Description:

Based on user input validation data, randomized subsets are created according to a user defined range. Input raster values are extracted to these subsets. FBCR is then ran on each subset, with critical layer importance scores exported as a csv file.

Tool folder structure:

* 1. ToolData
     1. Contains the input validation points and input raster layers
  2. Documentation
     1. Contains information on data, folder structure, and instructions on running the tool.
  3. Scripts
     1. Contains the python script
  4. Randompts
     1. Scratch workspace to hold generated random points
  5. Importance
     1. Scratch workspace to hold generated importance tables (dbf)
  6. Extracted Points
     1. Scratch workspace to hold generated random points with extracted raster values

Provided data:

Validation\_data.shp = Input validation data

Drainage.tif = Input raster for downslope drainage critical layer

Groundwater.tif = Input raster for groundwater contamination critical layer

Landforms.tif = Input raster for topographic landforms critical layer

NDVI = Input raster for vegetation robustness critical layer

Proximity.tif = Input raster for proximity to abandoned uranium mines critical layer

Roads.tif = Input raster for proximity to roads critical layer

Twe = Input raster for topographic wind index critical layer

Wind\_index = Input raster for wind index critical layer

Tool limitations:

* The input feature class must be points.
* Input rasters must be continuous (non-categorical)
* Outputs consist of csv files.
* Number and size of randomized subsets is user defined. Note: Large ranges can quickly use up memory and take a long time to run.
* Output folder should be empty, otherwise tool may not run properly.

See steps below for a guided run of the tool using data provided:

1. Start ArcGIS Pro
2. Add tool folder to Arc Catalog. Inside the tool folder are the toolbox file and five (5) folders:
   1. ToolData
      1. Contains the input validation points and input raster layers
   2. Documentation
      1. Contains information on data, folder structure, and instructions on running the tool.
   3. Scripts
      1. Contains the python script
   4. Randompts
      1. Scratch workspace to hold generated random points
   5. Importance
      1. Scratch workspace to hold generated importance tables (dbf)
   6. Extracted Points
      1. Scratch workspace to hold generated random points with extracted raster values
3. Open tool
4. Input random sample subset range bounds and increment (1000 for lower bound, 10,000 for upper bound, 1000 incriment) (Figure 8).

Graphical user interface, application, Word

Description automatically generated

**Figure 8** – Input random sample range parameters.

1. Input “Validation\_data.shp” for validation points and input the critical layer raster layers (Figure 9).

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Description automatically generated

**Figure 9** – Input validation data and explanatory raster layers.

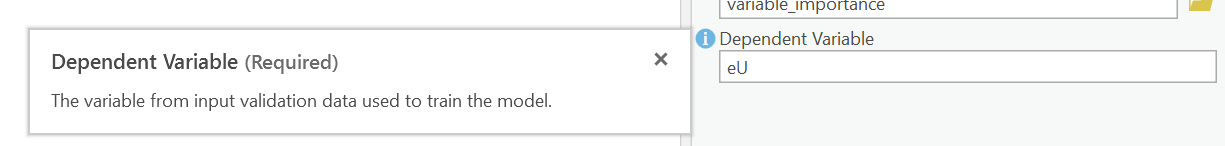
1. Choose/create output folder for variable importance tables. Note, this folder should be empty for the tool to run properly (Figure 10).

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**Figure 10** – Setting the output workspace.

1. Input the name of the field containing the dependent variable values (eU) (Figure 11).



**Figure 11** – Setting dependent variable (eU = equivalent uranium).

1. Run the tool:
   1. Tool is indicated to be running with a progress bar. Messages are written when each randomized sub-set is generated and joined with validation data (Figure 12).

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**Figure 12** – Generating and joining random subsets.

* 1. Messages are written as a raster is read in and has its values extracted to a random validation point subset. Tool progress bar shows percent completion for the extraction to each subset (Sampling) (Figure 13).

Graphical user interface, text, application, Word

Description automatically generated

**Figure 13** – Reading in raster layers and extracting (sampling) values.

* 1. Messages are written for each FBCR run. Tool progress bar indicates when decision trees are being created and when results are being written to output tables (Figure 14).

Graphical user interface, application, Word

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**Figure 14** – Running FBCR tests.

* 1. A message is written for each output csv file and includes the completion date and time and elapsed run time (Figure 15).

Graphical user interface, text, application

Description automatically generated

**Figure 15** – Generating output tables.

1. Go to your output folder to confirm that the csv files have been generated. Open one of the csv files. A file is created for each randomized subset, named after the number of points. Each csv consists of a variable importance table, containing variable field names, importance score, and converted percent importance (Table 1).

**Table 1** – Example of output variable importance table.

|  |  |  |  |
| --- | --- | --- | --- |
| OID | VARIABLES | IMPORTANCE | PERCENTAGE |
| 0 | drainage | 584.7403008 | 10.029 |
| 1 | groundwater | 1026.913199 | 17.612 |
| 2 | landforms | 87.39642634 | 1.499 |
| 3 | NDVI | 893.5430134 | 15.325 |
| 4 | proximity | 978.2944213 | 16.779 |
| 5 | roads | 364.6529751 | 6.254 |
| 6 | twe | 904.044242 | 15.505 |
| 7 | wind\_index | 991.0258861 | 16.997 |