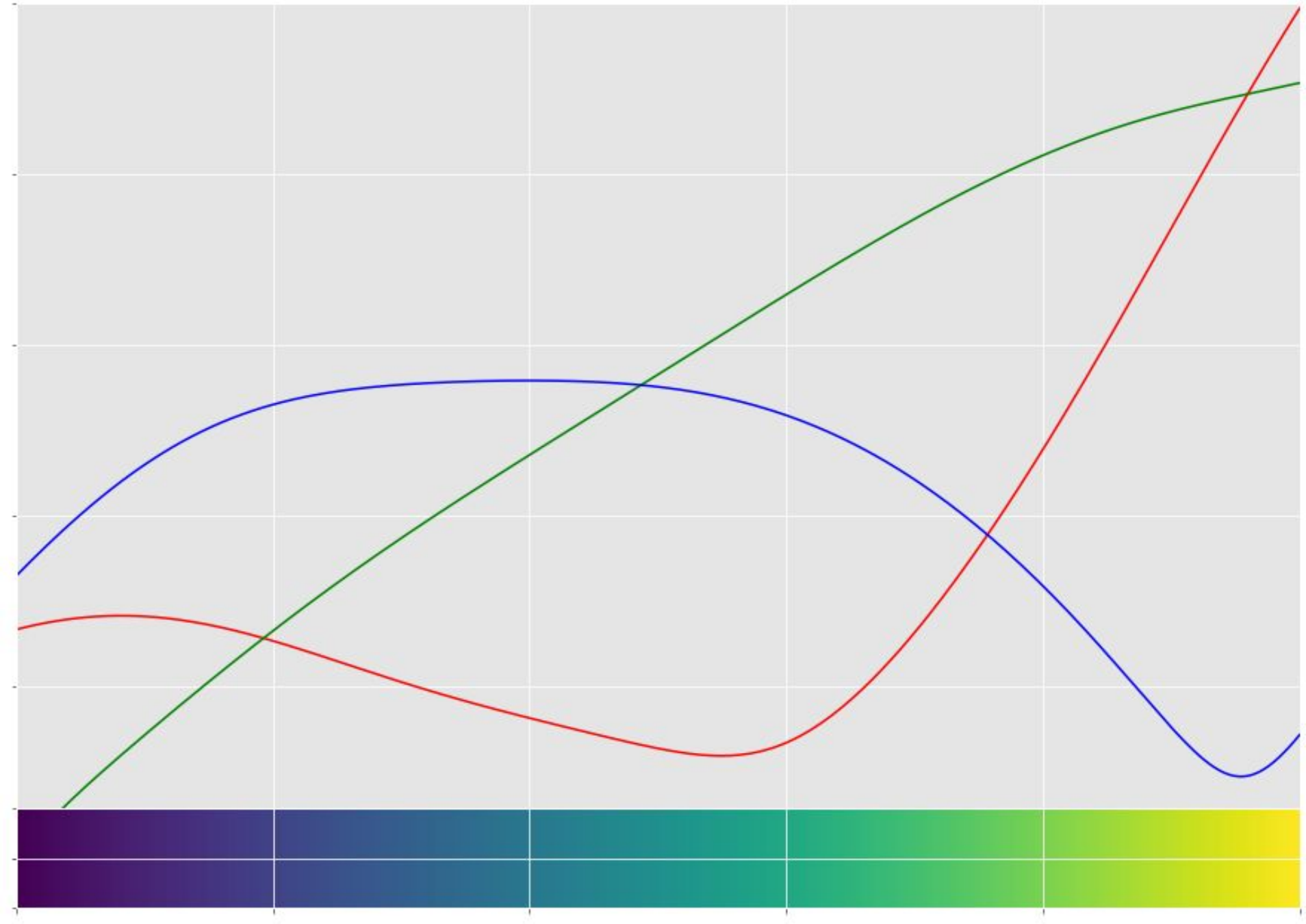
flag

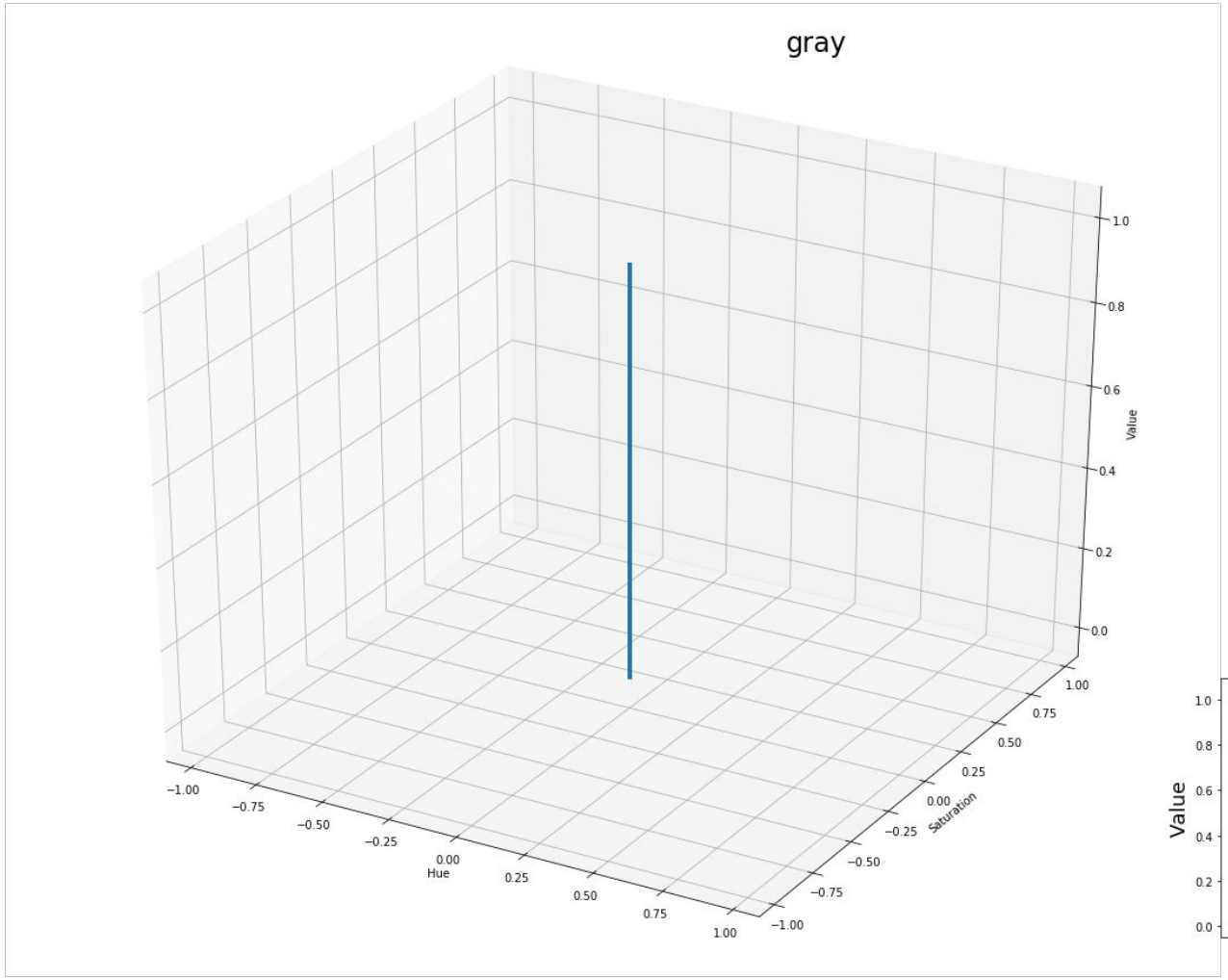


magma



Viridis

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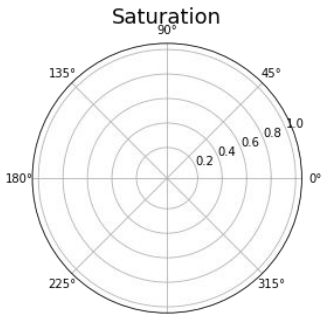
Hue
Saturation
Value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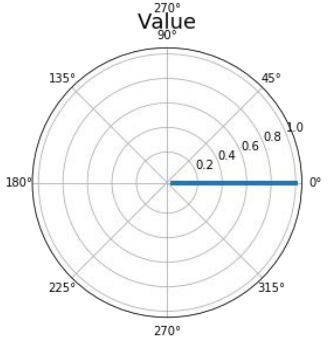
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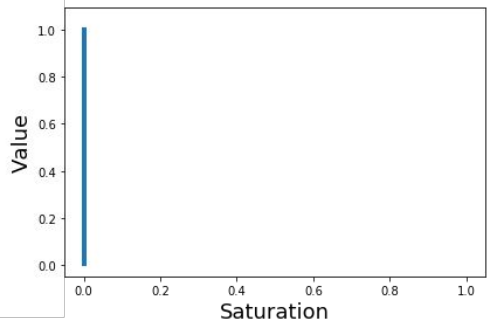
