

# COLORBLINDNESS EMULATOR



Ember & A1ly



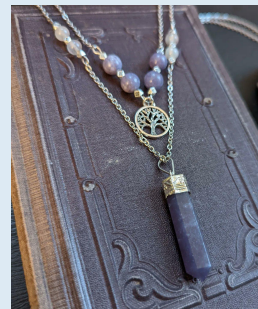
# About me






From




Living in



- Former Tech Recruiter
  - UI Engineer at CrowdStrike
  - Podcast Host: Agathe's Diary

 Agathebadia  
 in/agathe-badia  
 Agathe\_BADIA

 [agate-in-berlin.com](https://www.agathe-in-berlin.com)

Linktr.ee:



# ABOUT COLORBLINDNESS





How do people with colorblindness see colors?



# Colorblindness

- 1 in 12 persons with XY chromosomes
- 1 in 200 persons with XX chromosomes



# Colorblindness

- 1 in 12 persons with XY chromosomes
- 1 in 200 persons with XX chromosomes

But also:

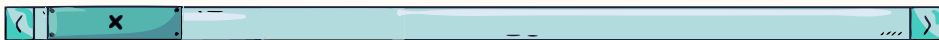
- Retinal damage
- Medical condition

Estimation: 350+ million persons are colorblind



**LET'S MAKE IT  
OURSELVES**





## SVG Filter

 [hail2u / color-blindness-emulation](#)



## SVG Filter

 [hail2u / color-blindness-emulation](#)

## Ember

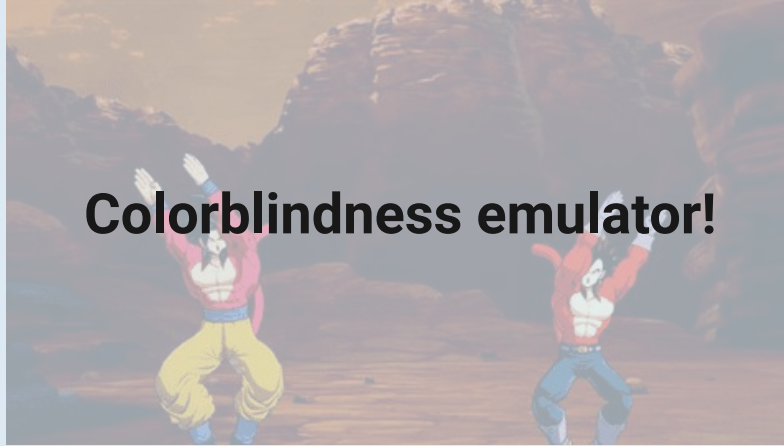
- + Information gathering
  - + Real life examples
  - + Aims to be 100% accessible
- = Awareness



SVG Filter

 [hail2u / color-blindness-emulation](https://hail2u.com/color-blindness-emulation)

**Colorblindness emulator!**



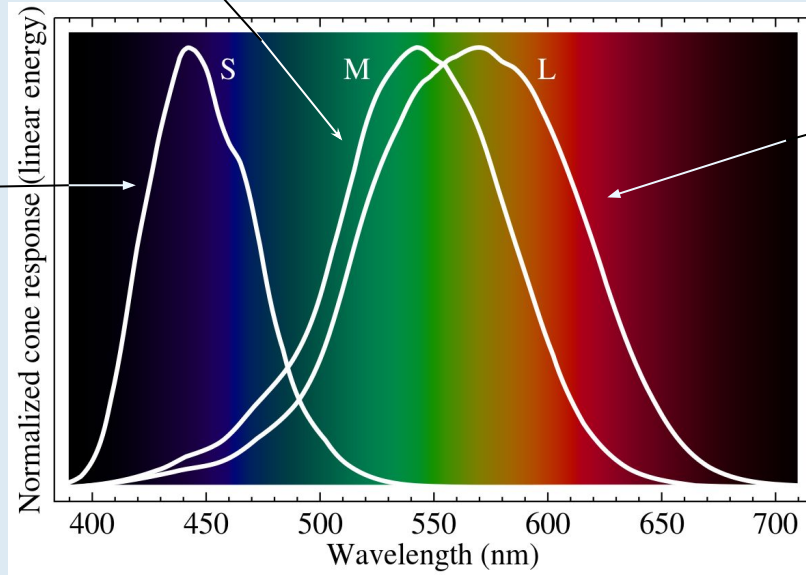
Ember

- + Information gathering
  - + Real life examples
  - + Aims to be 100% accessible
- = Awareness



