



A Bayesian Model for Determining Crew Affiliation with Terrorist Organizations

*Quantitative Methods in Defense
and National Security 2010*

*Rick Haberlin
May 25-26, 2010*

Agenda

- Background
- Research
- Model
- Case Studies
- Conclusions



Background

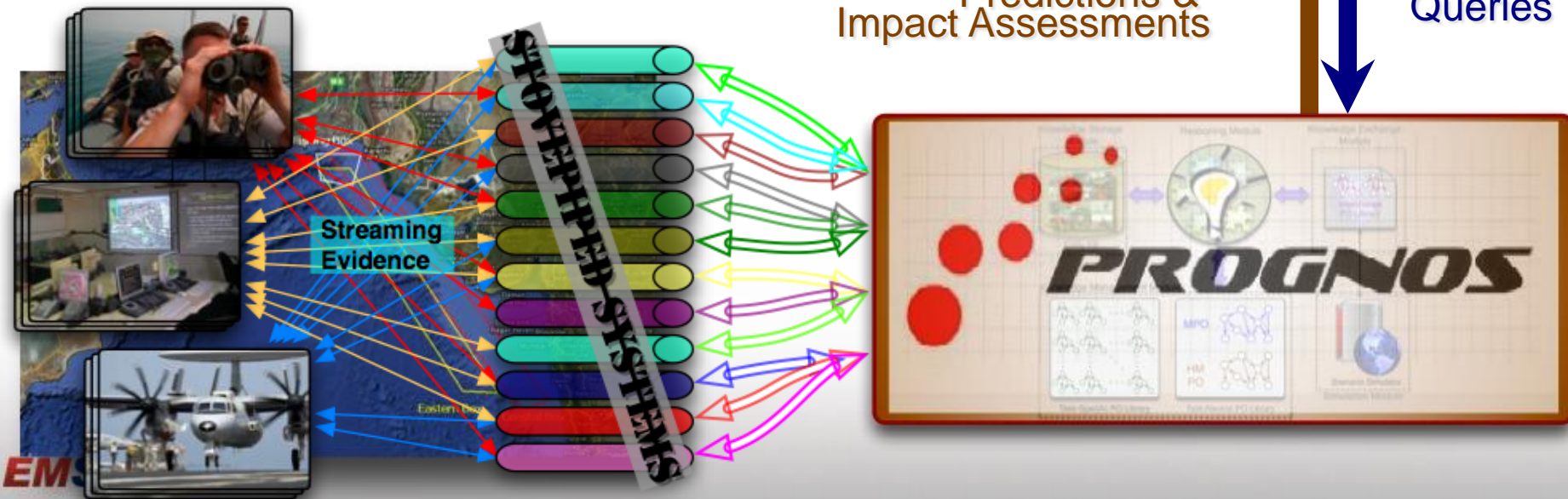
Probabilistic Ontologies for Net-Centric Operations Systems - PROGNOS

- Provide consistent higher-level fusion through knowledge representation and inferential reasoning
- Enable predictive analysis with principled hypothesis management