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Saturation

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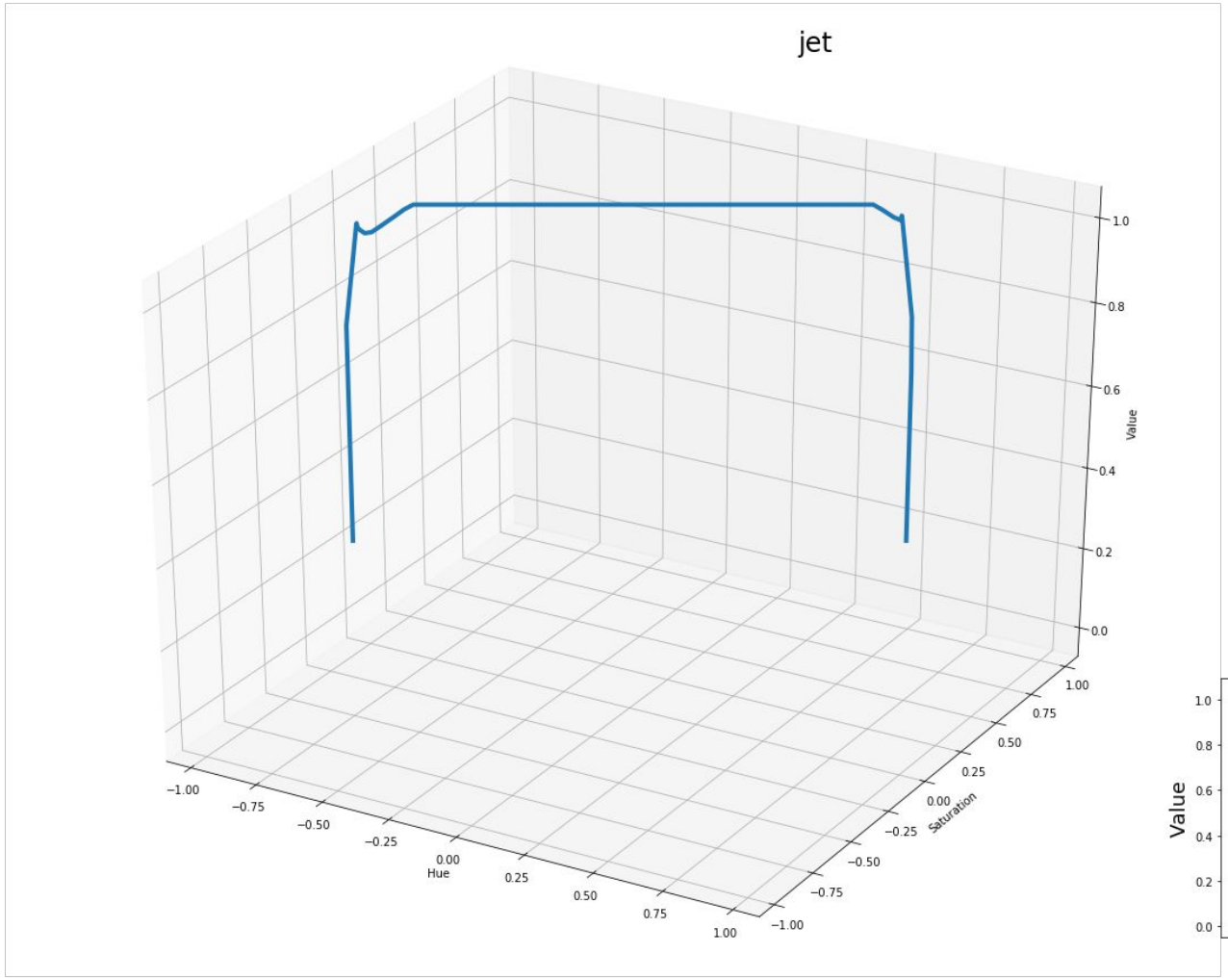
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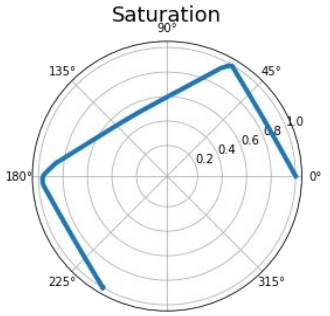
0.6
0.8
1.0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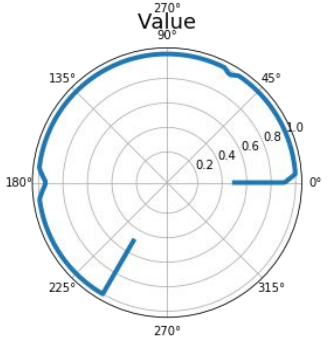
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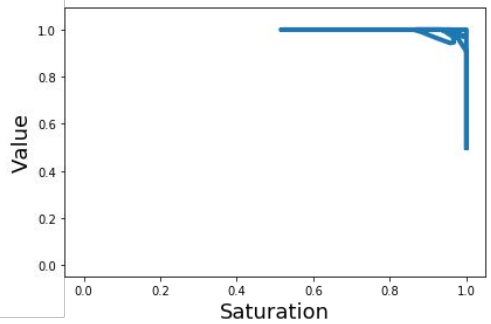
