The Economics of Mass Surveillance and The Questionable Value of Anonymous Communications

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Overview

- Introduction
- Model
- Obtaining network information
- Surveillance
- Discussion of effectiveness
- Conclusion

Introduction

- Participants belong to clubs
  - If one participant is under surveillance, all information shared and membership is revealed
- Questions
  - How many need to be under surveillance?
  - Who do we put under surveillance?
  - How does anonymity affect target selection?

Model

- People and spaces (or clubs)
- Relationships
  - When people belong to spaces
  - No links between people
  - Relationships have strength
    - Symbolizes degree of association between person and space
- Graph from set of people to set of spaces.

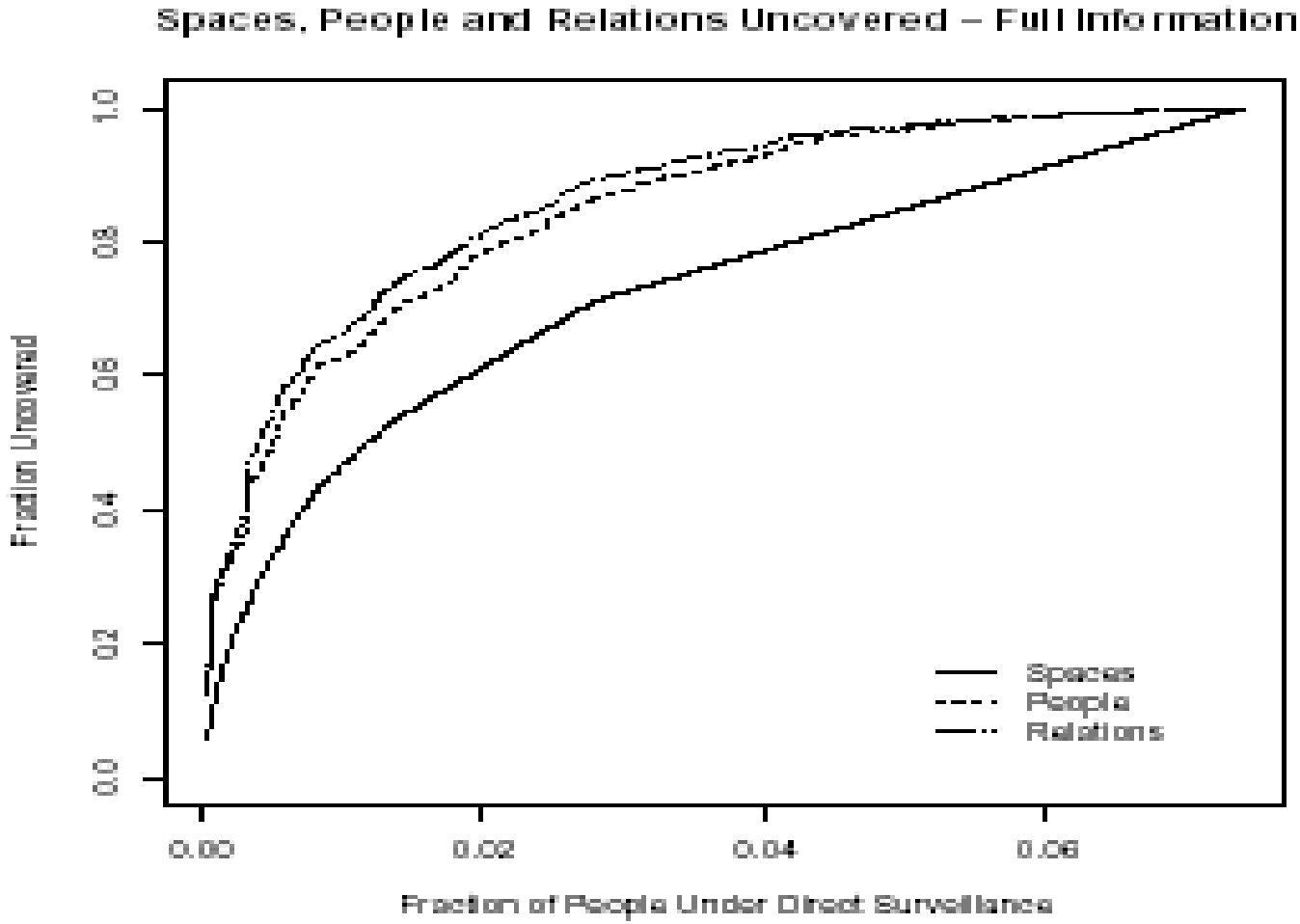
Extracting the Network from Data

- Used data from mailing list archives
- Mapped email address to space
- Mapped email to person
- Relations were created from messages to lists