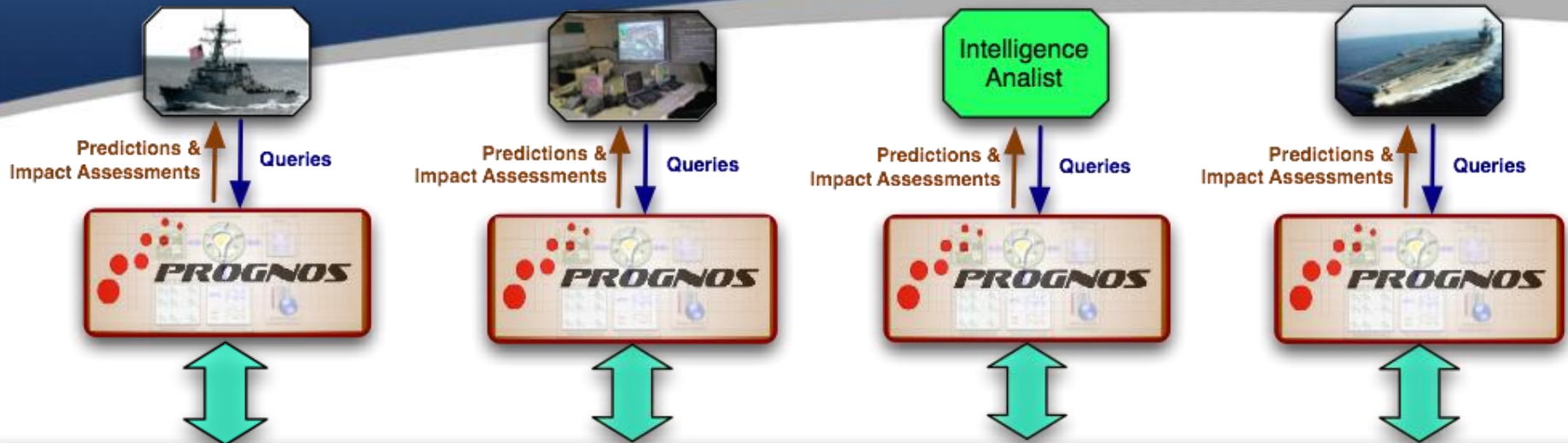


Predictions & Impact Assessments

Queries



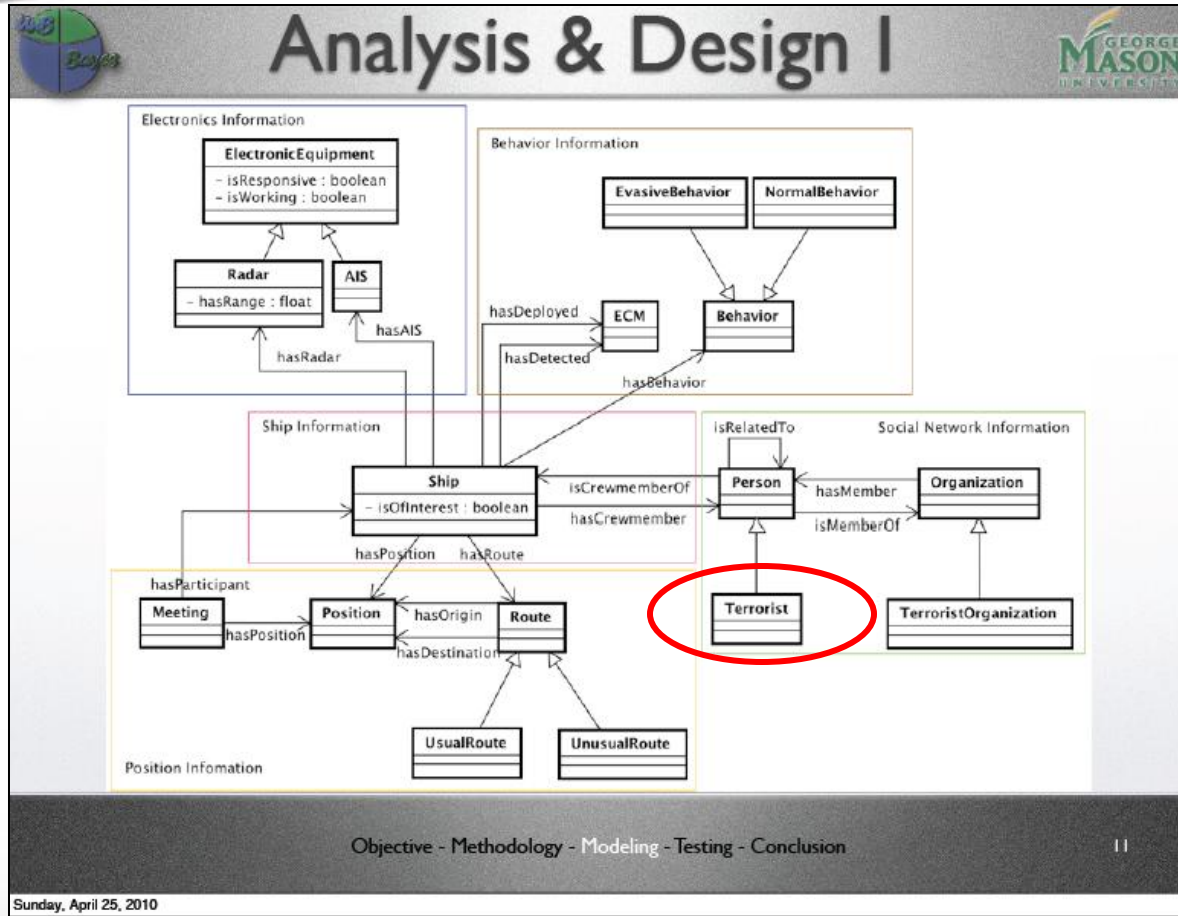
High-Level Fusion Architecture



Semantic Services Registry



Maritime Domain Awareness



Sunday, April 25, 2010

* From Carvalho – April 2010

Statement of the Problem

Minimize the likelihood that the transient and multinational nature of merchant vessel crewing can be leveraged as a means for international terrorist organizations to smuggle personnel and material into target countries