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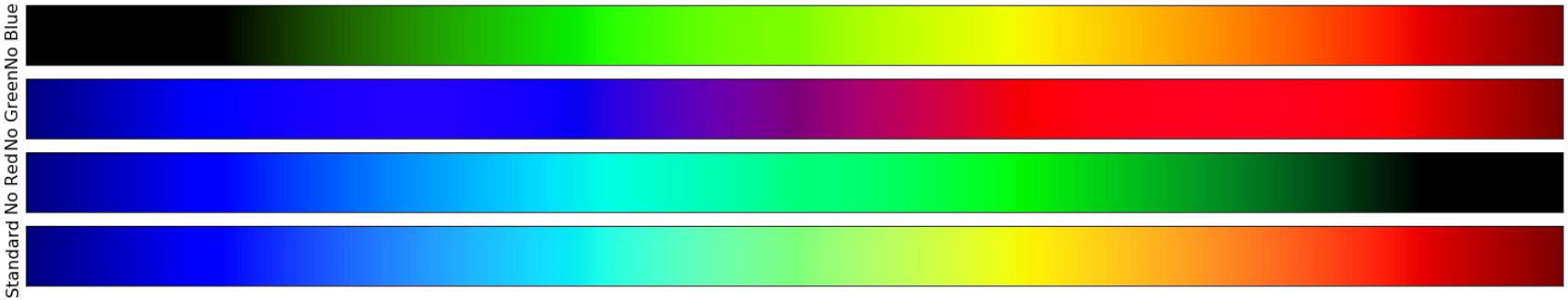
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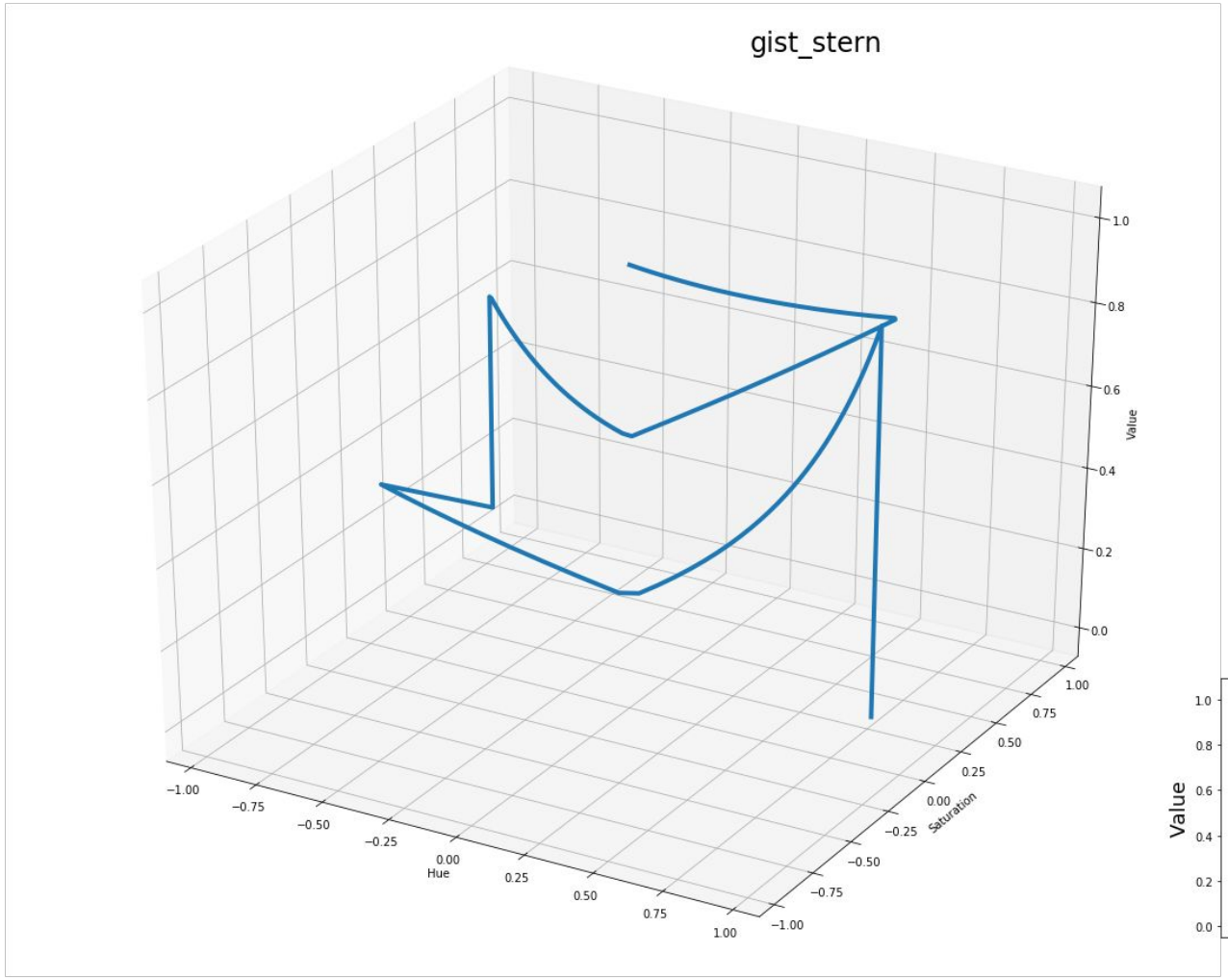
gist_stern
Hue
Saturation
Value
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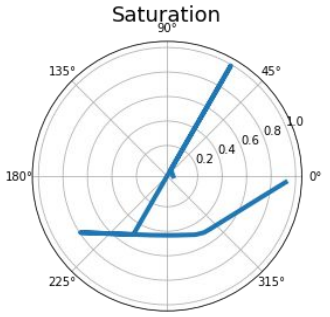
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135°
180°
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225°
