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Expert Elicitation for Bayesian Classification Trees

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Abstract

An expert elicitation approach for Bayesian classification trees is developed in this paper. This approach is illustrated for habitat suitability modelling of the threatened Australian brush-tailed rock-wallaby *Petrogale penicillata*, in which the opinion of one expert is elicited. In the ecological field, expert opinion has been acknowledged as providing valuable information in modelling, particularly when the observed data are limited or unreliable. The elicitation questions are on the size of the tree representing the number of decisions; the relative importance of the variables; and the splitting rules for the most important variables which quantify how decisions relate to variables. For each of these questions three approaches to elicitation were used: order from most important to least important; grade each item from 1 to 5; attach a numeric weight to each item. The results indicate that for this case study, expert informed priors were able to influence the tree structure (tree size, variables and splitting rules). Furthermore, through applying these priors a tree with better predictions of the presences was identified, compared to that based on non-informative priors. Hence combining expert

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informed priors with observed data using Bayesian classification trees may improve scientific understanding and conservation management planning.

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