**Application of AI-based Modelling and Remote Sensing to Assess Inselberg Habitats in Gamapaha District in Sri Lanka**

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***ABSTRACT***

Inselbergs are isolated rock formations that develop as a result of differential weathering and erosion advances during the formation of topographic etch plains. Inselbergs possess unique ecosystem characteristics, cultural significance, and geomorphological importance worldwide, including in Sri Lanka. However, studies on the application of geospatial technologies to identify the spatial distribution of Inselberg habitats to evaluate their geomorphological and ecological features in Sri Lanka are still lacking. Identification of the spatial distribution of these habitats and mapping of Inselbergs for later retrieval and reference will enhance the management and conservation interventions. In this context, the main objective of this study was to develop a model to identify the spatial distribution of Inselberg habitats in the Gampaha district using machine learning algorithms and remote sensing data. *Random forest* (RF) and *Support Vector Machines* (SVM) algorithms were used to model the Inselberg areas based on 36 topographic and spectral variables in R platform. Main R packages used for the analysis were “*caret*”, “*randomForest*”, “*raster*”, “*sf*”, and “*e1071*”. Model training was conducted using a training sample of 1035 points. The best-performing model was identified as SVM based model with a Kappa accuracy of 70.1%, a global accuracy of 94.5% and a sensitivity of 98.9%. Digital Elevation Model, Slope, Terrain Ruggedness Index, Maximal Curvature, Modified Normalized Difference Water Index and Sentinel Band 8 were identified as raster covariates that contributed most to the generated models. The findings of this study have shown significant potential in identifying Inselbergs in the Gampaha district. The generated results can be effectively used for the conservation of biodiversity in Inselberg habitats, to preserve the unique cultural identity and geodiversity of Inselbergs in Gampaha district. The model developed in this study can also be applied to the rest of the areas of Sri Lanka.

**Keywords:** Spatial models, Topography, Random Forest, Support Vector Machines, Classification