Deutan  
Responsible for green colors

Tritan  
Responsible for blue  
colors



Protan  
Responsible for red colors



# Colorblindness – Recap

**Protan**  
L-cones

**Protanopia**  
L cones are missing

**Protanomaly**  
L cones are defective

**Deutan**  
M-cones

**Deuteranopia**  
M cones are missing

**Deuteranomaly**  
M cones are defective

**Tritan**  
S-cones

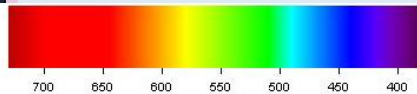
**Tritanopia**  
S cones are missing

**Tritanomaly**  
S cones are defective

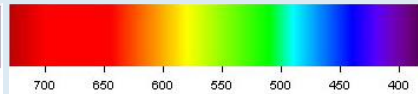
**Achromat**  
No color

**Achromatopsia**  
Total color blindness

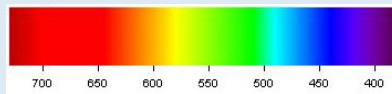
**Achromatomaly**  
Partial



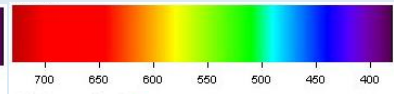
Protanopia



Deuteranopia



Tritanopia



Achromatopsia



Protanomaly



Deuteranomaly



Tritanomaly



Achromatomaly





**WHAT'S NEXT?**

# CHROME EXTENSION!

Where the magic happens



## SVG Filter

 [hail2u / color-blindness-emulation](https://github.com/hail2u/color-blindness-emulation)