Effectiveness of Partial Surveillance

- What is revealed?
  - Observing one member of a space
    - All relationships associated with that space
- Choice of target
  - Those with highest degree
    - Among spaces not under surveillance
  - Repeated as budget allows

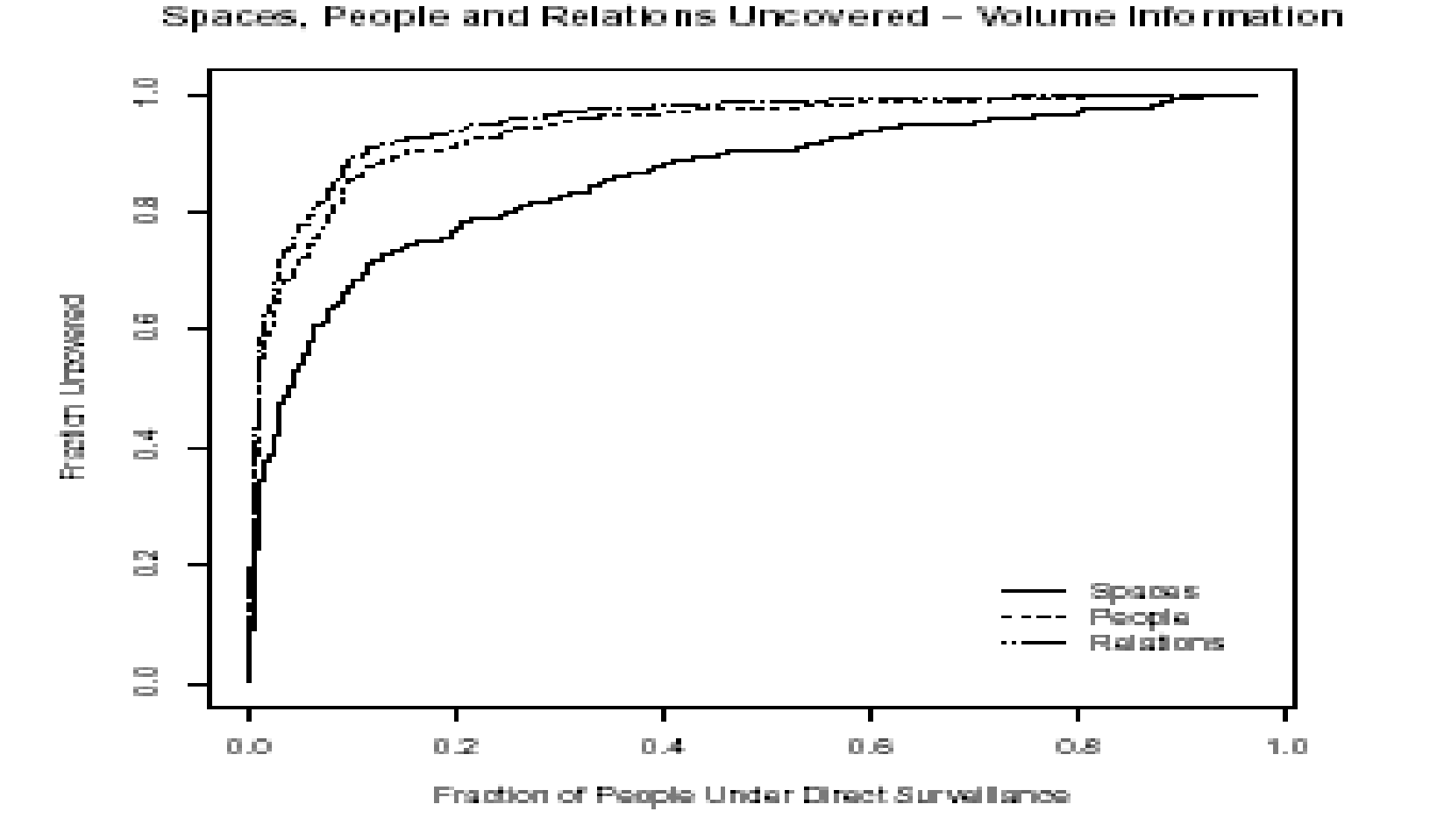
Data Uncovered – Full Info



Partial Information

- We can monitor volume of messages
  - Not degree or correspondents
- Target selection more difficult
  - Lower return on investment

Data Uncovered – Partial Info



Discussion

- The first model could represent no anonymity
  - Can obtain much information with little surveillance
- The second model represents some anonymity
  - No cover traffic
- Anonymized communication is helpful but not perfect

