



CSCI-UA-4-005

Intro to Web Design + Computer Principles

Raster Graphics – Condensed

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Binary Files

All files can be categorized into one of two file formats:

- Text
- Binary

When you write code, that is a text file.

An image file, on the other hand, is a binary file.

Binary files typically contain a sequence of bytes, or ordered groupings of eight bits.

Binary files store data in a format that is not meant to be human-readable, unlike text files.

Raster Graphics

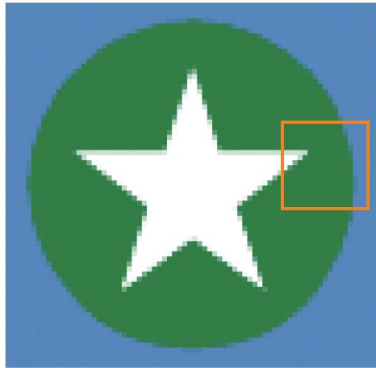
Raster Graphics, also referred to as “bitmap” graphics, are binary files.

Raster graphics consist of a grid of picture elements, pixels, each of which contain color and brightness information.

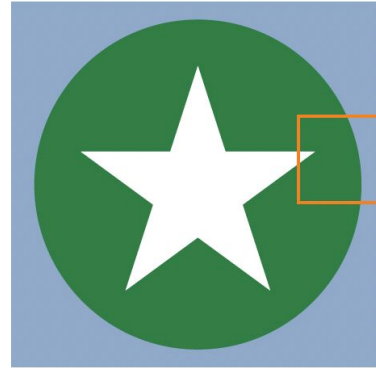
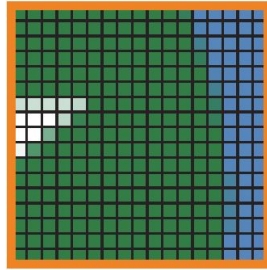
Pixels can be changed individually or as a group with program algorithms.

This is contrast to vector graphics, which describe points and lines.

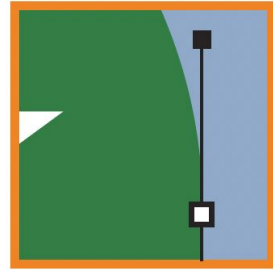
Raster vs Vector



Bitmapped images are made up of a grid of variously colored pixels, like a mosaic.



Vector images use mathematical equations to define shapes.



Show Image in TextEdit

Assignment #4

In this assignment, you will decontextualize an image of yourself and display it in the browser window on top of a full background image.

Foreground Image

- Decontextualize an image of yourself (refer to Ed Lesson tutorial)
- Export image as PNG
- 3 sizes: 1440px, 960px, 480px (make sure your original image is >1440px)

Background Image

- 1920x1920px square
- High quality JPG

Web Page

- Use `` element with `src`, `alt`, `width`, and `height` attributes
- Use `<srcset>` to offer your image at multiple resolutions
- Use CSS positioning other than static to place the image

Publishing Your Web Page

- Create a new directory called “images” on your i6 account
- Create a link from the “Raster Graphics” line of your assignments directory to your new web page.

*** We want the highest resolution images, but quality is usually proportional to file size**

The bigger the file sizes, the longer it takes for images to load, the slower our website runs!

Bits + Bytes

1 Bit	=	Binary Digit
1 Byte	=	8 Bits
1 Kilobyte (KB)	=	1024 Bytes
1 Megabyte (MB)	=	1024 KB
1 Gigabyte (GB)	=	1024 MB
1 Terabyte (TB)	=	1024 BG

- * Standard images for the web should be as small as possible (~5-500KB)
- * Images can get up to several hundred megabytes in size

Images

PNG	2 – 4 kB
GIF	6 – 8 kB
JPG	9 – 12 kB

Documents

DOCX	4 – 8 kB
PDF	18 – 20 kB

Media Files

eBook	1 – 5 MB
MP3 song	3 – 4 MB
DVD Movie	4 GB
HD Movie	5 – 8 GB
Blu-Ray	20 – 25 GB

File Size

Image file size is determined by:

