Locating an Ambulance

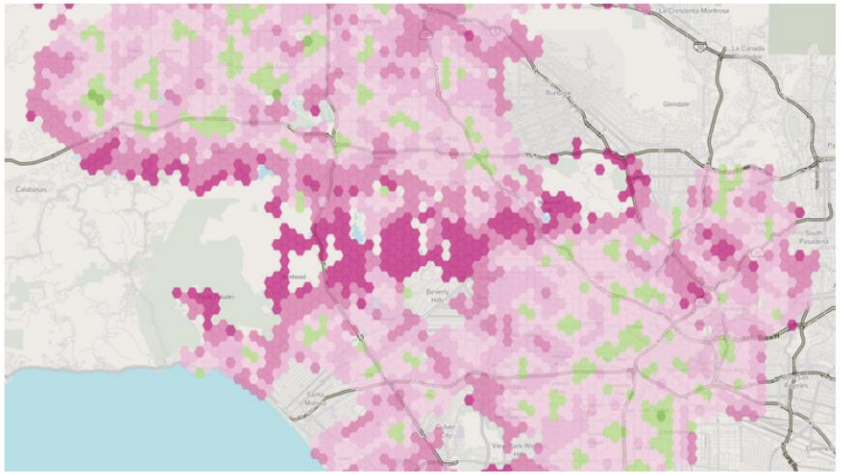
- Goal
  - Reduce mortality and morbidity
  - Operate within financial constraints
- Criteria
  - Various
    - Inputs
    - Process
    - Outcome
  - Focus
    - Response Times

Kind of a hard problem: San Francisco

- SF Gate (Sep, 2014)
  - "A patient at a skilled nursing center facing a life-threatening emergency waited more than 33 minutes for an ambulance to take them to a San Francisco hospital."
  - "Last month, there were 241 calls dispatched as **Code 3** where it took more than 20 minutes for an ambulance to arrive an average of eight times per day. **Nine times that month, it took more than an hour for an ambulance to arrive**."
- Calls for the SFFD Chief to resign

Kind of a hard problem: Los Angeles

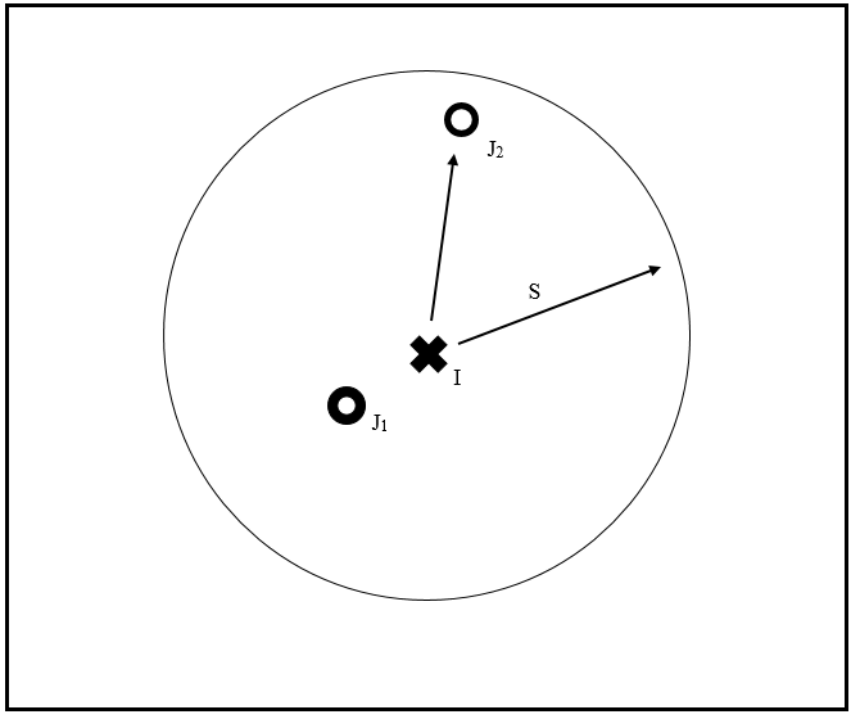
- LA Times (Oct 2012)
  - "911 callers within a quarter mile of the city border are nearly 50% more likely to wait more than 10 minutes for rescue crews to arrive"
- LA Times (Nov 2012)
  - "…the longest responses often occur when an area's primary rescue units are on other calls or are out of service, creating holes in coverage. Citywide, the first unit to reach victims in medical emergencies came from a more distant station at least 15% of the time…"