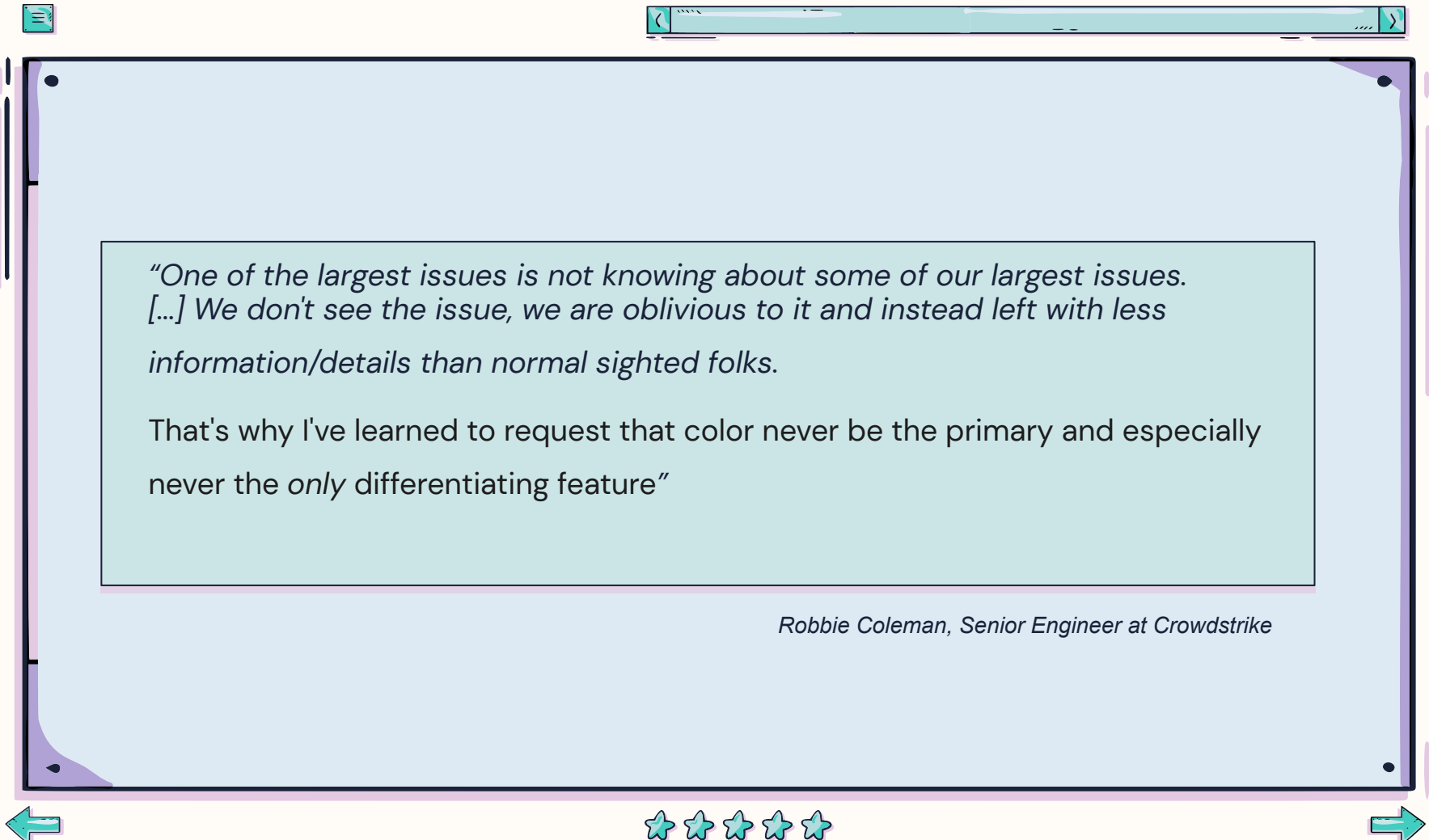
## Extension noob starter pack

- + Colorblind picker
- + Aim to be accessible
- = Immersive tool!



# RECOMMENDATIONS





*"One of the largest issues is not knowing about some of our largest issues. [...] We don't see the issue, we are oblivious to it and instead left with less information/details than normal sighted folks.*

That's why I've learned to request that color never be the primary and especially never the *only* differentiating feature"

*Robbie Coleman, Senior Engineer at CrowdStrike*



# What we can do:

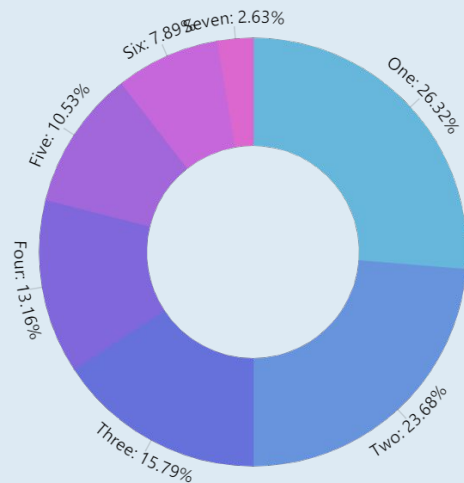
**Do not communicate information only via colors**

- Stronger contrast and brightness
- Rethink pre-attentive processing in an accessible way
- Include people with colorblindness in your work



