MURI 2013 Review, Part I

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Overview

- our focus: simulation approaches,

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- intra-MURI projects,

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- So: want simple tool to simulate mechanics

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- plus computational concerns (e.g., IO, cluster computation)

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Simulation Framework Syntax Progress

```
def star
[V <: Vertex[EdgeType,V]]
(spokes : Seq[V], src: V) = {
  src <~> spokes
  src +: spokes
}
```

so, e.g.

```
// A-E : Vertex
val spoked = star(A, List(B, C, D, E))
override def remix
[V <: Vertex[EdgeType,V]]
(vs : Seq[V], rate:Double) = {
  vs.dPairs.filter { _ => DoubleSrc.next < rate }.
  foreach { p => p._1 !~> p._2 }
}
remix(spoked,someRate) // directed edges flipped @ someRate
```

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

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- ROC could capture TPR vs FPR over criteria – measure ROC scalar (e.g., discrimination) time evolution?
- With several strategy knobs, even more complicated surface

Intra-MURI Projects

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

Intra-MURI Project: Lazer et al. Collaboration

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- star them to random subsets of firms,
- each step
  - test for random donation (emit events from R/D stars)
  - have candidates / PACs solicit firms, which in turn organize events
  - employees respond to events with some probability, based on previous giving, personal affiliation vs event affiliation, etc

Intra-MURI Project: Lazer et al. Collaboration

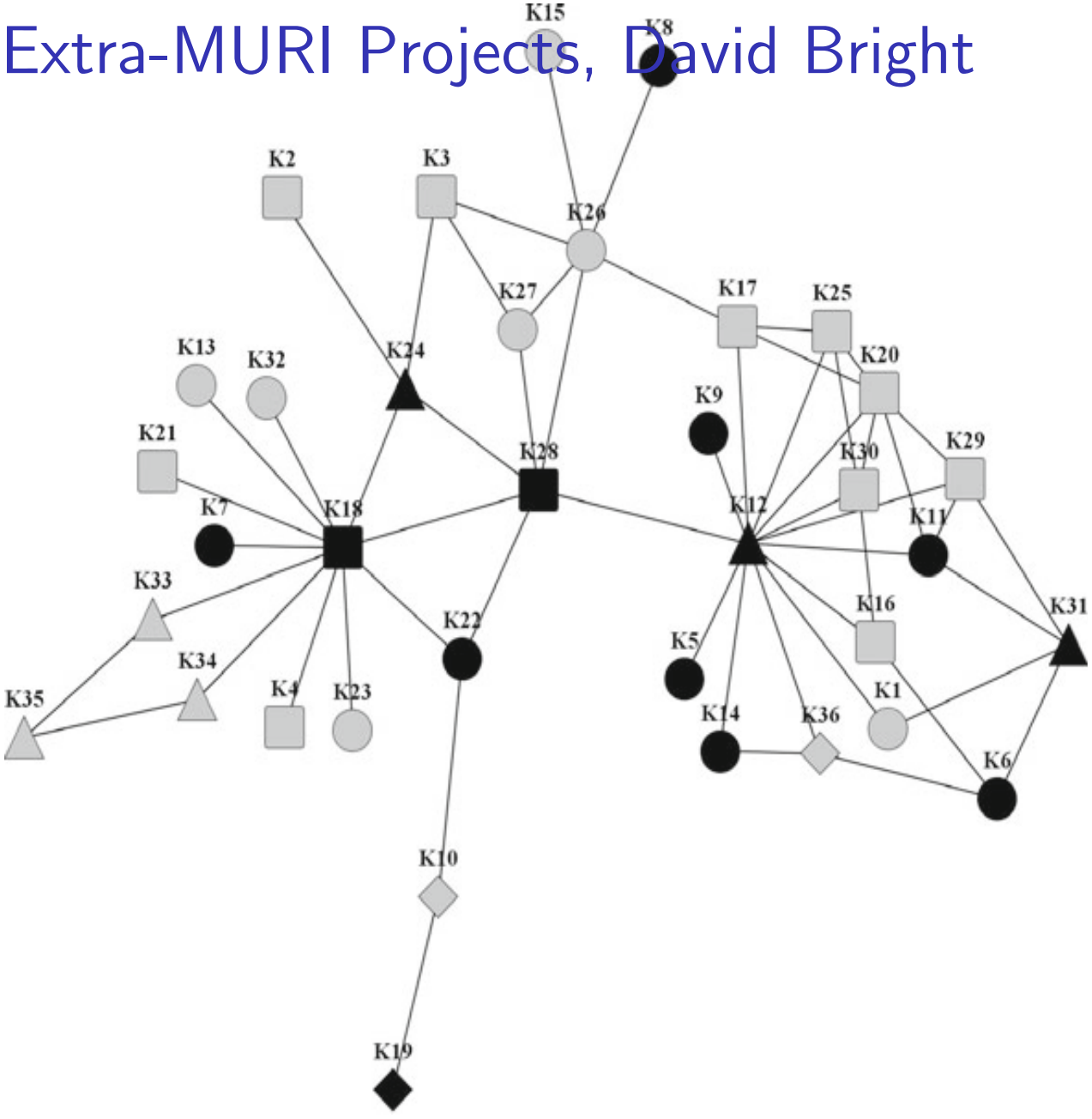
Analysis Idea

- intialize coordination belief network
- Each step provides Bayesian update based on concordant / discordant giving
- ROC discrimination calculated on percolation of coordination network

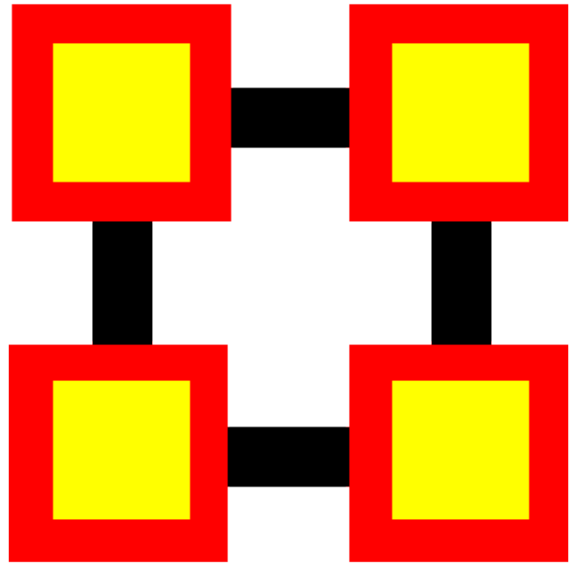
Extra-MURI Projects

- 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

Work on geo-temporal hashing.
They have good sifting tools to generate fuzzy co-location / time, but limited extrapolation.
Will be adding in some basic kinematics to expand that fuzz to unobserved periods, incorporate negative observations.

Extra-MURI Projects, Nancy Roberts & Sean Everton

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