Point Process Modeling using RINLA

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Refresher: Types of spatial data

1. Areal data
2. Geostatitics data
3. Point pattern

Application of Point Process

- **Healthcare**: disease Outbreaks, patient arrivals or discharge
- **Ecology**: species distribution, forest Ecology
- **Environmental Science**: rainfall, Wildfire occurrence
- **Finance**: transaction times, credit default, bankruptcies
- **Geosciences**: earthquakes, volcanic eruptions
- **Astronomy**: star distribution, cosmic Events (supernova)
- **Telecommunications**: call arrivals
- **Retail and Marketing**: customer arrivals, or churn, purchase
- **Sports**: events times, player movements
- **Transportation**: traffic flow, public transport, accidents
- **Security and Surveillance**: crime Analysis and surveillance systems
- **Manufacturing**: defect occurrences, maintenance Scheduling

Types of point process

1. Regular
2. Random
3. Clustered

Agenda

1. Examples of Point process
2. Study the class of Poisson Point process
   - 2.1 Definition and properties
   - 2.2 Homogeneous Poisson Process
   - 2.3 Non Homogeneous Poisson Process with deterministic intensity
   - 2.4 Non Homogeneous Poisson Process with stochastic intensity: Log Gaussian Cox Process
   - 2.5 Fitting all these models [Illian, Sørbye, and Rue 2012; Simpson et al. 2016]
3. Mention to **inlabru** and **metricgraph** libraries.

Topics not covered[1]

1. Exploratory data analysis
2. Model validation for PP
3. Model comparison for PP

[1] I will give some ideas

References

Illian, Janine B, Sigrunn H Sørbye, and Håvard Rue (2012). "A toolbox for fitting complex spatial point process models using integrated nested Laplace approximation (INLA)". In: *The Annals of Applied Statistics*.

Simpson, Daniel et al. (2016). "Going off grid: computationally efficient inference for log-Gaussian Cox processes". In: *Biometrika* 103.1, pp. 49–70.