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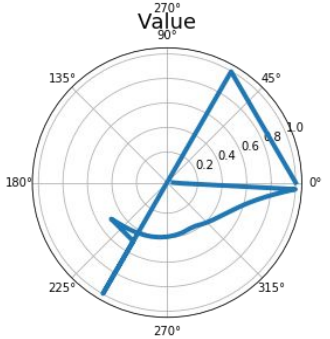
0.8
1.0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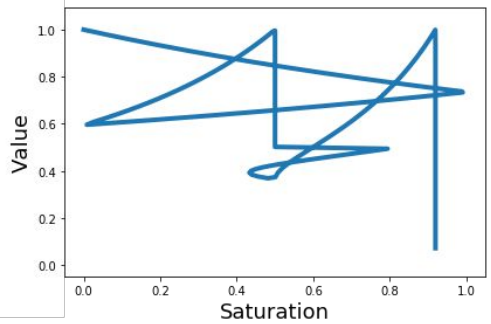
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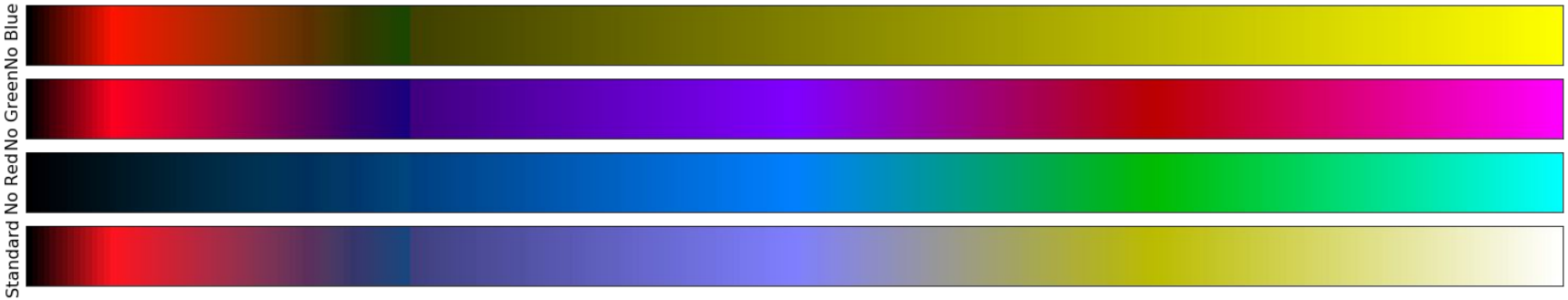
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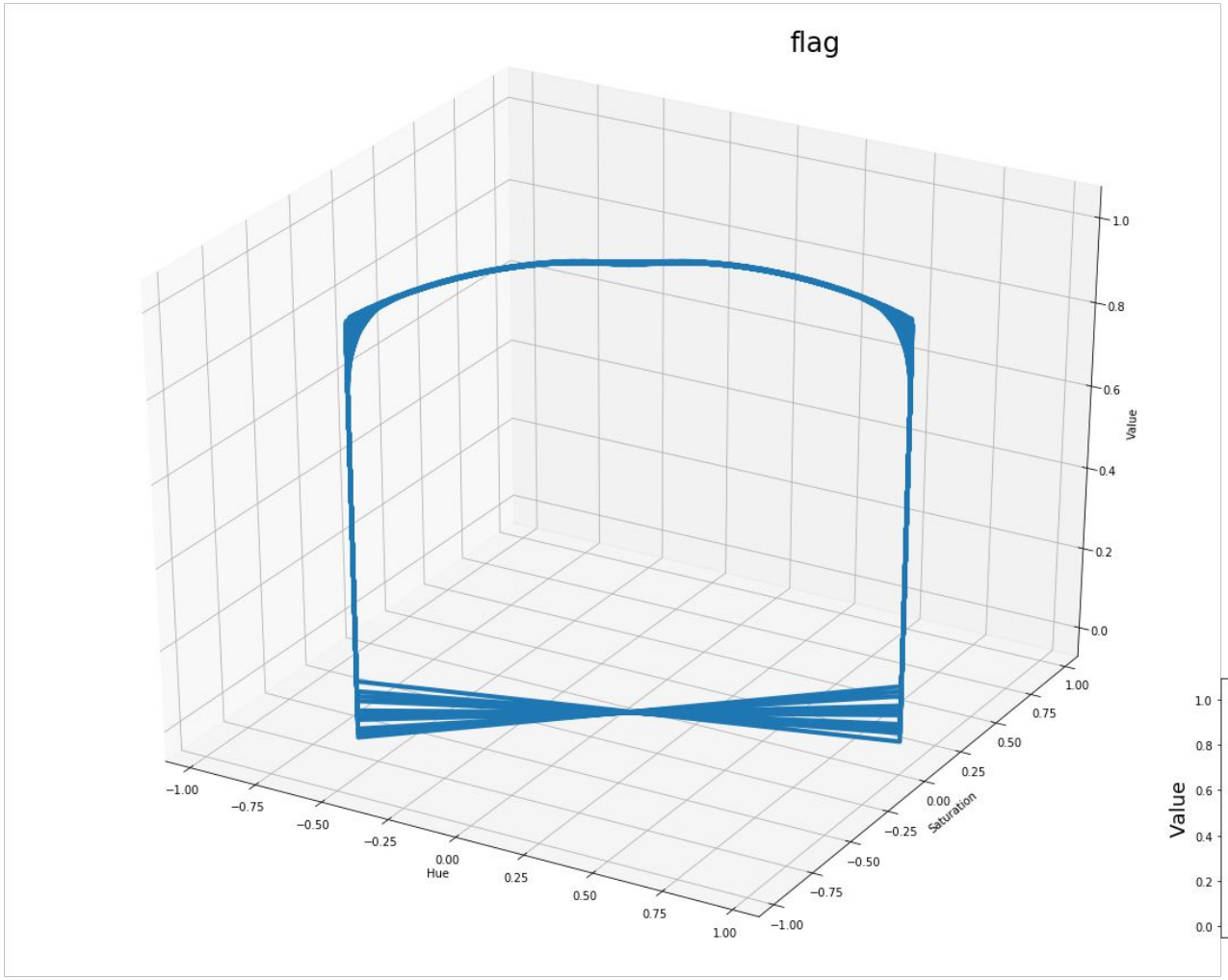
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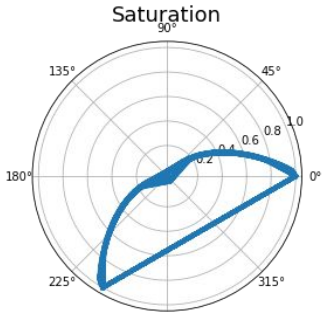
