

# Georeferencing with ArcGIS Pro

Fall 2023

**SCHOLARS' LAB**

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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.
4. Commit georeferencing.

## Class Page

<http://guides.lib.virginia.edu/gis>

Click **Teaching Resources > Fall 2023 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.

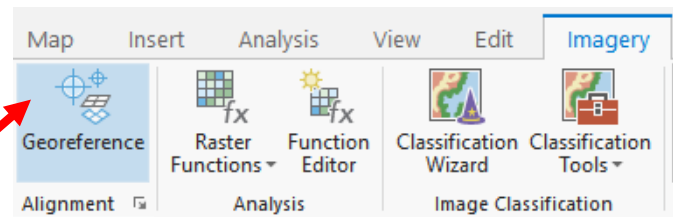
Three screenshots showing the ArcGIS Pro login process. The first screenshot shows the "Sign in with" menu with "Enterprise login" highlighted. The second screenshot shows the "Enterprise login" form with "uvalibrary" entered in the "Your ArcGIS organization's URL" field and the "Continue" button. The third screenshot shows the "Enterprise login" form with "University of Virginia" selected in the dropdown menu.

**If you Do Not have Netbadge credentials**, please contact us at [uvagis@virginia.edu](mailto:uvagis@virginia.edu).

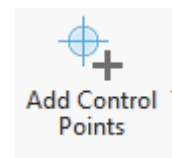
## Exercise One: Georeferencing subdivision plat

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. Under **Recent Projects**, click **Open another project**.
2. We want to search for projects on UVA's ArcGIS Online site. Under **Portal** select **My Organization**.
3. Click in the **Search My Organization** box, type "**Georeferencing Workshop**", and hit Enter. Select the **Georeferencing Workshop** Project Package and click **OK**.
4. To enable the georeferencing toolbar, click **ParkwayPlat.jpg** in the **Contents** pane to highlight it. Select the **Imagery** tab and click **Georeference**.



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

Map3: ParkwayPlat.jpg								
Similarity Polynomial								
	Link	Source X	Source Y	X Map	YMap	Residual X	Residual Y	Residual
<input checked="" type="checkbox"/>	1	583.266621	-728.385918	-8,736,082.936178	4,584,337.271942	2.034277	-0.520110	2.099713
<input checked="" type="checkbox"/>	2	1,457.256251	-756.067215	-8,735,906.294469	4,584,263.577471	-0.539061	-0.712296	0.893282
<input type="checkbox"/>	3	920.566713	-700.332724	-8,735,990.089695	4,584,306.155999	14.151195	-6.925053	15.754767
<input checked="" type="checkbox"/>	4	756.911596	-1,021.993750	-8,736,073.094400	4,584,263.389700	-1.394263	-0.013707	1.394331
<input checked="" type="checkbox"/>	5	1,375.226753	-110.906301	-8,735,872.860600	4,584,405.772400	-0.100953	1.246113	1.250195

7. Change the "fit" using the **Transformation** button to select different transformations. Compare the RMS errors.

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

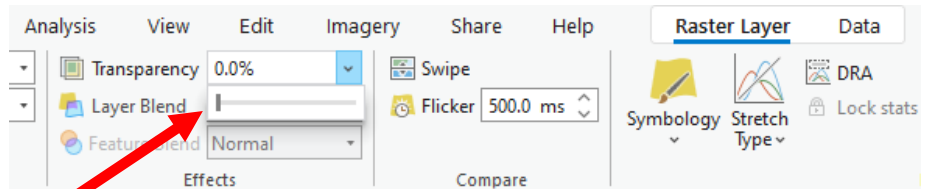
## Exercise Two: Georeferencing an historical map

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 **Raster Layer** tab, move the transparency slider.
6. When you're done, click Save on the Georeference ribbon.



## More Georeferencing Fun

Overview of Georeferencing

<http://pro.arcgis.com/en/pro-app/help/data/imagery/overview-of-georeferencing.htm>

ArcGIS Pro Georeferencing tools

<http://pro.arcgis.com/en/pro-app/help/data/imagery/georeferencing-tools.htm>

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

Charlottesville Historic Trolley:

<http://scholarslab.org/digital-humanities/charlottesvilles-street-car-system-in-gis/>

## 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://mappingville.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.