



Crowdsourcing Bayes Nets with Prediction Markets

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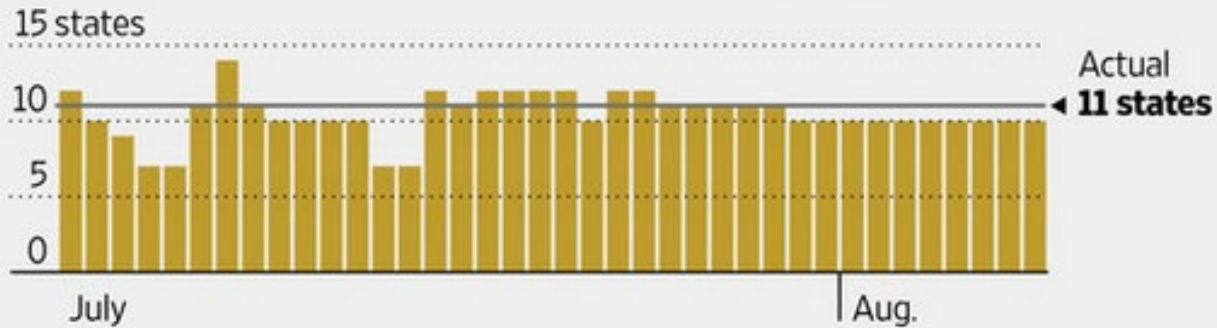
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Example Forecast – As reported by the *WSJ*



QUESTION: How many states will report at least one case of a West Nile virus human neuroinvasive disease by August 1?

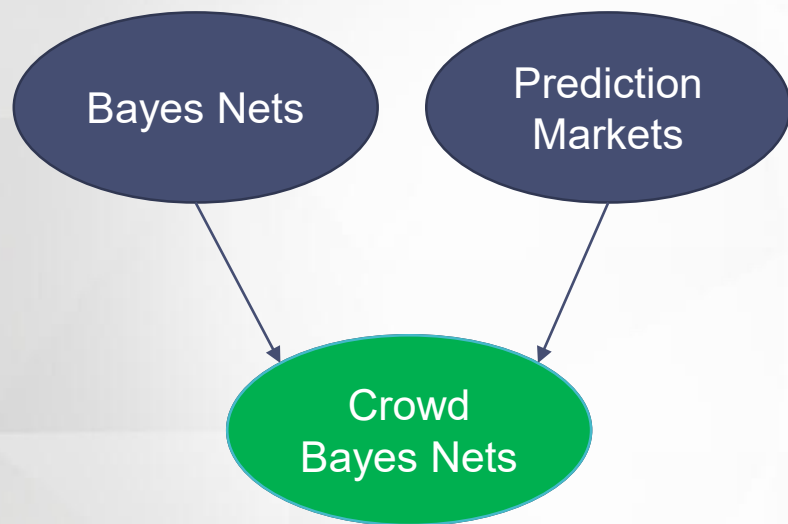


Source: Charles Twardy, George Mason University

The Wall Street Journal

From the *WSJ* Article: "U.S. Intelligence Community Explores More Rigorous Ways to Forecast Events" Sept 5, 2014

Graphical Model Market Maker for Combinatorial Prediction Markets



Kathryn Blackmond Laskey

George Mason University, Fairfax, VA, USA

Wei Sun

Freddie Mac, McLean, VA, USA

Robin Hanson

George Mason University, Fairfax, VA, USA

Charles Twardy

Shou Matsumoto

George Mason University, Fairfax, VA, USA

Brandon Goldfedder

Gold Brand Software, Herndon, VA, USA

Elicit and Aggregate...

