Automated Production of High-Volume, Near-Real-Time Political Event Data

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This project was funded by contracts from the Defense Advanced Research Projects Agency under the Integrated Crisis Early Warning System (ICEWS) program (Prime Contract #FA8650-07-C-7749: Lockheed-Martin Advanced Technology Laboratories) as well as grants from the National Science Foundation (SES-0096086, SES-0455158, SES-0527564, SES-1004414). The results and findings in no way represent the views of Lockheed-Martin, the Department of Defense, DARPA, or NSF The open source software discussed in this paper, as well data sets generated in earlier NSF-funded research, can be downloaded from the web site: http://eventdata.psu.edu/

What do these events have in common?

- 1941 Pearl Harbor attack
- 1950 Chinese intervention in Korea
- 1962 Cuban missile crisis
- 1973 Middle East War
- 1979 Iranian Revolution
- 1989 End of Soviet-supported regimes in Eastern Europe
- 1994 Rwanda genocide
- 1998 Indian nuclear tests
- 2001 Al-Qaeda attack on U.S.

Surprise!

Surprise!

- Strategic surprise: unexpected events with major consequences
- This despite the fact that people were supposed to be watching

Surprise!

- Strategic surprise: unexpected events with major consequences
- This despite the fact that people were supposed to be watching
  - $50-billion to $80-billion of watching

Protecting yourself from political surprise…

Some approaches…

Protecting yourself from political surprise…

Some approaches…

“The further you look back, the further you can see ahead”—Winston Churchill

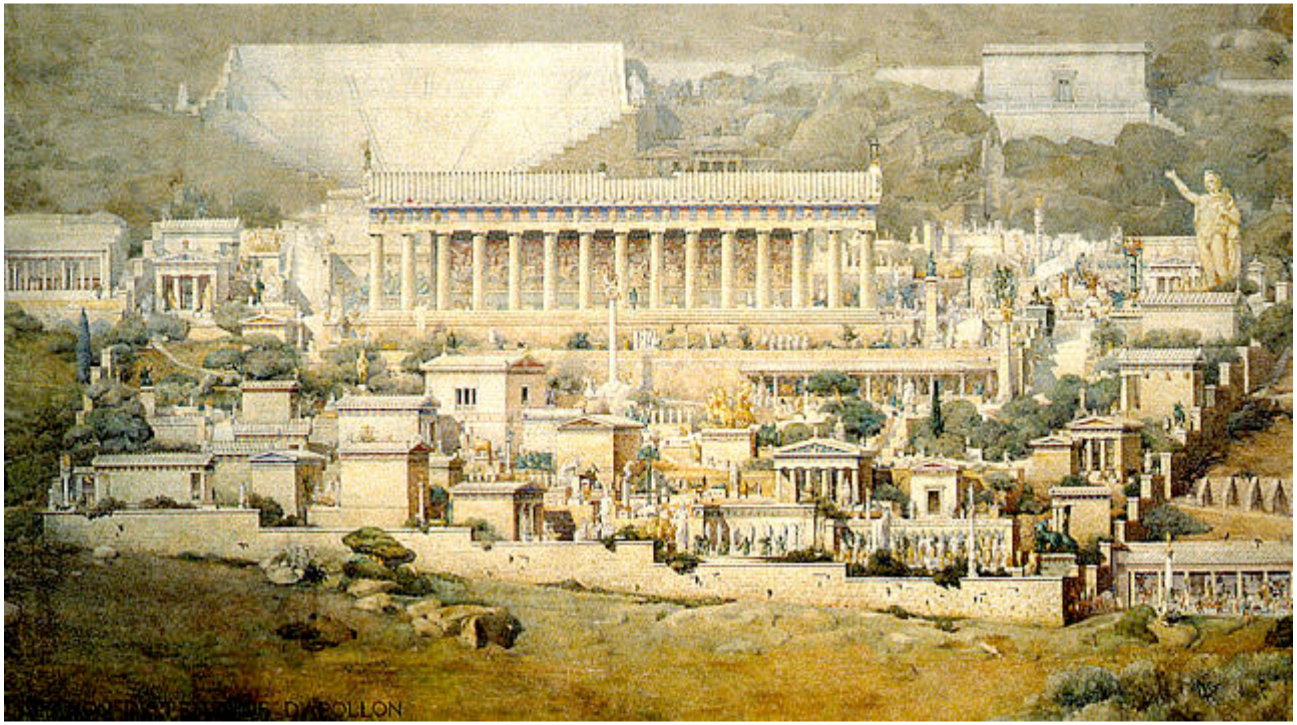
Early technical forecasting models

- Divination model of sheep liver
- Source: Babylonia, ca. 600 BC

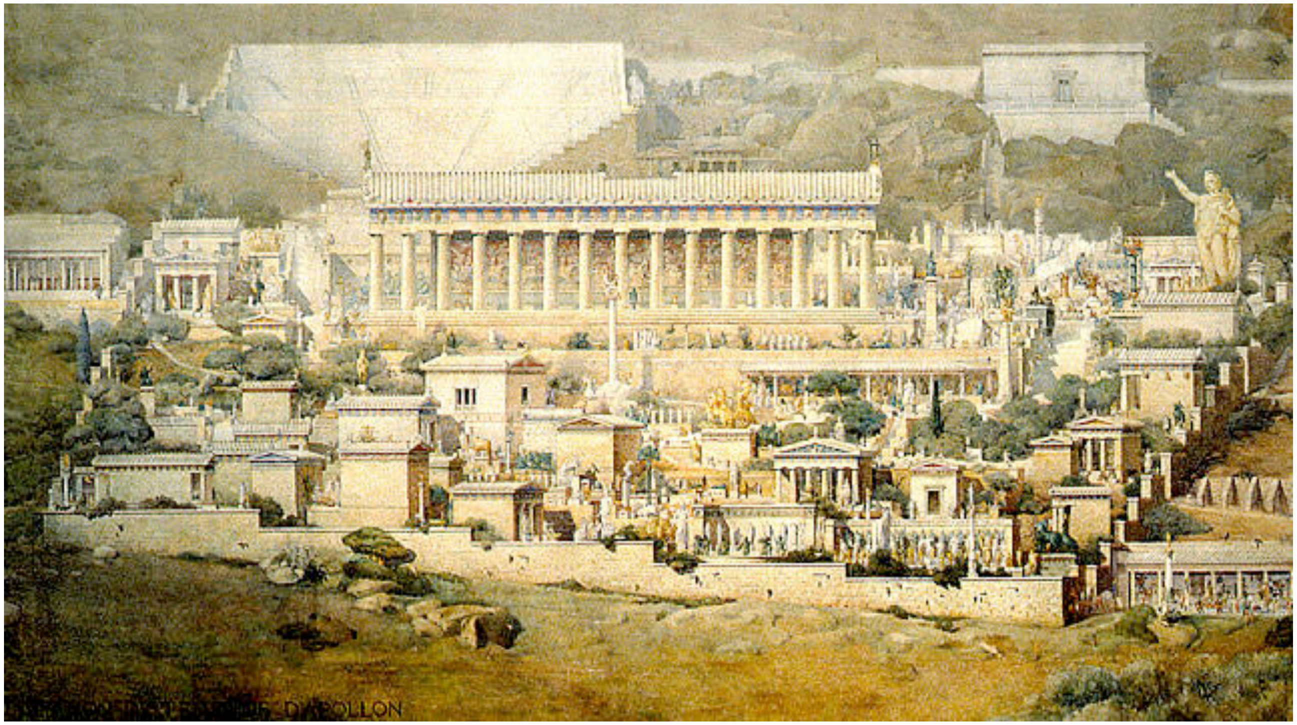
Early technical forecasting models

- Divination model of sheep liver
- Source: Babylonia, ca. 600 BC
- Persian conquest of Babylonia 539 BCE

Temple of Apollo at Delphi



Temple of Apollo at Delphi



Methodology:

- Inhale hallucinogenic vapors
- Make ambiguous predictions: “A mighty kingdom will fall”

Modern solution: the ubiquitous SME

“Subject matter expert”

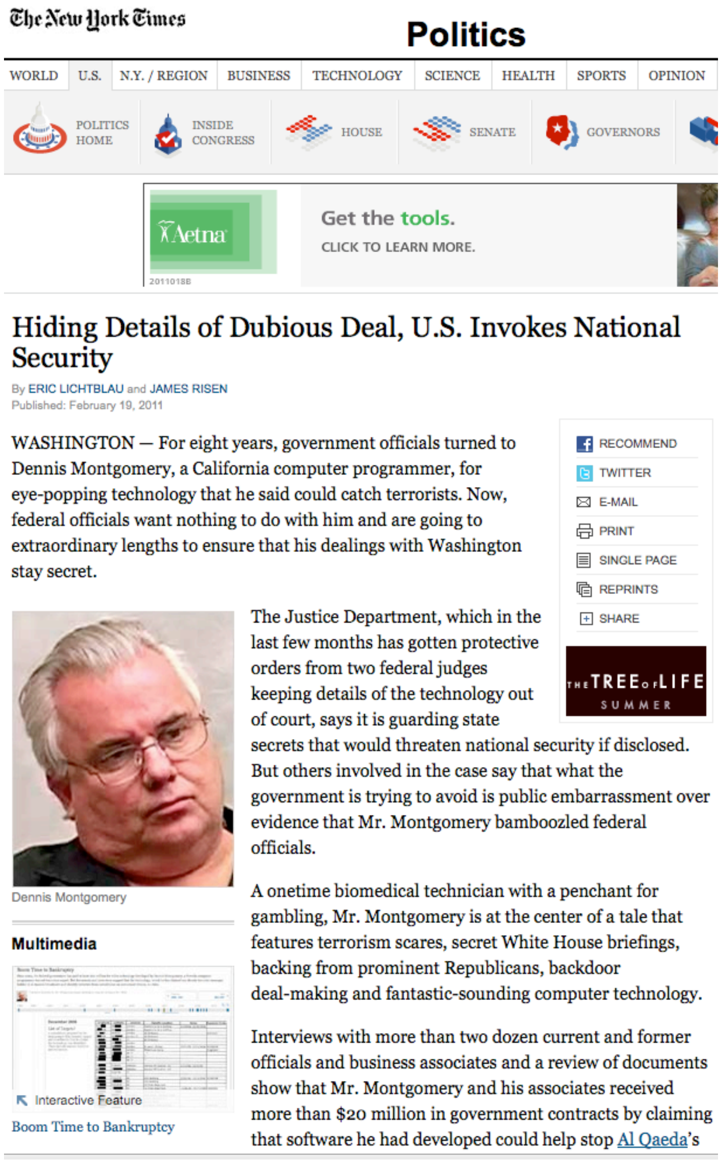
SMEs: Self-Perception

SMEs: Reality

Political Analysis Department
PUBLIC RELATIONS

BILL MAULDIN'S ARMY

SMEs: Real Reality



Hiding Details of Dubious Deal, U.S. Invokes National Security

By ERIC LICHTBLAU and JAMES RISEN
Published: February 19, 2011

WASHINGTON — For eight years, government officials turned to Dennis Montgomery, a California computer programmer, for eye-popping technology that he said could catch terrorists. Now, federal officials want nothing to do with him and are going to extraordinary lengths to ensure that his dealings with Washington stay secret.

