Using Building Footprint Extraction – India model in ArcGIS Pro

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Model overview

You can use the downloaded **Building Footprint Extraction—India** DLPK model in the Classify Pixels Using Deep Learning tool available in the Image Analyst toolbox for inference. Follow the steps below to use the model to extract building footprints from high resolution Orthorectified imagery.

- **Input** - 8-bit, 3-band high-resolution (10–50 cm) Orthorectified imagery (on-the-fly or persisted ortho products).
- **Output** – Classified raster containing building class
- **Post-processed Output** – One feature class containing building footprints generated from output raster.
- **Applicable Geographies** - This model is expected to work well within Urban area of India such as Hyderabad, Nagpur etc.
- **Architecture** - This model is based on the SamLoRA model architecture implemented using ArcGIS API for Python.
- **Accuracy Metrics** - This model has an average precision score of 0.807.

Note: Off-nadir imagery or imagery with a high obliquity angle will not produce suitable results.

Accessing the model

Download the **Building Footprint Extraction—India** pretrained model from ArcGIS Living Atlas of the World.

Downloading the model

1. Browse to Esri Living Atlas.

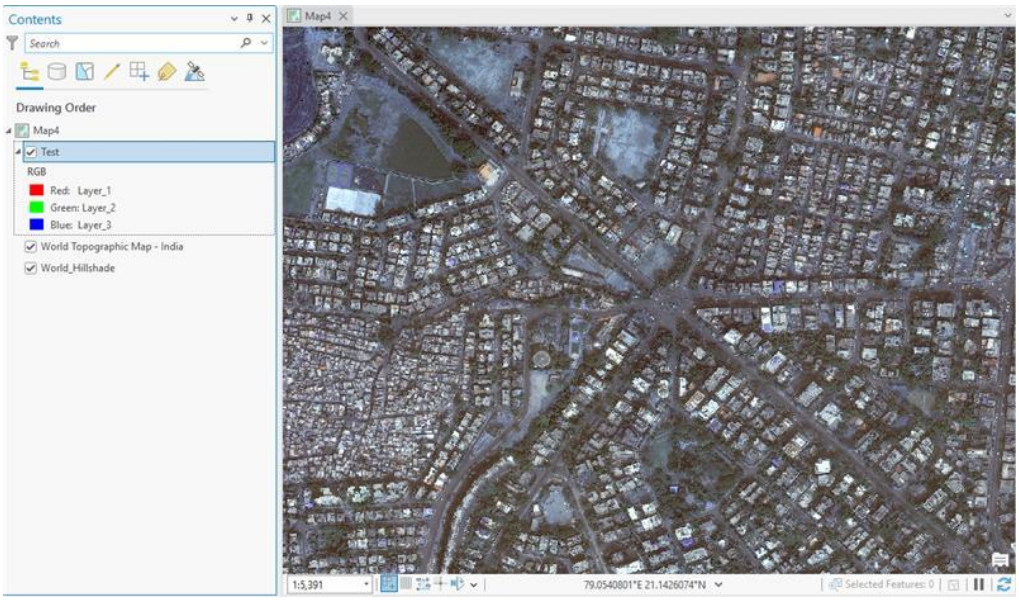
2. Click the Download button to download the model. The downloaded DLPK file can be directly used in ArcGIS Pro. Additionally, you can finetune the pretrained model if necessary for your requirements

Using the model

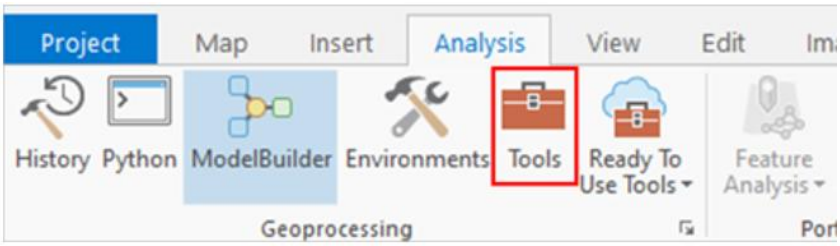
You can use this model in the Classify Pixels Using Deep Learning tool available in the Image Analyst toolbox in ArcGIS Pro.

1. Download the model and add the imagery layer in ArcGIS Pro.

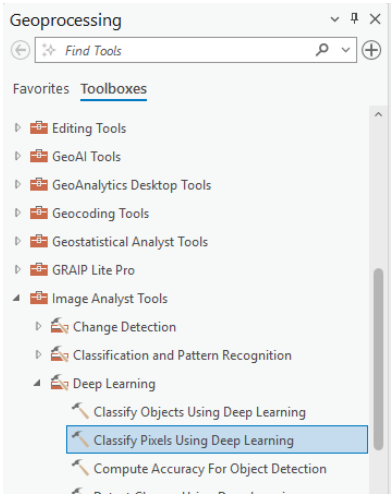
2. Zoom to an area of interest.