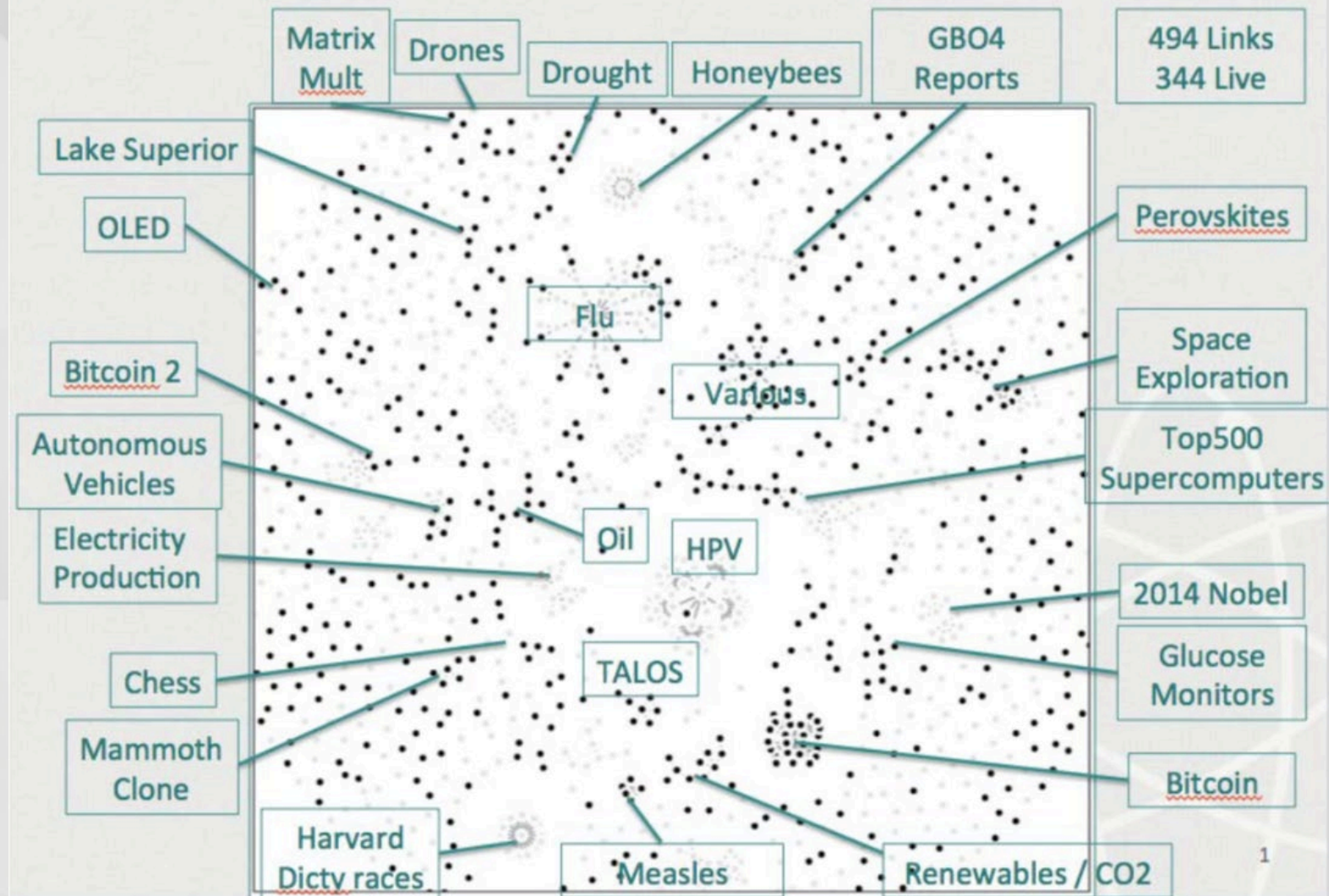


130,000	probabilities
10,000	participants
1,200	variables
540	days
>240	probs/day

Average Error (0 is best):

