

云冷杉阔叶混交林不同树种组单木枝下高非参数模拟

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摘要: 【目的】对比不同非参数建模方法和不同变量类型对云冷杉阔叶混交林不同树种组单木枝下高的模拟差异和拟合精度比较, 为云冷杉阔叶混交林科学经营决策提供理论依据。【方法】基于 12 块 1 公顷大样地数据, 运用广义可加模型、BRT 模型、Cubist 模型、MARS 模型来模拟中国东北云冷杉阔叶混交林不同树种组单木的 HCB 并评估不同类型变量的重要性和这些变量对 HCB 影响的趋势, 并对影响枝下高的各类因子的变量重要性进行评估。【结果】就变量重要性而言, 单木变量(针叶、云冷杉、硬阔叶和软阔叶组分别为 77.54%、31.02%、31.12%和 73.69%)和林分变量(针叶组、云冷杉组、硬阔叶组和软阔叶组分别为 5.00%、20.34%、11.03%和 8.71%)具有较高的相对重要性, 而林分空间结构变量(针叶类、云冷杉类、硬阔叶类和软阔叶类分别为 4.57%、12.14%、21.91%和 5.89%)、密度指数变量树种变量(针叶树、云冷杉、硬阔叶和软阔叶组分别为 10.79%、35.20%、31.90%和 8.84%)的相对重要性较低。【结论】BRT 和 Cubist 是模拟云冷杉阔叶混交林四个树种组单木 HCB 的最佳方法。单木和林分变量对不同树种组的单木 HCB 影响最大, 虽然空间结构变量的相对重要性较小, 但应深入研究。

关键词: 竞争指数; 基尼系数; 机器学习; 广义可加模型; 树种组; 林分空间结构

Non parametric simulation of height to crown base for different tree species groups in a mixed forest of spruce fir and broad-leaved forests

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Abstract: [Objective] To compare the simulation differences and fitting accuracy of different non parametric modeling methods and variable types on the height of single branches of different tree species groups in a mixed forest of spruce and fir broad-leaved trees, and to provide theoretical basis for scientific management decision-making in this forest. [Method] Based on data from 12 large-scale plots of 1 hectare, the generalized additive model, BRT model, Cubist model, and MARS model were used to simulate the HCB of different tree species groups in a

broad-leaved mixed forest of spruce and fir in Northeast China. The importance of different types of variables and their impact trends on HCB were evaluated, and the importance of various factors affecting branch height was assessed. [Results] In terms of variable importance, single tree variables (coniferous, spruce, hard broad-leaved, and soft broad-leaved groups accounting for 77.54%, 31.02%, 31.12%, and 73.69%, respectively) and forest partition variables (coniferous, spruce, hard broad-leaved, and soft broad-leaved groups accounting for 5.00%, 20.34%, 11.03%, and 8.71%, respectively) have relatively high relative importance, while forest spatial structure variables (coniferous, spruce, hard broad-leaved, and soft broad-leaved groups accounting for 4.57%, 12.14%, 21.91%, and 5.89%, respectively) and density index variables (coniferous, spruce, hard broad-leaved, and soft broad-leaved groups accounting for 10.79%, 35.20%, 31.90%, and 8.84%, respectively) have relatively low relative importance. [Conclusion] BRT and Cubist are the best methods for simulating single tree HCB of four tree species groups in a mixed forest of spruce and broad-leaved trees. The single tree and stand variables have the greatest impact on the HCB of different tree species groups. Although the relative importance of spatial structure variables is relatively small, further research is needed.

Keywords: Competition index; Gini coefficient; Machine learning; Generalized additive model; Tree species-specific group; Stand spatial structure