

# Data Visualisation

## CSE613

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facebook

- Why the Facebook Logo is Blue??
  - Any Marketing Strategy....
  - it's simple....
- **Mark Zuckerberg has red-green colorblind** - According to The New Yorker
- **He can see the Blue at his best**
- **Zuck says - Blue is the richest color for me; I can see all of blue**

# Why are Indian Rupee notes are colored differently?





- Four colors of the New Microsoft Company Logo
  - **BLUE:** Windows, Windows Live, Azure, Internet Explorer
  - **RED:** Microsoft Office
  - **GREEN:** Microsoft Xbox, Xbox Live
  - **YELLOW:** Bing

# Color Theory - INTRODUCTION

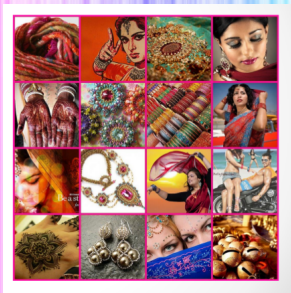
- **Meaning of Color:** Need of the Color
  - Unlike any other language, color is immediate communication.
  - It truly is the only language (other than music) that doesn't require any words.
  - Color largely influenced by the culture we live in.

Figure 7.19: Color Meaning in Different Geographic Locations

COLOR	W. EUROPE & USA	CHINA	JAPAN	MIDDLE EAST
	danger, anger, stop	joy, festive	anger, danger	danger, evil
	caution, cowardice	honor, loyalty	grace, nobility, childish gaiety	happiness, prosperity
	sexual, safe, sour, go	youth, growth	future, youth, energy	fertility, strength
	purity, virtue	mourning, humility	death, mourning	purity, mourning
	masculinity, calm, authority	strength, power	villainy	
	death, evil	evil	evil	mystery, evil

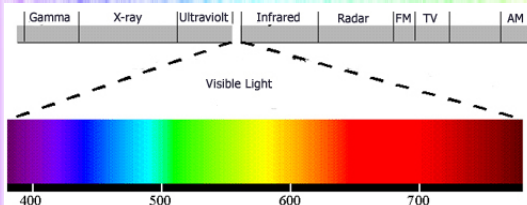
# Color Theory - INTRODUCTION

- Colors can be used in specific combinations to strengthen a visual work.
- It keeps User Attention
- It take advantage of specific meanings that color can evoke.
- It Influence your viewer's first-impression.
- Color reflects the mood of a design and can invoke emotions, feelings, and even memories.



- **Visible Spectrum:**

- Visible light is the portion of the electromagnetic spectrum visible to the human eye.
- The Visible Color Spectrum is measured in Wavelengths
- Range is 380 nm to 750 nm (Begins with Violet and Ends with Red)
- This band makes up the full spectrum of what can be seen by the human eye.
- The Human Eye has limitation to capture and reproduce the color, when it comes to rendering the spectrum.
  - Example: Photo of beautiful sunset → printout → Dull.



- **Color Theory:**

- **Color Theory is the study of the effect colors exert on the mental and physical conditions of humans**
- **Color is used to express various emotions, to spark reactions, or to inform**