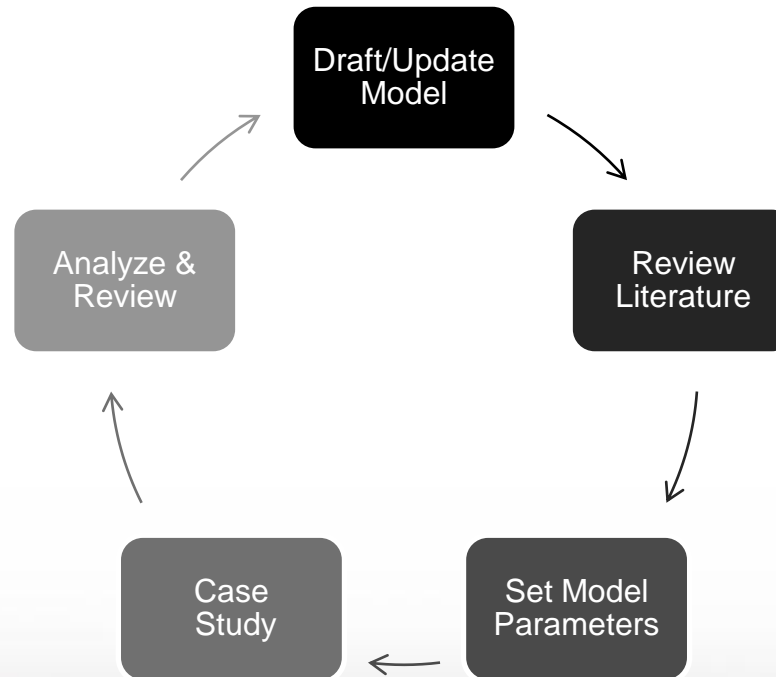
Develop a model to suggest an individual crewmember's terrorist affiliation given his close relations, group membership, communications, and background

PROFILING



Research

Iterative spiral of development Open-source data sparse



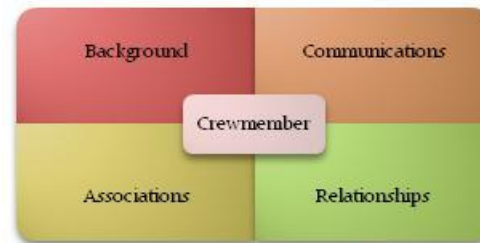
Three iterations

Literature Review

Yang, et. al.	Social network from weblog data
Coffman, et. al.	Social network via pattern analysis
Dombrosky, et. al.	Hierarchical Bayesian influence network
Arizona State University	Dark Web Project
Krebs	Terrorist network topology
Wagenhals, et. al.	Timed influence nets for population interaction
Moon, et. al.	Network evolution over time
Sageman	Psychology of Terrorists

Hypothesis

Given that terrorist organizations are persistently looking for new ways to deliver personnel and material into target countries, profiling personnel with opportunity to arrive in western ports under legitimate pretences presents prospects to identify these individuals prior to their arrival.

