Modeling and Simulating Large-Scale Wireless Networks (ZJ1-14)

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Overview
Stochastic geometry plays an important role in modeling the spatial structure of base stations. It can be applied in network planning to design the distribution of base stations minimizing the performance degradation caused by interference. In this project, two prominent stochastic models - Poisson point process and Matern point process are analyzed and compared to derive the optimized solution with best network performance.

Objectives
This project aims to:
• Investigate the impact of key parameters on performance
• Compare and derive the optimized solution in single-tier networks and heterogeneous networks

Methodology

Single-Tier Networks
- Poisson point process
- Matern point process
  - Intensity of base stations
  - Minimum distance between two macro base stations
  - Comparison

Heterogeneous Networks
- Poisson point process
- Matern point process
  - Intensity of base stations
  - Minimum distance between macro and pico base stations
  - Minimum distance between two pico base stations
  - Comparison

Simulation flowchart
Implementation of this project can be divided into three stages:
1. Validate the simulation results of both point processes
2. Evaluate and compare the performance in single-tier networks
3. Evaluate and compare the performance in heterogeneous networks

Results

Impact of intensity of base stations
Impact of minimum distance between two base stations & comparison between two point processes

Concluded from simulation results, the optimized solution is:
• Matern point process
• Higher intensity of base stations
• Greater minimum distance between two base stations