JCAT: A Bayesian inference/belief network tool from AFRL

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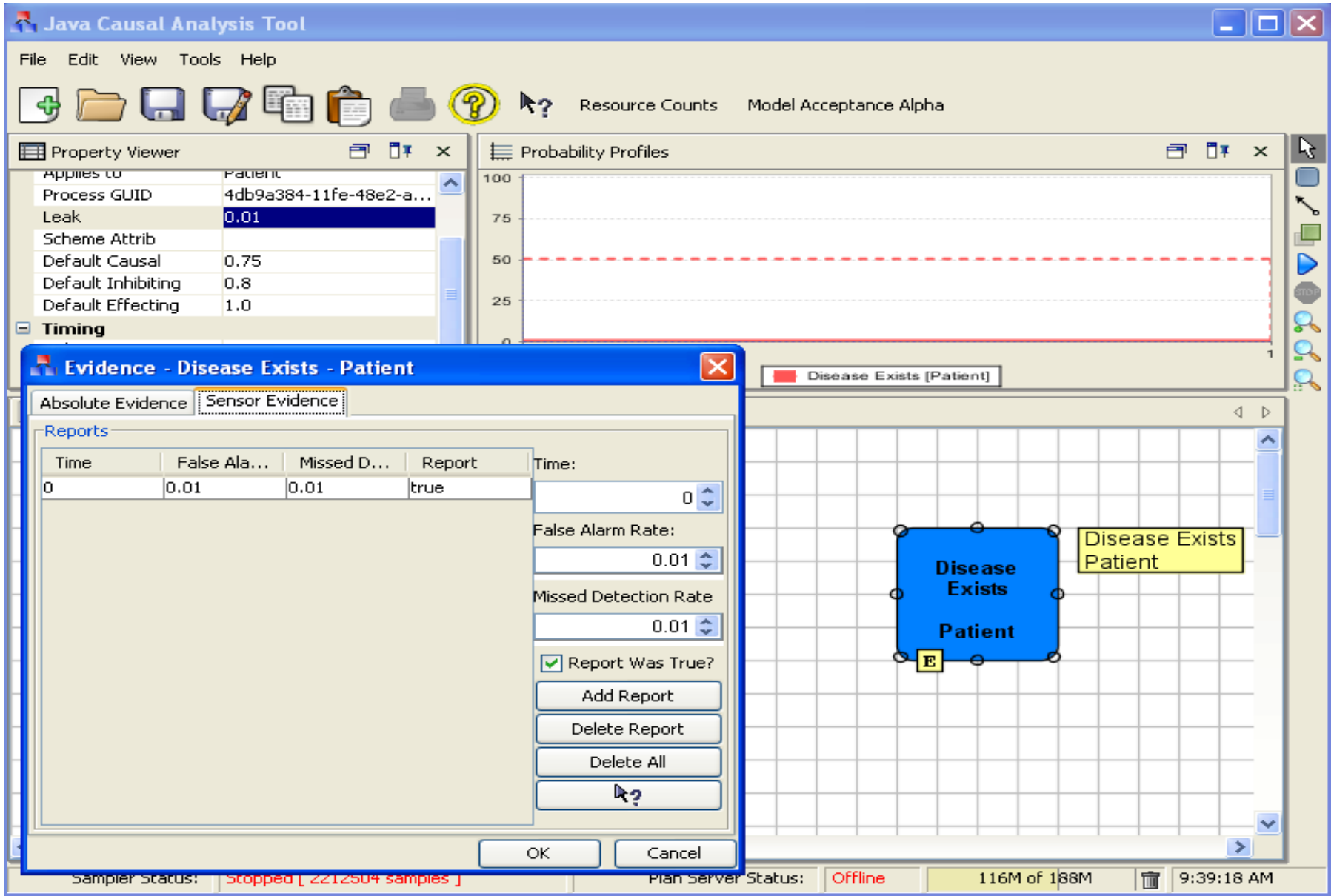
JCat Goals