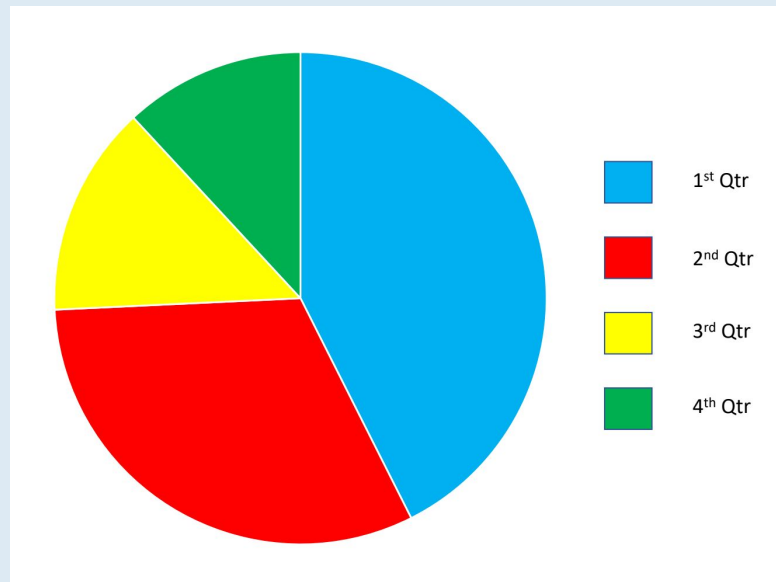
## Stronger contrast and brightness

Keep a strong contrast in hue/color, but also in brightness



One 26.32% Two 23.68% Three 15.79% Four 13.16% Five 10.53% Six 7.89% Seven 2.63%

*Low brightness*



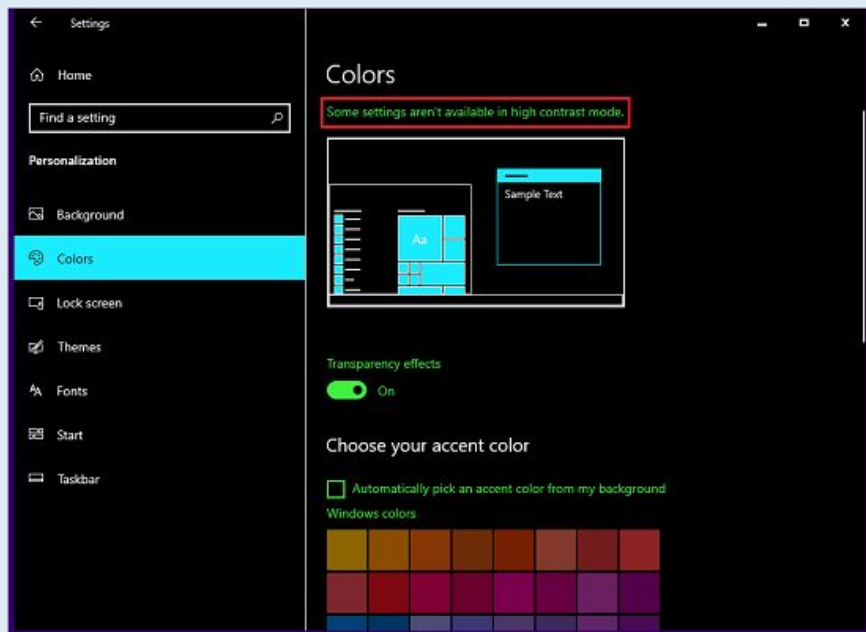
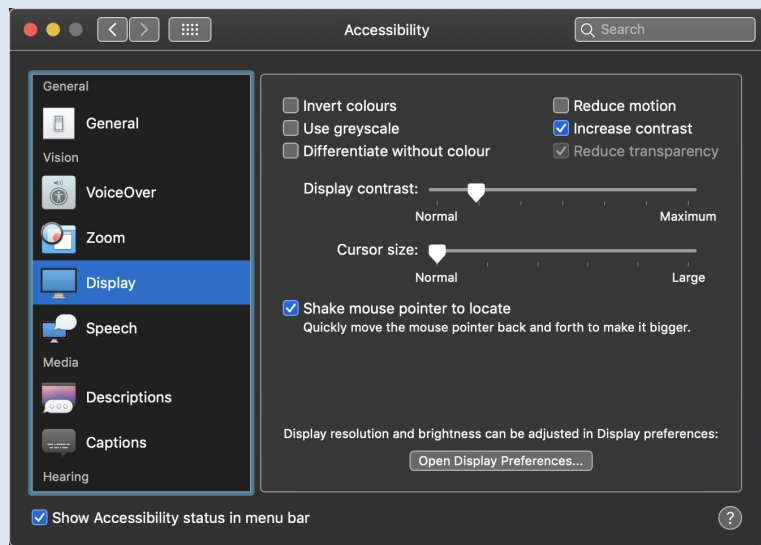
1st Qtr  
2nd Qtr  
3rd Qtr  
4th Qtr

*Higher brightness*



## Stronger contrast and brightness

- Design in gray scale
- Built-in high contrast mode + using SVG icons that also have contrast mode