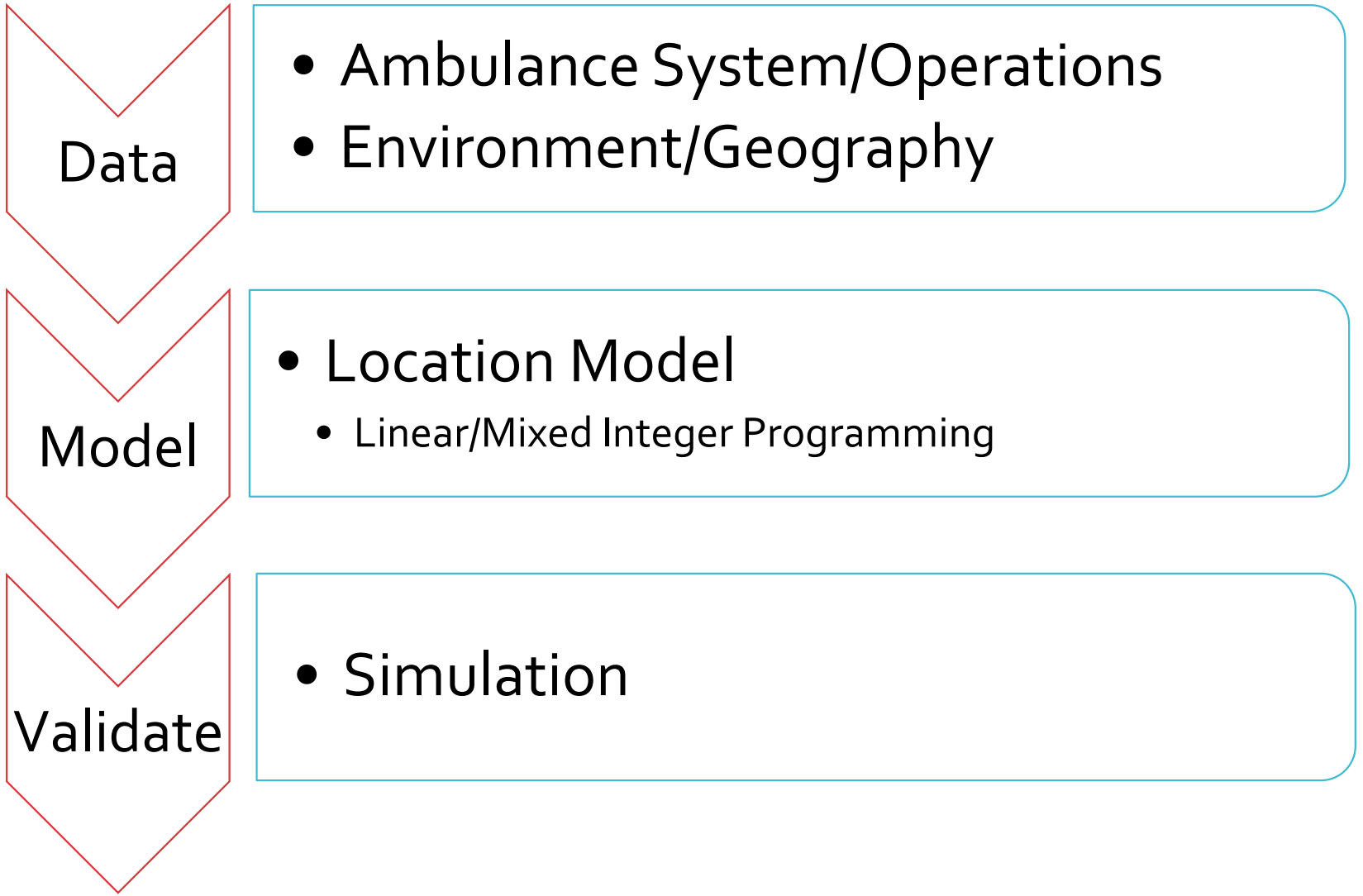
Average response time map for LA (Credit: LA Times)

Solving the Ambulance Problem

- Naïve Approach
  - "Buffer" approach
  - BOGGSAT method
- More Systematic Approaches
  - Covering Modeling
  - *p*-Median Modeling
- Problems
  - Estimating "true" solution fitness
    - Stochastic Demand
    - Congestion
  - Optimality Matters
- TRADITIONAL GIS/SPATIAL ANALYSIS TOOLS NOT VERY USEFUL



Solving the Ambulance Problem



Problems

- Data
  - Accessibility
  - Collection
- Software
  - Expensive
  - Specialized Interfaces and Languages
  - Ad-Hoc Workflows
  - Black Box

Role of Open Source

- Open Data
  - Recommendations about what data to collect and how to collect it
  - Analysis outside of the relevant agency more possible
  - Helps scientists advance the state of the art
- Open Source Software
  - Lowering barriers to entry
    - Cost
    - Knowledge
  - Stream lining workflows via intermediary software