- To develop a fully Bayesian temporal causal modeling system that is both computationally feasible and theoretically sound
- Eliminate common independence assumptions which degrade the resolution of models
- Construct an environment to allow quick easy use of powerful modeling technology
- Provide cutting edge capabilities to users across the DoD

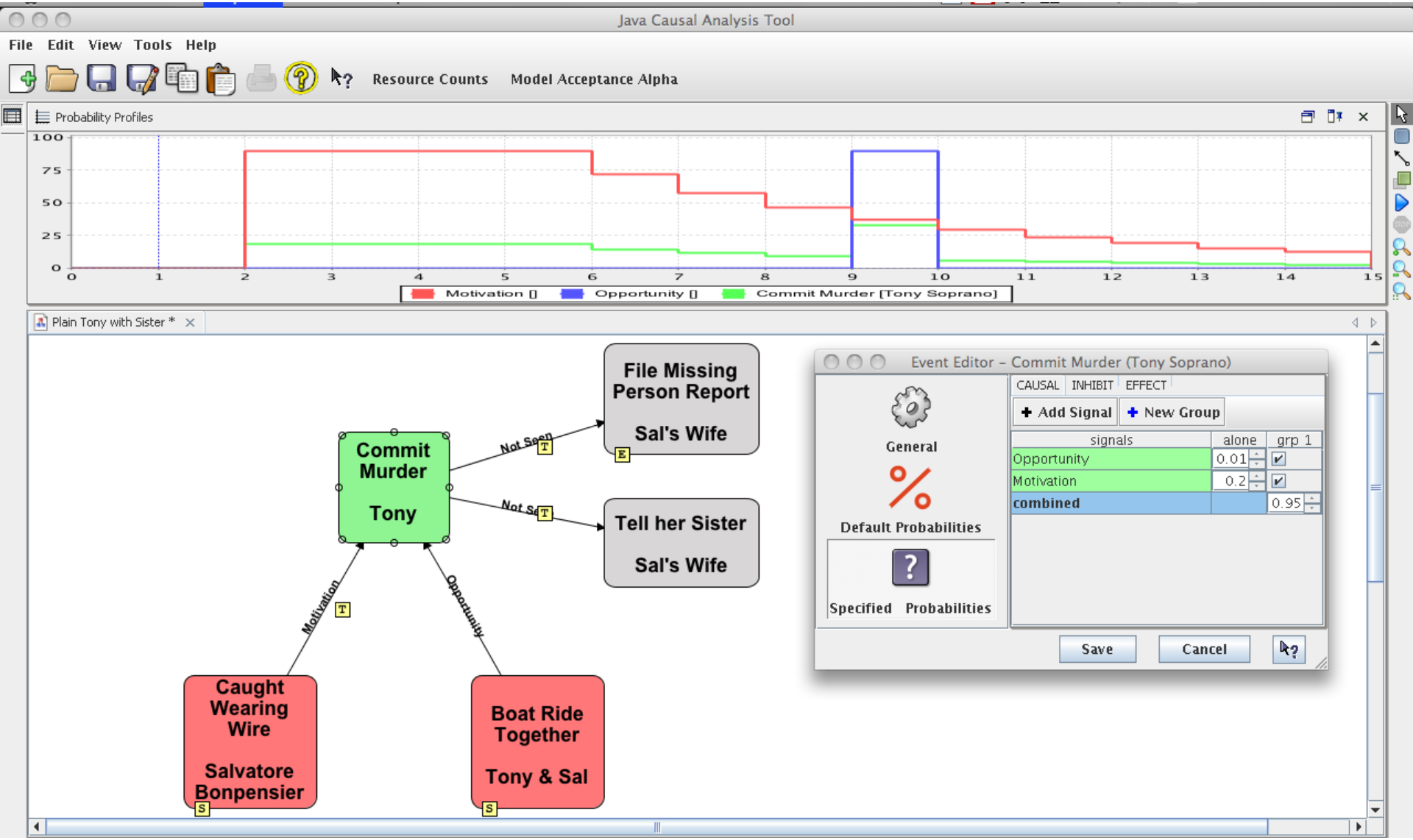
Uncertainty is not Intuitive

- A disease Infects 1% of the Population
- There is a test with 99% accuracy.
  - 99% of sick people are positive
  - 99% of well people are negative
- You test positive
  - What is the probability you are sick?

