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Title: Unifying methods for species distribution modelling using presence-only data in ecology

Abstract: Technology has enabled rapid advances in data analysis across multiple disciplines – with the collection of new types of data posing new challenges, and with the development of new methods for analysing data rapidly increasing our analytical capacity. An important example is species distribution modelling using presence-only data – geographic information systems (GIS) enable the study of environmental variables at a spatial resolution far higher than previously possible, and new methods of data analysis are rapidly being developed for studying how such environmental variables relate to species occurrence (or “presence-only”) records.

In this paper, we show that three different methods of analysis, from the ecology, machine learning and statistical literatures, are all equivalent. This advance offers new insights on how to overcome the methodological weaknesses of the two most widely used methods for species distribution modelling using presence-only data - pseudo-absence regression and MAXENT - via the use of a point process model specification. An example issue that can now be addressed more effectively is understanding the role of spatial resolution in species distribution modelling. The increased functionality available via point process models will be discussed, and finally, a new method for accounting for observer bias proposed.