Dennis Montgomery

The Justice Department, which in the last few months has gotten protective orders from two federal judges keeping details of the technology out of court, says it is guarding state secrets that would threaten national security if disclosed. But others involved in the case say that what the government is trying to avoid is public embarrassment over evidence that Mr. Montgomery bamboozled federal officials.

A onetime biomedical technician with a penchant for gambling, Mr. Montgomery is at the center of a tale that features terrorism scares, secret White House briefings, backing from prominent Republicans, backdoor deal-making and fantastic-sounding computer technology.

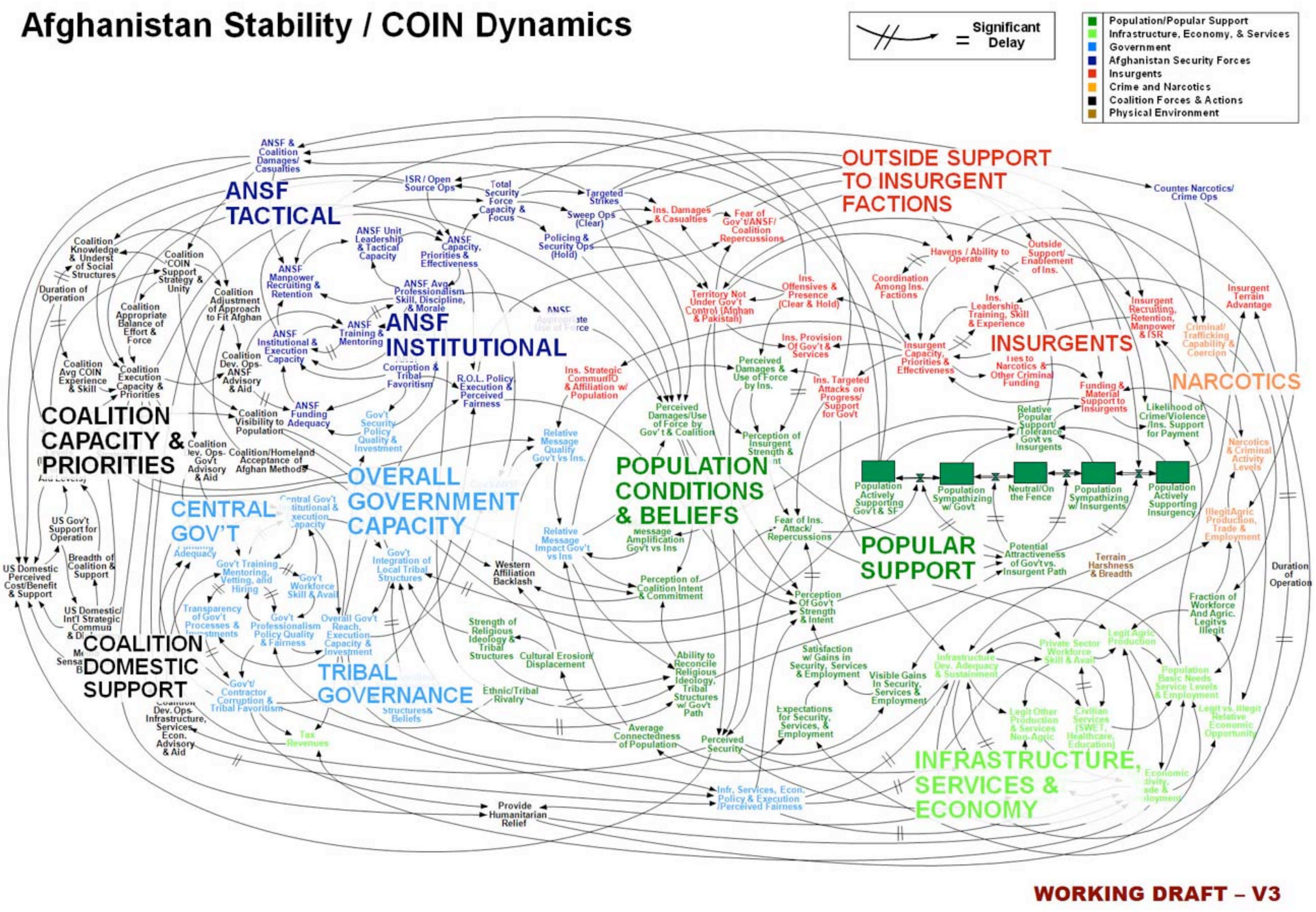
Interviews with more than two dozen current and former officials and business associates and a review of documents show that Mr. Montgomery and his associates received more than $20 million in government contracts by claiming that software he had developed could help stop Al Qaeda's

Multimedia

Interactive Feature

Boom Time to Bankruptcy

“McChrystal’s Hairball”


Afghanistan Stability / COIN Dynamics
= Significant Delay
🟩 Population/Popular Support
🟩 Infrastructure, Economy, & Services
🟦 Government
🟦 Afghanistan Security Forces
🟥 Insurgents
🟧 Crime and Narcotics
⬛ Coalition Forces & Actions
🟫 Physical Environment
ANSF & Coalition Damages/ Casualties
ANSF TACTICAL
ISR / Open Source Ops
Total Security Force Capacity & Focus
Targeted Strikes
Sweep Ops (Clear)
Policing & Security Ops (Hold)
Ins. Damages & Casualties
Fear of Gov't/ANSF/ Coalition Repercussions
OUTSIDE SUPPORT TO INSURGENT FACTIONS
Counter Narcotics/ Crime Ops
Coalition Knowledge & Underst of Social Structures
Coalition COIN Support Strategy & Unity
Duration of Operation
Coalition Adjustment of Approach to Fit Afghan
Coalition Appropriate Balance of Effort & Force
ANSF Unit Leadership & Tactical Capacity
ANSF Capacity, Priorities & Effectiveness
ANSF Manpower Recruiting & Retention
ANSF Avg Professionalism, Skill, Discipline, & Morale
ANSF Appropriate Use of Force
ANSF Training & Mentoring
ANSF INSTITUTIONAL
ANSF Institutional & Execution Capacity
Coalition Dev. Ops- ANSF Advisory & Aid
Coalition Avg COIN Experience & Skill
Coalition Execution Capacity & Priorities
ANSF Funding Adequacy
Corruption & Tribal Favoritism
R.O.L. Policy Execution & Perceived Fairness
Territory Not Under Gov't Control (Afghan & Pakistan)
Ins. Offensives & Presence (Clear & Hold)
Havens / Ability to Operate
Outside Support/ Enablement of Ins.
Coordination Among Ins. Factions
Ins. Leadership, Training, Skill & Experience
Insurgent Recruiting, Retention, Manpower & ISR
Insurgent Terrain Advantage
Criminal/ Trafficking Capability & Coercion
INSURGENTS
Insurgent Capacity, Priorities & Effectiveness
Ties to Narcotics & Other Criminal Funding
Funding & Material Support to Insurgents
NARCOTICS
Ins. Provision Of Gov't & Services
Perceived Damages & Use of Force by Ins.
Ins. Strategic CommunIO & Affiliation w/ Population
Ins. Targeted Attacks on Progress/ Support for Govt
COALITION CAPACITY & PRIORITIES
Coalition Visibility to Population
Coalition Dev. Ops- Gov't Advisory & Aid
Coalition/Homeland Acceptance of Afghan Methods
Gov't Security Policy Quality & Investment
Relative Message Quality Gov't vs Ins.
Perceived Damages/Use of Force by Gov't & Coalition
Perception of Insurgent Strength & Intent
Relative Popular Support/ Tolerance Gov't vs Insurgents
Likelihood of Crime/Violence /Ins. Support for Payment
Narcotics & Criminal Activity Levels
OVERALL GOVERNMENT CAPACITY
POPULATION CONDITIONS & BELIEFS
Population Actively Supporting Gov't & SF
Population Sympathizing w/ Govt
Neutral/On the Fence
Population Sympathizing w/ Insurgents
Population Actively Supporting Insurgency
CENTRAL GOV'T
Central Gov't Institutional & Execution Capacity
Adequacy
Relative Message Impact Gov't vs Ins
Message Amplification Gov't vs Ins
Fear of Ins. Attack/ Repercussions
POPULAR SUPPORT
Potential Attractiveness of Gov't vs. Insurgent Path
Terrain Harshness & Breadth
IllegitAgric Production, Trade & Employment
US Gov't Support for Operation
US Domestic Perceived Cost/Benefit & Support
Breadth of Coalition & Support
Gov't Training, Mentoring, Vetting, and Hiring
Gov't Workforce Skill & Avail
Gov't Integration of Local Tribal Structures
Western Affiliation Backlash
Perception of Coalition Intent & Commitment
Perception Of Gov't Strength & Intent
Duration of Operation
US Domestic/ Int'l Strategic Commun
Transparency of Gov't Processes & Investments
Gov't Professionalism Policy Quality & Fairness
Overall Gov't Reach, Execution Capacity & Investment
Strength of Religious Ideology & Tribal Structures
Cultural Erosion/ Displacement
Satisfaction w/ Gains in Security, Services & Employment
Fraction of Workforce And Agric. Legit vs Illegit
COALITION DOMESTIC SUPPORT
TRIBAL GOVERNANCE
Gov't/ Contractor Corruption & Tribal Favoritism
Ethnic/Tribal Rivalry
Ability to Reconcile Religious Ideology, Tribal Structures w/ Gov't Path
Visible Gains In Security, Services & Employment
Infrastructure Dev. Adequacy & Sustainment
Private Sector Workforce Skill & Avail
Legit Agric Production
Population Basic Needs Service Levels & Employment
Coalition Dev. Ops- Infrastructure, Services Econ. Advisory & Aid
Tax Revenues
Structures & Beliefs
Average Connectedness of Population
Perceived Security
Expectations for Security, Services, & Employment
Legit Other Production & Services Non-Agric
Civilian Services (SWET, Healthcare, Education)
Legit vs. Illegit Relative Economic Opportunity
INFRASTRUCTURE, SERVICES & ECONOMY
Economic Activity, Trade & Employment
Infr, Services, Econ. Policy & Execution /Perceived Fairness
Provide Humanitarian Relief
WORKING DRAFT – V3

