

Inferring multi-species interactions from camera trap data with Hawkes processes

Inter-specific interactions play a key role in the structure and functioning of ecological communities. However, they are very difficult to observe directly because of the high number of species and the scale of natural ecosystems.

Camera traps have become popular to gather large amounts of data in a non-invasive and automated manner. In particular, camera traps can gather invaluable information on how species are distributed in space and time in their natural environment.

Few methods exist to study the influence species have on the multi-species distribution patterns of the community, which could be informative about species interactions. More importantly, most existing methods are ill-suited to the type of data provided by camera traps, mainly because many of them aggregate data over some time unit, thus losing a large part of the temporal information.

The Hawkes model seems to be a good candidate to fill this gap: this model is a point process which can model the excitatory or inhibitory effect of a given species occurrence at a camera trap on the following species. It is used in many other fields, for example to model earthquake aftershocks, neuronal spike trains or financial market fluctuations.

I will present the scientific questions that this method could answer and illustrate this tool on an example from a camera trap dataset of large animal communities of the African savanna, collected as part of the Snapshot Safari program.