3. Browse to Tools under Analysis tab on the ribbon. Click on Tools. Geoprocessing pane will open.



4. Click Toolboxes tab in the Geoprocessing pane, expand Image Analyst Tools and browse to Classify Pixels Using Deep Learning tool under Deep Learning.



5. Set the variables under Parameters tab as follows:

a) Input Raster – Select the imagery.

b) Output Raster Dataset– Set the output raster name and location to save the raster.

c) Model Definition – Select the downloaded .dlpk file.

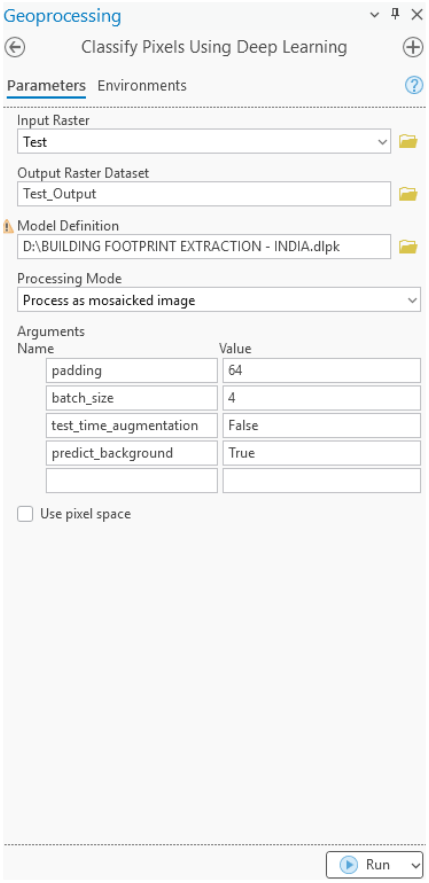
d) Arguments (optional)—Change the values of the arguments if required.

a. **padding**—Number of pixels at the border of image tiles from which predictions are blended for adjacent tiles. Increase its value to smooth the output while reducing edge artifacts. The maximum value of the padding can be half of the tile size value.

b. **batch size**—Number of image tiles processed in each step of the model inference. This depends on the memory of your graphics card.

c. **predict background**=False.

d. **test_time_augmentation** – Performs test time augmentation while predicting. If true, predictions of flipped and rotated variants of the input image will be merged into the final output.

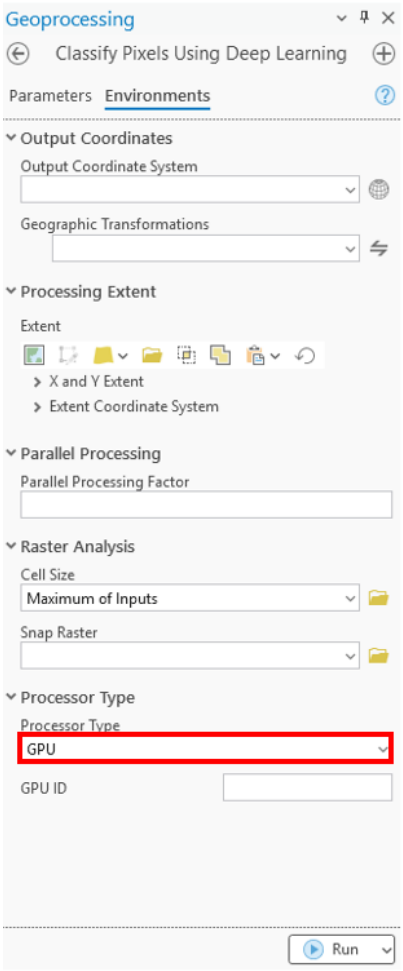


6.Set the variables under Environments tab as follows:

a) **Processing Extent** – Select Current Display Extent or any other option from the dropdown menu.

b) **Cell Size** – Set the value to 0.3. (Note: The expected raster resolution is 0.1- 0.5 meters.)

c) **Processor Type** – Select CPU/GPU as per the need. (Note: If GPU is available, it is recommended to select GPU and set GPU ID to specify the GPU to be used.)



7. Click Run to execute. As soon as processing finishes, the output Classified raster containing building class is added to the map.