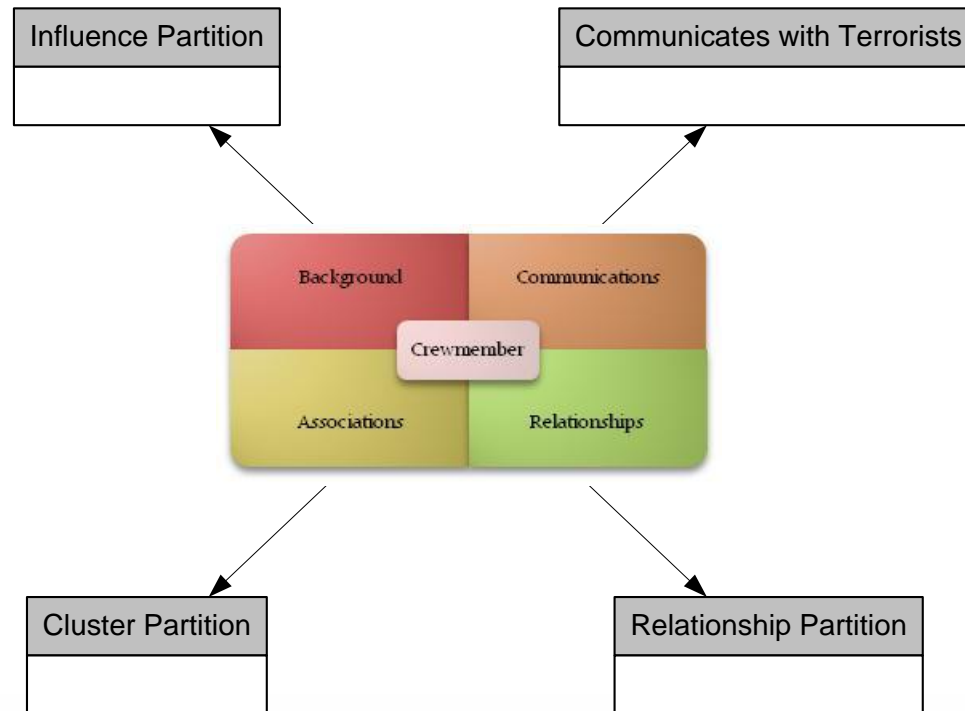


An individual crewmember's terrorist affiliation can be estimated given his close relations, group associations, communications, and background influences



