Pseudo Codes of Knowledge distillation models of geospatial regression

1. Load required libraries:

- Load geospatial and machine learning libraries

2. Read shapefile:

- Load spatial dataset containing geographic and attribute information

3. Convert spatial dataset to appropriate format:

- Convert the dataset to a spatial format suitable for further analysis

4. Define spatial relationships:

- Extract coordinate points

- Create nearest-neighbor connectivity

5. Prepare the target variable:

- Compute log-transformed dependent variable

6. Partition data:

- Split dataset into training and testing subsets

7. Train the teacher model:

- Define spatial regression model using selected independent variables

- Fit the model to the training data

- Generate predictions

8. Extract independent variables:

- Select relevant features from the dataset

9. Define train and test sets:

- Create logical indexing for splitting the data

- Extract training and testing subsets for independent variables

10. Generate teacher model predictions:

- Store teacher model predictions for use in student model training

11. Prepare data for knowledge distillation:

- Combine independent variables and teacher model predictions

12. Define custom loss function:

- Compute mean squared error (MSE)

- Define a weighted loss combining standard loss and distillation loss

13. Train the student model (Linear Regression):

- Fit linear regression model using the combined training data

- Generate student model predictions on test data

- Compute mean squared error for evaluation

14. Train the student model (Neural Network):

- Define deep learning model architecture

- Compile model with custom loss function and optimizer

- Train the model using the training dataset with validation

15. Evaluate student model:

- Compute mean squared error on test dataset

- Compare student model performance with teacher model

16. Output results:

- Print evaluation metrics