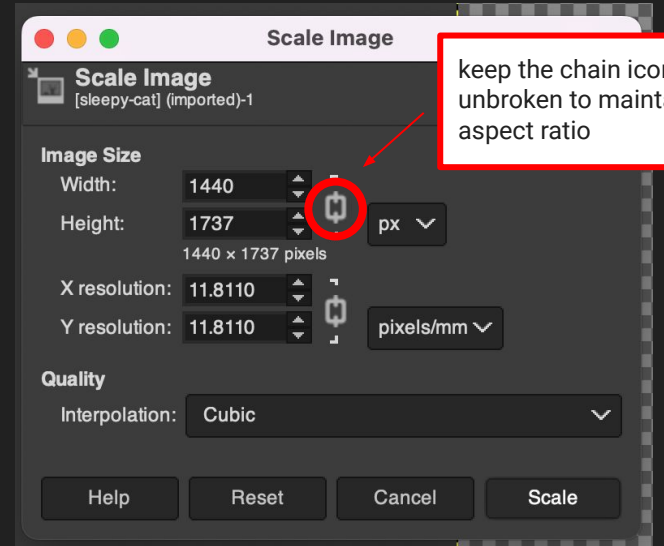
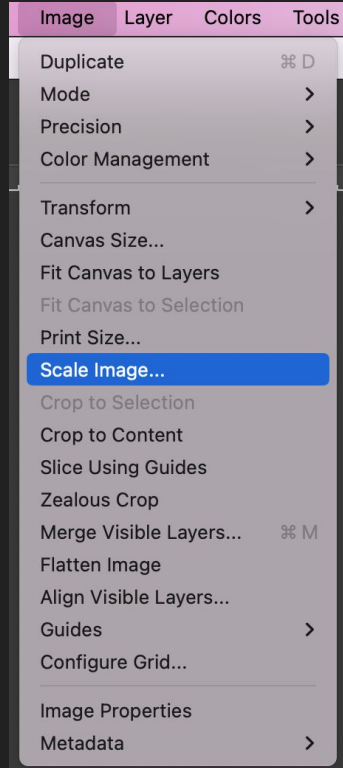
- **Bit depth:** The number of bits used to indicate the color of a single pixel. Higher bit depths allow for more colors but also result in larger file sizes.
- **Image dimensions:** The width and height of the image in pixels. Larger dimensions generally result in larger file sizes because there are more pixels to store.
- **File type:** The format in which the image is saved, such as JPEG, PNG, GIF, or TIFF. Different file formats use different compression techniques, which can affect the file size.