Problems with SMEs

- Like diamonds, expensive and rare
- Affected by fatigue and boredom, cognitive dissonance and consulting fees
  - "You want it real bad, you're gonna get it real bad…"
  - Usually (not always) considerably more entertaining and articulate than computer models
- SMEs with native language and cultural expertise may have axes to grind…
  - See N. Machiavelli, 1513 on trusting exiles
- Accuracy is only slightly better than chance on hard problems
  - The more visible the SME, the less accurate the record

Technical forecasting as the alternative

Mix in proper proportions

- Political science theory
- Data
- Statistical Models
- Computing power

Result: models accurate in the 75% - 85% range

Cantor-Fitzgerald forecasting algorithms

Cantor-Fitzgerald forecasting algorithms

+

All the sports data Cantor-Fitzgerald can afford

(all the sports data that exists)

Cantor-Fitzgerald forecasting algorithms

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(all the sports data that exists)

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All the computing power Cantor-Fitzgerald can afford

(a lot of computing power)

Cantor-Fitzgerald forecasting algorithms

+

All the sports data Cantor-Fitzgerald can afford

(all the sports data that exists)

+

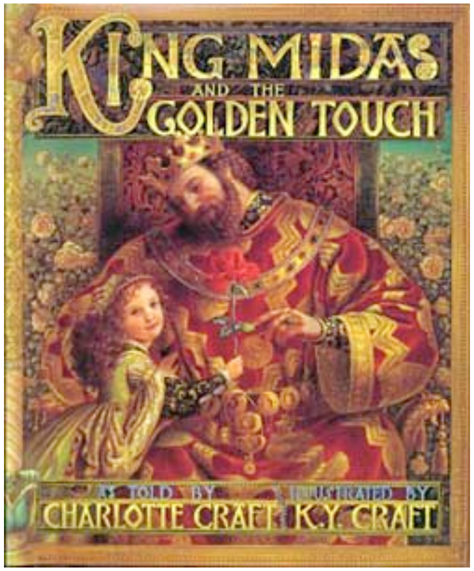
All the computing power Cantor-Fitzgerald can afford

(a lot of computing power)

A sports betting system

Bling!

Cantor-Fitzgerald MIDAS System



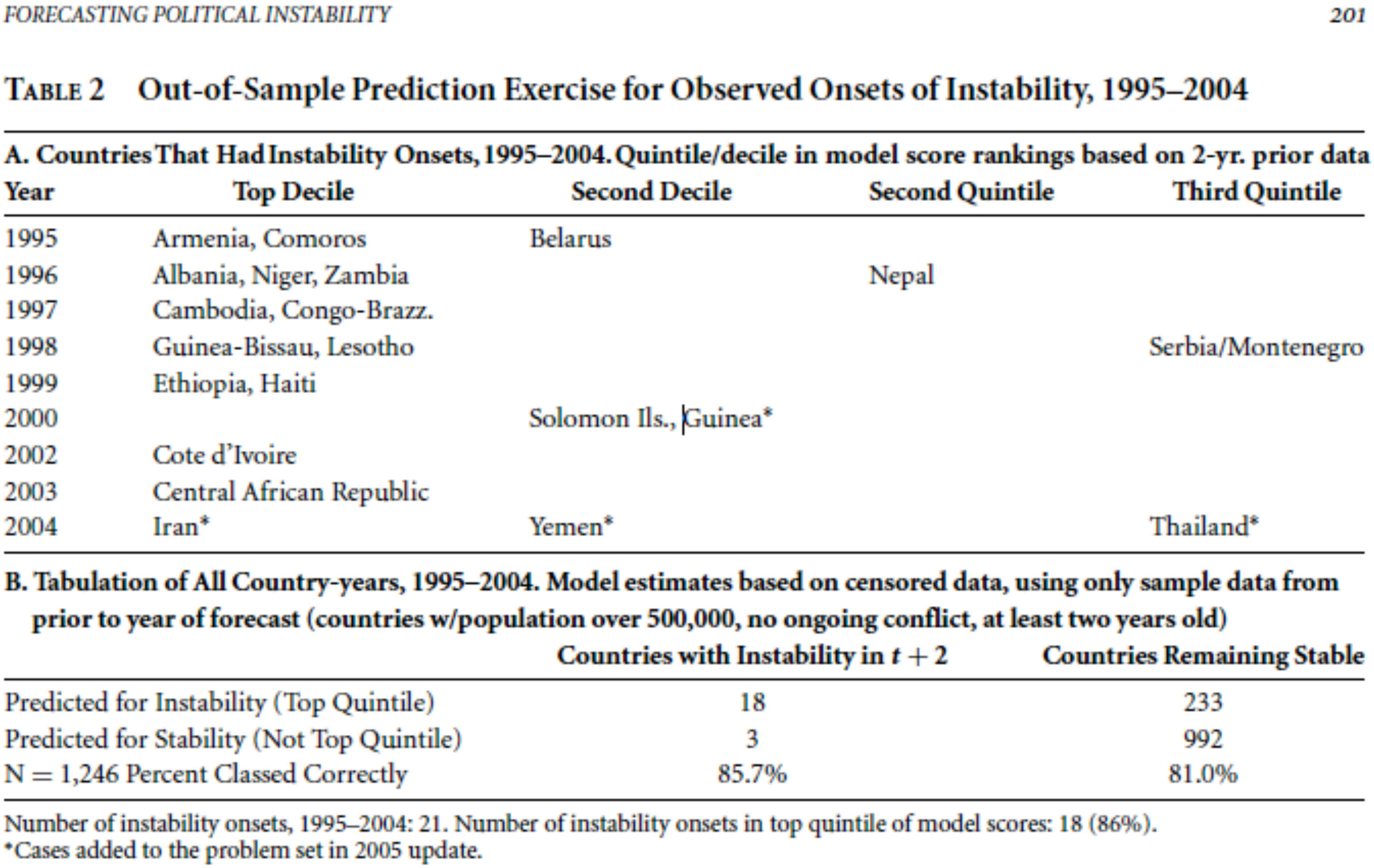
Integrated Conflict Early Warning System

- Funded by DARPA Information Processing Techniques Office [unclassified]
- Funding at $40-million for 2007-2011
  - Largest quantitative conflict analysis project since the 1970s
- Objective is real-time forecasting of indicators of political instability in Asia with 6-24 month leads, 70%-80% accuracy
- Machine-coded event data has developed as the core methodology
  - Data covers 1997-present with 8.5-million stories from 27 sources

Political Instability Task Force

- Multi-agency, including State, Census, DoD, but primarily CIA [unclassified]
- Initially established in 1995 as "State Failures Project" in response to former Yugoslavia, Somalia and Rwanda
- Global forecasting of state failure, democratic-authoritarian transitions, mass killings and other indicators at 6-24 month leads, models have demonstrated 70%-80% accuracy
- Funds a number of major data collection efforts
- Other participating academic institutions include Harvard, Stanford, Columbia, Michigan, George Mason

Political Instability Task Force (AJPS 2010)



FORECASTING POLITICAL INSTABILITY **201**

TABLE 2 Out-of-Sample Prediction Exercise for Observed Onsets of Instability, 1995–2004

A. Countries That Had Instability Onsets, 1995–2004. Quintile/decile in model score rankings based on 2-yr. prior data

Year	Top Decile	Second Decile	Second Quintile	Third Quintile
1995	Armenia, Comoros	Belarus		
1996	Albania, Niger, Zambia		Nepal	
1997	Cambodia, Congo-Brazz.			
1998	Guinea-Bissau, Lesotho			Serbia/Montenegro
1999	Ethiopia, Haiti			
2000		Solomon Ils., Guinea*		
2002	Cote d'Ivoire			
2003	Central African Republic			
2004	Iran*	Yemen*		Thailand*

B. Tabulation of All Country-years, 1995–2004. Model estimates based on censored data, using only sample data from prior to year of forecast (countries w/population over 500,000, no ongoing conflict, at least two years old)

	Countries with Instability in $t + 2$	Countries Remaining Stable
Predicted for Instability (Top Quintile)	18	233
Predicted for Stability (Not Top Quintile)	3	992
N = 1,246 Percent Classed Correctly	85.7%	81.0%

Number of instability onsets, 1995–2004: 21. Number of instability onsets in top quintile of model scores: 18 (86%).

*Cases added to the problem set in 2005 update.

Example: 18 December 2007

BAGHDAD — Iraqi leaders criticized Turkey on Monday for bombing Kurdish militants in northern Iraq with airstrikes that they said had left at least one woman dead.

The Turkish attacks in Dohuk Province on Sunday — involving dozens of warplanes and artillery — were the largest known cross-border attack since 2003. They occurred with at least tacit approval from American officials. The Iraqi government, however, said it had not been consulted or informed about the attacks.

Massoud Barzani, leader of the autonomous Kurdish region in the north, condemned the assaults as a violation of Iraqi sovereignty that had undermined months of diplomacy. "These attacks hinder the political efforts exerted to find a peaceful solution based on mutual respect."

New York Times, 18 December 2007

http://www.nytimes.com/2007/12/18/world/middleeast/18iraq.html?_r=1&ref=world&oref=slogin (Accessed 18 December 2007)

TABARI Coding

BAGHDAD — Iraqi leaders criticized Turkey on Monday for bombing Kurdish militants in northern Iraq with airstrikes that they said had left at least one woman dead.

TABARI Coding: Verb

BAGHDAD — Iraqi leaders criticized Turkey on Monday for bombing Kurdish militants in northern Iraq with airstrikes that they said had left at least one woman dead.

Event Code: 111

TABARI Coding: Actors

BAGHDAD — Iraqi leaders criticized Turkey on Monday for bombing Kurdish militants in northern Iraq with airstrikes that they said had left at least one woman dead.

Event Code: 111

Source: IRQ

Target: TUR

TABARI Coding: Agents

BAGHDAD — Iraqi leaders criticized Turkey on Monday for bombing Kurdish militants in northern Iraq with airstrikes that they said had left at least one woman dead.

Event Code: 111

Source: IRQ GOV

Target: TUR

TABARI Coding: Verb [2]

BAGHDAD — Iraqi leaders criticized Turkey on Monday for bombing Kurdish militants in northern Iraq with airstrikes that they said had left at least one woman dead.

Event Code: 111

Source: IRQ GOV

Target: TUR

Event Code: 223

TABARI Coding: Actors [2]

BAGHDAD — Iraqi leaders criticized Turkey on Monday for bombing Kurdish militants in northern Iraq with airstrikes that they said had left at least one woman dead.

