
A Bayesian Nonparametric Approach to Ecological Risk Assessment

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Abstract

We revisit a classical method for ecological risk assessment, the Species Sensitivity Distribution (SSD) approach, in a Bayesian nonparametric framework. SSD is a mandatory diagnostic required by environmental regulatory bodies from the European Union, the United States, Australia, China etc. Yet, it is subject to much scientific criticism, notably concerning a historically debated parametric assumption for modelling species variability. Tackling the problem using nonparametric mixture models, it is possible to shed this parametric assumption and build a statistically sounder basis for SSD. We use Normalized Random Measures with Independent Increments (NRMI) as the mixing measure because they offer a greater flexibility than the Dirichlet process. Indeed, NRMI can induce a prior on the number of components in the mixture model that is less informative than the Dirichlet process. This feature is consistent with the fact that SSD practitioners do not usually have a strong prior belief on the number of components.

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