Resizing Images

Foreground Image

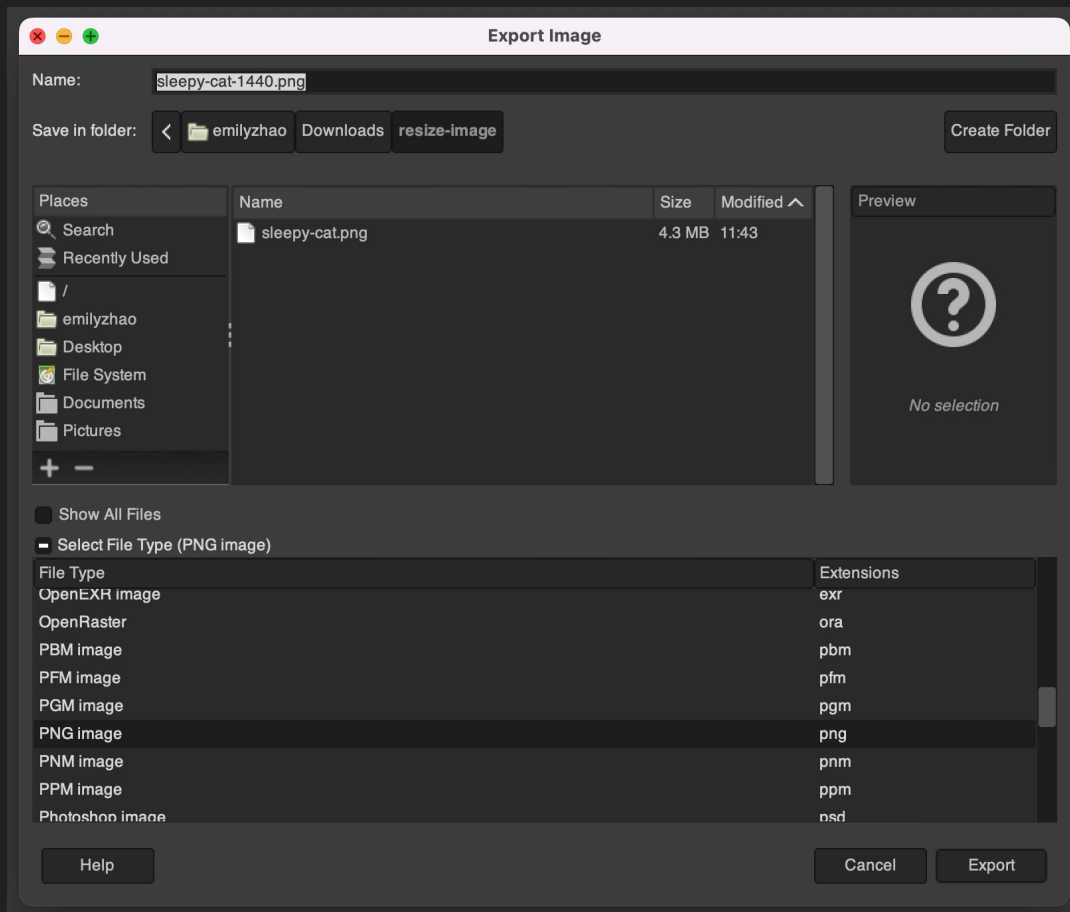
Resizing + exporting an image in GIMP

- Image > Scale Image...
- Make sure units are in pixels
- Set width and/or height
- Scale



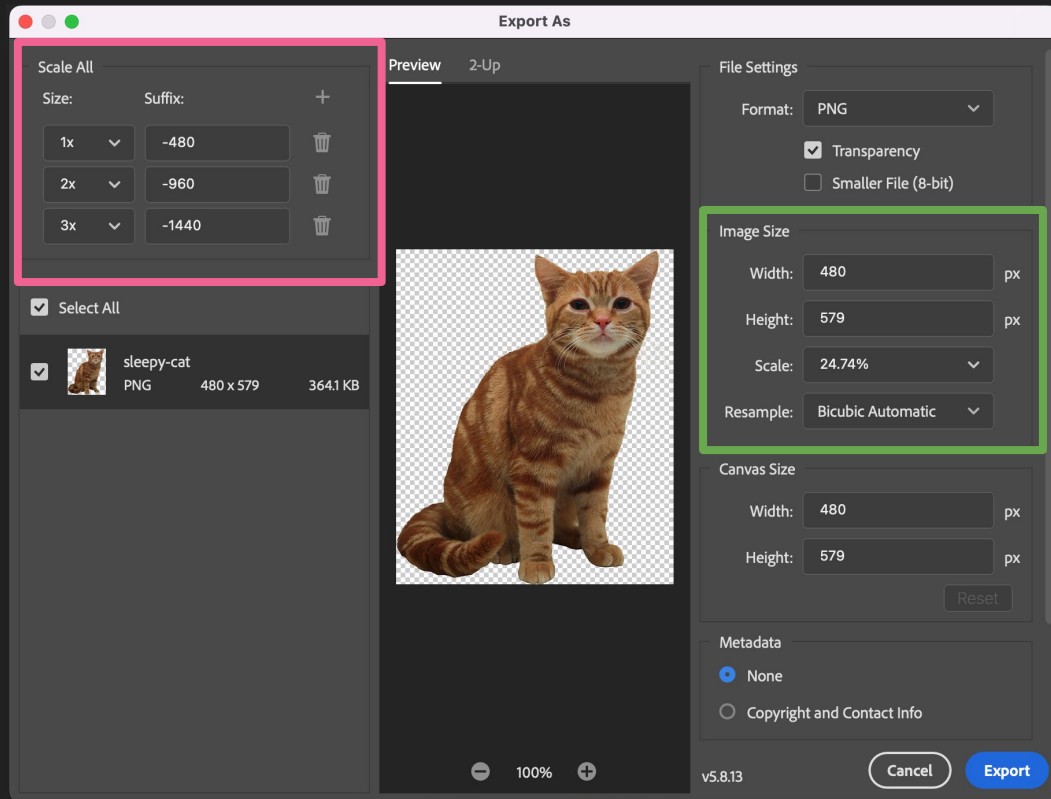
Resizing + exporting an image in GIMP

- File > Export As...
- In the export dialog box, select the desired file format (PNG).