Event Code: 111

Source: IRQ GOV

Target: TUR

Event Code: 223

Source: TUR

Target: IRQKRD

TABARI Coding: Agents [2]

BAGHDAD — Iraqi leaders criticized Turkey on Monday for bombing Kurdish militants in northern Iraq with airstrikes that they said had left at least one woman dead.

Event Code: 111

Source: IRQ GOV

Target: TUR

Event Code: 223

Source: TUR

Target: IRQKRD REB

Event Model: Core Innovation

- Once calibrated, real-time event forecasting models can be run ***entirely*** without human intervention
  - – Web-based news feeds provide a rich multi-source flow of political information in real time
  - – Statistical models can be run and tested automatically, and are 100% transparent
- In other words, for the first time in human history—quite literally—we have a system that can provide real-time measures of political activity without any human intermediaries

Event Data in the [original] DARPA period

- Nation-state orientation; most analysis dealt with Cold War major power relations
- Global coverage
- Human coding
- Source texts were major Western newspapers
- Statistical models were relatively simple

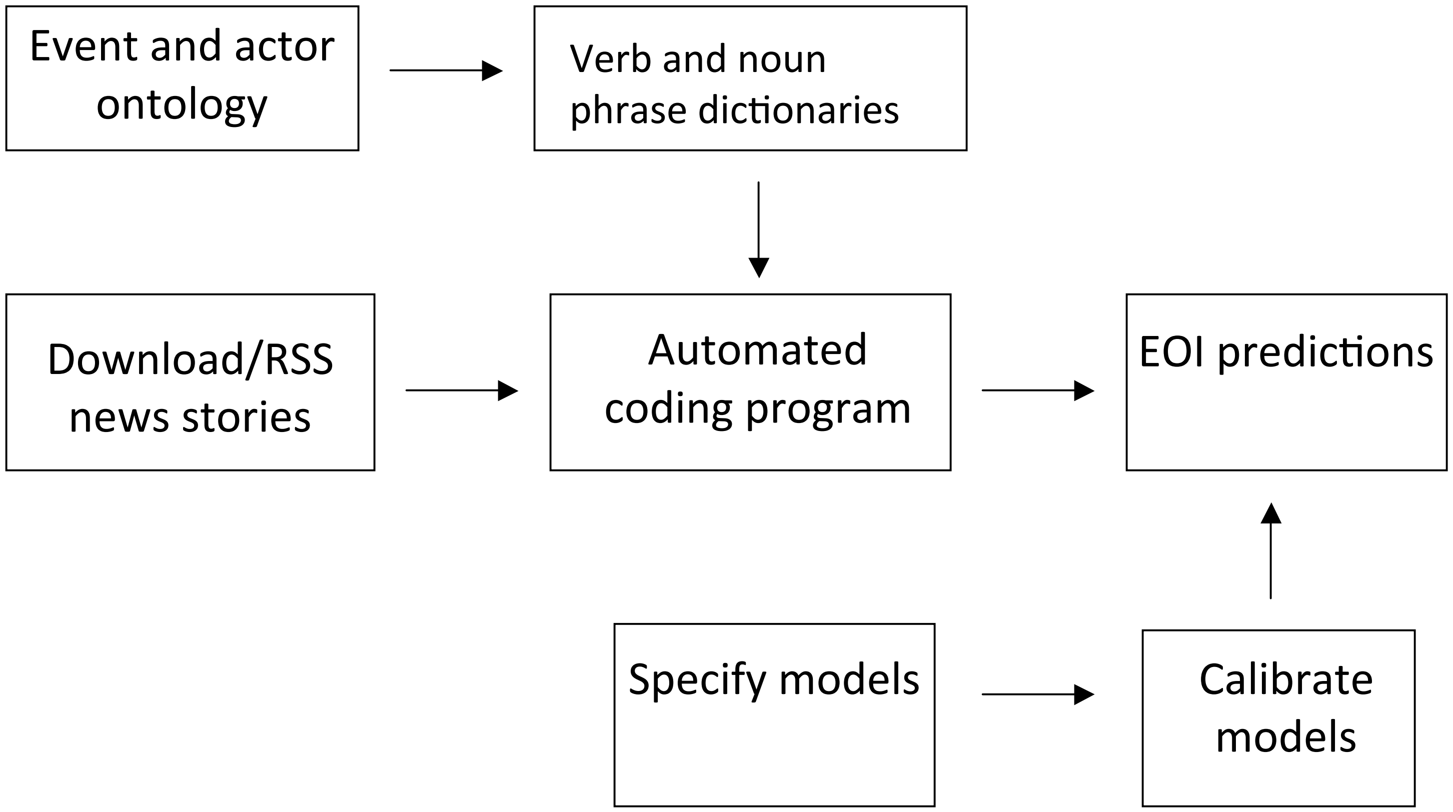
Contemporary Event Data

- Substate and nonstate actors; most analysis deals with protracted conflicts
- Single-conflict and regional coverage
- Automated coding
- Source texts are from wire services (Reuters, AFP)
- Statistical models are very complex

ICEWS Event Data

- 30-gigabytes of text from Lexis-Nexis
- 25 sources
- 8-million stories
- 26-million sentences
  - Only first four sentences coded in each story
- 3-million events
- Generally two orders of magnitude greater than any prior event coding effort