“Coin toss”	0.5
SciCast	0.3
+ \$Prizes:	0.1

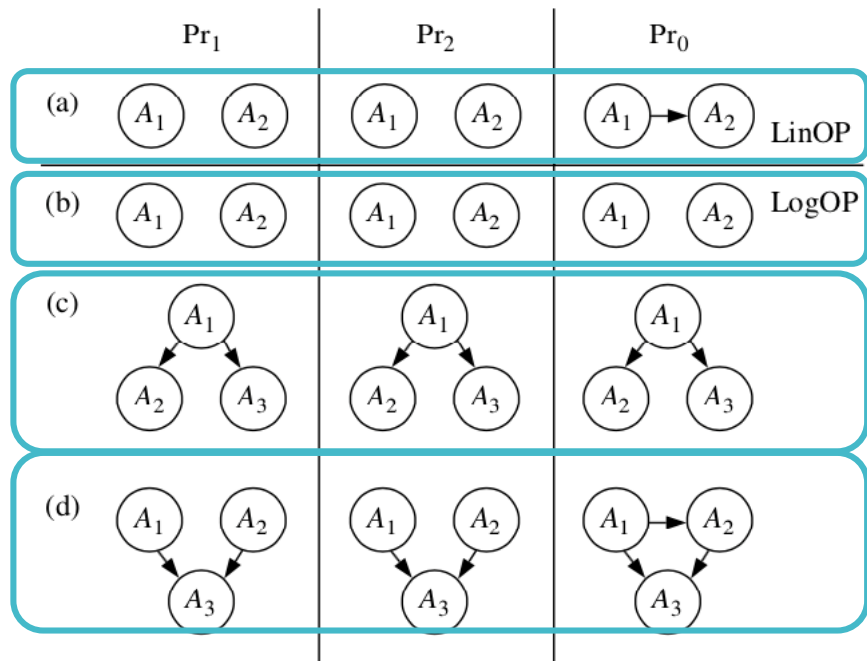
(619 completed forecast Qs)



Oh... belief aggregating is impossible

“...no belief aggregation function can maintain all independencies ... in a BN.”

Figure 1 Independence Preservation Behavior of (a) LinOP and (b)–(d) LogOP



Can't have all these:

- Independence Preservation
- Unanimity
- Nondictatorship
- Proportionality (indep. of irrel.)

Can have:

- Markov independence

But expensive

The next 2 slides stand in for a short demo

Try our demo site, scicast.c4i.gmu.edu.

It's not "live" anymore, but there are plenty of questions and question clusters left to explore and get an idea how it works.



Will at least 250 data breaches in the US be reported by the ITRC between January 1, 2015 and March 31, 2015?