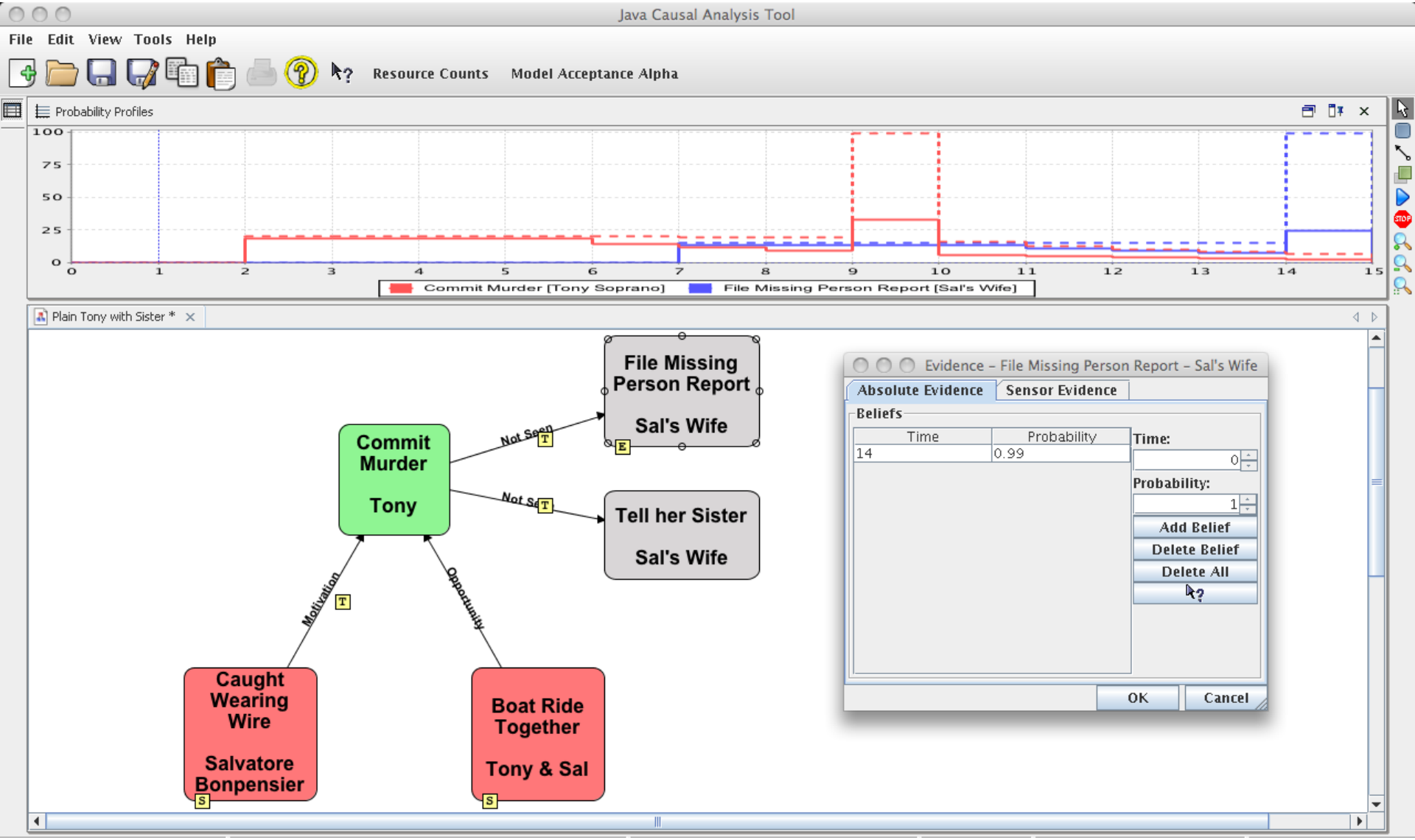
$p(s|+) = p(+|s) * p(s) / p(+)$


Java Causal Analysis Tool
File Edit View Tools Help
Resource Counts
Model Acceptance Alpha
Property Viewer
Process GUID 4db9a384-11fe-48e2-a...
Leak 0.01
Scheme Attrib
Default Causal 0.75
Default Inhibiting 0.8
Default Effecting 1.0
Timing
Probability Profiles
100
75
50
25
Disease Exists [Patient]
Evidence - Disease Exists - Patient
Absolute Evidence
Sensor Evidence
Reports
Time False Ala... Missed D... Report
0 0.01 0.01 true
Time:
0
False Alarm Rate:
0.01
Missed Detection Rate
0.01
Report Was True?
Add Report
Delete Report
Delete All
OK
Cancel
Disease Exists Patient
Disease Exists Patient
E
Sampler Status:
Stopped [2212504 samples]
Plan Server Status:
Offline
116M of 188M
9:39:18 AM