Exporting multiple image sizes in Photoshop

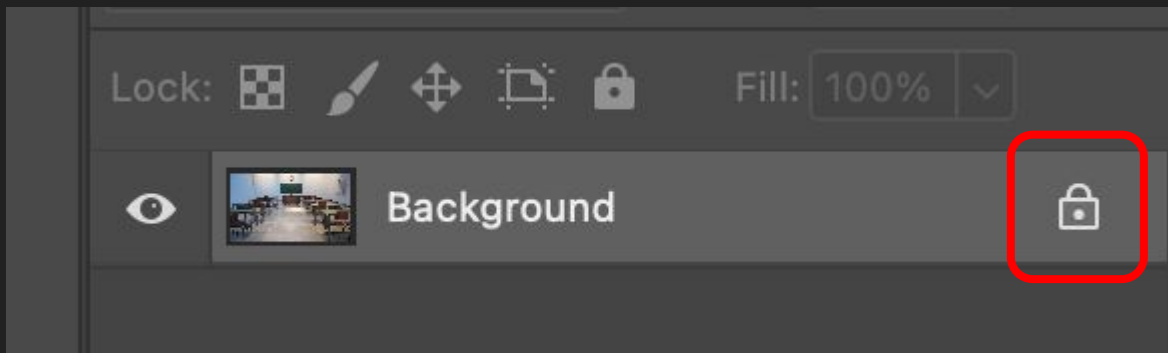
- File > Export > Export as...
- **Set initial image size** to smallest size (480px)
- **Click the +** to add additional sizings
 - Select the size factor (1x, 2x, 3x, etc...)
 - Include optional suffixes to your file name (-480, -960, -1440, etc...)
- Export



Background Image

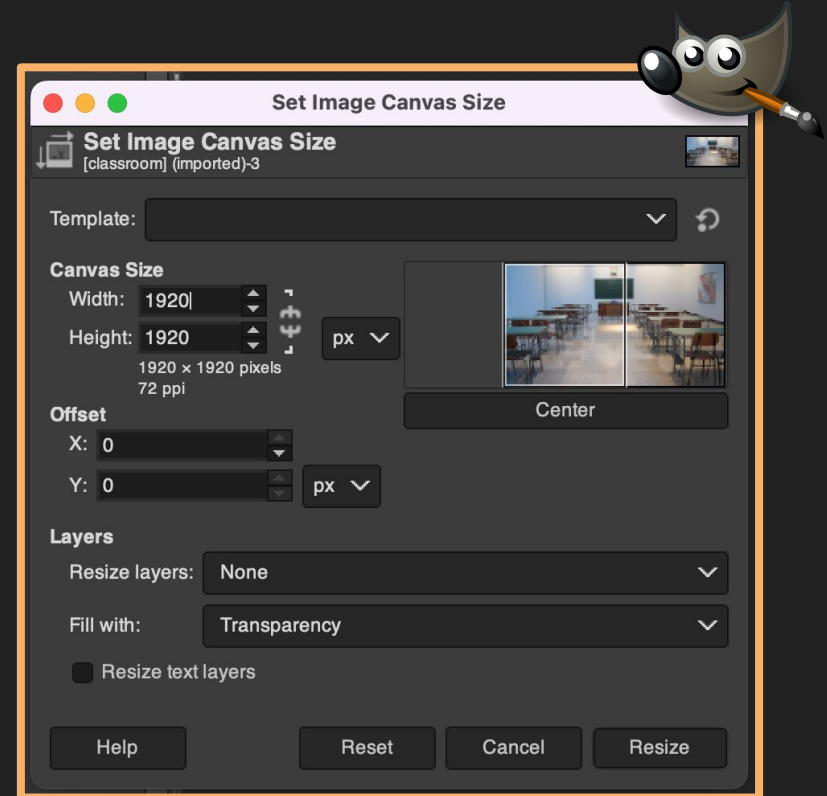
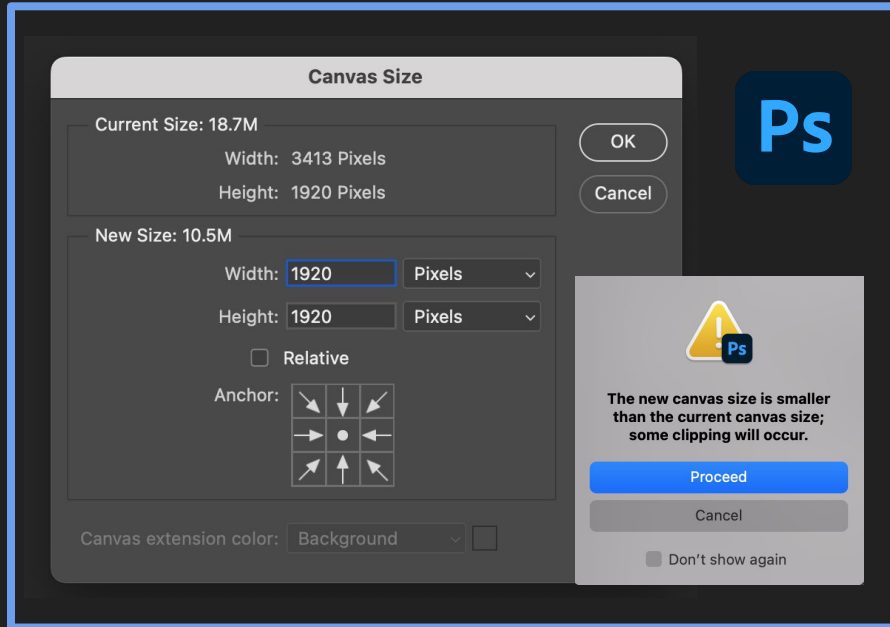
If you're using Photoshop...

