Remote WMD Capabilities Assessment
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Biological Weapons (BW)

Research Objectives

- Overarching Problem Addressed
  - Detect offensive WMD programs run by countries
  - Remote detection based primarily on open-source data
  - Early, low-cost detection

- Challenges in BW Area
  - Secrecy & dual-use nature of BW technology

- Approach in BW Area
  - Joint motivation & latent capabilities approach
  - Systematic analysis of all countries

Motivation Assessment

- Motivational Factors
  - BW more attractive to dissatisfied states
  - BW attractive as in-kind deterrent

- Computational Method: Social Influence Model
  - Equation: \( y(t) = A W y(t-1) + (A - A) y(t), t = 2,3, \ldots \)
  - \( y(t) \): countries’ motivation at time \( t \)
  - \( A \): states’ susceptibility to interstate influence
  - \( W \): interstate influence
  - \( y(0) \): Initial motivation

- Parameters
  - \( A \): Based on trade-to-GDP ratio (satisfaction measure)
  - \( W \): International hostilitys matrix
  - \( y(0) \): Whether states are suspected of having BW

Latent Capabilities Assessment

- Metrics
  - Number of BW papers
  - Trade volume of dual-use biological items
  - Pharmaceutical capability

Results

<table>
<thead>
<tr>
<th>Countries known or suspected to have offensive capability</th>
<th>Countries to watch for</th>
</tr>
</thead>
<tbody>
<tr>
<td>China, Egypt, Israel, N. Korea, Russia, Syria, Taiwan</td>
<td>India, Pakistan, Taiwan, Georgia, Sudan, Lebanon, Sudan</td>
</tr>
</tbody>
</table>

Nuclear Weapons

Expertise Identification & Tracking

- Methodology

- Results

- Joint Capabilities & Motivations

- Motivational Factors
  - Enemy has weapon \( \Rightarrow \) increased motivation
  - Ally has weapon \( \Rightarrow \) reassurance

- Capabilities based on research & trade

<table>
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<th>Countries with nuclear weapons</th>
<th>Countries to watch for</th>
</tr>
</thead>
<tbody>
<tr>
<td>US, France, Russia, China, India, UK, Israel, Pakistan, N. Korea</td>
<td>Taiwan, Slovakia</td>
</tr>
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Incremental Computation of Measures

- Motivating example
  - Above networks may be huge, and we want monitor their growth in real time – some measures too complex
  - Incremental computation overcomes complexity barrier

- Approach
  - On network update: e.g., Insert an edge
  - Change only affects part of the network

Case Study: Iran’s Nuclear Program

- Results
  - Very active nuclear program
  - No unequivocal evidence that Iran is weaponizing its nuclear program

Next Step: Cyber WMDs

- Mining Telemetry Dataset from Symantec
  - 1 billion antivirus submissions & 1 billion intrusion detection submissions

- Extracting amount of attacks detected in each country

- Extracting country attack network
  - Source country attribution difficult

- Cyber security papers 2001-2011

- Subject Matter Opinion