Model

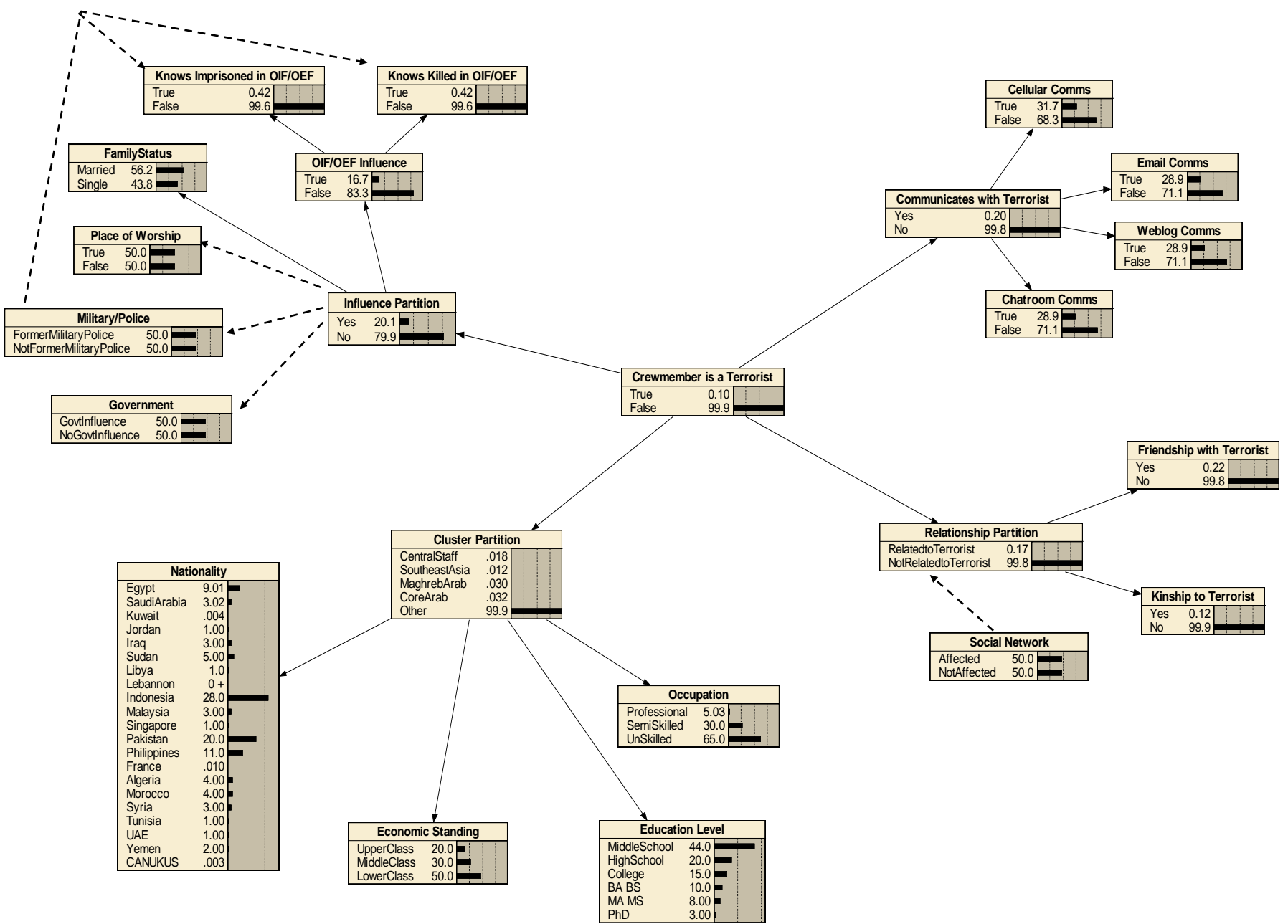
The Hydra Model

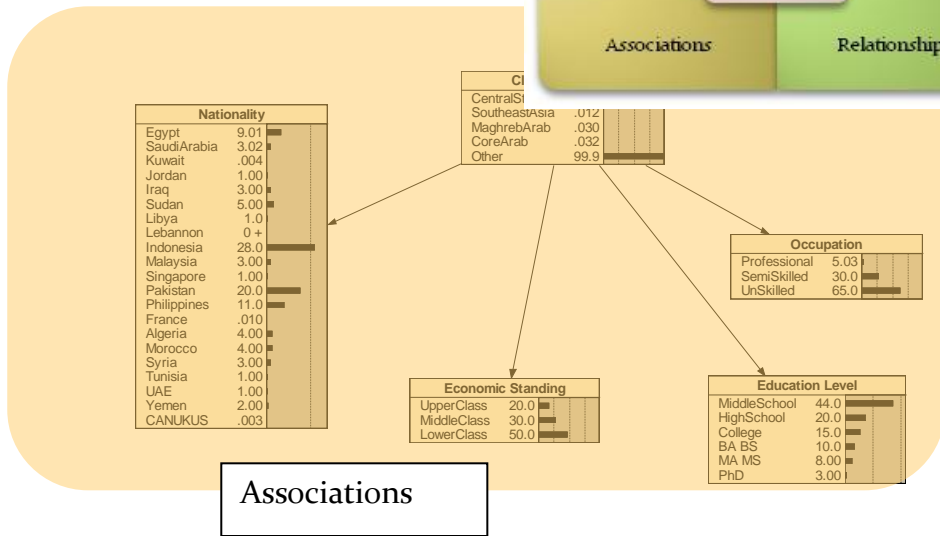
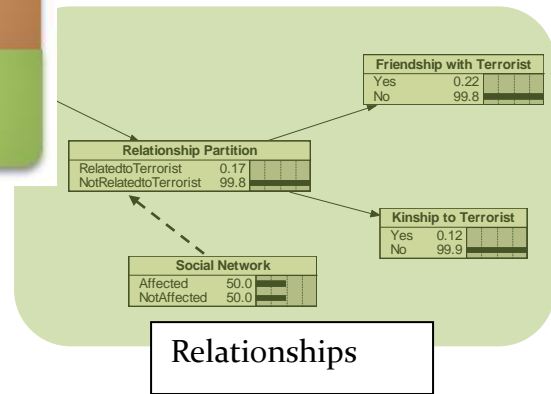
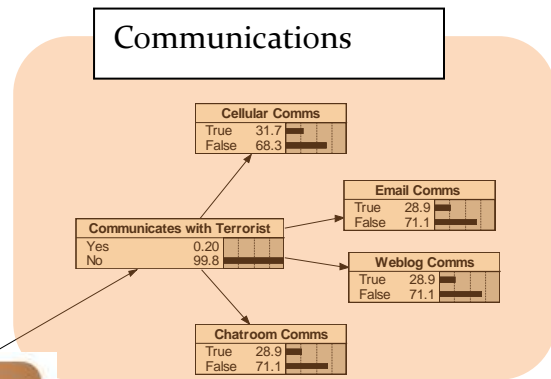
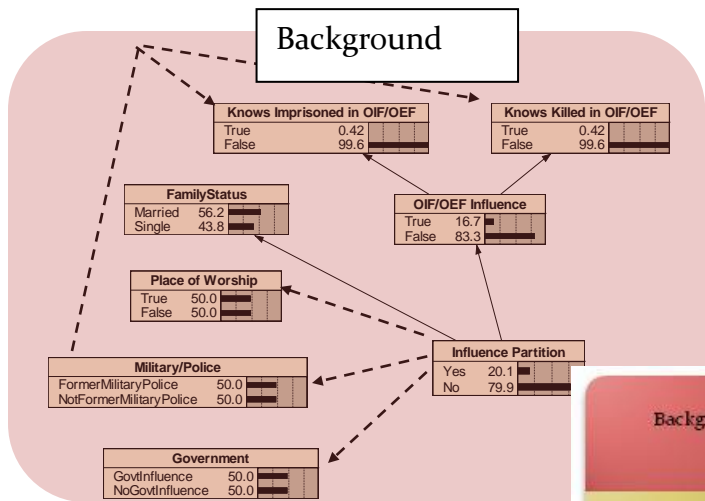