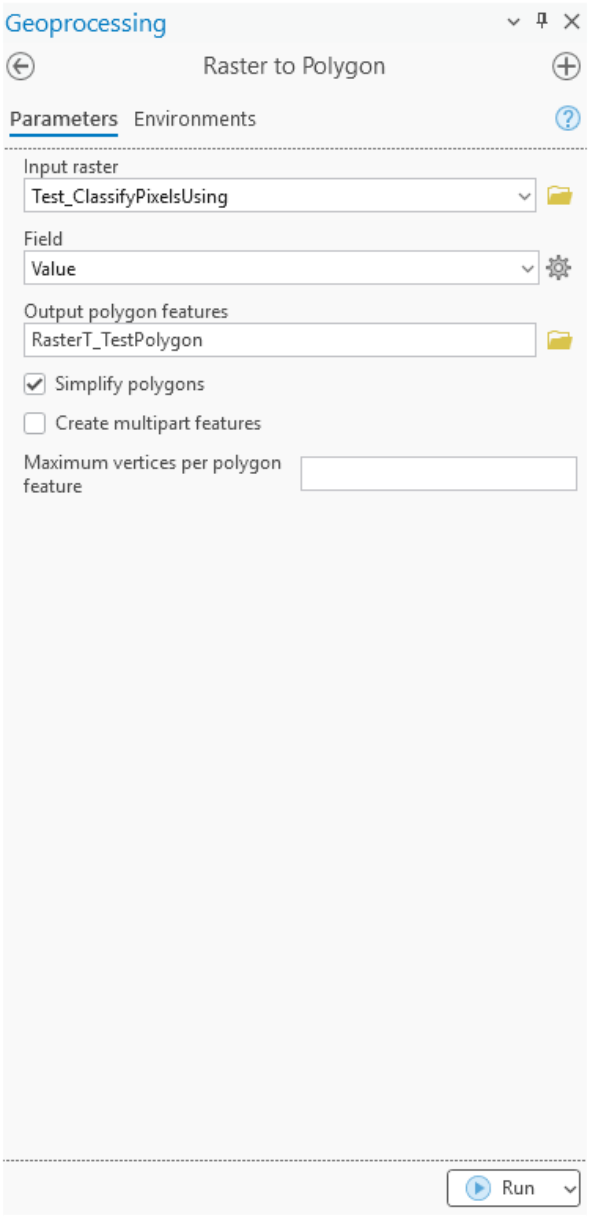
Post Processing for Building Footprint Extraction

To generate a vector data for building footprints, you need to convert the output raster from "Classify Pixels Using Deep Learning" geoprocessing tool to polygon using "Raster to Polygon" geoprocessing tool.

Raster to Polygon (Conversion)

Converts a raster dataset to polygon features –

1. **For Input raster** – Browse to the raster that we obtained in above "Classify Pixels Using Deep Learning" process
2. **For Field** – Select "Value" option
3. **For Output polygon features** – Set the output polygon name under the file geodatabase in the desired location to save the output polygon features.
4. Check on "Simplify polygon" option
5. Keep rest of the parameters as default and run the tool.

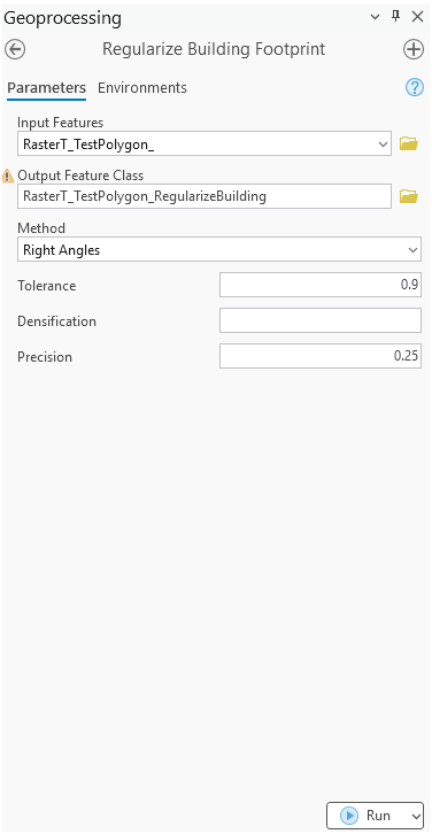


The output Vector feature layer is added to the map automatically if not added please browse to the file geodatabase where you save the feature class and add to map.

The output that we obtain from “Raster to polygon” process will not have the proper shapes and hence we need to run the “Regularize Building Footprints” geoprocessing tool to normalizes the footprint of building polygons by eliminating undesirable artifacts in their geometry.

Regularize Building Footprint

a. **For Input features** – Please select the output that you have obtained using the “Raster to Polygon” tool
b. **For output Feature class** – Select the file geodatabase and provide the valid feature class name
c. **For Method** – Choose Right Angles for the method option
d. **For Tolerance, Densification, Precision** – Please use the default value or if you want to specify the parameter values based on your requirement then you can specify the value
e. Click Run to execute the tool



The output Vector feature layer is added to the map automatically if not added please browse to the file geodatabase where you save the feature class and add to map.

Here are a few results from the model:

Note: You can also create a model builder tool by combining all the three tools once the parameters are fixed.