Diminishing Returns

- Initial investment provides great return
- As budget is increased, marginal returns decrease.
  - Cost per unit of intelligence rapidly increases
- Useful information may be very costly
- Privacy violation is high

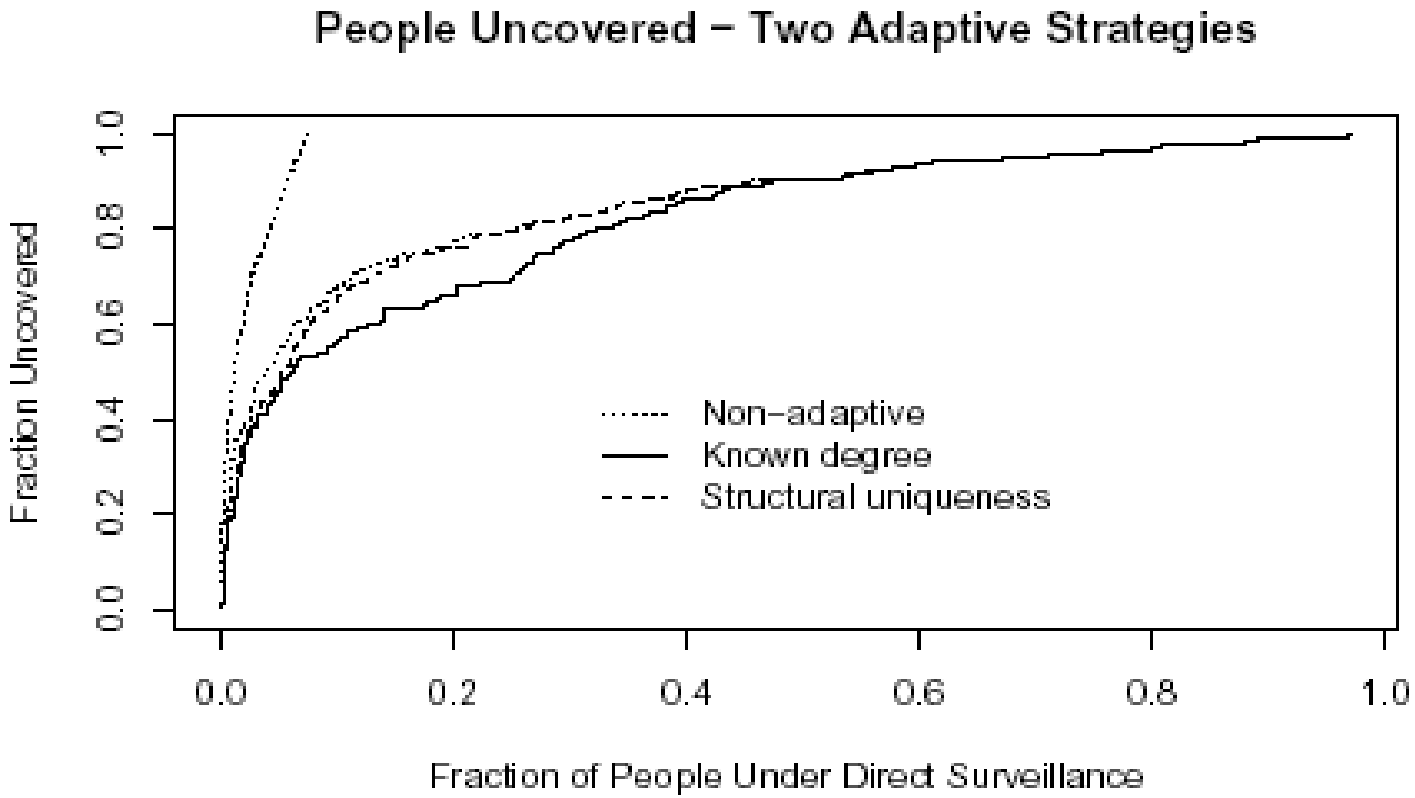
Interception Figures

- Warrants issued vs. number under surveillance
- UK population
  - Full information graph used
  - Formula for those under surveillance
    - (0.5/0.01)X
  - (0.5/0.01)1849 = 92000 people
  - Info on 50 people revealed for each one monitored

