



Computational Science:
Computational Methods in Engineering

Graphical Design Concepts



Outline

- Typefaces & Fonts
- Pictures
- Labels
- Color
- Layouts
- Graphics Software



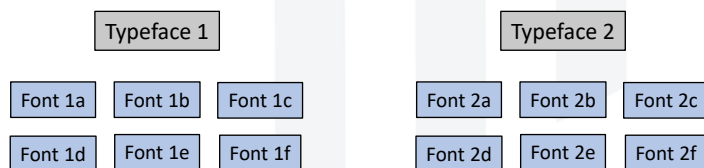
Typefaces & Fonts




Typeface Vs. Fonts

Fonts – A complete set of characters that share a common weight, width, and style.

Typeface – A collection of fonts sharing an overall appearance that are designed to be used together.



Typefaces

- **Serif** – Strokes help guide eyes along sentences.
- **Sans Serif** – No strokes. More pleasing to eye.
- **DISPLAY** – Large titles. Decorative.
- *Script* – Implies handwritten and personal.
-  **Dingbat** – Special symbols.

Serifs

Serifs are tails or decorative structures at the ends of the strokes of letters.

Serif Fonts

Serif

- Serifs guide the eyes making text easier to read.
- Used mostly for body text where many lines must be read.
- Draws attention. More decorative.
- May be overwhelming as a title or label font.

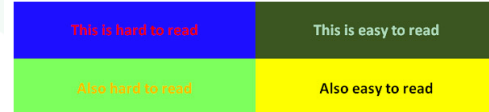
Sans Serif Fonts

Sans Serif

- Simpler and more legible.
- Better looking when scaled large.
- Should be your go-to style, except for body text.

General Rules

- Do not use too many typefaces.
- Use well contrasting colors.
- **LIMIT USE OF DISPLAY FONTS.**
- Make your text easily read and scannable. Use bold headings and focus points to organize.
- Don't distort typefaces. This means not using the bold and italics styles!



