Application of Machine Learning Algorithms to Correct Images to Help the Color Blind

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Introduction

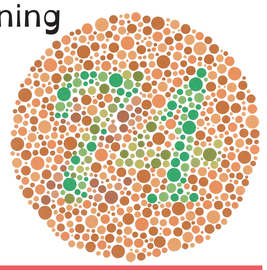
• Color blindness or color deficiency stems is a persons inability to perceive colors normally.

• These problems stem from issues with the color detecting cells in the eye called *cones*.

• Color blindness is different for everyone, but some common types are red-green and blue-yellow.

• With the Internet shifting to a more multimedia-centric form of communication rather than just text, a solution is needed to help effectively translate this data to those affected by color blindness.

• A compilation of machine learning algorithms can help achieve this goal.



Ishihara plates are the standard for testing color blindness

https://en.wikipedia.org/wiki/Ishihara_test

Methods

• A machine learning system is used to identify and correct potential color blind issues in images. The example follows these steps.

1. Generate an image that has color blind problem areas.

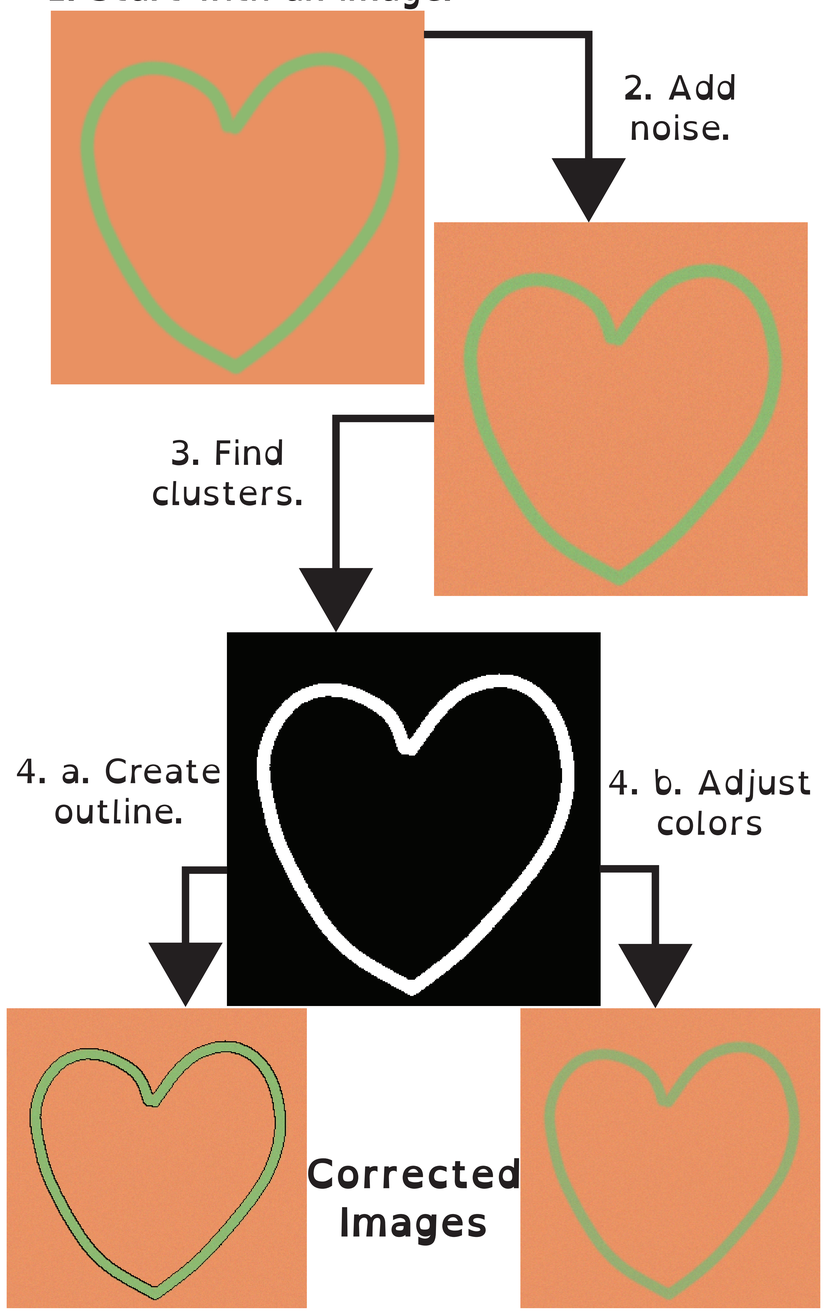
2. Add noise to that image. This will help avoid over fitting the predictive model.

3. Divide the image into the clusters of colors creating the problems. This is done with k-means clutering.

4. Correct the problem.
   a. Create a thin outline between the clusters.
   b. Adjust the colors in the clusters to increase recognizability.

An Example

• This example illustrates the first portion of the training process for the system.

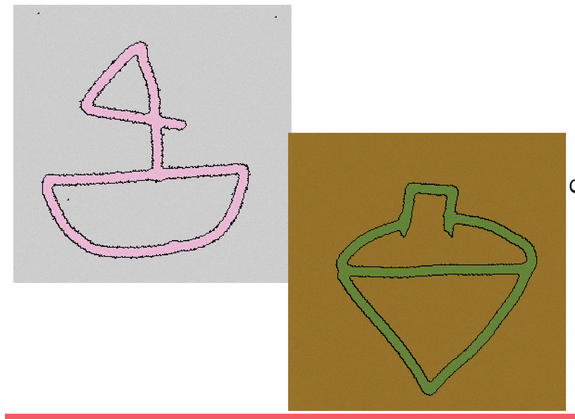


Results

• The system can take an image and create a data file of the color values for every pixel.

• It adds noise and then clusters this data.

• From there, it can create an outline or adjust the colors to help distinguish between the clusters.



Check out this project on GitHub

Future Work

• Stack the image data together to find common clusters between images.

• Train a supervised learning algorithm, such as a neural network, to learn to classify these clusters.

• Apply this learning algorithm to other images.

• Improve the color adjustment algorithm.

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