Assumptions

- Terrorists leave clues in their past
- Terrorist proportion in target demographic is 0.1%
- Terrorists communicate among themselves with certainty
- Inadvertent interaction with terrorists is possible
- Model area is Middle East, North Africa, Southeast Asia
- Terrorists fall into four major cluster organizations









Case Studies

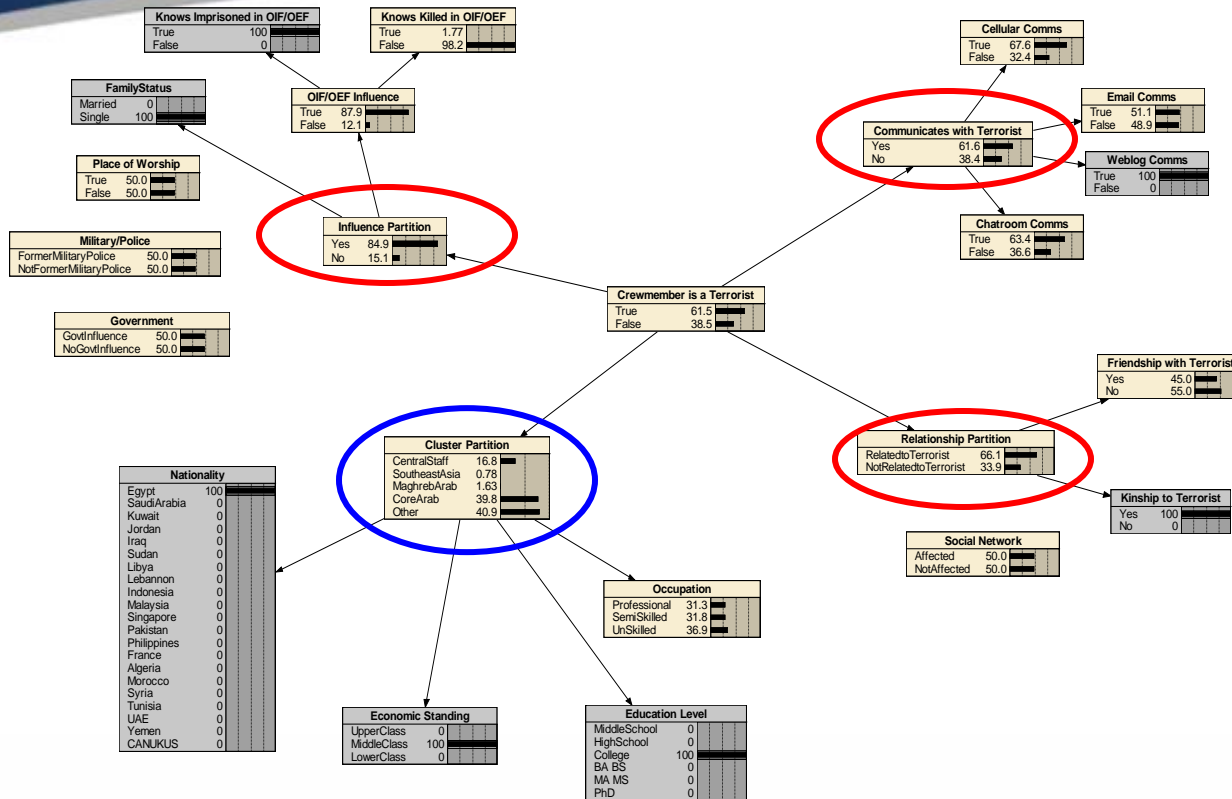
Case Studies

- I. The Egyptian
(Guilty – Obvious)

- II. The Indonesian
(Guilty – looks innocent)

- III. The Jordanian
(Innocent – looks guilty)

Study I: The Egyptian (Guilty – Obvious)