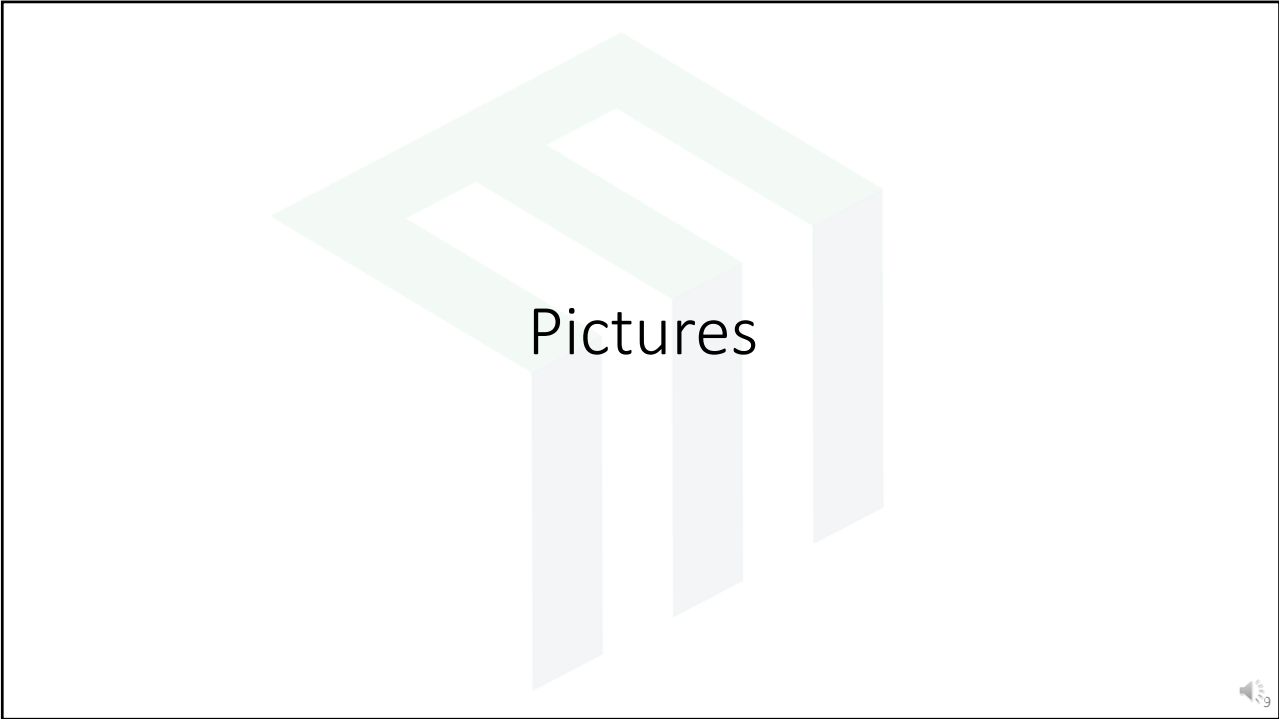
Equations

In math equations, only variables should ever be italicized. Variables that are upper case Greek letters are not capitalized.

<u>Incorrect Formatting</u>	<u>Correct Formatting</u>	<u>Why?</u>
$\cos(\theta)$	$\cos(\theta)$	Variable θ should be italicized.
$cos(\theta)$	$\cos(\theta)$	The function should not be italicized.
$\cos(\theta)$	$\cos(\theta)$	Parentheses are not correct.
$\nabla \cdot \vec{A}$	$\nabla \bullet \vec{A}$	Dot products should have a large dot.
P_{avg}	P_{avg}	avg is text and should not be italicized.

Use the correct symbol for the operation!

$$ab \quad a \cdot b \quad a * b \quad \vec{a} \times \vec{b} \quad \vec{a} \bullet \vec{b} \quad a \otimes b$$



Engineer the Contrast (1 of 2)

Your eyes are drawn to contrast.



Engineer the Contrast (2 of 2)

Design the contrast in your pictures to keep attention on what is important.




There are other techniques for drawing attention to the object(s) of interest. This is just one and probably not the best.



Labels





Problem with High Contrast Diagrams



Parabolic dish antenna

Parabolic dish antenna

Neither dark or light lines work well as labels in this picture.



A Solution



Parabolic dish antenna

Dark lines with a light outline are good way to label high-contrast diagrams.

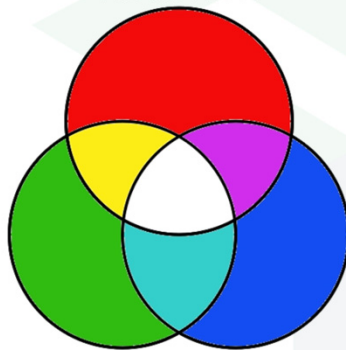
Color

Theory

Colors have an extraordinary ability to influence mood, emotions, and perceptions. They can attract attention and even convey cultural and personal meaning.

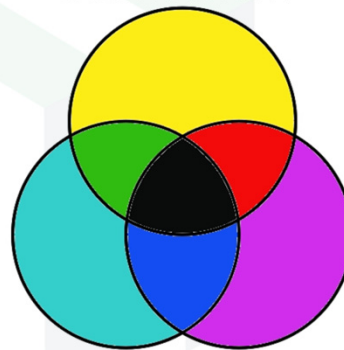
Color Wheels

ADDITIVE



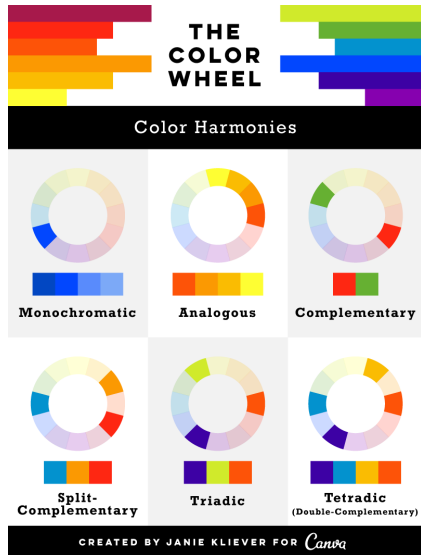
- All about mixing light.
- Used for graphics on a computer screen.

SUBTRACTIVE



- All about mixing pigments.
- Used for printed graphics.

