
SPMODEL: SPATIAL MODELING IN R

A PREPRINT

Michael Dumelle *

United States
Environmental Protection Agency
200 SW 35th St, Corvallis, OR, 97333
Dumelle.Michael@epa.gov

Matt Higham

Department of Math, Computer Science, and Statistics
St. Lawrence University
23 Romoda Drive, Canton, NY, 13617
mhigham@stlawu.edu

Jay M. Ver Hoef

National Oceanic and Atmospheric Administration
Alaska Fisheries Science Center
Marine Mammal Laboratory, Seattle, WA, 98115
jay.verhoef@noaa.gov

April 23, 2022

Abstract

Enter the text of your abstract here.

Keywords Spatial covariance · Linear Model · Autoregressive model

1 Introduction

```
R> x <- 1
R> x <- list(
+   a = 1
+ )
R> x
```

```
$a
[1] 1
```

Here we describe the general role of spatial modeling, discuss existing software, and argue spmodel is a valuable contribution.

2 Background and Usage

2.1 Spatial Linear Models

- REML citations (Patterson and Thompson 1971; Harville 1977; Wolfinger, Tobias, and Sall 1994)
- SV-WLS citations (Cressie 1985, 1993)
- SV-CL citations (Curriero and Lele 1999)

*Corresponding Author

2.1.1 Anisotropy

2.2 Spatial Autoregressive Models

2.3 Prediction

2.4 Neighborhood Indexing for Big Data

2.4.1 The local list

2.5 Random Effects

2.6 Partition Factors

2.7 Initial Values and Known Values

2.8 Simulating Gaussian Random Variables

3 Discussion

Data and Code Availability

Acknowledgements

References

- Cressie, Noel. 1985. “Fitting Variogram Models by Weighted Least Squares.” *Journal of the International Association for Mathematical Geology* 17 (5): 563–86.
- . 1993. *Statistics for Spatial Data*. John Wiley & Sons.
- Curriero, Frank C, and Subhash Lele. 1999. “A Composite Likelihood Approach to Semivariogram Estimation.” *Journal of Agricultural, Biological, and Environmental Statistics*, 9–28.
- Harville, David A. 1977. “Maximum Likelihood Approaches to Variance Component Estimation and to Related Problems.” *Journal of the American Statistical Association* 72 (358): 320–38.
- Patterson, H Desmond, and Robin Thompson. 1971. “Recovery of Inter-Block Information When Block Sizes Are Unequal.” *Biometrika* 58 (3): 545–54.
- Wolfinger, Russ, Randy Tobias, and John Sall. 1994. “Computing Gaussian Likelihoods and Their Derivatives for General Linear Mixed Models.” *SIAM Journal on Scientific Computing* 15 (6): 1294–1310.