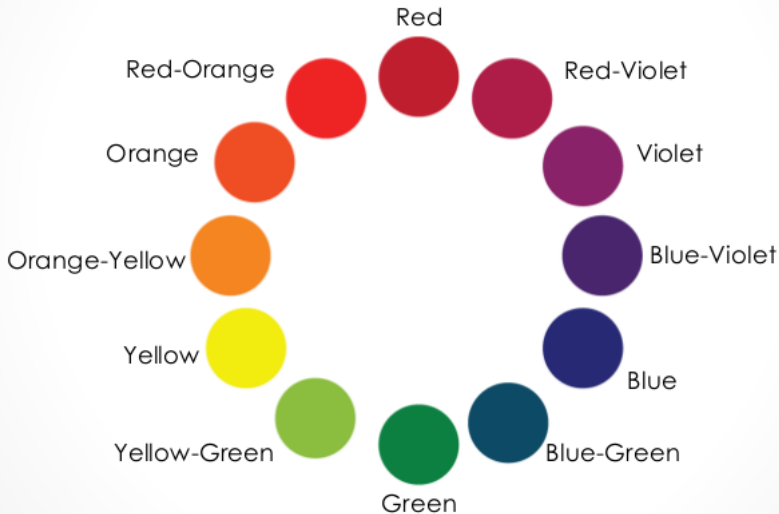
- **Color Wheel:**

- A color wheel or color circle is an abstract illustrative organization of color hues around a circle that shows relationships between primary colors, secondary colors, tertiary colors etc.
- Three Main Quantities of Color are:
  - **Hue**(Color): The Relative Position located on the color Wheel
  - **Value**: Intensity of tone, lightness or darkness of the color
  - **Saturation**(Chroma): Purity of the color



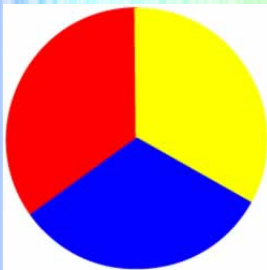
# Color Theory - INTRODUCTION

- Color Wheel Shades



- **Primary Colors Wheel:**

- These colors can not be created by combining other colors
- The sets of colors that can be combined to make a useful range of colors.
- Red, Yellow and Blue are the primary Colors (Additive Combination)
- Primary colors are the lowest, most fundamental colors in the RYB model.



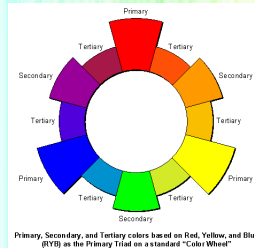
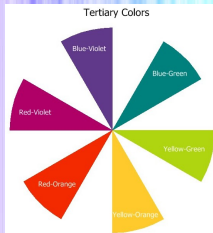
- **Secondary Colors Wheel:**

- A secondary color is a color made by mixing two primary colors in a given color space.
- Orange, Green and Purple are the Secondary Colors
- 



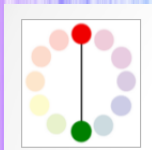
## • Tertiary Colors Wheel:

- The mixing a primary and secondary shade on the color wheel.
- Red-violet, red-orange, yellow-orange, yellow-green, blue-green and blue-violet



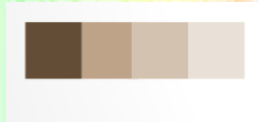
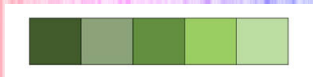
## • Other Colors Wheel:

- Complementary: Colors exactly opposite from each other on the color wheel
- Split Complementary: This combination is created by first picking a color and then finding the two colors touching the first color's complements.
- Tertiary Triad: A combination of equidistant tertiary shades that form a triangle on the color wheel.
- Analogous: Any set of colors that are adjacent to each other on the color wheel.
- This combination is created by first picking a color and then finding one color touching the first color's complement.



# Color Theory - INTRODUCTION

- Monochromatic: A single color and any tints or shades associated with that color.
- Achromatic: A color scheme that is absent of color, only using shades of black, white and gray.
- Neutral: A color palette that is created by adding a little bit of a colors complement to itself, often resulting in light, pale shades.



## EDWARD TUFTE:

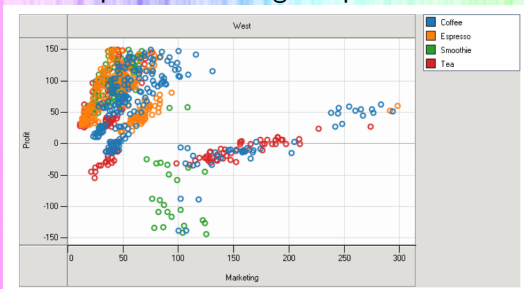
...avoiding catastrophe becomes the first principle in bringing color to information: Above all, do no harm.

- Color selection in data visualization
  - It is not a merely an aesthetic choice.
  - It is a crucial tool to convey Quantitative Information.
  - It specifies How Data Visualization are interpreted.
  - It influences the speed at which the users are understood.
- Properly selected colors convey the underlying data accurately, in contrast to many color schemes commonly used in visualization that distort relationships between data values
- If we are using color effectively, it enhance and clarify a presentation.

