Bayesian optimal design for species distribution modelling

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In various spatio-temporal applications, the acquisition of data can be labour intensive or costly such that in practice one is interested in an efficient design for data collection. Although a rich literature is available on spatio-temporal survey designs, less is known on how to develop optimum designs for integrating field surveys with modern acquisition techniques such as citizen science. In this work we present a Bayesian design for species distribution modelling. The approach seeks to improve designs for occupancy modelling via the integration of presence-only and presence-absence data within the design optimization. For this purpose, the prior knowledge of the presence-only data is captured through a Poisson process model and used to inform about the sampling location for a site-occupancy model. Results show that in this way surveys for presence-absence data can be made more efficient while improving inference. Future research aims to extend these techniques to other spatio-temporal applications.