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### **Inference for Count Data using the Spatial Random Effects Model**

The set-up proposed in this talk could be thought of as non-linear Fay-Herriot modelling. Count data over spatial lattices are the building blocks of geographic and econometric data (e.g., unemployment rates in small areas). We consider a hierarchical statistical model made up of a Poisson model for the counts and an underlying Spatial Random Effects (SRE) process for the logarithm of the mean of the Poisson distribution. We wish to make inference on this unknown spatial mean, but no assumptions of homogeneity, stationarity, or isotropy are made. We develop maximum-likelihood estimates for the parameters of the underlying process using an EM algorithm. The resulting dimension reduction leads to substantial computational speed-ups, as is demonstrated through simulation. Finally, an epidemiological dataset is used to illustrate the methodology. This is joint research with Aritra Sengupta of The Ohio State University.