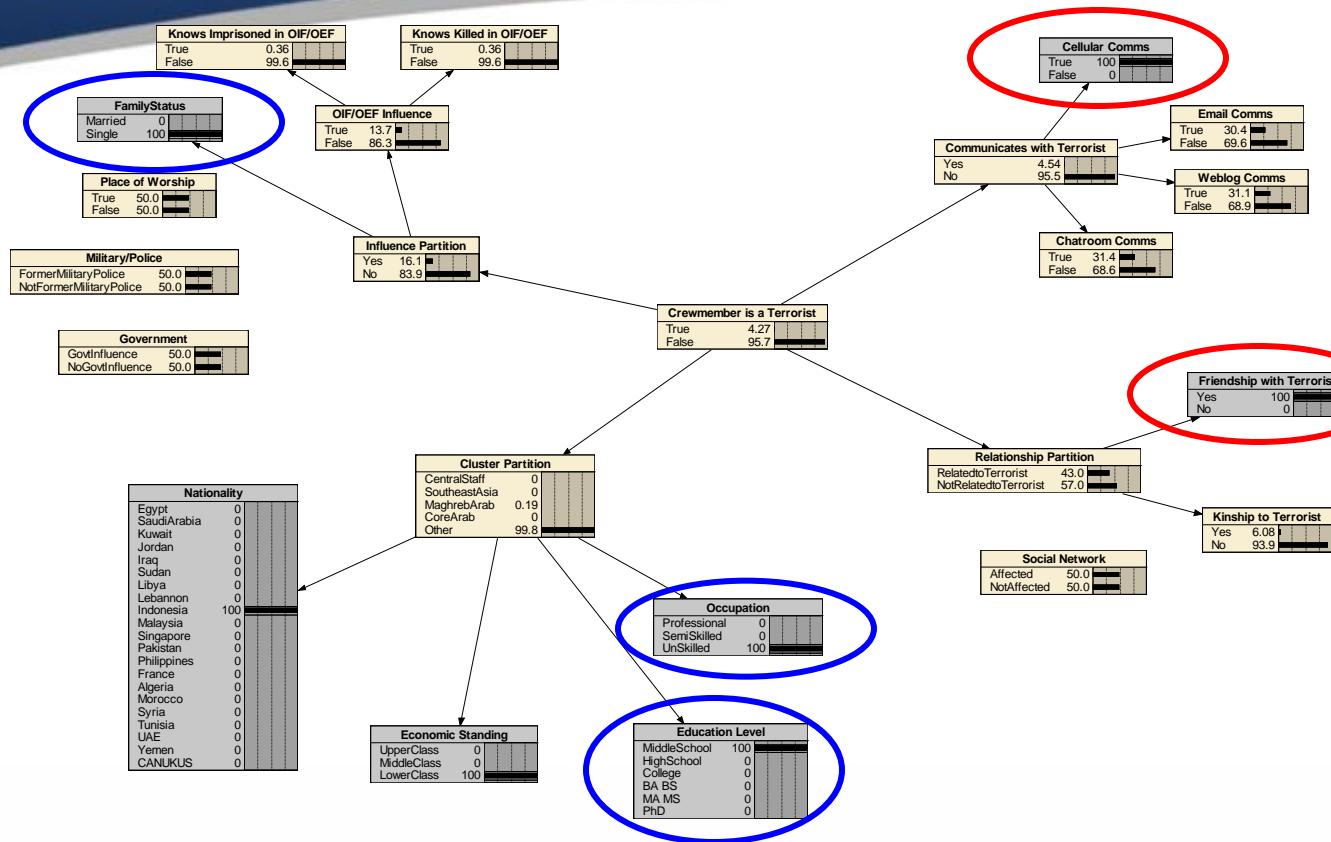
Parameters

- Student
- Middle class
- Egyptian
- Uncle terrorist
- Single
- Blog postings
- Colleagues detained

• Strong effects of influence, communications, and relationships

• Estimated to be associated with Core Arab clique

Study II: The Indonesian (*Guilty – looks innocent*)