- Make sure you convert your image from a Background to a Layer before beginning by clicking the lock button



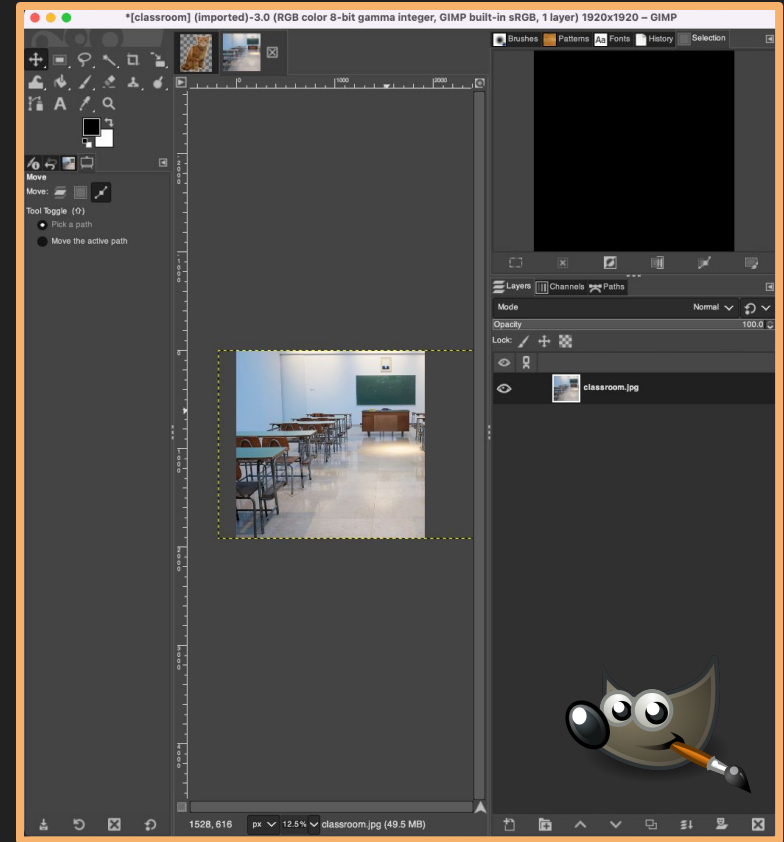
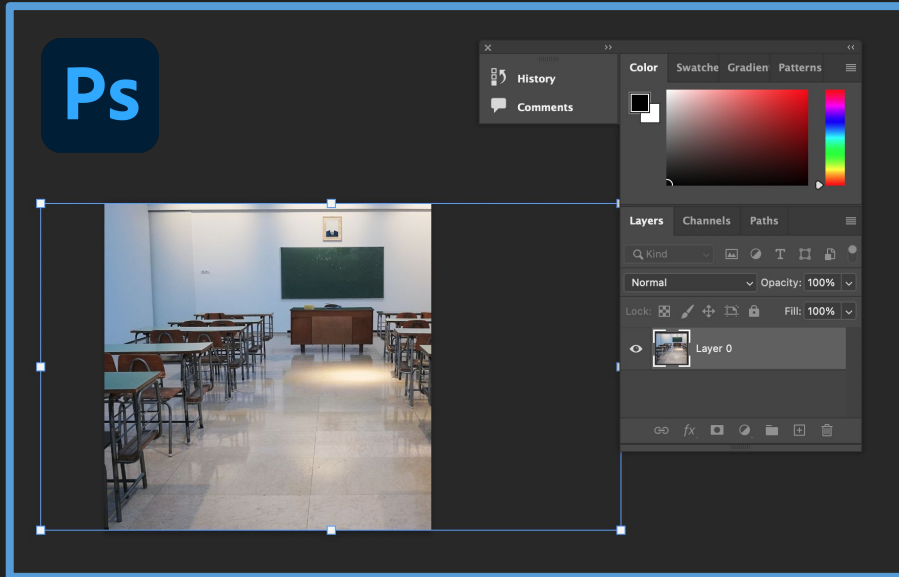
Change Canvas Size

