

Land Use Classification from Aerial Imagery Using Support Vector Machine (SVM)

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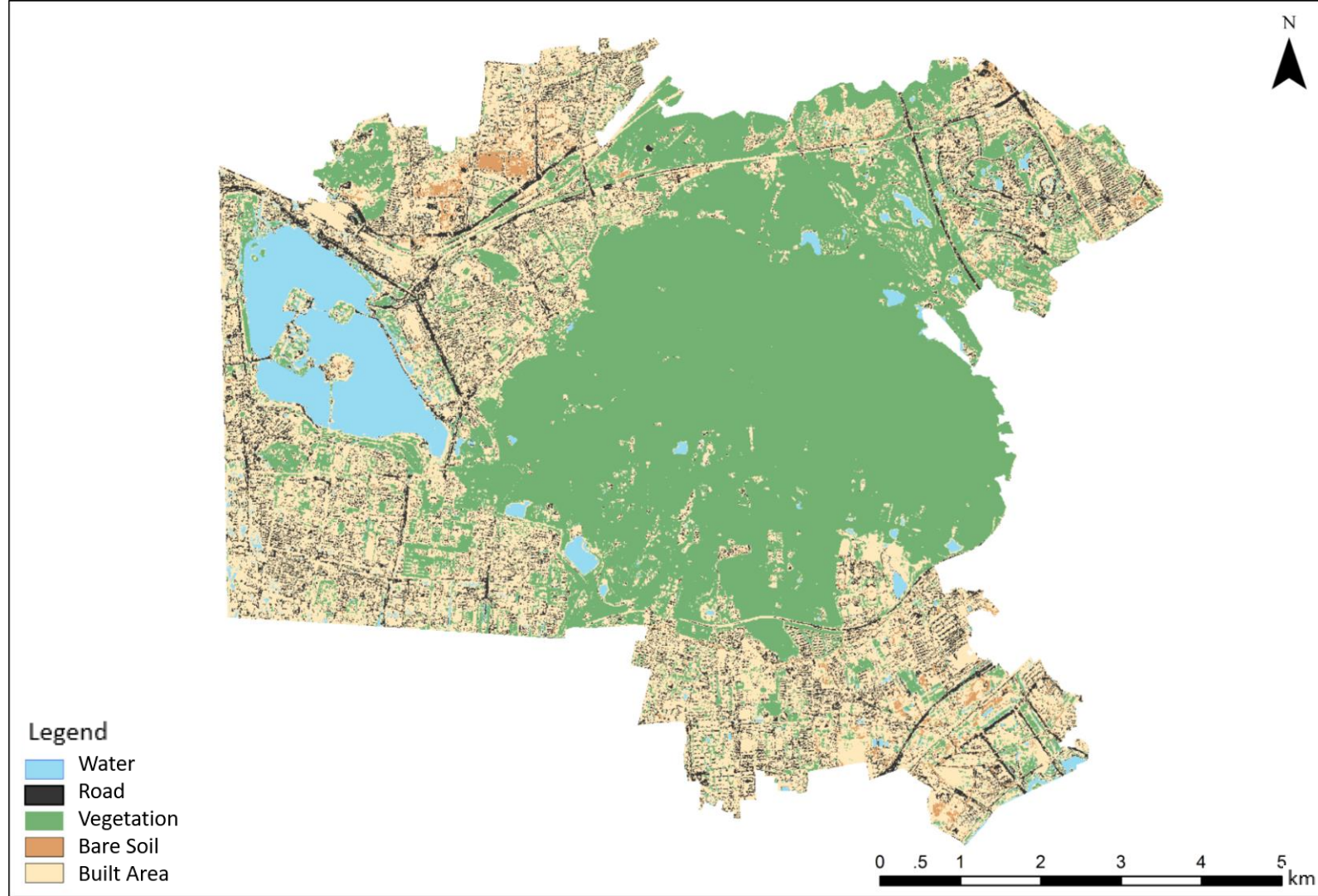
Original Image:

- A Sentinel 2 multi spectral image took in May 2019
- Spatial resolution of the RGB and the near infrared (NIR) bands are 10 meters which means each pixel represent a 10m-by-10m area on the ground
- The size of the image is 7591 pixels by 7731 pixels



Method:

1. The boundary of the study area was downloaded from Open Street Map (OSM). The original satellite image was cropped to that boundary.
2. A total of 11,177 pixels were sampled from the original image. The regions of interest (ROI) include the following land use categories: water, road, vegetation, bare soil, developed area.
3. 5000 pixels in the ROIs were used for training, and the rest were left out for validation. Four bands used for training include the red, green, blue and NIR band.
4. The `svm()` function from R pack `e1071` was used. It was found that the validation set generated the smallest error when kernel = "radial", cost = 10, and gamma = 2.



Result and Post-Processing:

1. A confusion matrix was derived and a Kappa coefficient of 0.878 was calculated. This shows high agreement between the classification result and the reference labels.
2. As the final deliverable was requested to be a vector map, the raster output was directly transformed to vectors in ArcMap, except the pixels classified as road.
3. Since the classification of roads are pixelate, roads on the vector map were eventually hand-drawn based on the classification result and online resources.
4. The final map is presented to the right.