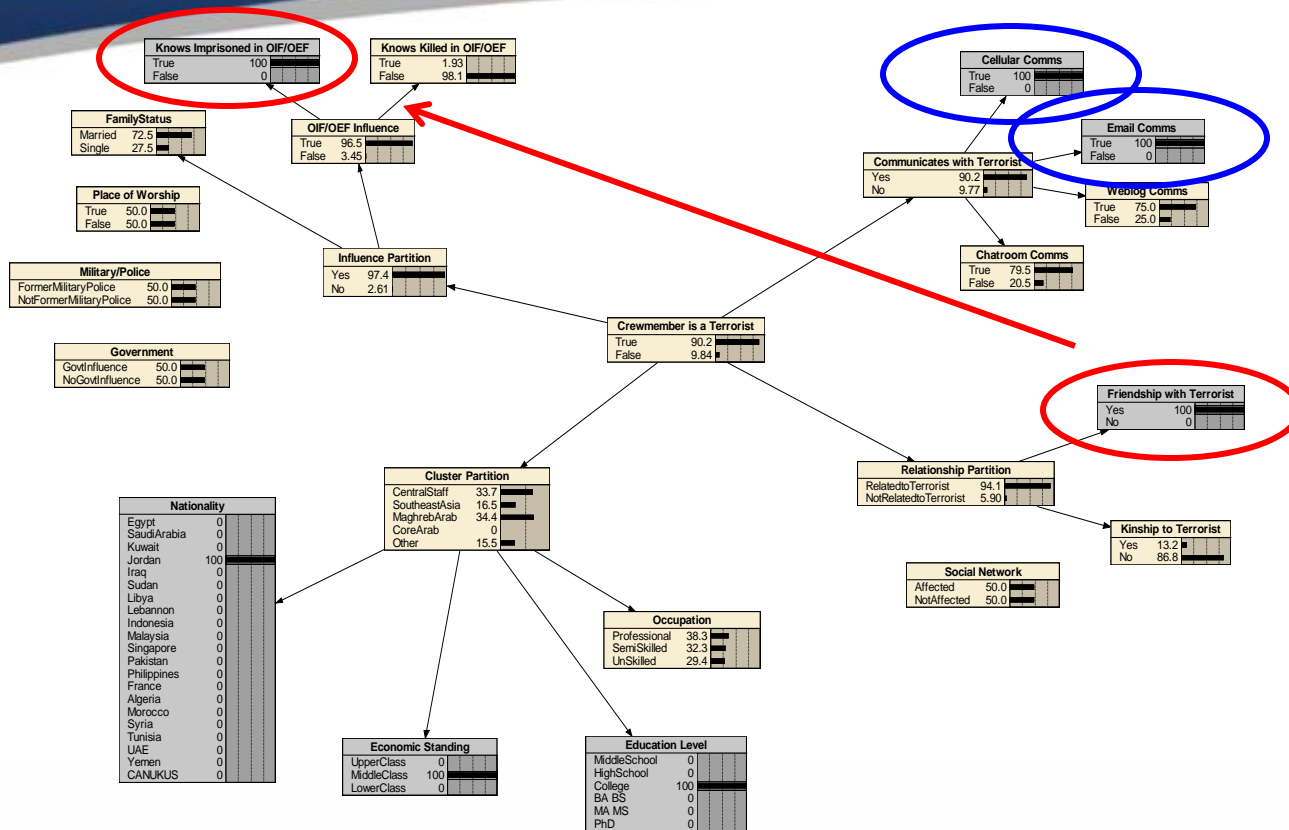
Parameters

- Indonesian
- Unmarried
- Unskilled
- Incomplete high schl.
- Roommate terror aff.
- Cell phone

⦿ Time latency of model cannot keep up with shifting alliances

⦿ Does not fit the terrorist “profile”

Study III: The Jordanian (Innocent – looks guilty)



Parameters

- Jordanian
- Middle class
- College student
- Friends detained
- Email & Cell
- Friends terrorists?

• Did he know his colleagues were involved?

• Do prior communications imply guilt?

Case Study Lessons

- I. The Egyptian: (*Guilty – Obvious*)
 - *Heavy reliance on communications*
 - *Name-based mistaken identity*

- II. The Indonesian: (*Guilty – looks innocent*)
 - *Profile on history*
 - *Cannot account for transition*

- III. The Jordanian: (*Innocent – looks guilty*)
 - *Relationships determine guilt*
 - *No feedback on friends' determination*



Conclusions

Further Research

- Classified sources of material
- General population terrorist statistics for target demographics
- Terrorists who attend an affiliated religious institution
- Former military or police affiliation effect on terrorist recruiting
- Former military or police affiliation on effects of OEF/OIF
- Vengeance in terrorist recruiting
- Government (perception of) effect on terrorist recruiting
- Social networking effect on terrorist recruiting
- Nuclear family effect on terrorist recruiting

Conclusions

- Good proof of concept
- Needs to be classified for real use
- Context specific research required



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