- Image > Canvas Size...
- Set width and height to 1920px



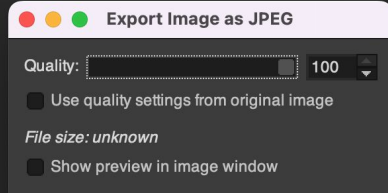
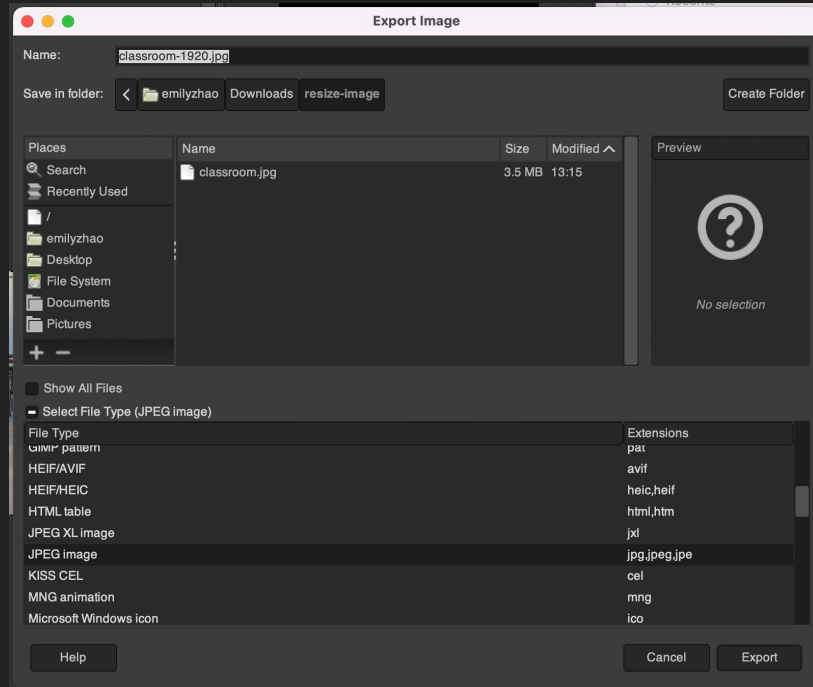
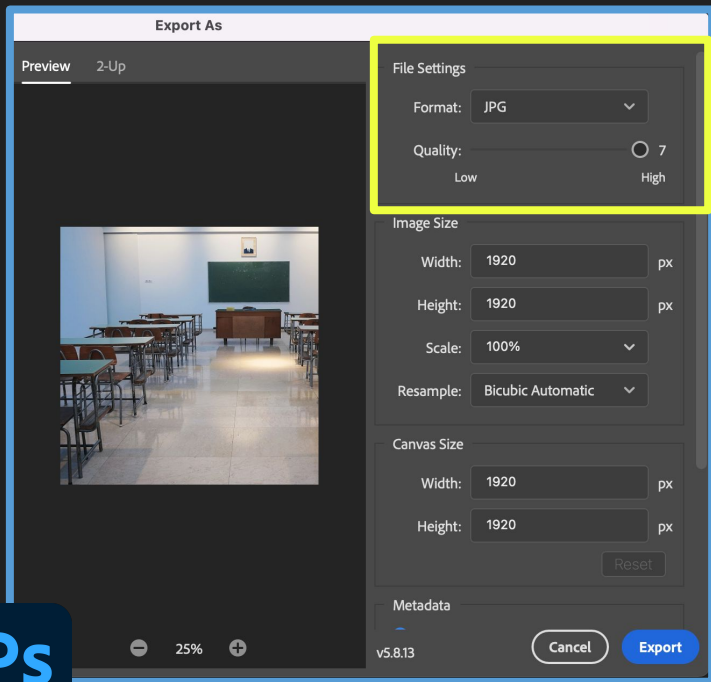
Re-place Image in New Canvas Area