Event Data Generation Process



Event and actor ontology

Verb and noun phrase dictionaries

Download/RSS news stories

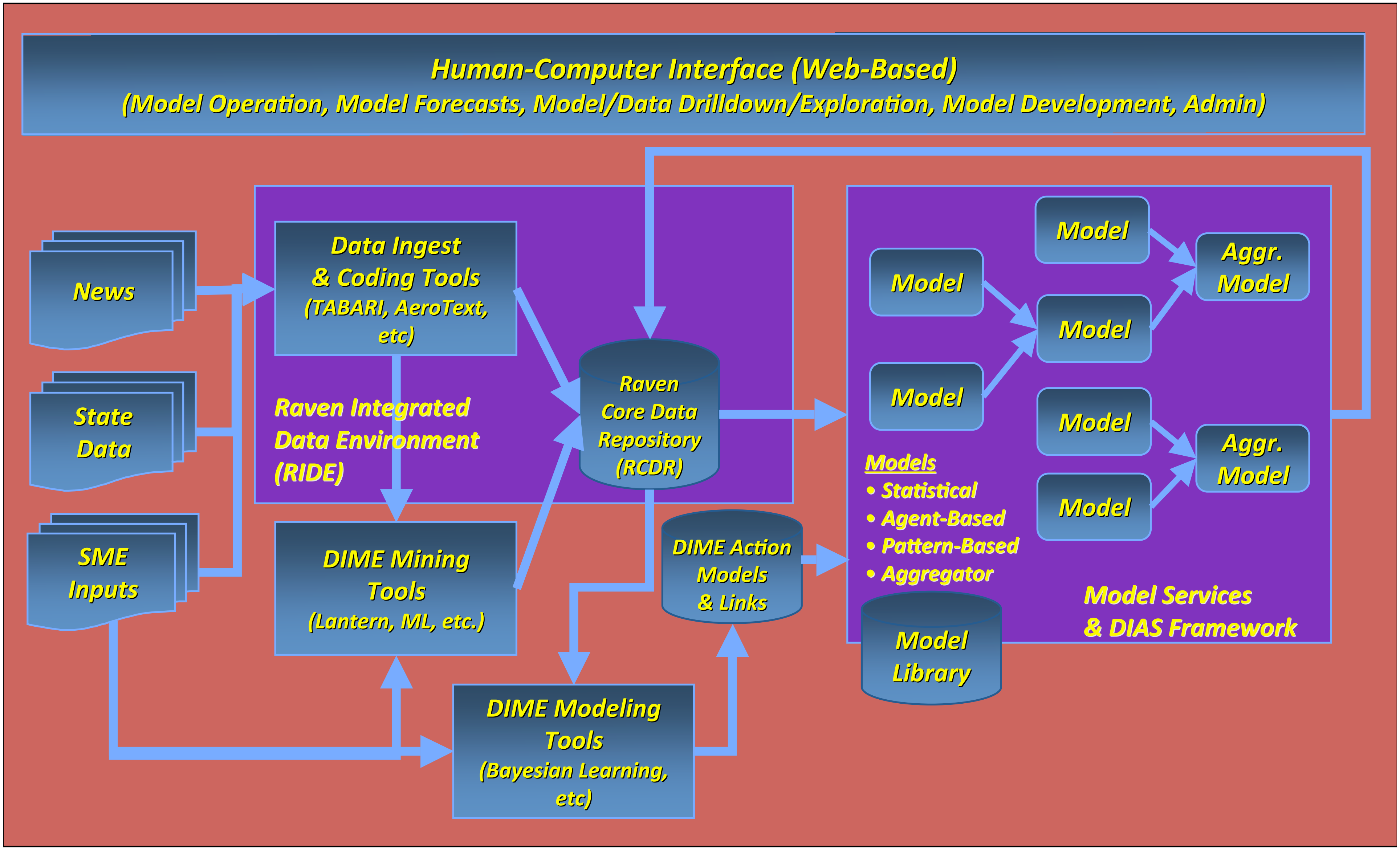
Automated coding program

EOI predictions

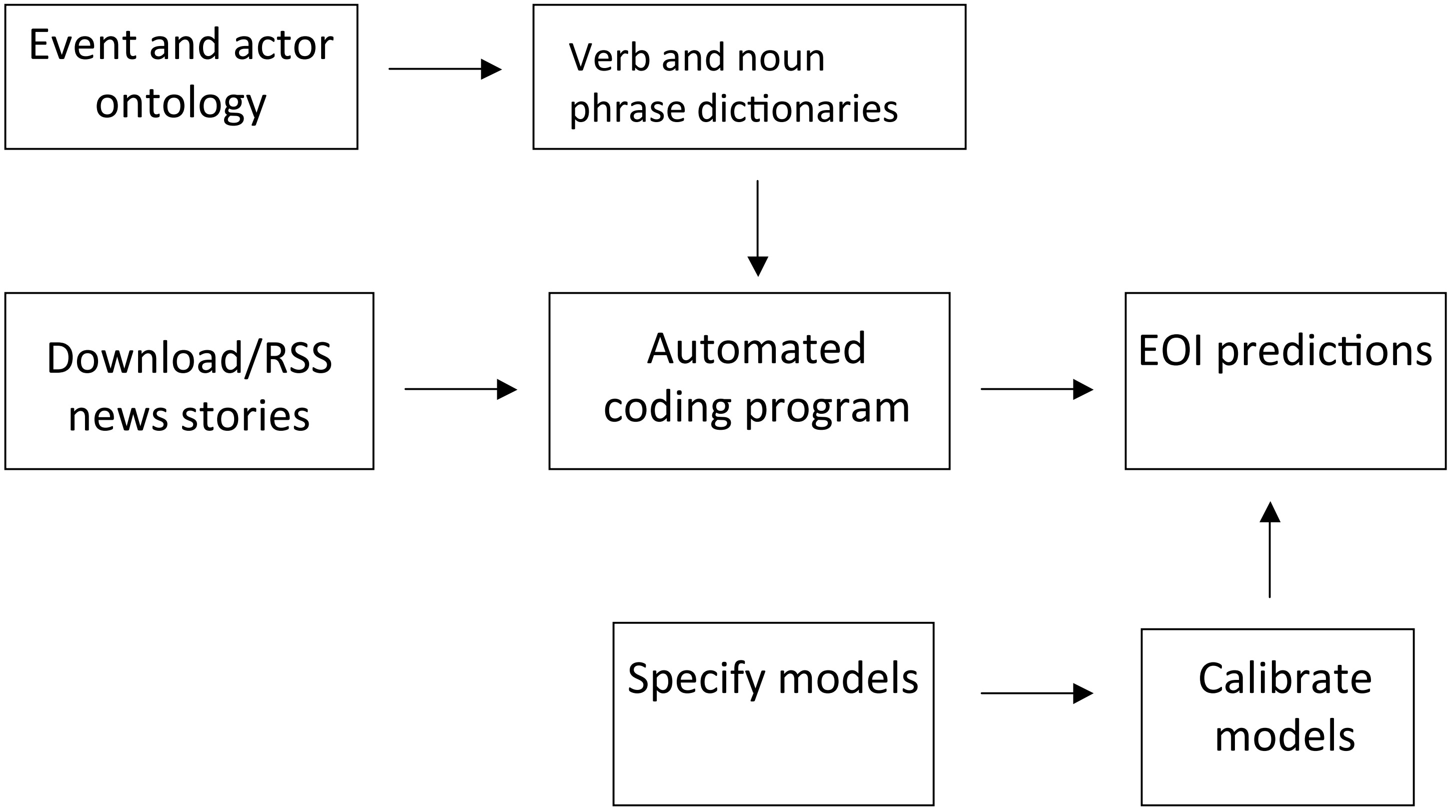
Specify models

Calibrate models

Raven Phase 2 Functional View


Human-Computer Interface (Web-Based)
(Model Operation, Model Forecasts, Model/Data Drilldown/Exploration, Model Development, Admin)
News
State Data
SME Inputs
Data Ingest & Coding Tools (TABARI, AeroText, etc)
Raven Integrated Data Environment (RIDE)
Raven Core Data Repository (RCDR)
DIME Mining Tools (Lantern, ML, etc.)
DIME Action Models & Links
DIME Modeling Tools (Bayesian Learning, etc)
Model
Model
Model
Model
Model
Model
Aggr. Model
Aggr. Model
Models
• Statistical
• Agent-Based
• Pattern-Based
• Aggregator
Model Library
Model Services & DIAS Framework

Event Data Generation Process



ICEWS “Events of Interest”

Domestic Political Crisis—Significant opposition to the government, but not to the level of rebellion or insurgency (for example, power struggle between two political factions involving disruptive strikes or violent clashes between supporters)

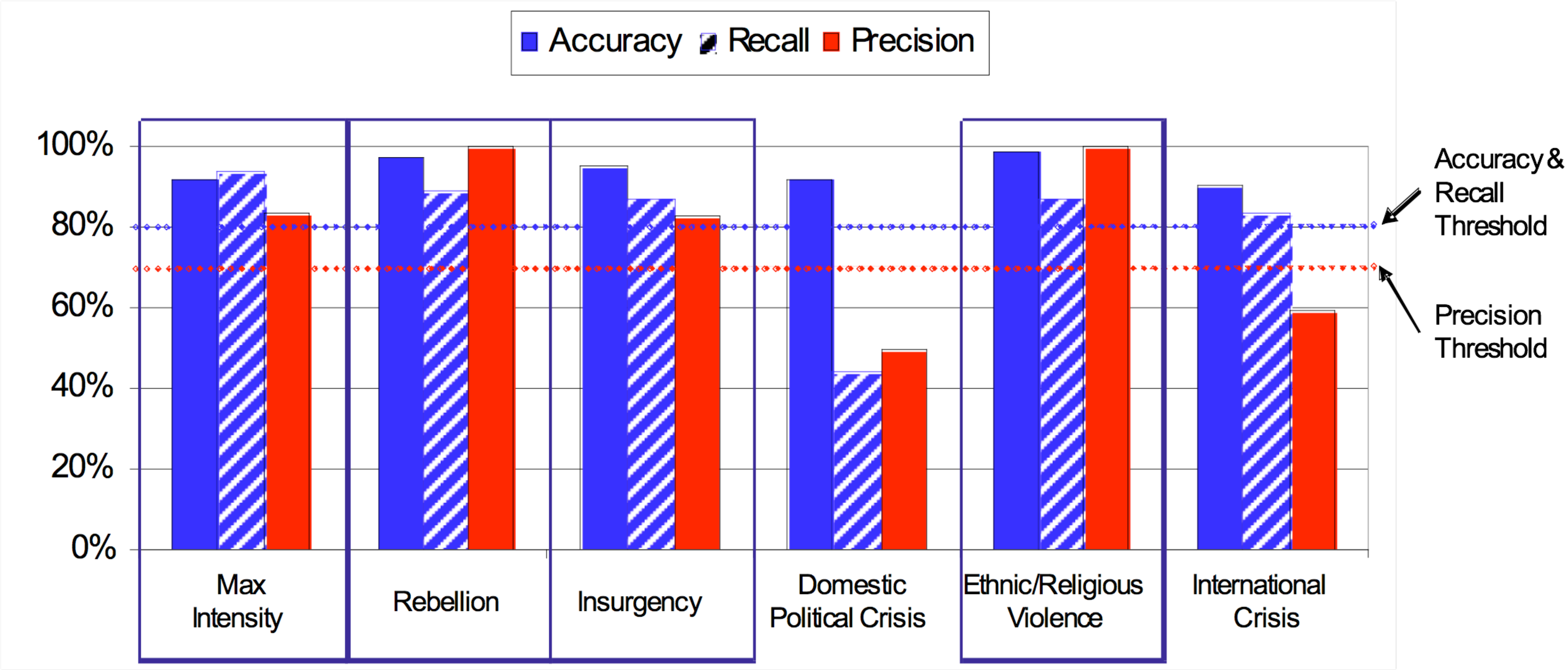
Rebellion—Organized opposition where the objective is to seek autonomy or independence

Insurgency—Organized opposition where the objective is to overthrow the central government

Ethnic／Religious Violence—Violence between ethnic or religious groups that is not specifically directed against the government

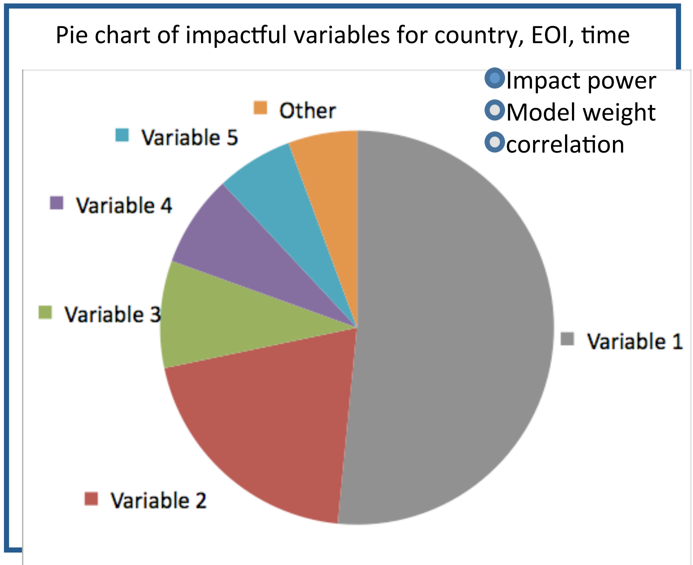
International Crisis—Conflict between two or more states or elevated tensions between two or more states that could lead to conflict

Phase 1 Results: LM-ATL Out-of-Sample Results (DARPA Chart)

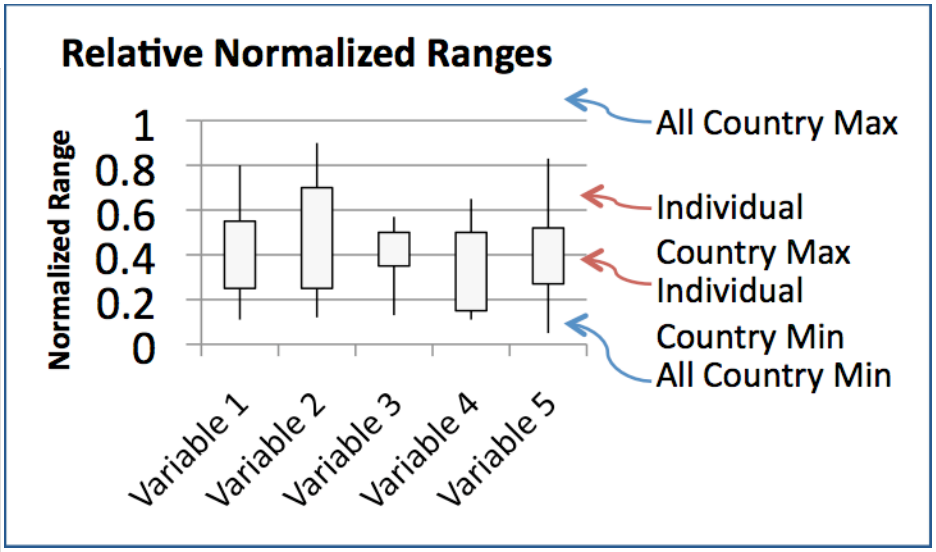


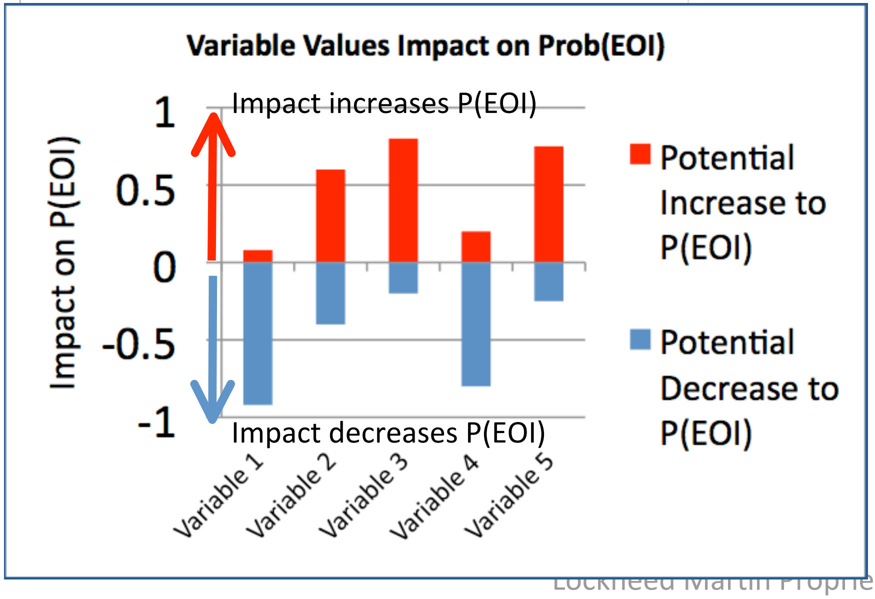
- Exceeds metrics for the maximum intensity index and 3 instability events: Rebellion, Insurgency, and Ethnic/Religious Violence – Passes Phase 1 gates
- By integrating improved versions of best of breed models from multiple perspectives, team achieves more accurate, precise forecasts than any one model alone

