# Kobold programming challenge prompt

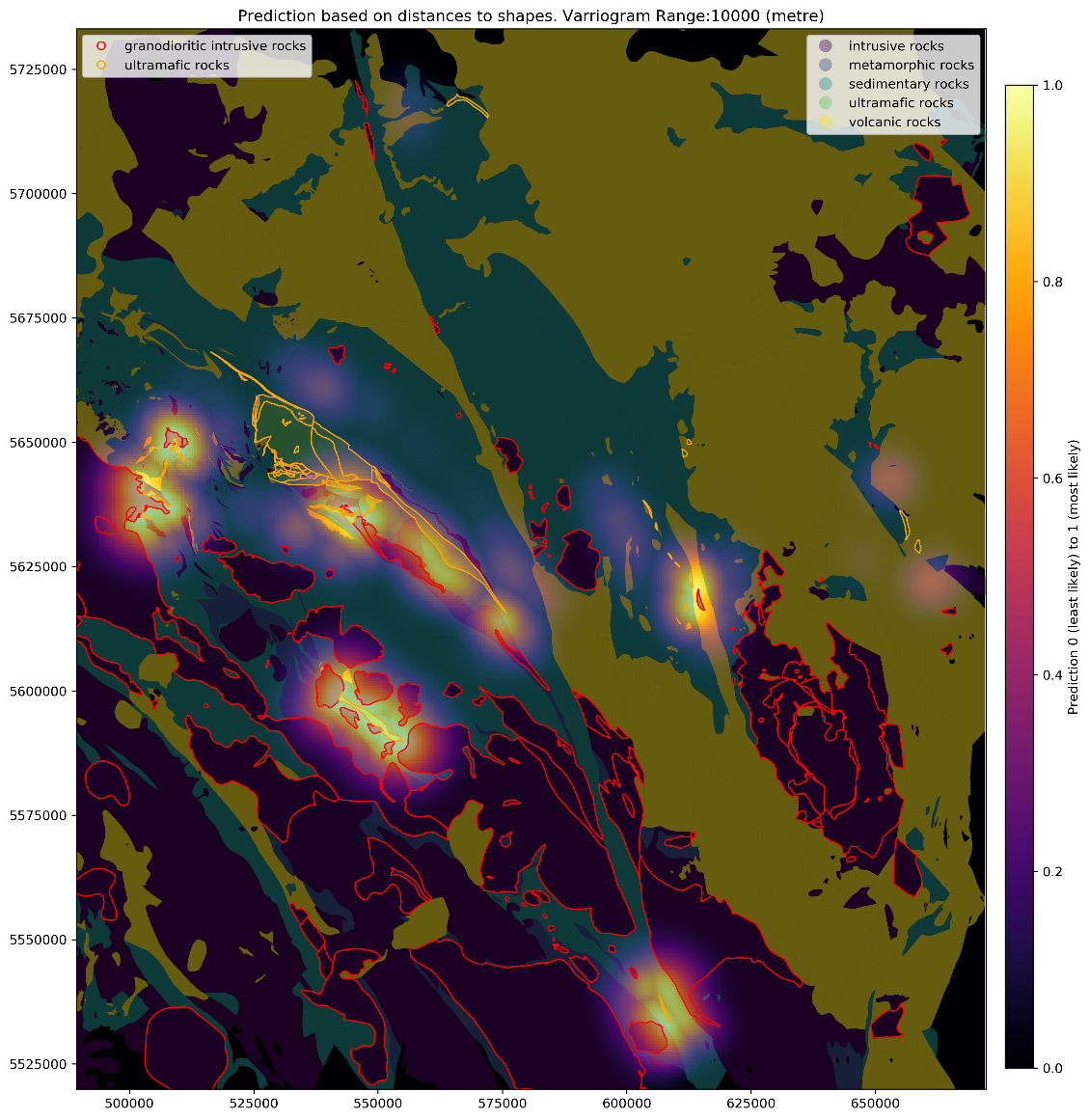
The objective was to create a dataset in the form of a heat map that represented the likelihood of finding a cobalt deposit at each point on the map. The heat map is stored in a raster format with the template information below. Included is the information for the python package I wrote to make the prospectivity prediction and display the data.