- Click on your image in the Layer panel and using the Move Tool, place it where you would like within the new resized canvas



Export your image as a JPG

- Export your image (File > Export) as a JPEG
- Set the quality to high

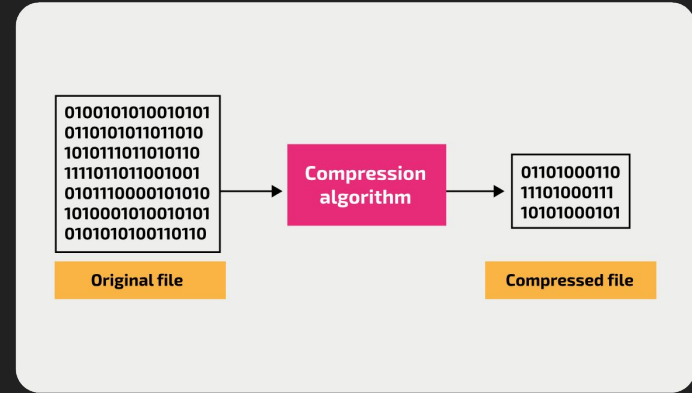


File Compression

- Compression is when algorithms minimize your file size
- Different file types use different compression algorithms

Lossy: some data is discarded and approximated resulting in smaller file size

Lossless: original data is reconstructed resulting in a more accurate file with a larger file size



Web Formats

JPEG

“Joint Photographic Experts Group”

PNG

“Portable Network Graphics”

GIF

“Graphic Interchange Format”

WebP

Newer web image format that is gaining solid browser support

AVIF

New, open-source image format for still and animated image

size | transparency | compression | browser support

JPEG

Joint Photographic
Experts Group

- Great for photographs
- Capable of displaying millions of colors in RGB space
 - 24 bit color (R,G,B all defined with 8 bits of information)
- Lossy compression
- 👍 Works well with gradient and blended colors
- 👎 Struggles with flat colors and hard edges

PNG

Portable Network Graphics

- Newest image format (meant to replace GIF)
- Preserves transparency
- Lossless compression
- 24-bit (PNG-24): millions of colors
- 8 bit (PNG-8): 256



Good for flat color (logos, line art, icons)



Works for photos but won't be saved as efficiently, resulting in larger files sizes

GIF

Graphic Information Format

- First image format supported by web browsers
- Supports animation
- Preserves transparency
- Lossless compression
- 8-bit: only 256 colors



Smaller file size, great for simple graphics



PNG can do everything the GIF can and better
(except animation)