# Pre-attentive processing



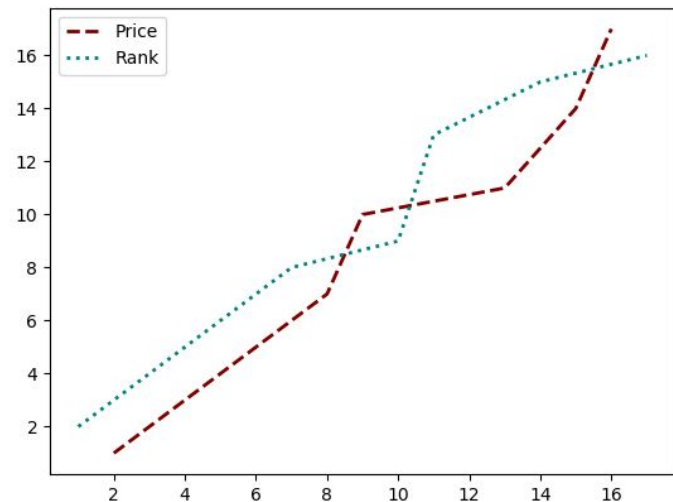
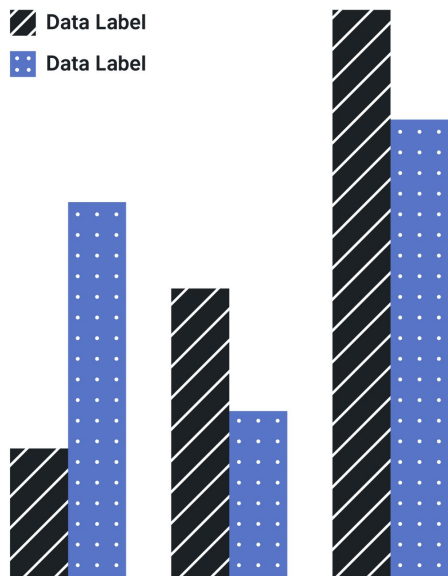
## Pre-attentive processing

- Combination of color with different patterns/hatching



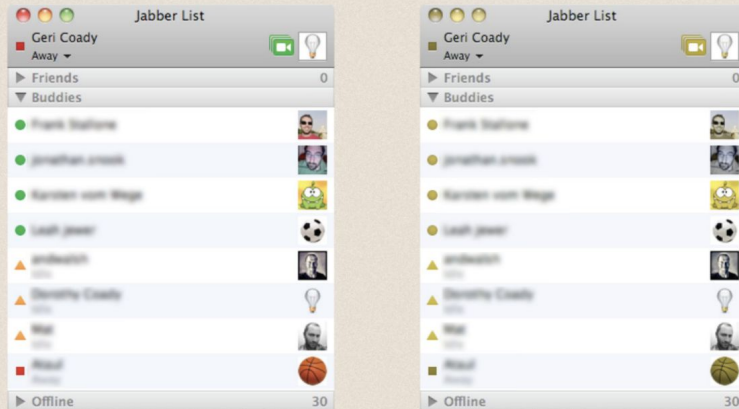
## Pre-attentive processing

- Combination of color with different patterns/hatching
- Color with solid - dotted lines



## Pre-attentive processing

- Color and shapes (circles, triangles, squares...)