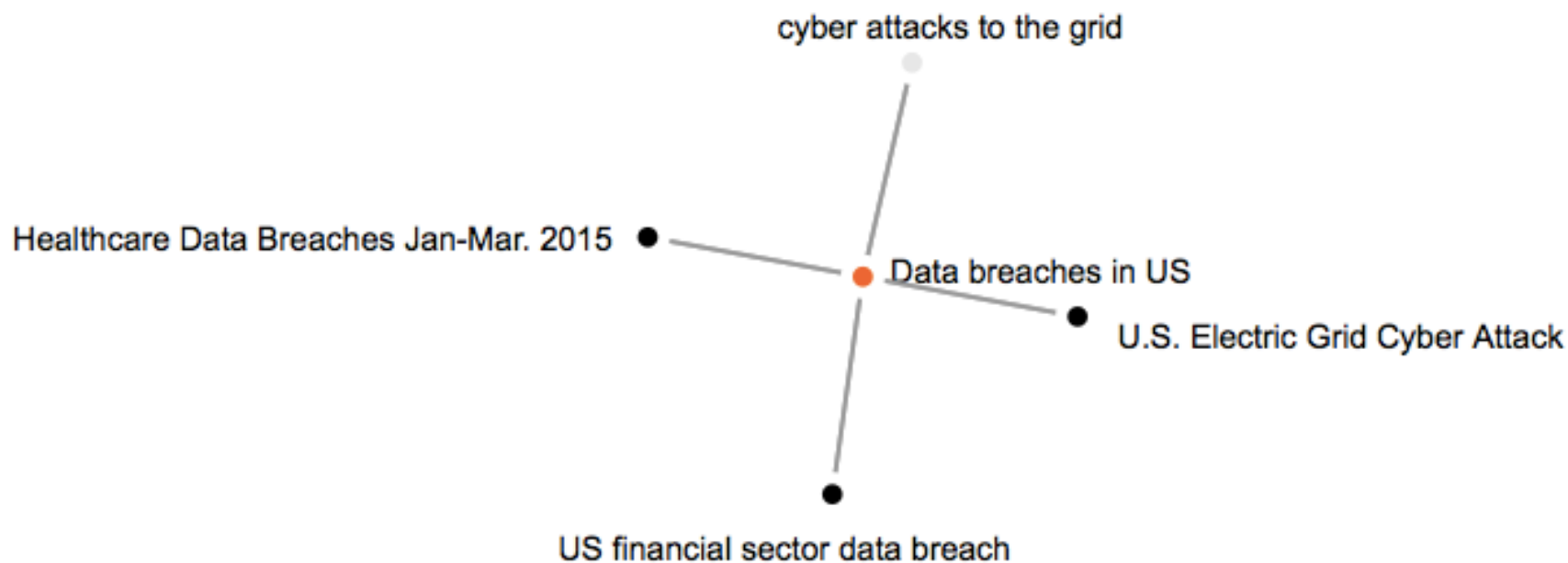
Make a Forecast

Discussion (2)

Background

Trends & History

Network





Will at least 250 data breaches in the US be reported by the ITRC between January 1, 2015 and March 31, 2015?

Make a Forecast

Discussion (2)

Background

Trends & History

Network

1 If: the answer to one of these related questions is:

Your Assumption	Question
<i>TIP: Forecast different scenarios using these assumptions. If an answer occurs, what will happen in the question asked below?</i>	
<input type="text" value="False"/>	Will at least 6% of data breaches reported in the US by the ITRC in the first quarter of 2015 be in the banking/credit/financial sector?

