

# Title

2D color maps

## Abstract

All of the color mapping in Matplotlib is currently derived from `ScalarMappable` which as the name suggests maps scalars from  $\mathbb{R}^1 \rightarrow \mathbb{R}^4$  RGBA color space. It is common to want to map a vector to colors, for example to control the alpha based on a second value in a scatter plot or to show the orientation of a field.

Intensity	Involves	Mentors
Intermediate	Python	tacaswell,story645

## Technical Details

- All the work will be done in Python
- It will be in accordance with current implementation of 1D colormaps.
- Extending the existing 1D normalization for 2D data : This can be done by a family of normalizers which go from data  $\rightarrow$  unit-disk or square in the complex plane
- Creating color maps that go from the unit disk or square  $\rightarrow$  RGBA
- Exposing these classes to user as either new API or extending the existing `ScalarMappable` API
- Implementing a 2D color bar
- Developing 2D color maps : They can be created by doing bi-linear interpolation between four colours. Also major focus would be on developing perceptually friendly colormaps so that color blind people have no difficulty in distinguishing colors

## Schedule of Deliverables

### May 1th - May 28th, Community Bonding Period

- Before the official time period begins I will do some tasks listed under [MEP21](#): color and cm refactor. This will greatly help in understanding the current implementation of normalization and color mapping tools in Matplotlib. Some tasks that can be done as part of this are:
  - Tidying up namespace
  - Defining a “Color” tuple
  - Improving construction of colormap by changing current dictionary approach

- Analyzing the feasibility of renaming `cm` module to something more descriptive. It will be a major API change so this will be done only if its pros outweighs cons
- Set up a blog
- Along with this I will continue to solve issues on github

#### **May 29th - June 3rd**

- Decide on how API will be exposed to users as new API or as extension of `ScalerMappable`
- Start working on normalizers

#### **June 5th - June 9th**

- Finish up normalizers
- Write tests
- Starting working on color map that maps unit circle or square to rgba
- Write blog

#### **June 12th - June 16th**

- Finish up color maps
- Debug and test
- Write tests

#### **June 19th - June 23th, End of Phase 1**

- Complete any unfinished work in Phase 1
- Write documentation for code written so far
- Write blog for Phase 1

#### **June 26 - June 30th, Begin of Phase 2**

- Make API for exposing normalizers and color maps to user
- Test new API
- Document the API so that it is exposed to users

#### **July 3rd - July 7th**

- Start implementing 2D color bar
- Write blog

**July 10th - July 14th**

- Continue implementing 2D color bar

**July 17th - July 21th, End of Phase 2**

- Complete any unfinished work of Phase 2
- Write blog for Phase 2

**July 24th - July 28th, Begin of Phase 3**

- Research on perceptually friendly colormaps

**July 31st - August 4th**

- Develop 2D colormaps

**August 7th - August 11th**

- Test and document colormaps
- Write blog

**August 14th - August 18th**

- Write examples for Matplotlib gallery to demonstrate 2D color maps

**August 21st - August 25th, Final Week**

- Buffer period for any unfinished work
- Write blog for Phase 3
- Clean up code

**August 28th - August 29th, Submit final work****Future works**

- In future the project can be extended to higher dimensions by mapping to quaternions as well.
- Different types of colormaps can be added

## Open Source Development Experience

- (Merged) [#8094](#) Cleaned up documentation by removing an example
- (Merged) [#8097](#) Improved the code to use `plt.gca` instead of `plt.axes`
- (Merged) [#8154](#) Merged `fill_demo` and `fill_demo_features` examples
- (Merged) [#8190](#) Added link to Gitter channel in readme
- (Merged) [#8234](#) Fixed broken Gitter badge
- (Merged) [#8343](#) Made `ArrowStyle` docstrings `numpydoc` compatible
- (Open) [#8336](#) Merged three `streamplot` examples into one plot with subplots
- (Open) [#8157](#) Added 'which' kwarg to `autofmtxdate` and wrote tests

## Other Experiences

- [AI-Bot](#) in python for 4X4 Ultimate-Tic-Tac-Toe
- [Brick-Breaker](#), a 2d shooter game in OpenGL
- [Bloxorz](#), a 3d puzzle game in OpenGL

## Why this project?

Currently there are no multidimensional colormaps in Matplotlib. This is a big nuisance if we want to modulate the color and opacity based on data in different dimensions independently. This project has been requested for a long time by people in neuroscience, astronomy etc. Here are some of those requests :

- [#4369](#)
- [Bivariate Colormaps](#)

Having used Matplotlib for displaying graphical information several times, I wanted to give something back to the community. I am the right person to do this project because not only I want to contribute to Open Source but I have also worked closely with the community for last month so I have good understanding of workflow.

## Appendix

### About Me

I am a sophomore at International Institute of Information Technology, Hyderabad majoring in Computer Science. I have intermediate proficiency in Python and have worked on several projects with it. I am also an active contributor of Matplotlib for some time.

## Contact

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## Availability

I don't have any commitments in summer and GSOC will be my full time job. My summer vacations starts on 27 April and college reopens in last week of July.

- **Time Zone :** Indian Standard Time (IST) UTC +5:30
- **Hours per week :** 35-40 hours(during vacations), this may go down to 30-35 hours in August