MURI 2013 Review

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Overview

- development of simulation framework,
- intra-MURI projects,
- extra-MURI projects

Simulation Framework

- Basic problem: lots of graph metrics, so what?
- Limited closure of inductive-deductive loop
- Experimental options restricted
- Want simple tool to try mechanics
- so: need piping connecting
  - initial graph generation
  - dynamic graph evolution
  - "message" passing and observation model
  - agent-to-agent behavior
  - agent-to-broadcast (and vv.) behavior
  - interventions
  - plus computational concerns (e.g., IO, cluster computation)

Simulation Framework Progress

- ≈ initial graph generation (on-going work w/ Ed/Edo re correlated interaction types)
- ✗ dynamic graph evolution
- ✓ "message" passing and observation model
- ✓ agent-to-agent behavior
- ✗ agent-to-broadcast (and vv.) behavior
- ✗ interventions
- ≈ plus computational concerns (e.g., IO, cluster computation)

Results Reported at Sunbelt

Worked w/ Edo & Ed to prepare basic simulated communications

- simple graph generation:
    - mixed interaction types
    - households into communities
    - clandestine manager + cliqued groups of subordinates
- simple message passing - "Good" vs. "Bad", time-independent probabilities

Sample Population Graphs

show mixed interaction types

Sample Population Graphs

highlight particular interaction types

Sample Results Analysis

toss in sunbelt example

Aside on Results

Measured strategies as TPR and FPR (sensitivity and 1 - specificity) over time, with fixed strategy criteria.
ROC could capture TPR vs FPR over criteria – measure ROC scalar (e.g., discrimination) time evolution?
Even more complicated surface with several internal setpoints

Intra-MURI Projects

- Airoldi / Kao – implement more sophisticated conditional tie generators
- Lazer et al. – simulate firm-induced vs background donations
- Shapiro – identification with evolving SIMs, and using telephony data to parametrize graph generation

Extra-MURI Projects

- D. Bright, UNSW – agent/process-based models of meth production
- K. Carley, CMU – adding broadcast/mean-field perspectives to agent-models
- SAIC/L. Gerdes, USMA – geo-temporal hashing, specifically estimating between-observation distribution
- N. Roberts and S. Everton, NPGS – dynamic growth of Noordin network
- Assorted EPI – cryptic infections (equivalent to rumor spreading source ID), using large Montreal WiFi access metadata

Extra-MURI Projects, David Bright

meth network highlighting players of different roles

Extra-MURI Projects, Kathleen Carley

ORA logo - unfortunately, other part is under NDA, though they are supposed to be used in tandem

Extra-MURI Projects, SAIC/Luke Gerdes

mostly about applying kinematics $+$ diffusion theory to describe probability distribution of multiple actors between observations

Missing figure

Some of their Noordin results?

Extra-MURI Projects, EPI

Mostly focused on large, anonymized data set of Montreal municipal WiFi access.

Tracking spread of cryptic pathogen analogous to tracking rumor to source