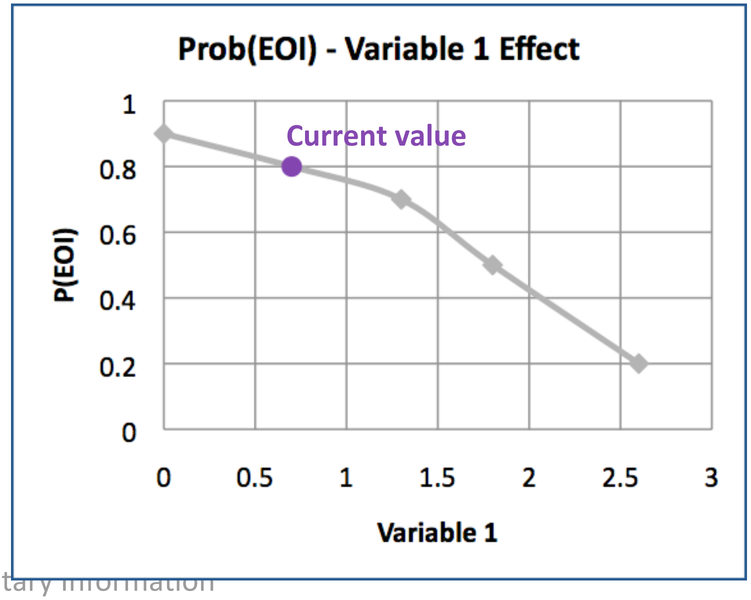
Components of a forecast


Pie chart of impactful variables for country, EOI, time

○Impact power
○Model weight
○correlation


Relative Normalized Ranges


Variable Values Impact on Prob(EOI)


Prob(EOI) - Variable 1 Effect

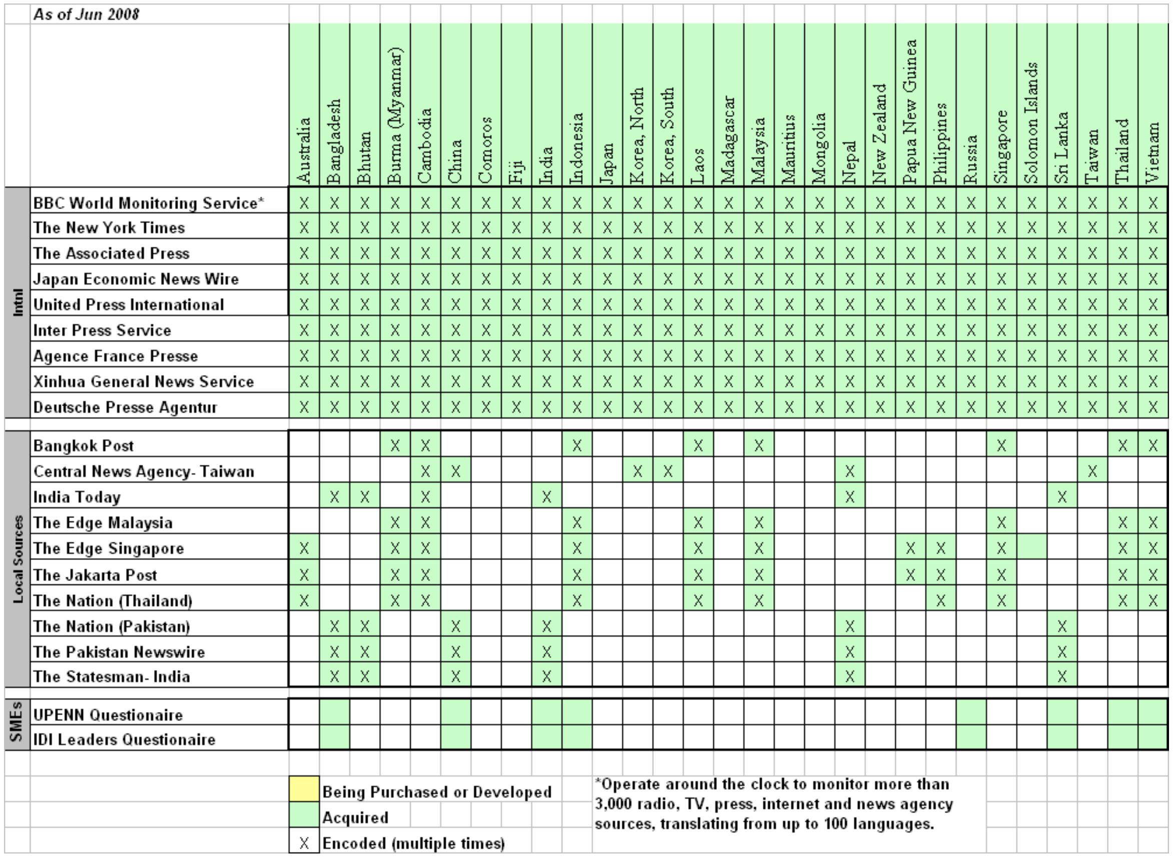
Challenges

- Lexis-Nexis
  - It was not designed for this sort of thing
  - Money is not the issue; the institution is the issue
- Duplicate detection
  - Considerably complicated by multiple sources
- Irrelevant story detection: at least a third of the downloads
- Dictionary development
  - 15,000 verb phrases are mostly adequate
  - Actor dictionaries—currently around 15,000 entries—were a major challenge
  - CountryCodes.xml generic dictionary shared with NSF/MID work
- TABARI in parallel coding mode works at 70,000 events per second
  - Parallelism on the cheap—just split the files

News & Other Data Sources (Phase 1)

- TABARI open source event data coding tool
  - 6.7M news stories from 75+ sources
  - 253M lines of text
  - 30 dictionaries, 20K entries
  - CAMEO action taxonomy
  - complementing with AeroText in Phase 2
- Country/State data
  - 16+ sources
- SME interviews for agent-based country models

It is estimated that this is the largest automated event coding project to date. Enabled by end-to-end automated process.



	As of Jun 2008	Australia	Bangladesh	Bhutan	Burma (Myanmar)	Cambodia	China	Comoros	Fiji	India	Indonesia	Japan	Korea, North	Korea, South	Laos	Madagascar	Malaysia	Mauritius	Mongolia	Nepal	New Zealand	Papua New Guinea	Philippines	Russia	Singapore	Solomon Islands	Sri Lanka	Taiwan	Thailand	Vietnam
Intnl	BBC World Monitoring Service*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	The New York Times	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	The Associated Press	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Japan Economic News Wire	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	United Press International	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Inter Press Service	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Agence France Presse	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Xinhua General News Service	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Deutsche Presse Agentur	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Local Sources	Bangkok Post				X	X					X				X		X								X				X	X
	Central News Agency- Taiwan					X	X						X	X						X								X		
	India Today		X	X		X				X										X							X			
	The Edge Malaysia				X	X					X				X		X								X				X	X
	The Edge Singapore	X			X	X					X				X		X					X	X		X	🟩			X	X
	The Jakarta Post	X			X	X					X				X		X					X	X		X				X	X
	The Nation (Thailand)	X			X	X					X				X		X						X		X				X	X
	The Nation (Pakistan)		X	X			X			X										X							X			
	The Pakistan Newswire		X	X			X			X										X							X			
	The Statesman- India		X	X			X			X										X							X			
SMEs	UPENN Questionaire		🟩				🟩			🟩	🟩													🟩			🟩		🟩	🟩
	IDI Leaders Questionaire		🟩				🟩			🟩	🟩													🟩			🟩		🟩	🟩

🟨 Being Purchased or Developed

🟩 Acquired

X Encoded (multiple times)

*Operate around the clock to monitor more than 3,000 radio, TV, press, internet and news agency sources, translating from up to 100 languages.

[Near-] Real Time Coding

- ICEWS is currently doing monthly updating
- Experimental system at Kansas did daily coding based on web site news feeds from Reuters and UPI
  - This is be implemented and enhanced under NSF funding at UT/Dallas (Brandt)
  - This is will linked to a real-time prediction module

Expansion to Global Coverage

- Projecting an additional 25M stories, 2000-2011
  - International sources appear to provide most of the coverage in English
- Intake of a existing political entity lists such as rulers.org, CIA World Factbook, Joshua Project
- Rapid development of remaining actor dictionaries using NER tools
- XML-based Hierarchical dictionaries: Move entity information to a database and generate specific codes as needed
- Objective: complete project by August 2011

Third Generation Coder using Open Source NLP Tools

- Full parsing using the TreeBank parse tree format
- Named-entity recognition/resolution software
- Parts of speech markup for noun-verb disambiguation
- Stemming: Porter stemmer
- WordNet synsets
- Sentence delineation
- GeoNet Names Server for geographical place names
- Regular expressions for dictionary syntax

JABARI-NLP Performance

- TABARI baseline: 56% precision, 54% recall
- Add Open-NLP Penn TreeBank parser:
  68% precision, 35.4% recall
- Add GATE-Annie noun phrase synonyms, pronoun coreferencing, and default location agent resolution:
  77% precision, 66.5% recall

Additional needed tasks

- Duplicate detection and content classification
  - Google News and European Media Monitor
- Hierarchical dictionaries
  - Move entity information to a database and generate specific codes as needed
  - Automated dictionary updating based on dense sources such as rulers.org
- Move entire system to the web
  - Separate graphical and processor-intensive components
- Sophisticated error detection/correction

Unsolicited career advice

Unsolicited career advice

- Learn computer programming
- Eric Drexler: “data-driven science”
- *Fourth Paradigm: Data Intensive Scientific Discovery* (Hey, Tansley and Toole, eds.)