Choosing Colors



Monochromatic -- various shades, tones, or tints of one color. This type of scheme is more subtle and conservative

Analogous -- hues that are side by side on the color wheel. Easy and versatile to use.

Complementary -- opposites on the color wheel. Complementary colors are high-contrast and high-intensity, but can be difficult to apply in a balanced, harmonious way.

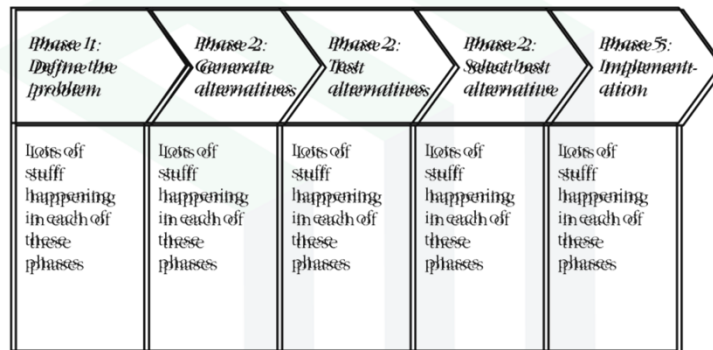
Split-Complementary -- any color on the color wheel plus the two that flank its complement. This scheme still has strong visual contrast, but is less jarring than a complementary color combination

Triadic -- any three colors that are evenly spaced on the color wheel.

Tetradic/Double-Complementary -- two complementary pairs. This scheme is very eye-catching, but may be even harder to apply than one pair of complementary colors, since more colors are more difficult to balance.

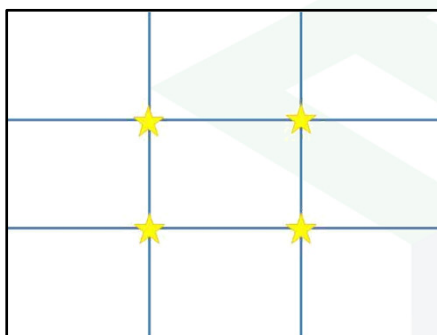
Layouts

Layout Must Convey Meaning



Even though the text is not readable (bad), the layout immediately conveys there is a step-by-step process being conveyed.

Rule of Thirds



- Divides a layout into three rows and three columns.
- Creates visual interest without overcrowding.
- Either place elements in the boxes or at the locations of the stars.

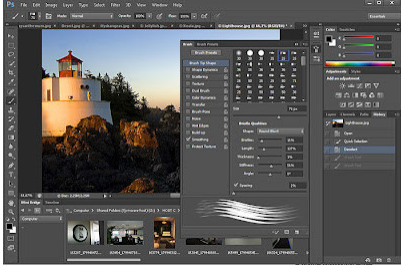


Graphics Software

Manipulating Photos & Images

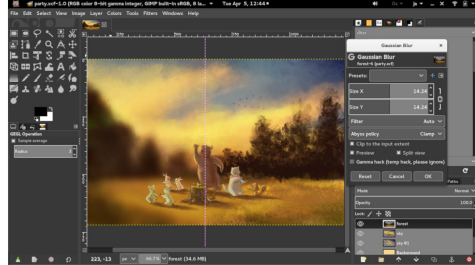
Commercial King

Adobe Photoshop



Open Source King

GIMP



The slide features a large, light green, stylized 'A' logo in the background. Below the main title, two software interfaces are shown side-by-side. The left interface is Adobe Photoshop, displaying a lighthouse image and various toolbars and panels. The right interface is GIMP, showing a landscape image and its respective toolbars and panels. The text 'Commercial King' and 'Open Source King' are positioned above their respective screenshots. The text 'Adobe Photoshop' and 'GIMP' are written in blue italics below their respective screenshots. The EMPossible logo is in the bottom left corner, and 'Slide 24' is in the bottom right corner.