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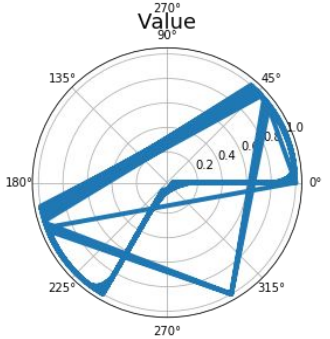
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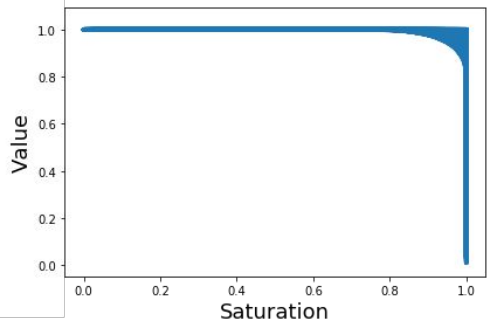
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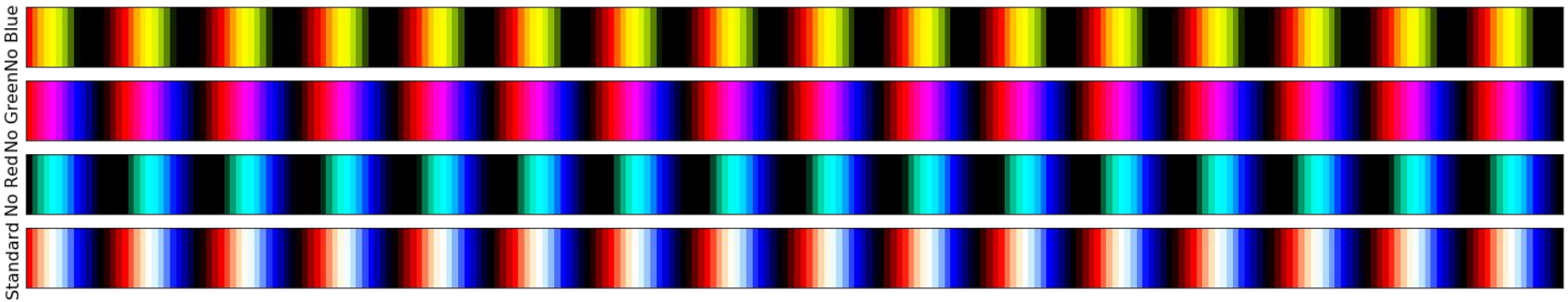
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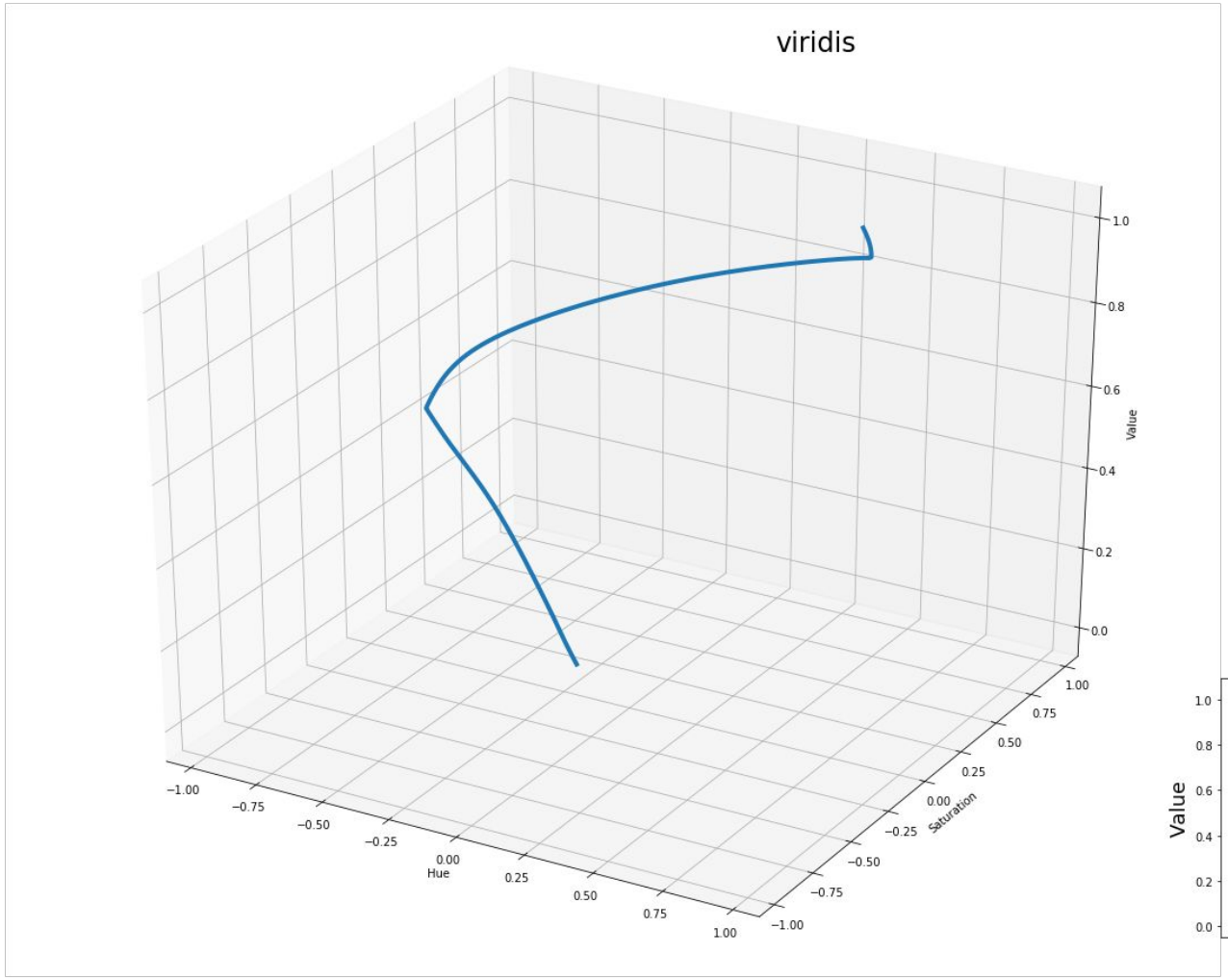