## ESSENCE OF COLOR IN DATA VISUALIZATION

what information are trying to convey, and how (or whether) color can enhance it.

- Color in Data visualization:
  - To distinguish one element from another → "to label" → Edward Tufte
  - Scatter plot: marketing vs. profit for four different products.





- An Effective Design presents information:
  - in an organized manner
  - making it easy for the viewer to understand the roles and the relationships between the elements.
- A good Organizing Principle:
  - define categories of information
  - grouped by function
  - ordered by importance
- An effective use of color will group related items and command attention in proportion to importance.

- Principles of Color Design:
  - Contrast and analogy are the principles that define color design.
  - Contrasting colors are different in nature.
  - analogous colors are similar in nature.
  - Contrast colors → draws attention
  - analogy color → groups

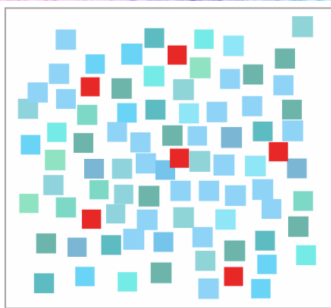
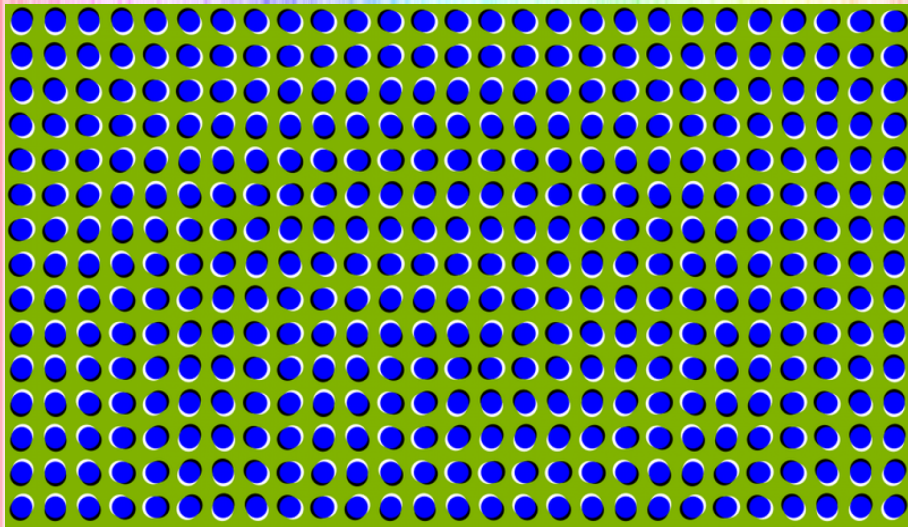


Figure 2. Contrast and analogy. The red squares contrast with the analogous blue-green ones.



- In most design situations, the best results are achieved by limiting hue to a palette of two or three colors.
- using hue and chroma variations within palette hue to create distinguishably different colors.
- Such a palette is both aesthetically pleasing and functional.
- It minimizes an over-dependence on hue variation (which can cause visual clutter), and replaces it with careful control of value and chroma.
- Now Problem is, How do you choose good palette
- **Example in Class** → [choosing\\_colors\\_data visualization.pdf](#) in moodle

- Examples:
  - Contrasting colors can even give you the illusion of motion



- **Interactive Color Design Tools**

- colorschemedesigner
  - <http://colorschemedesigner.com/csd-3.5/>
- Color Ramp Creator
  - <http://www.pixelfor.me/crc/F0000032>
- Color Scheme Designer3
  - <http://paletton.com/uid=1000u0klIIlaFw0g0qFqFg0w0aF>
- Color Brewer2
  - <http://colorbrewer2.org/>
- Color Oracle
  - <http://colororacle.org/>
- Kular
  - <https://color.adobe.com/create/color-wheel/>
- iwantHue
  - <http://tools.medialab.sciences-po.fr/iwanthue/index.php>
- **One Interesting website on Colors is**
  - <http://datavizblog.com/category/color-theory/>