Vector Graphics

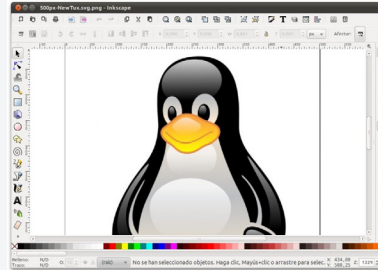
Commercial King

Adobe Illustrator



Open Source King

Inkscape

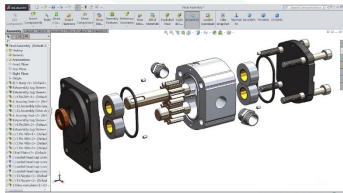


Consider using a vector graphics package to create, edit, or annotate diagrams.

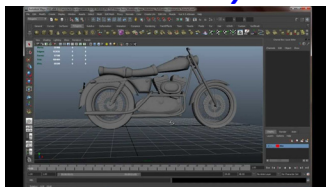
3D Modeling & Animation

Commercial King

Engineering CAD -- SolidWorks

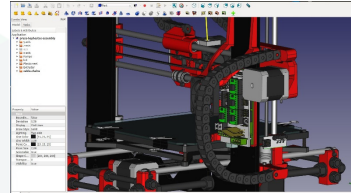


Artistic -- Maya



Open Source King

Engineering CAD -- FreeCAD



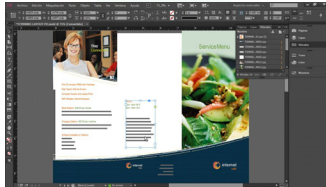
Artistic -- Blender



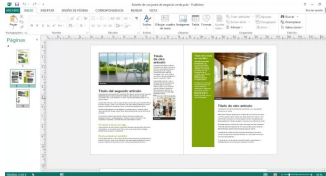
Posters, Pamphlets, Etc.

Commercial King

Adobe InDesign

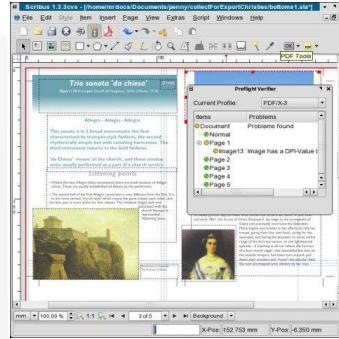


Microsoft Publisher



Open Source King

Scribus

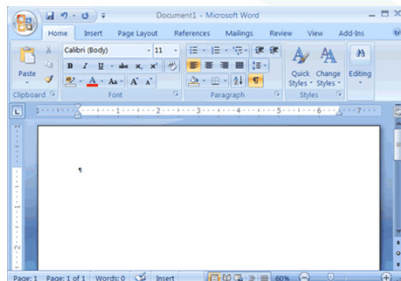


DO NOT EVER USE POWERPOINT FOR POSTERS!!!!!!

Text Documents

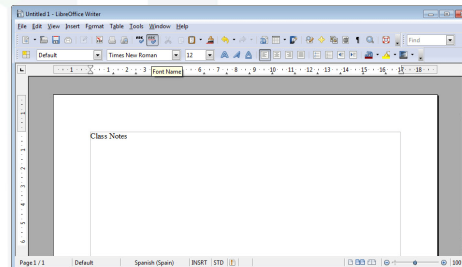
Commercial King

Microsoft Word



Open Source King

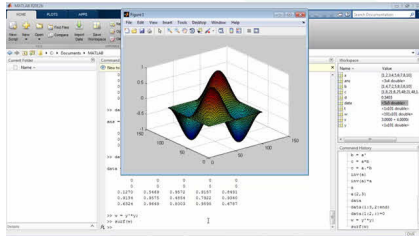
LibreOffice



Scientific Data Visualization

Commercial King

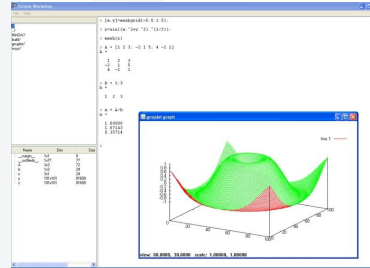
MATLAB*



* MATLAB does not produce the best quality graphics, but is arguably the best for the ease and number of ways to visualize data.

Open Source King

Octave**



** Octave is not the best open-source scientific visualization package, but it wins here due to being the closest clone of MATLAB.