WebP

Web Picture Format

- Developed by Google intended as a replacement for JPEG, PNG, and GIF file formats.
- Preserves animations and transparency
- Can produce smaller file sizes than JPEG
- Supports both lossless and lossy compression



“the Swiss Army knife of image formats”



Not well supported (yet)

TABLE 23-1. Choosing the best bitmapped (raster) file format

If your image...	use...	because...
Is graphical, with flat colors	8-bit PNG or GIF	PNG and GIF excel at compressing flat color.
Is a photograph or contains graduated color	JPEG	JPEG compression works best on images with blended colors. Because it is lossy, it generally results in smaller file sizes than 24-bit PNG.
Is a combination of flat and photographic imagery	8-bit PNG or GIF	Indexed color formats are best at preserving and compressing flat color areas. The pixelation (dithering) that appears in the photographic areas as a result of reducing to a palette is usually not problematic.
Requires transparency	GIF or PNG-8	Both GIF and PNG allow on/off transparency in images.
Requires multiple levels of transparency	PNG-24 or PNG-8	Only PNG supports multiple levels of transparency. PNG-24s with alpha transparency have a much larger file size, but it is easier to find tools to create them. WebP also supports alpha transparency, and may be a better option once it is better supported.
Requires animation	GIF	GIF is the only supported format that can contain animation frames. APNG and WebP may be better options in the future.

srcset

srcset

- `srcset` is an HTML image attribute that specifies the list of images to use in different browser situations.
- The browser will pick the most optimal image version, based on the screen size and resolution.

```

```

srcset + image density

- A common way to to set include **size** information in the **srcset** attribute is to label each file by image density.
- You do this by putting 1x, 2x, 3x and so forth after the URL.

```

```

srcset + image width

- The other way to inform the browser about the different sizes is to actually specify the image width in pixels.
- This gives the browser more information about the images, so it can make a better decision about which one to select.
- This is also good if your image versions aren't in exact proportion to each other.

```

```

CSS Positioning

CSS Positioning

The CSS position property specifies the type of positioning used for an element on a page.

static

Default document flow

relative

Element is positioned relative to its normal position

absolute

Element is positioned relative to its first positioned (not static) parent element

fixed

Element is positioned relative to the browser window

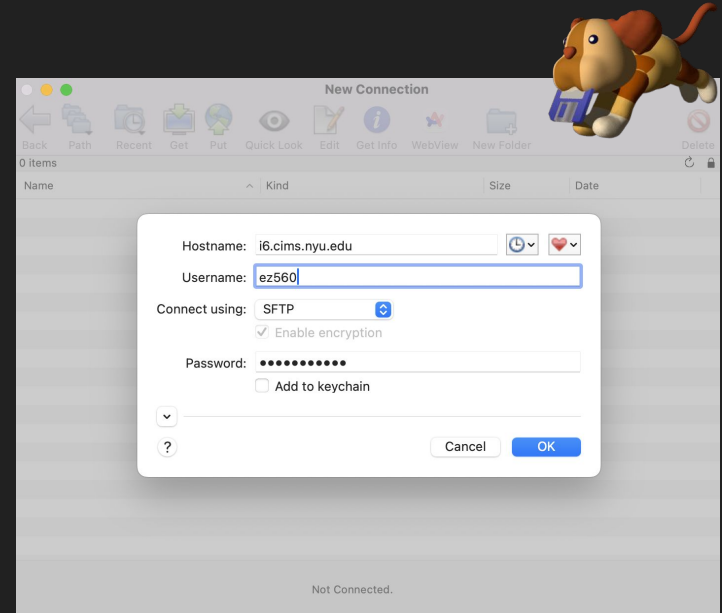
sticky

Positioned based on the user's scroll position

Cyberduck Issues

SFTP Solutions

- Since the beginning of the semester, many people have been having trouble connecting via SFTP with Cyberduck.
- The department has found that the [previous versions](#) of Cyberduck seems to work better.
- If you are a Mac user, consider using a [Free Educational Version of Fetch](#)



Open Workshop

Today's Attendance

(via PollEverywhere)

pollev.com/emilyzhao

→ How far did you get with
Assignment #4?



For next time

- Ed Lesson: SVG Basics (due before next class)
- Assignment #4 (due next class at 11:59PM)