Behavior of a Mob Guy



Evidence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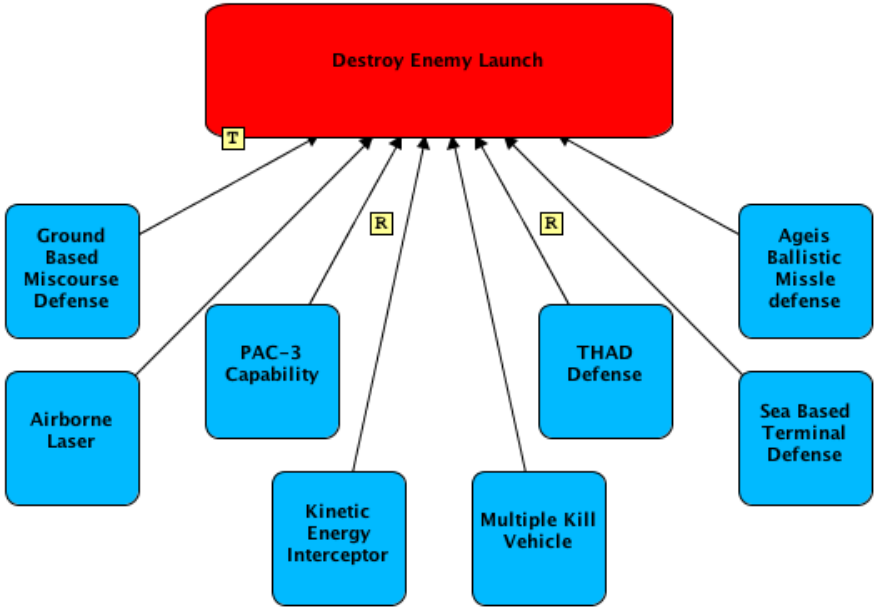
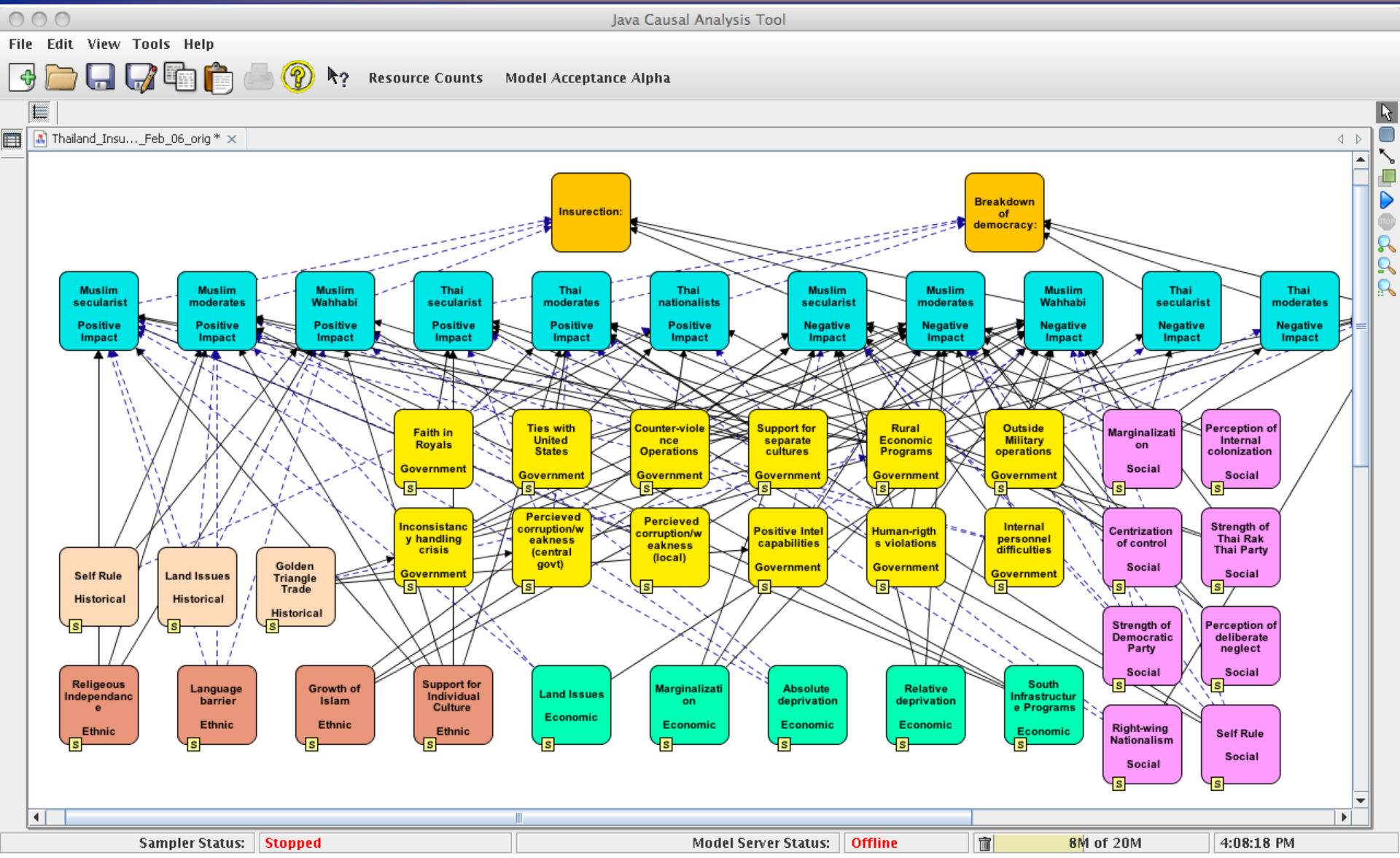
100
75
50
25
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Commit Murder [Tony Soprano]
File Missing Person Report [Sal's Wife]
Plain Tony with Sister *
File Missing Person Report Sal's Wife
Commit Murder Tony
Not Seen
T
E
Not Se
Tell her Sister Sal's Wife
Motivation
Opportunity
Caught Wearing Wire Salvatore Bonpensier
Boat Ride Together Tony & Sal
S
Evidence – File Missing Person Report – Sal's Wife
Absolute Evidence
Sensor Evidence
Beliefs
Time
Probability
14
0.99
Time:
0
Probability:
1
Add Belief
Delete Belief
Delete All
OK
Cancel

Usability

- Standard Bayesian Systems would require 256 parameters to be entered
- Recursive Noisy OR (RNOR) reduces required user input
- Reduces the burden of making a high resolution model



Real World Scenario



Summary

- JCat provides powerful temporal modeling capabilities in an easy to use platform
- Allows models to be quickly updated and tested
- Incorporation of real world observations in to predictive models
- Has been used successfully on real problems with open source information

Questions?

Ask me for a demo

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