2 Then: Will at least 250 data breaches in the US be reported by the ITRC between January 1, 2015 and March 31, 2015?

CURRENT FORECAST

87%

YOUR FORECAST

87%

CHANGE FORECAST TO

87%

MINIMUM
AVAILABLE POINTS

PREVIOUS
FORECASTS

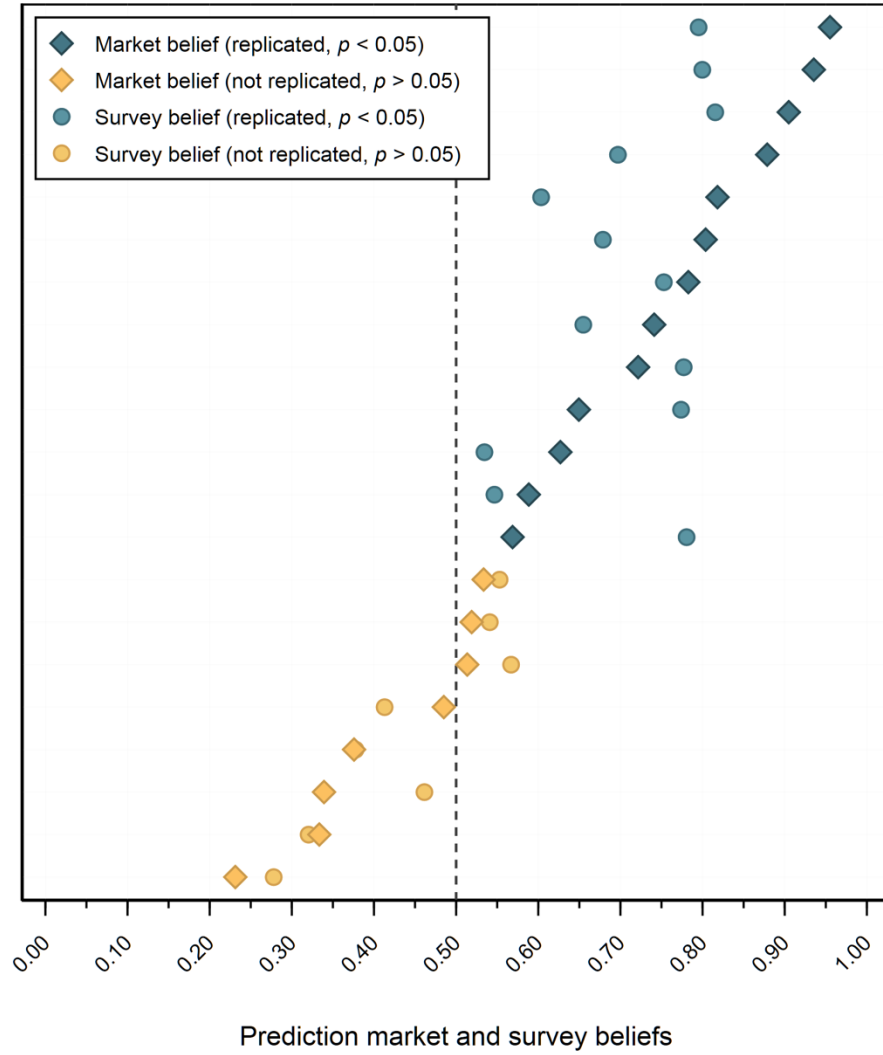


Next steps.

Evaluating the replicability of social science experiments in *Nature* and *Science* between 2010 and 2015

Colin F. Camerer^{1,16}, Anna Dreber^{2,16}, Felix Holzmeister^{3,16}, Teck-Hua Ho^{4,16}, Jürgen Huber^{3,16}, Magnus Johannesson^{2,16}, Michael Kirchler^{3,5,16}, Gideon Nave^{6,16}, Brian A. Nosek^{7,8,16}, Thomas Pfeiffer^{9,16}, Adam Altmeld², Nick Buttrick^{7,8}, Taizan Chan¹⁰, Yiling Chen¹¹, Eskil Forsell¹², Anup Gampa^{7,8}, Emma Heikensten², Lily Hummel⁸, Taisuke Imai¹³, Siri Isaksson², Dylan Manfredi⁶, Julia Rose³, Eric-Jan Wagenmakers¹⁴ and Hang Wu¹⁵

Ackerman et al. (2010)¹⁶, Science
Lee and Schwarz (2010)²⁸, Science
Kidd and Castano (2013)²⁶, Science
Gervais and Norenzayan (2012)²¹, Science
Shah et al. (2012)³⁴, Science
Sparrow et al. (2011)³⁵, Science
Ramirez and Beilock (2011)³², Science
Rand et al. (2012)³³, Nature
Wilson et al. (2014)³⁶, Science
Morewedge et al. (2010)²⁹, Science
Kovacs et al. (2010)²⁷, Science
Derey et al. (2013)¹⁹, Nature
Karpicke and Blunt (2011)²⁵, Science
Duncan et al. (2012)²⁰, Science
Nishi et al. (2015)³⁰, Nature
Aviezer et al. (2012)¹⁷, Science
Pyc and Rawson (2010)³¹, Science
Balafoutas and Sutter (2012)¹⁸, Science
Janssen et al. (2010)²⁴, Science
Gneezy et al. (2014)²², Science
Hauser et al. (2014)²³, Nature



Further Reading

SciCast & DAGGRE (our BN markets)

- SciCast Blog: blog.scicast.org
- SciCast Demo: scicast.c4i.gmu.edu
- WSJ Sep. 5, 2014, “[U.S. Intelligence Community Explores More Rigorous Ways to Forecast Events](#)”
- Brief intro:** Twardy et al. (2014). SciCast: Collective Forecasting of Innovation. Presented at the Collective Intelligence 2014, MIT, Cambridge MA.
- Olson et al. (2015). [Accuracy of Simulated Flat, Combinatorial, and Penalized Prediction Markets](#). Presented at the Collective Intelligence 2015.
- Very Technical.** Laskey et al. (in press) Graphical Market Maker for Combinatorial Prediction Markets. *J. Artificial Intelligence Research*.
- SciCast 2015 Annual Report

All available on request

Prediction Markets

- Classic reference:** Prediction Markets in Theory & Practice. www.nber.org/papers/w12083
- Overview:** CIA article on prediction markets, *Studies in Intelligence* 50:4.

Some Live Markets:

- Hypermind: www.hypermind.com
- PredictIt: www.predictit.com
- Cultivate Labs: www.cultivatelabs.com
- Foresight Exchange: www.ideosphere.com
 - Possibly the longest-running prediction market. Very plain.

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scicast.c4i.gmu.edu
(small demo site)