Ecological Data Science Metrics

Data Science In Ecology · Answer Key · 10 Questions

1. In spatial ecology, which statistical method is specifically used to handle zero-inflated count data in species distribution modeling?

A) Maximum Likelihood Estimation
B) Hurdle Models
C) Simple Linear Regression
D) K-Nearest Neighbors

2. What is the primary function of a 'random forest' algorithm when classifying remote sensing data for land cover change analysis?

A) Dimension reduction
B) Ensemble learning for classification
C) Time-series decomposition
D) Kernel density estimation

3. Which metric is used in community ecology to quantify the 'evenness' of species distribution while accounting for both richness and relative abundance?

A) Shannon Index
B) Pielou's Evenness
C) Gini Coefficient
D) Simpson Diversity Index

4. In bioacoustics data science, what mathematical transform is essential for converting time-domain audio signals of bird calls into frequency-domain spectrograms?

A) Fast Fourier Transform
B) Principal Component Analysis
C) Wavelet Decomposition
D) Logarithmic Scaling

5. When applying Maximum Entropy (MaxEnt) modeling to predict the niche of an endangered species, what does the 'background data' represent?

A) Presence-only occurrence points
B) Pseudo-absence locations
C) Training set labels
D) Test set residuals

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6. Which statistical framework is standard for estimating the population size of animals using capture-mark-recapture data in a Bayesian inference context?

A) Hidden Markov Models
B) Schumacher-Eschmeyer Estimator
C) GLMM (Generalized Linear Mixed Models)
D) Jolly-Seber Model

7. In genetic data science, which algorithm is commonly used for clustering individuals into ancestral populations based on Single Nucleotide Polymorphism (SNP) data?

A) DBSCAN
B) STRUCTURE
C) Hierarchical Clustering
D) Logistic Regression

8. What is the 'Wallace Effect' in the context of data-driven phylogeography?

A) The tendency for larger datasets to show stronger p-values
B) The reinforcement of reproductive isolation through natural selection
C) The decline in species richness as latitude increases
D) The error rate in automated acoustic detection

9. In satellite-derived vegetation indices, what is the specific purpose of the 'Red-Edge' band in multispectral analysis?

A) To measure ocean salinity
B) To detect early chlorophyll stress in plant tissues
C) To calculate atmospheric aerosol density
D) To calibrate thermal emissivity

10. Which data normalization technique is most appropriate for ecological datasets where variables have different measurement units, such as temperature and species count?

A) Min-Max Scaling
B) Z-score Standardization
C) Logarithmic Transformation
D) Box-Cox Transformation

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