GOOD COLOR VISION

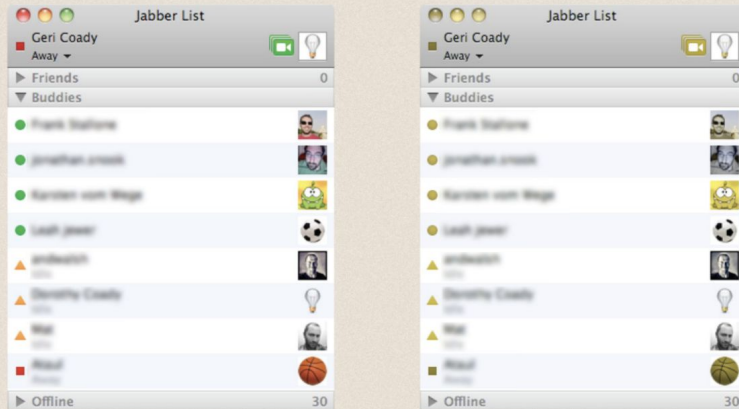
DEUTERANOPIA

Screenshot by Geri Coady



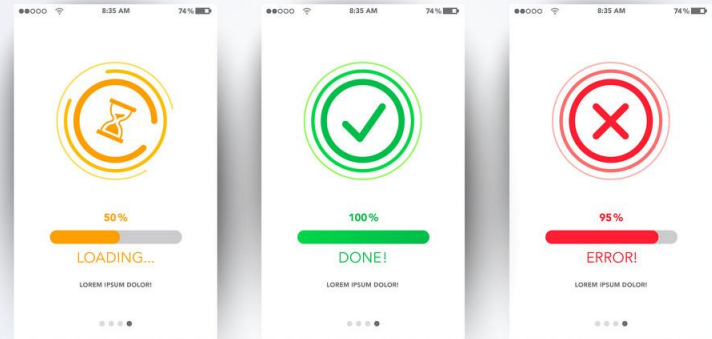
## Pre-attentive processing

- Color and shapes (circles, triangles, squares...)
- Color and icons



GOOD COLOR VISION

DEUTERANOPIA



VectorStock®

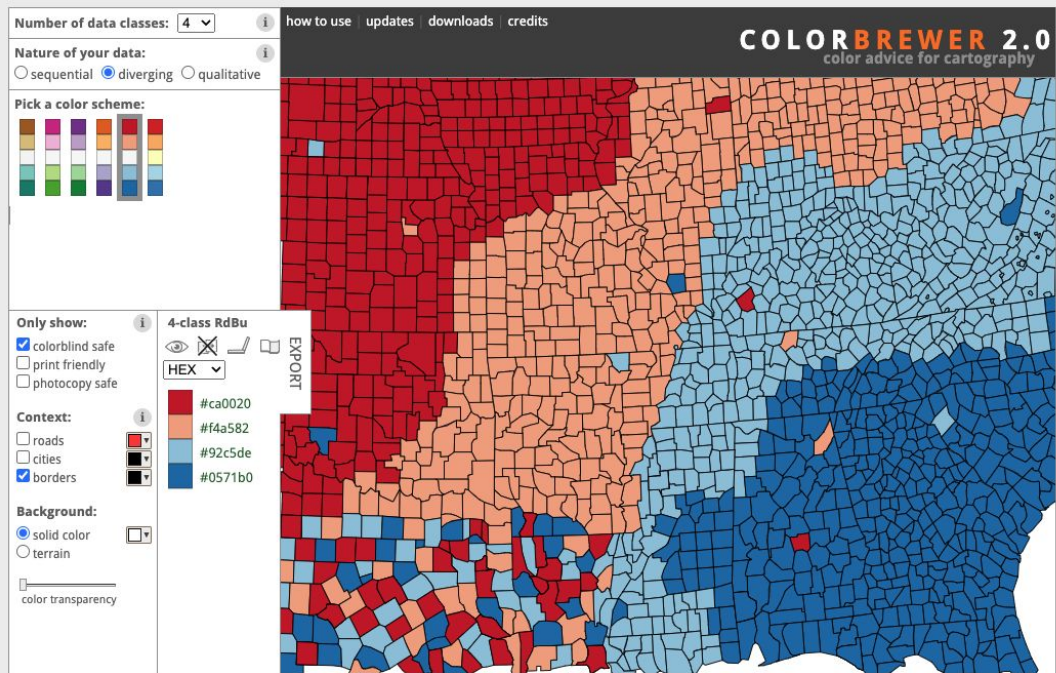
VectorStock.com/23774593

Screenshot by Geri Coady



# Pre-attentive processing

## Colorblind friendly swatch



© Cynthia Brewer, Mark Harrower and The Pennsylvania State University  
[Source code and feedback](#)  
[Back to Flash version](#)  
[Back to ColorBrewer 1.0](#)

axismaps



## Include people with colorblindness in your research projects and test phase

- Able to solve more problems in less time, and with better outcomes





# CONCLUSION



**Robbie Coleman**

**Zoë Bijl**

**Jim Schofield**

**Florian Kraft**

**Yehuda Katz**

**Jenny Judova**

**Nicole Chung**

**Anne-Greeth Schot  
-van Herwijnen**

**Michal Bryxi**




**Gonçalo Morais**

# THANK YOU

We're hiring!



Let's connect!

 Agathebadia  
 in/agathe-badia  
 Agathe\_BADIA

Resources & projects