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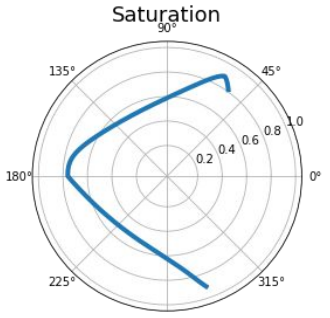
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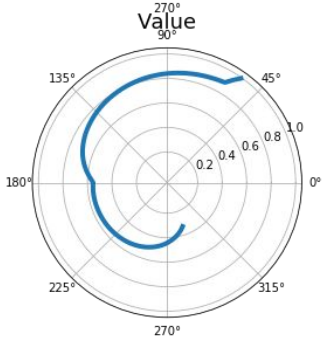
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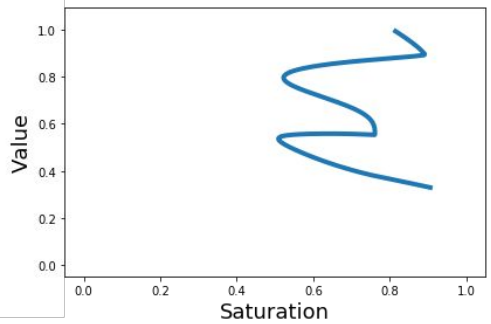
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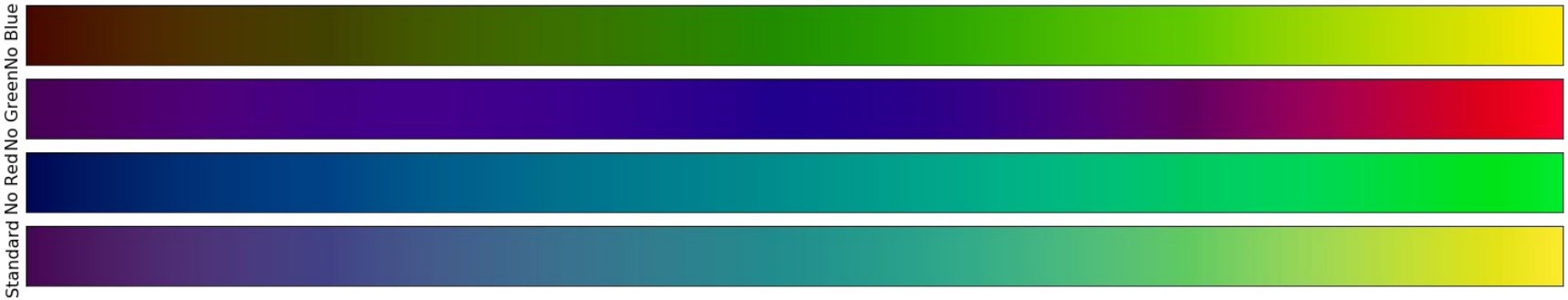
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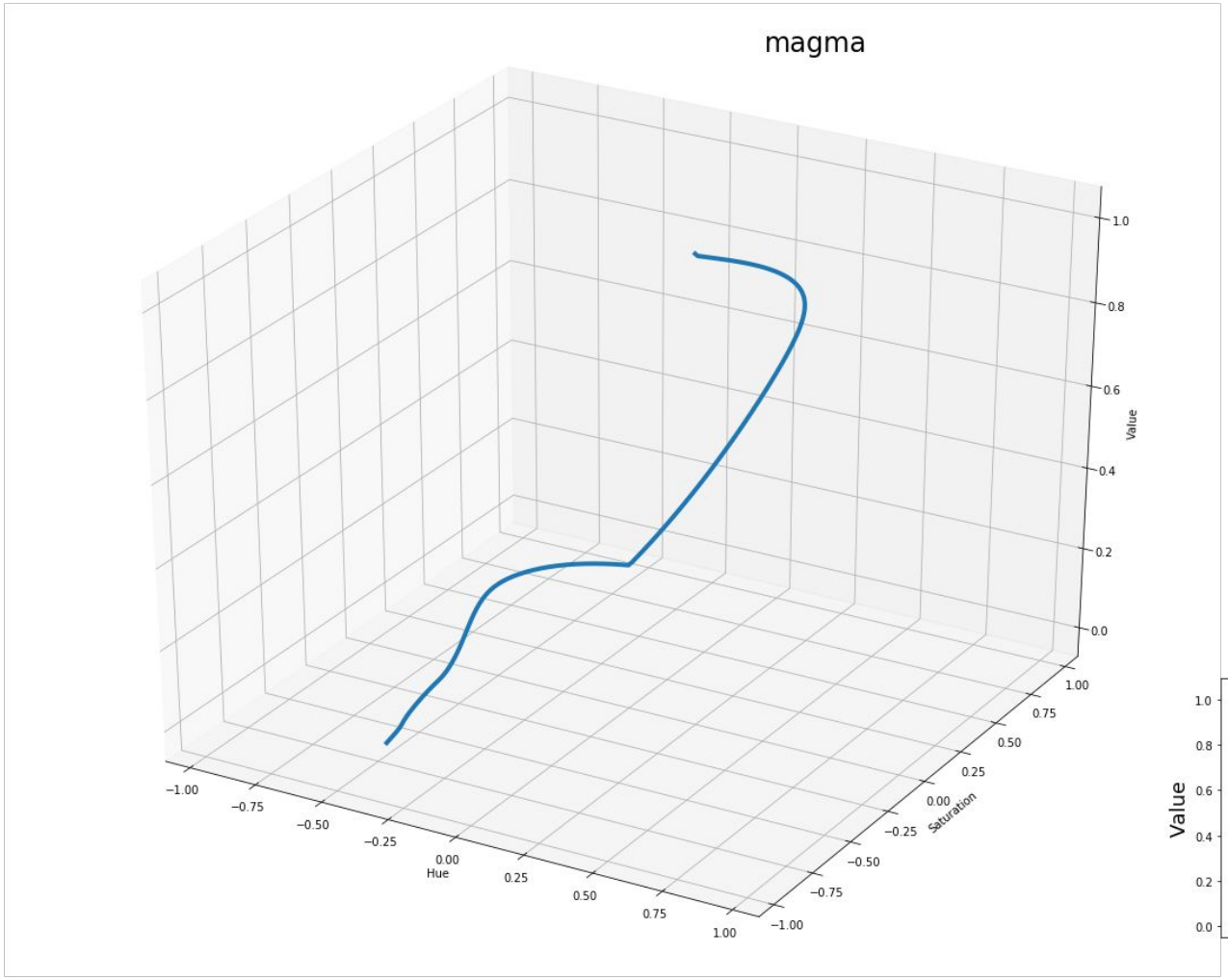
