### 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

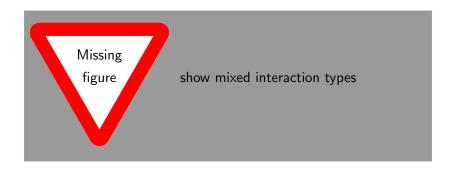
- pprox initial graph generation (on-going work w/ Ed/Edo re correlated interaction types)
- X dynamic graph evolution
- √ "message" passing and observation model
- ✓ agent-to-agent behavior
- agent-to-broadcast (and vv.) behavior
- interventions
- pprox plus computational concerns (e.g., IO, cluster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

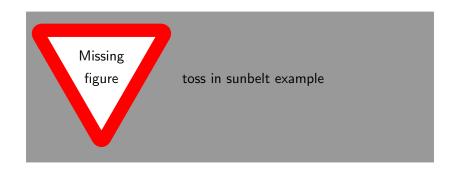
# Sample Population Graphs



# Sample Population Graphs



# Sample Results Analysis



#### 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

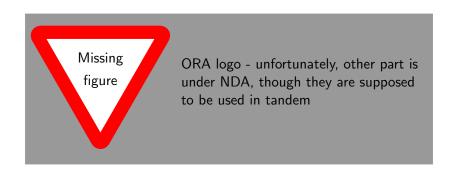
## Extra-MURI Projects

- ▶ 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



## Extra-MURI Projects, Kathleen Carley



## Extra-MURI Projects, SAIC/Luke Gerdes



## Extra-MURI Projects, Nancy Roberts & Sean Everton



### 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