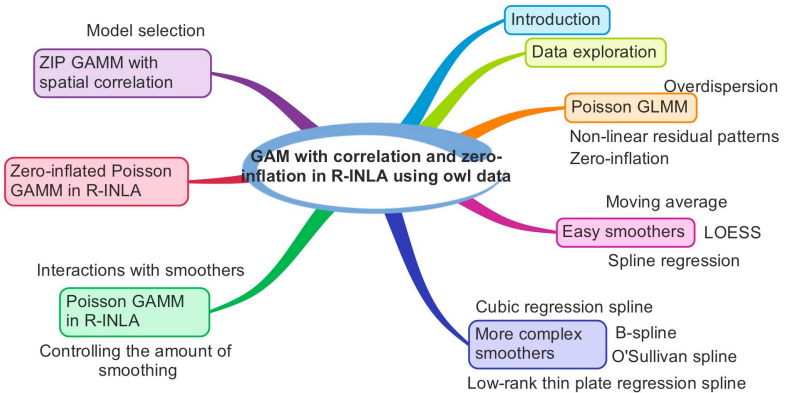


20 GAM with correlation and zero-inflation in R-INLA using owl data

Using a data set on vocal begging behaviour of nestling barn owls (Roulin and Bersier 2007; Zuur et al. 2009a, 2012a), we will illustrate how to implement generalised additive mixed effects models (GAMM) with zero inflation and spatial correlation in R-INLA in this chapter.

The flowchart below shows the key elements of the chapter. We will start with an introduction and data exploration. We will then apply a Poisson generalised linear mixed effects model (GLMM) and discover that there is overdispersion due to non-linear patterns in the residuals and also due to zero inflation. We explain the underlying principle of smoothing models using trivial smoothers (e.g. moving average smoothers). Once we have done that we consider more practical smoothers like cubic regression splines, B-splines, thin-plate regression splines and O'Sullivan splines. In the second part of the chapter we apply these smoothers in R-INLA and combine them with zero-inflation and spatial correlation components.



Prerequisite for this chapter: You need to be familiar with fitting a Poisson GLMM in R-INLA (see Chapters 9 and 10 of Volume I), using random walk smoothers in R-INLA (see Chapter 14 of Volume I) and zero-inflated Poisson (ZIP) models (see Chapter 18 of this volume).

20.1 Vocal begging behaviour of nestling barn owls

Using microphones and a video recorder, Roulin and Bersier (2007) gathered data from 27 owl nests to investigate vocal behaviour of nestlings. Sibling negotiation is defined as the number of calls made by all offspring, in the absence of the parents, during 30-sec time periods recorded at 15-min intervals. The number of calls from the recorded