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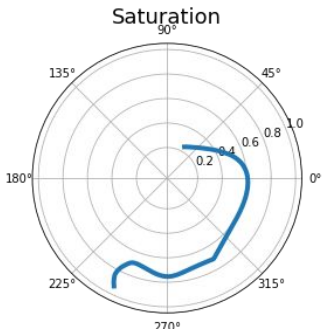
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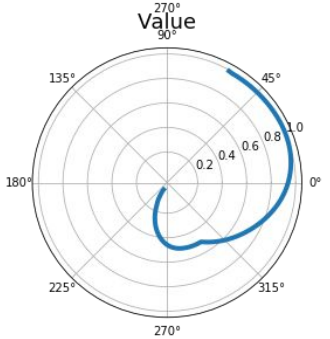
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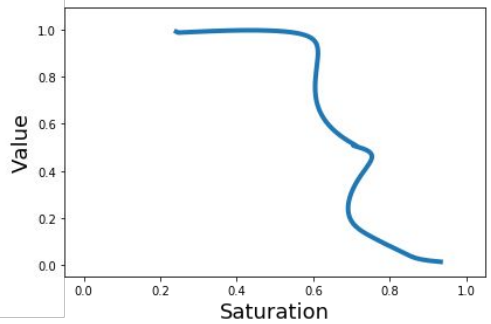
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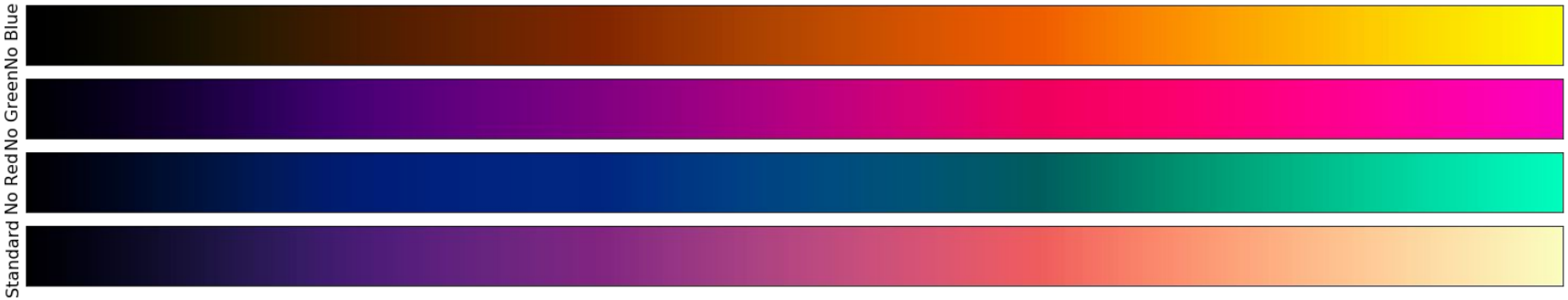
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Modules and Scripts

- Reusability
- Execution

the humble import statement

- The “import” statement loads and makes accessible
- Python will search paths to find the script to import
  - sys.path is a list of these
  - Current directory may or may not be included
- Modules are reusable collections of functions and scripts
  - The presence of an __init__.py file indicates something is a package
  - We will be building a module