July 19, 2021

Dear Editors,

My co-author, Brennan Bean, and I are pleased to submit our manuscript, "remap: Regionalized Models with Spatially Smooth Predictions" to *The R Journal* for consideration of publication as an add-on package article.

Geospatial models are broadly utilized in fields such as geology, climatology, ecology, and engineering. One limitation with many existing methods is that they assume that drift (i.e. trend) coefficients and/or spatial autocorrelation structure are constant across the landscape. This is problematic when trying to apply such methods to large geographical areas. In these cases, geospatial models can be improved by building independent models with data from smaller sub-regions. The problem with this approach is that predictions can change sharply at sub-region borders. Also, there is a general lack of software, including R software, to build regional geospatial models, especially those that respect changes in variable relationships across landscapes.

In this manuscript, we describe a novel modeling framework to build and use regional models with smooth transitions between region boundaries, implemented in the R package **remap** available on the Comprehensive R Archive Network (CRAN). The modeling framework employs a user-provided spatial partition to build a set of regional models. Final predictions are made by taking a weighted average of predictions from all regional models where weights are based on the nearest distances from the prediction location to region borders.

The functions of **remap** are well documented and straightforward to use with examples provided in a package vignette. However, the utility of **remap** resides as much in its modeling *framework* as in the actual package functions. This framework makes full use of the functional programming aspect of the R language to accommodate a wide variety of spatial modeling approaches and therefore a wide variety of applications and disciplines. The package is optimized to work on large problems where naïve implementation results in prohibitive computational time. This manuscript provides crucial details about the development and mathematics of this framework, including a rigorous discussion of the placement of this framework within the existing regional modeling literature. Such details lie beyond the scope of a package vignette, yet are crucial in helping a broader audience recognize the applicability of **remap** in their own research.

The **remap** package has already been used in the construction of design snow load maps that have been accepted into ASCE 7-22, which is the design standards for U.S. building codes set forth by the American Society of Civil Engineers. We have spoken to researchers in engineering and ecology who have mentioned a need for smooth regional spatial models in their own research. As such, we believe that the novel methodology and broad application of **remap** will draw wide readership. Thank you for your consideration and we look forward to your feedback.

Regards,

Jadon Wagstaff
Department of Oncological Sciences,
Huntsman Cancer Institute, University of Utah
jadonw@gmail.com
385-223-0582