

# Prequel to Hawkes Processes: An Overview of Temporal and Spatio-Temporal Point Processes and Some Simulations

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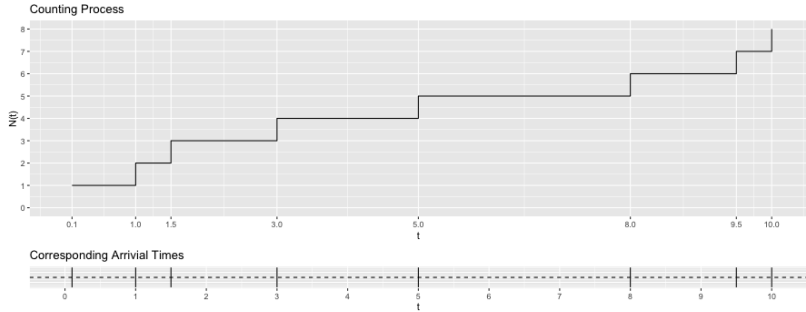
# Background and Objectives

# Introductions, Definitions, Properties, and Graphs

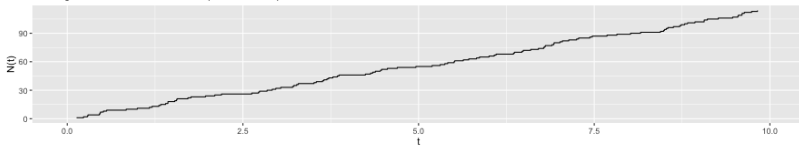
1. Counting process
2. HPP (Homogeneous Poisson Process)
3. NPP (Nonhomogeneous Poisson Process)
4. Cox and Cluster processes
5. Hawkes process
6. Spatio-temporal self-exciting point process

# Counting Process

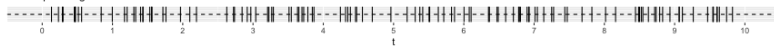
# Counting Process



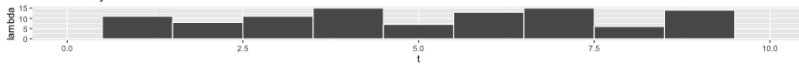
# HPP (Homogeneous Poisson Process)

Homogeneous Poisson Process ( $\lambda = 10$ )

Corresponding Inter-Arrival Times



Rate/Intensity

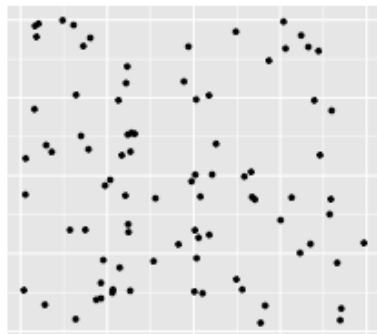


# NPP (Nonhomogeneous Poisson Process)

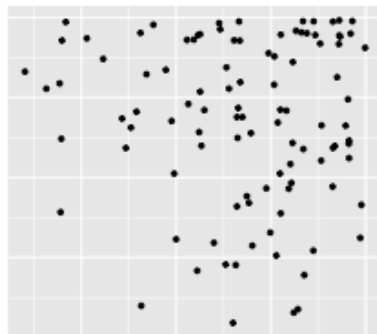


## HPP vs. NPP in 2D

HPP (rate = 100)



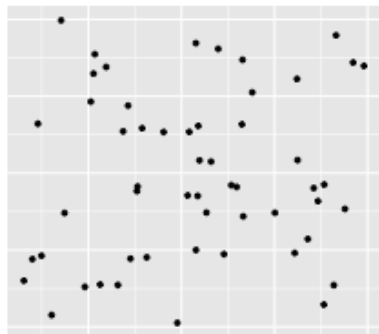
NPP



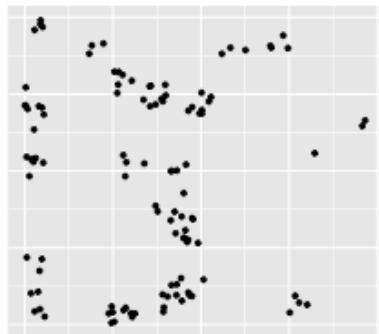
# Cox and Cluter Processes

## Cox vs. Matern Cluter in 2D

Cox Process

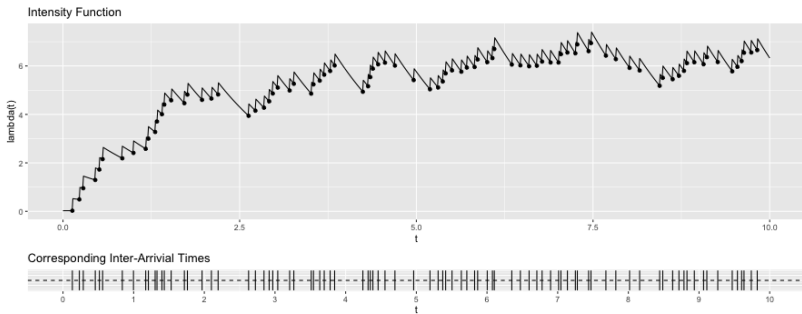


Matern Cluter Process



# (Temporal) Hawkes Process

# Hawkes Process



# Spatio-temporal Self-exciting Point Process

# Acknowledgments

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