Failure of Adaptive Target Selection

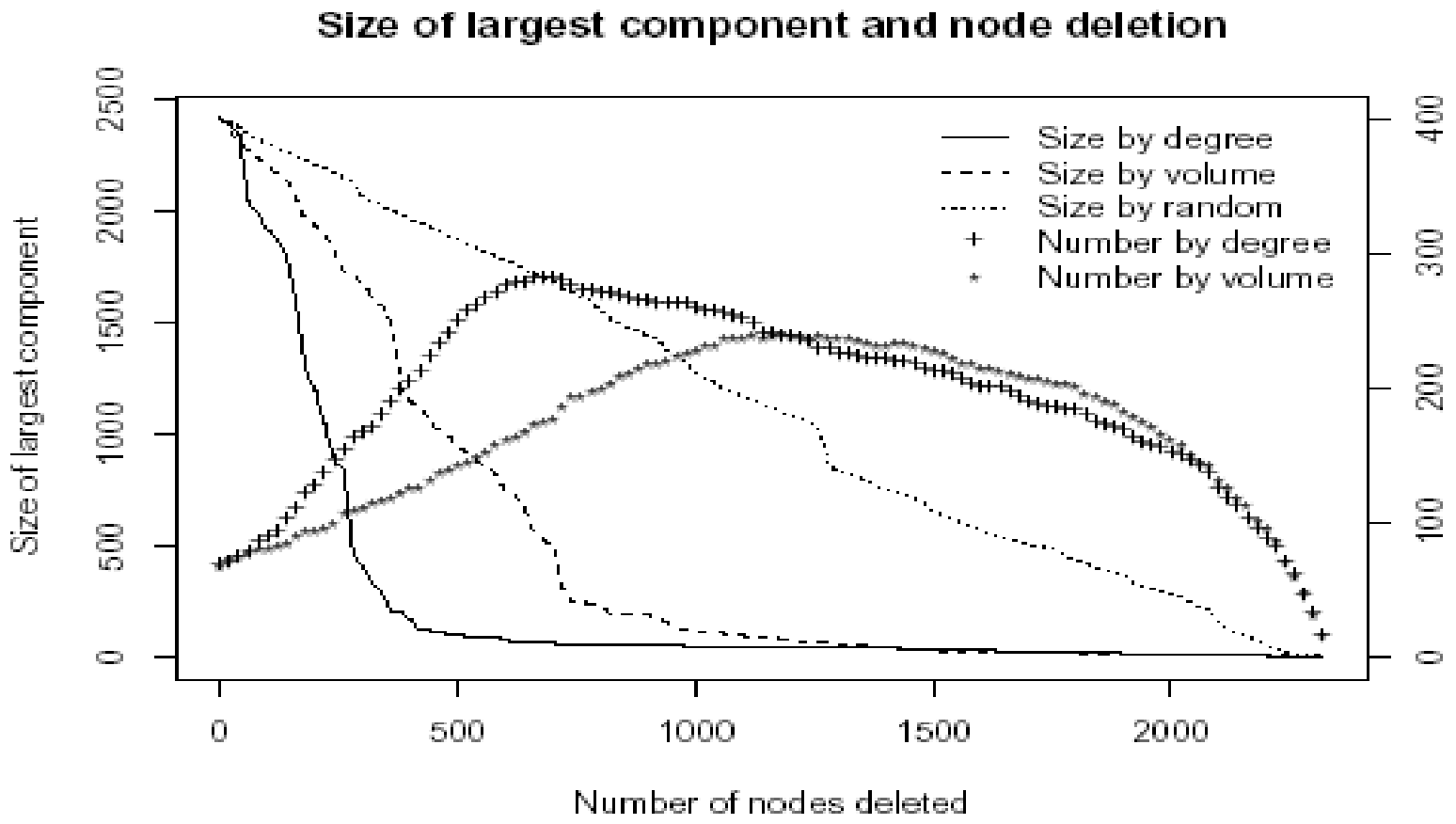
- Adaptive strategies are inferior to volume selection
- Adaptive Strategies
  - High known degree
    - Likely to have links to undiscovered spaces
  - Structural equivalence
    - High know degree and few nodes sharing its position

Strategy Comparison



Target Selection for Disruption

- What if goal is to disrupt network?
  - Remove nodes with highest degree
  - Remove nodes with high volume
- Selection results not very different
  - Need to remove twice as many using volume info.


Size of largest component and node deletion
Size of largest component
Number of nodes deleted
Size by degree
Size by volume
Size by random
Number by degree
Number by volume
0
500
1000
1500
2000
2500
100
200
300
400

Conclusion

- Information is leaked through third parties
- A small carefully selected set of nodes reveal a large amount of information
- Unlinkablility is not sufficient, unobservability is necessary
- Surveillance will violate privacy of innocent parties
- Finding guilty parties will be costly