## Problem

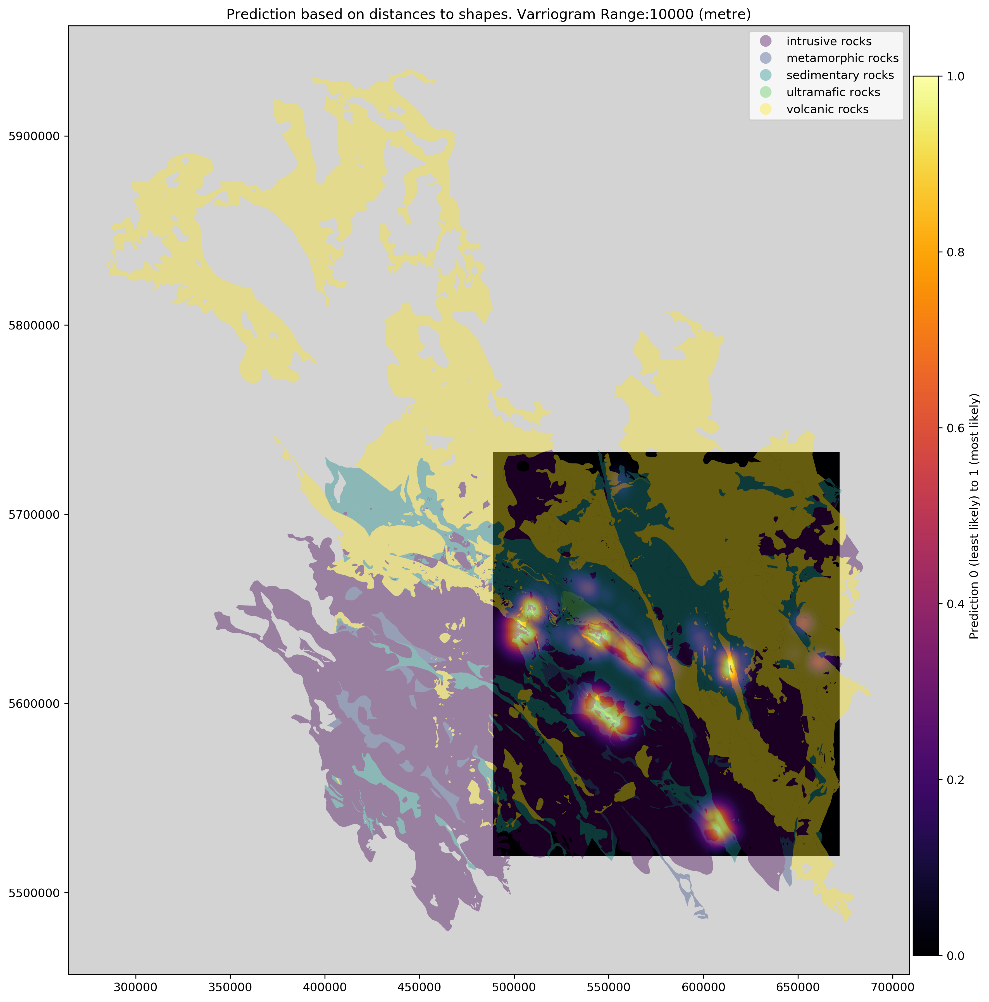
The heat map represents a prediction on how likely we are to find cobalt give the distance to specific bedrock units (granodiorite and serpentinite/ultramafic rocks). The prediction should fall smoothly towards zero at some distance away.

## Solution

To solve the problem, I developed a python package and prediction weighting schema to predict the likelihood of finding a cobalt package. The resulting heatmap is saved as a raster file that can be loaded and viewed using the included package or the rasterio package. Below is the resulting heat map zoomed into the project boundaries.



Here is the heat map superimposed on the larger shapefile boundary to get a better sense of the location of the prospective areas.



## Python Package

The package developed for this challenge (prospectPredictor) handles the prep work and prediction based on GIS shapefiles. The package resides at <https://github.com/tyleracorn/prospectPredictor> and is included in a zip file. Included in the package is an example.ipynb that demos using the package and creating the heat map (I’ll also include a pdf of the notebook in the email with this document). Since the package relies heavily on other package such as geopandas, an environment.yml file is included to show the environment I used when developing the package.

## Prediction Weighting Schema

For the prediction I decided to use an omni-directional variogram weighting schema using the variogram model below.

In the above variogram model dist1 = distance to 1st bedrock unit, and dist2 = distance to 2nd bedrock unit. This ensured that the predictions approached zero when a location reached the range of the variogram. There are some issues / notes to think about with this weighting schema.

### Weighting schema issues:

The weighting schema I used is an omnidirectional schema so there isn’t

The prediction raster/heat map included in this report uses the following template:

CRS: EPSG:26910  
Cell Width, Height: (500, 500)  
Raster Dimensions: (427, 366)  
Raster DataType: float32   
Raster Boundary: minx (489327), miny (5519925), maxx (672302), maxy (5733138)  
prediction values: range from 0 (least likely) to 1 (most likely)