Statistics Packages :: Cars

Statistics Packages :: Cars

Stata

Statistics Packages :: Cars

Stata

SAS

Statistics Packages :: Cars

Stata

R

SAS

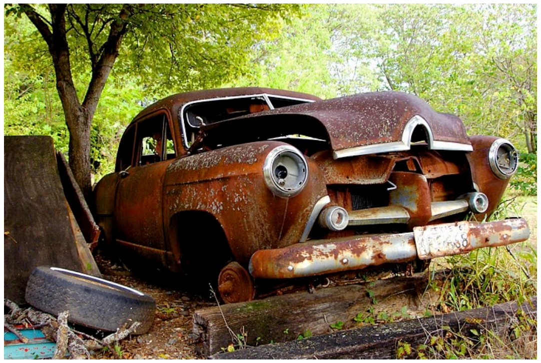
Statistics Packages :: Cars

Stata

R

SAS

SPSS



NPL Components :: Smart Phones

NLP… it's all components

Evolution of Statistical Training in Political Science

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- 1985: Objective is to get grad students to take advanced courses in econometrics
  - Hint: deadends— SEM, co-integration models

Evolution of Statistical Training in Political Science

- 1985: Objective is to get grad students to take advanced courses in econometrics
  - Hint: deadends— SEM, co-integration models
- 2010: Objective is to develop advanced techniques that will be adopted in other disciplines
  - Imai, Sekhon, Fowler, Gill, King
  - Hint: Medical schools are rumored to pay better than the liberal arts

The Transition We Need in Programming

- Old model:
  - “We’ll just hire a programmer because that will be more efficient than doing it ourselves”

The Transition We Need in Programming

- Old model:
  - "We'll just hire a programmer because that will be more efficient than doing it ourselves"
- Reality
  - Computer science departments and ExxonMobil can't find enough programmers either
  - You take a serious efficiency hit in trying to explain what you want done
  - You may take a serious efficiency hit in not doing the task in the best way—NLP (and statistics) are specialized subfields
  - *Jurassic Park* vs. computational linguistics

We need…

- Some formal training in core algorithms and data structures
  - Not just AP Java
- Rapid development scripting languages: perl and Python
- Lingua franca (and GUI): Java
- High performance: C/C++

Three more things I’m not supposed to say…

Three more things I’m not supposed to say…

- From a single source…

Bacon!

Tactical Bacon™ Tactical Bacon™ Tactical Bacon
CMMG
Tactical Bacon
smoke flavor added
Fully Cooked!
I firmly believe that bacon has the potential to bring about world peace! - anonymous
NET WT. 9 OZ
Tac Bac™ Tac Bac™ Tac Bac™ Tac Bac™ Tac Bac™

UNCLE OINKER'S
savory
BACON
MINTS
Net Weight 0.7oz (20g) 100 Mints

I
delicious
meats

Bacon!

Tactical Bacon™ Tactical Bacon™ Tactical Bacon
CMMG
Tactical Bacon
smoke flavor added
Fully Cooked!
I firmly believe that bacon has the potential to bring about world peace! - anonymous
NET WT. 9 OZ
Tac Bac™ Tac Bac™ Tac Bac™ Tac Bac™ Tac Bac™

No, not that kind of Bacon…

Bacon!

Francis Bacon [1561 – 1626]

Relevant scientific principles from Sir Francis

Relevant scientific principles from Sir Francis

- The entire scientific method

Relevant scientific principles from Sir Francis

- The entire scientific method
  - With additional help from Galileo and Descartes
  - Won’t want to discard all that now, would we?

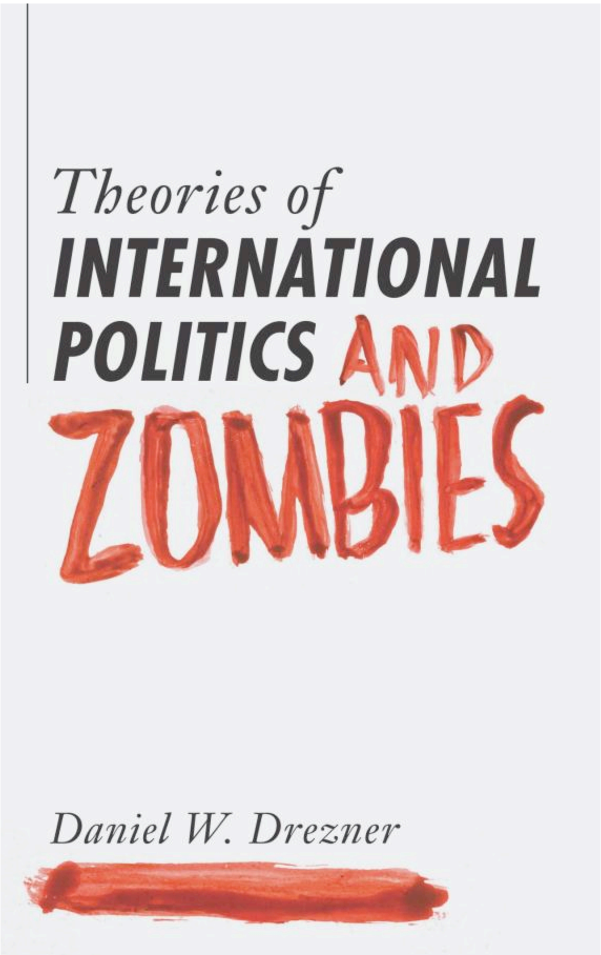
Relevant scientific principles from Sir Francis

- Knowledge comes from induction, not just theory

Relevant scientific principles from Sir Francis

- Knowledge comes from induction, not just theory
  - What's wrong with theory??? I'm not a real political scientist unless I have many, many, many theories…

Yeah, right…


Theories of
INTERNATIONAL
POLITICS AND
ZOMBIES
Daniel W. Drezner

Or this?...

scientific
Science
11 February 2011 | $10
information
climate
science
research
sharing
scientists
challenges
analysis
new
visualization
researchers
access
many
human
health
brain
model
tools
public
community
funding
example
knowledge
methods
2010
2009
data
AAAS

Relevant scientific principles from Sir Francis

- Knowledge comes from induction, not just theory
  - “If you’ve got too much data, you need better theory’ if you’ve got too much theory, you need better data”
  - When theory trumps data, you have Scholasticism

Relevant scientific principles from Sir Francis

- Knowledge comes from induction, not just theory
  - "If you've got too much data, you need better theory' if you've got too much theory, you need better data"
  - When theory trumps data, you have Scholasticism
  - Which dominated the academic world for 250 years after Bacon and Descartes
    - Which is hardly reassuring

Relevant scientific principles from Sir Francis

- A theory is only scientific if it is predictive
  - With help from the logical positivists, in particular Quine and Hempel

Relevant scientific principles from Sir Francis

- A theory is only scientific if it is predictive
  - With help from the logical positivists, in particular Quine and Hempel
  - Predictive power is the only feature that distinguishes astronomy from astrology
    - Really…this is not just a cheap shot

Relevant scientific principles from Sir Francis

- A theory is only scientific if it is predictive
  - With help from the logical positivists, in particular Quine and Hempel
  - Predictive power is the only feature that distinguishes astronomy from astrology
    - Really…this is not just a cheap shot
  - Focus on prediction and you will also wean yourself from frequentism
    - p-value frequentism and the logical-hypothetical method are mutually inconsistent

Relevant scientific principles from Sir Francis

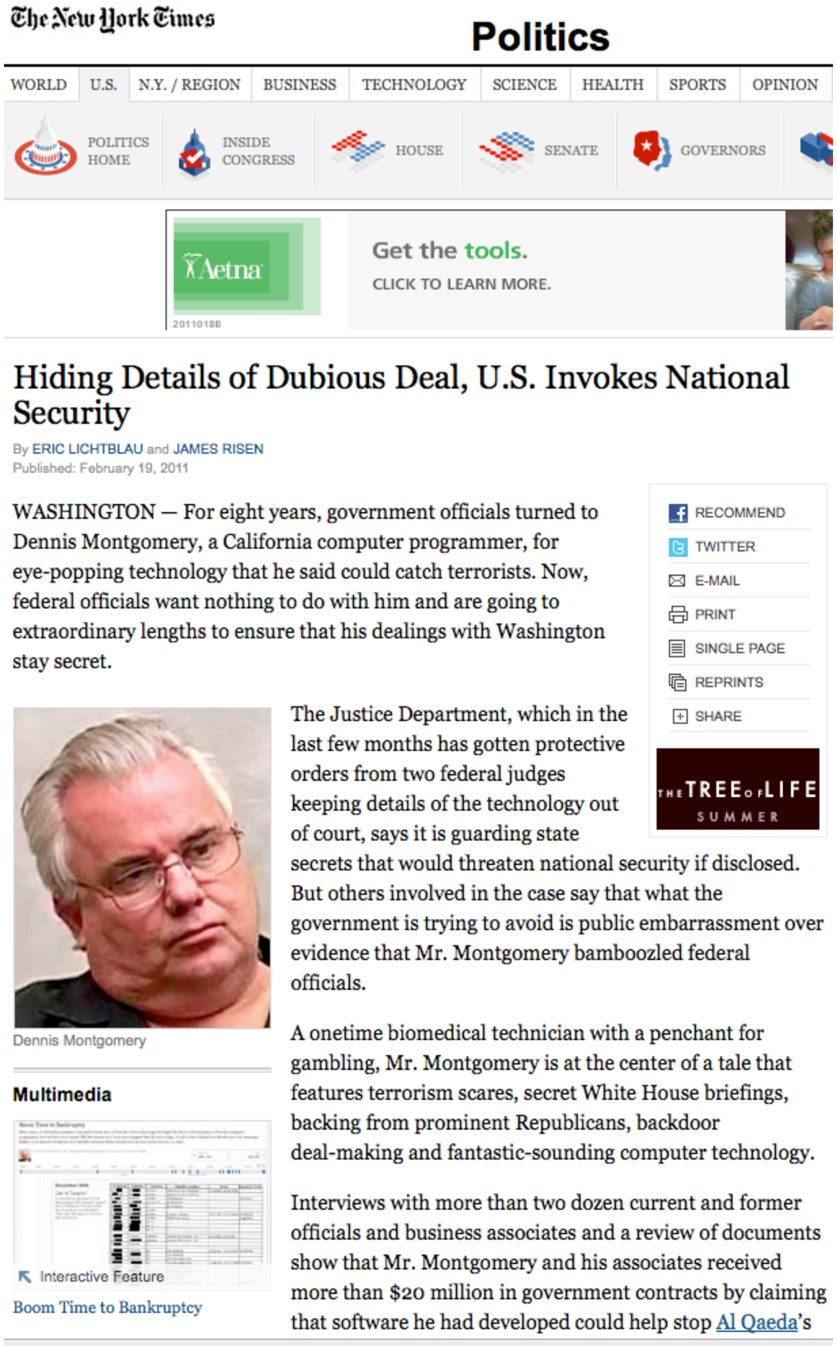
- Science should serve the public good

Relevant scientific principles from Sir Francis

- Science should serve the public good
  - At least think about trying to developing statistical methods for applied forecasting

Relevant scientific principles from Sir Francis

- Science should serve the public good
  - At least think about trying to developing statistical methods for applied forecasting
  - Maj Gen Michael Flynn, *Fixing Intel: A blueprint for making intelligence relevant in Afghanistan*
  - They need all the help they can get…



Hiding Details of Dubious Deal, U.S. Invokes National Security

By ERIC LICHTBLAU and JAMES RISEN

Published: February 19, 2011

WASHINGTON — For eight years, government officials turned to Dennis Montgomery, a California computer programmer, for eye-popping technology that he said could catch terrorists. Now, federal officials want nothing to do with him and are going to extraordinary lengths to ensure that his dealings with Washington stay secret.

