Georeferencing is the process of assigning spatial location to a raster dataset (for example the scanned image of a paper map) so it will align with other spatially-aware datasets for visualization and analysis in GIS software.

The general steps for georeferencing:

1. In GIS software, open your non-georeferenced raster dataset along with an accurate reference basemap.
2. Identify common locations and mark them with control points.
3. Adjust transformation for fit.

Class Page

http://guides.lib.virginia.edu/gis
Click Teaching Resources > Fall 2019 Workshops

Open ArcGIS Pro, and login using the appropriate credentials

If you have NetBadge credentials, click Enterprise Login. For the organization URL, type “uvalibrary”, and click Continue. Click University of Virginia. You will be directed to NetBadge where you will login as normal. If you do not currently have an ArcGIS Online account, this process will create one for you.

If you Do Not have Netbadge credentials, please hang tight at the Sign in with dialogue. We'll get you set up momentarily.
Exercise One: Georeferencing subdivision plat

First, we need base data. What better data to use than the current parcel boundaries? Luckily, we have Charlottesville parcel boundaries available in ArcGIS Online, along with the rest of our data and bookmarks, in a Project Package.

1. Click Open an existing Project
2. Click Portal > Browse

3. We want to search for projects on UVA’s ArcGIS Online site. Under Portal select All Portal. On the top, far right of the dialog, click the small Search My Organization button.

4. In the search box, type “Georeferencing Workshop” and hit Enter. Click the Georeferencing Workshop package and click OK.

5. Activate the georeferencing toolbar. Highlight ParkwayPlat.jpg in the Contents pane. Select the Imagery tab and click Georeference.

6. On the Georeference ribbon, click the Fit to Display button to bring ParkwayPlat.jpg into the current view.

7. Use the Add Control Points tool to add common reference points. Work from ParkwayPlat.jpg to base data. Pro will prompt you to which layer you should be marking at the time.

The first control point shifts the layer. The second rotates and scales. More distributed control points will make the map fit better.

Want to get exactly on the corner of a parcel vector? Turn on Snapping on the lower bar under the map.

Make a mistake when placing a control point? Open the Control Point Table and uncheck the box next to the offending point or highlight it and delete it.
8. Change the “fit” using the **Transformation** button to select different transformations. Compare the RMS errors.

9. Once satisfied, you can commit your changes using the **Save** button. This writes a world file to the image directory.

**Exercise Two: Georeferencing an historical map**

Sometimes, you cannot use exact features like the corners of parcels. Because drawings were not accurately drawn, or conditions have changed, you may need to estimate locations. The Johnston Map is a good example of both. Most of the buildings represented on the map no longer exist and street corners are slightly off. For these reasons, estimating the center of the intersections for control points seems to work best. Work through the georeferencing process for the Johnson Map.

1. Uncheck the box next to the Parkway Map and check the box next to the Johnson Map.

2. Switch to the Imagery Basemap. **Map > Basemap > Imagery.**

3. On the **Map** ribbon, click **Bookmarks > Court Square.**

4. Activate **Georeference** toolbar. Highlight **JohnsonMap1828.jpg > Imagery Tab > Georeference.** Click **Fit to Display.**

5. Add control points using the **Add Control Points** tool. You’ll have to estimate the centers of all the intersections.

Does the courthouse line up? Enable transparency on the Johnson Map to find out.

5. On the **Appearance** tab, move the transparency slider.

6. When you’re done, click **Save** on the Georeference ribbon.
More Georeferencing Fun

Overview of Georeferencing

ArcGIS Pro Georeferencing tools

Google Earth Georeferencing: https://support.google.com/earth/answer/148099?hl=en

Online Georeferencing: New York Public Library: http://maps.nypl.org/warper/

Charlottesville Historic Trolley:

About These Maps

Jordy Yager provided the subdivision map. He collected it as part of his research into racial covenants in Charlottesville neighborhood development. These properties were restricted to whites only.

https://mappingcville.home.blog/

https://www.cvilletomorrow.org/specials/friendship-court/

The Johnson map from UVa Library’s special collections and highlights an African American business and residential district that was razed in order to build the park for the Stonewall Jackson statue.