Dennis Montgomery

The Justice Department, which in the last few months has gotten protective orders from two federal judges keeping details of the technology out of court, says it is guarding state secrets that would threaten national security if disclosed. But others involved in the case say that what the government is trying to avoid is public embarrassment over evidence that Mr. Montgomery bamboozled federal officials.

A onetime biomedical technician with a penchant for gambling, Mr. Montgomery is at the center of a tale that features terrorism scares, secret White House briefings, backing from prominent Republicans, backdoor deal-making and fantastic-sounding computer technology.

Interviews with more than two dozen current and former officials and business associates and a review of documents show that Mr. Montgomery and his associates received more than $20 million in government contracts by claiming that software he had developed could help stop Al Qaeda's

Multimedia

Interactive Feature

Boom Time to Bankruptcy

Questions?

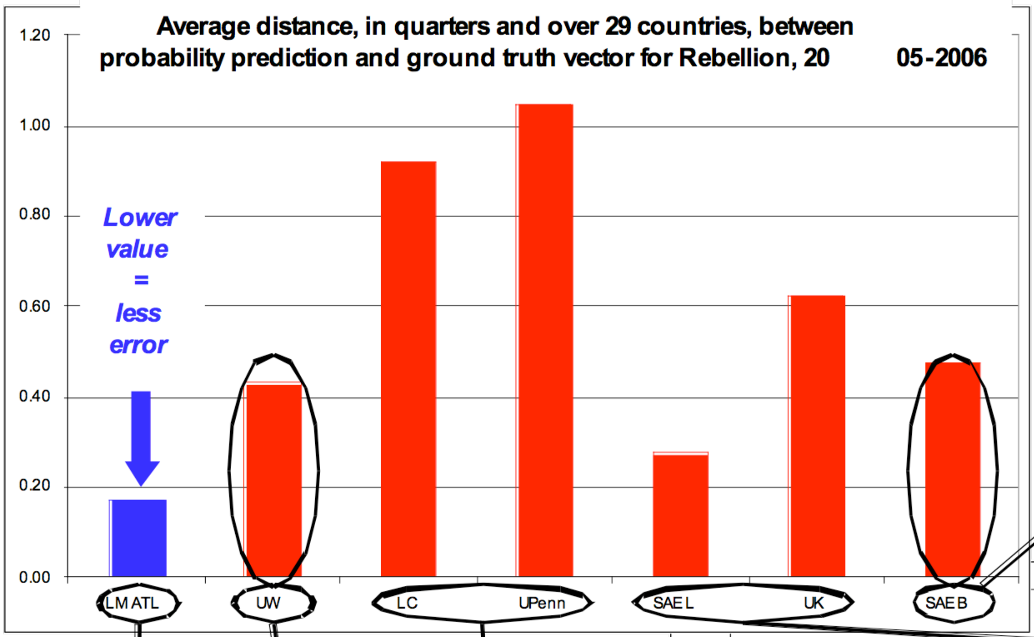
Philip A. Schrodt
Political Science
Pennsylvania State University
State College, PA 16802

Phone: 814-863-8978

Email: schrodt@psu.edu

Project Web Site: http://eventdata.psu.edu

LM ATL Results by Model



- **Aggregating model scores with a learned Bayesian network outperforms any one other model**
  - Because different models cover the EOIs and countries with varying levels of performance

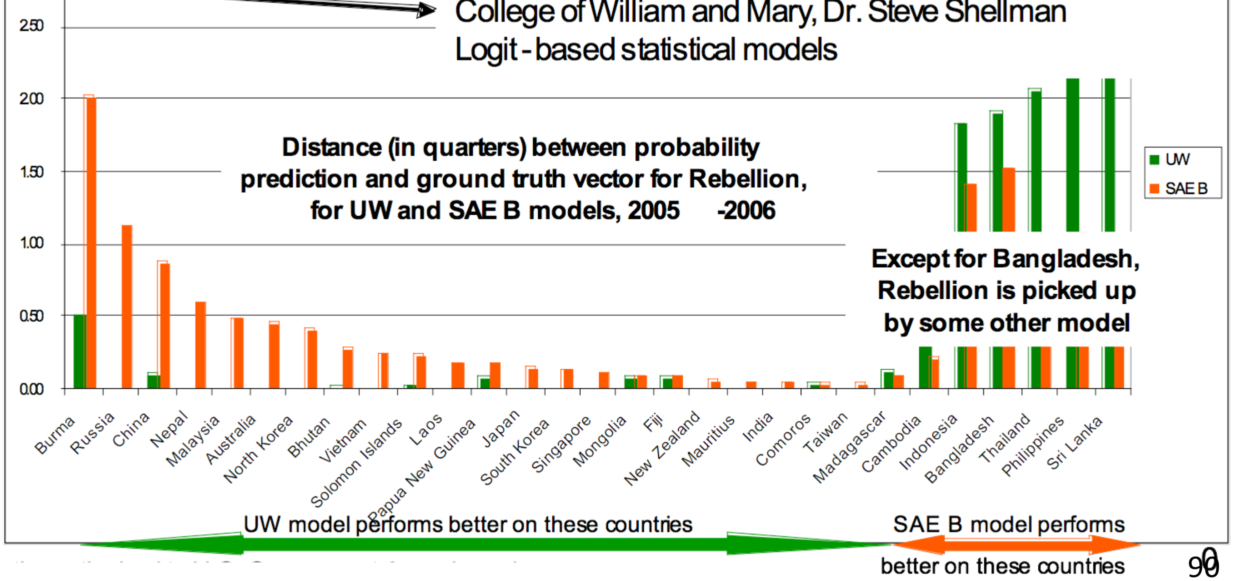
College of William and Mary, Dr. Steve Shellman
Bayesian statistical model

University of Kansas, Dr. Phil Schrodt
College of William and Mary, Dr. Steve Shellman
Logit-based statistical models

Aggregation model

University of Penn,
Dr. Ian Lustic and
Dr. Barry Silverman
Agent-base models
(only 6 and 4 "hard" countries resp.)

University of Washington, Dr. Michael Ward
Geo-spatial statistics applied to trade ties, flow of people, social similarity

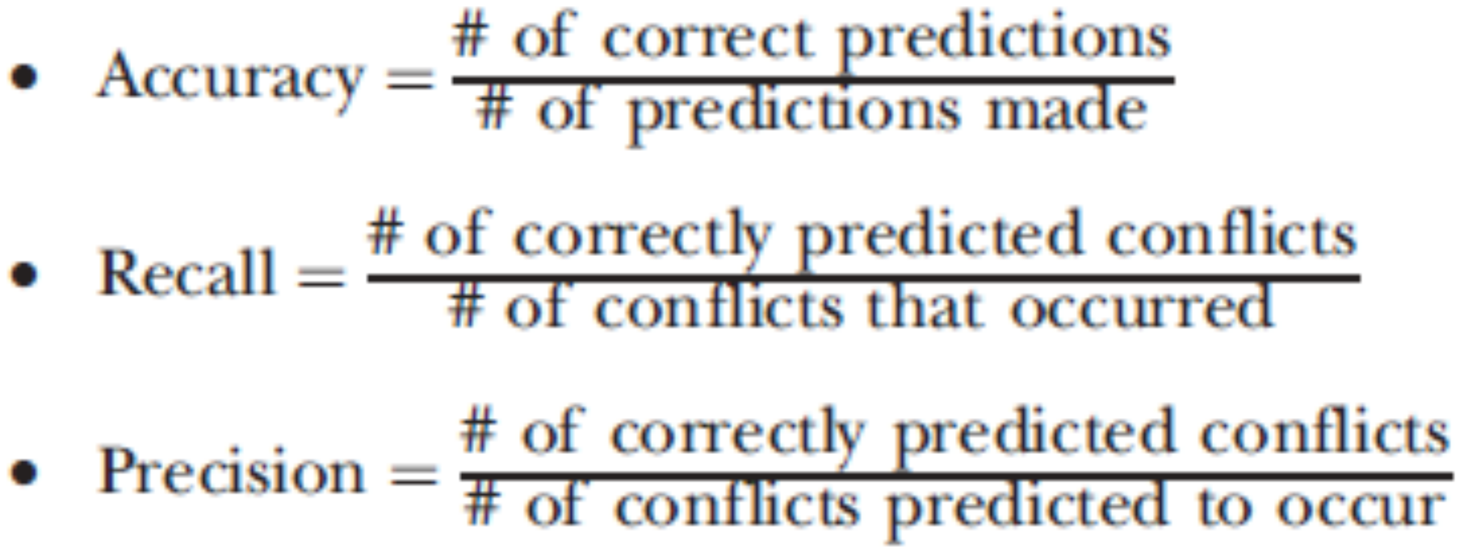


Except for Bangladesh, Rebellion is picked up by some other model

UW model performs better on these countries

SAE B model performs better on these countries

ICEWS Evaluation Criteria



- Accuracy $= \dfrac{\text{\# of correct predictions}}{\text{\# of predictions made}}$
- Recall $= \dfrac{\text{\# of correctly predicted conflicts}}{\text{\# of conflicts that occurred}}$
- Precision $= \dfrac{\text{\# of correctly predicted conflicts}}{\text{\# of conflicts predicted to occur}}$

Contemporary Event Data

- Substate and nonstate actors; most analysis deals with protracted conflicts
- Single-conflict and regional coverage
- Automated coding
- Source texts are from wire services (Reuters, AFP)
- Statistical models are very complex