

Microsoft Research
Faculty
Summit
2013



Session on Prediction Engines

Speakers:

Robin Hanson, George Mason University

Nicolas Lambert, Stanford University

Sanmay Das, Washington University in St. Louis

Microsoft Researchers:

Miro Dudik, Sebastien Lahaie, David Pennock,

David Rothschild, Jenn Wortman Vaughan



Prediction Engine

Prediction = Probability

- ✘ *Hillary Clinton will win the 2016 US Presidential election*
- ✔ *27% chance Hillary Clinton will win the 2016 US Presidential election*



Calibration

Prediction	Likelihood
VA: Romney	98.7%
MA: Romney	99.6%
VT: Romney	97.5%
ID: Romney	95.7%
GA: Gingrich	98.0%
OH: Romney	82.6%
OK: Santorum	88.6%
ND: Romney	72.1%
AK: Romney	82.6%
TN: Santorum	57.1%

“Super Tuesday” predictions
as of 2:52 p.m. ET
Monday, March 5, 2012

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total	872.5%
Expected num correct	8.725

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Prediction Engine

Technology to:

- Collect and formulate predictions
 - Where? From an expert; From a crowd; Historical data
 - How? Polling; Scoring rules; Prediction markets
 - Devil in User interface; Incentives
- Combine predictions
- Handle combinatorial/related predictions
- Browse/search predictions; Explain and visualize predictions
- Tinker, experiment with all of the above



Ideal Prediction Engine

- Predict (nearly) anything – General purpose
- Accurate
- Real-time
- Cost effective
- Rewards information, not
 - Raw computational power
 - Persuasion, power, conviction



Prediction Markets

- A random variable, e.g.

Will H. Clinton win 2016 Presidential election?
(Y/N)

- Turned into a financial instrument
payoff = realized value of variable

I am entitled to:

\$1 if

Clinton
wins

\$0 if

Other
wins



Trade elections like stocks

2016 Presidential Election - Next President

Betting on: Hillary Clinton

Total matched on this event: **\$11,687**

Betting summary - Volume: **\$6,654**

Last price matched: **3.35**

Price/Volume over time



Inverse Axis

The information on this page may be slightly delayed.

Traded and Available			
Price	To back	To lay	Traded
1.01	\$173		
1.02	\$76		
1.03	\$6		
1.04	\$151		
2.50	\$48		
2.52	\$3		
2.80	\$19		
2.82	\$3		
3.00	\$48		
3.05	\$3		
3.25	\$64		
3.30	\$195		\$15
3.35	\$3		\$82
3.40			\$36
3.45			\$72
3.50			\$531
3.55			\$311
3.60			\$94
3.65			\$103
3.70		\$33	\$63

Between
27.0%
and
29.9%
Chance



Predict (almost) anything

Bloomberg

Our Company | Professional | Anywhere

HOME QUICK NEWS OPINION MARKET DATA PERSONAL FINANCE **TECH** POLITICS SUSTA

GLOBALTECH

COVERING THE 57 MILLION SQUARE MILES OUTSIDE SILICON

Microsoft Predicts Eurovision (Yup, you heard that right). The Winner Will Be Denmark

By Amy Thomson - May 15, 2013 10:45 AM ET

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QUEUE  

To win Eurovision, the annual pan-European song contest that launched the careers of Abba and Celine Dion, you've got to have style, a killer song and enough charm to convince judges from rival countries to vote for you. For the 2013 finals, aired across the region this weekend, the odds are on Denmark, according to Microsoft.

What does a big tech company -- that's a big tech company that didn't invent iTunes, by the way (remember the Zune? Didn't think so) -- know about a kitschy European songfest? Microsoft Research economist David Rothschild has a project called [PredictWise](#) that sifts through zillions of data points scooped up from the Internet to predict outcomes of various public events like Eurovision, the Academy Awards, and elections.

TrueHoop

JUN 18

7:50
PM ET

What prediction markets say about Game 6

By ESPN Forecast
ESPN.com
[Archive](#)

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Justin Rao and David Rothschild of Microsoft Research looked at what betting markets and our expert panel at ESPN Forecast were telling us ahead of Game 6 and found an interesting disparity:

Are the Heat still favorites? Betting markets and the panel of [ESPN Forecast experts](#) disagree.

Is it possible the first five games of the NBA Finals have increased the chances the Heat will win Games 6 and 7? According to the betting markets, the answer is yes.

Predict (almost) anything

PredictWise FOLLOW PREDICTWISE

Predictions Results & Papers Still to Come FAQ Blog

POLITICS **SPORTS** **ECONOMIC/FINANCIAL**

2016 Presidential Election - Next President

Hillary Clinton	28.4 %
Marco Rubio	9.7 %
Jeb Bush	6.0 %
Chris Christie	5.3 %

See All »

2016 Presidential Election - Likelihood of Republican Nomination

Marco Rubio	18.3 %
Jeb Bush	12.6 %
Rand Paul	8.0 %

See All »

2013 MLB World Series - Likelihood to Win

Detroit Tigers	11.5 %
Atlanta Braves	9.8 %
St Louis Cardinals	8.3 %

See All »

The Open Championship 2013 - Likelihood to Win

Tiger Woods	10.5 %
Justin Rose	4.7 %
Adam Scott	4.3 %

See All »

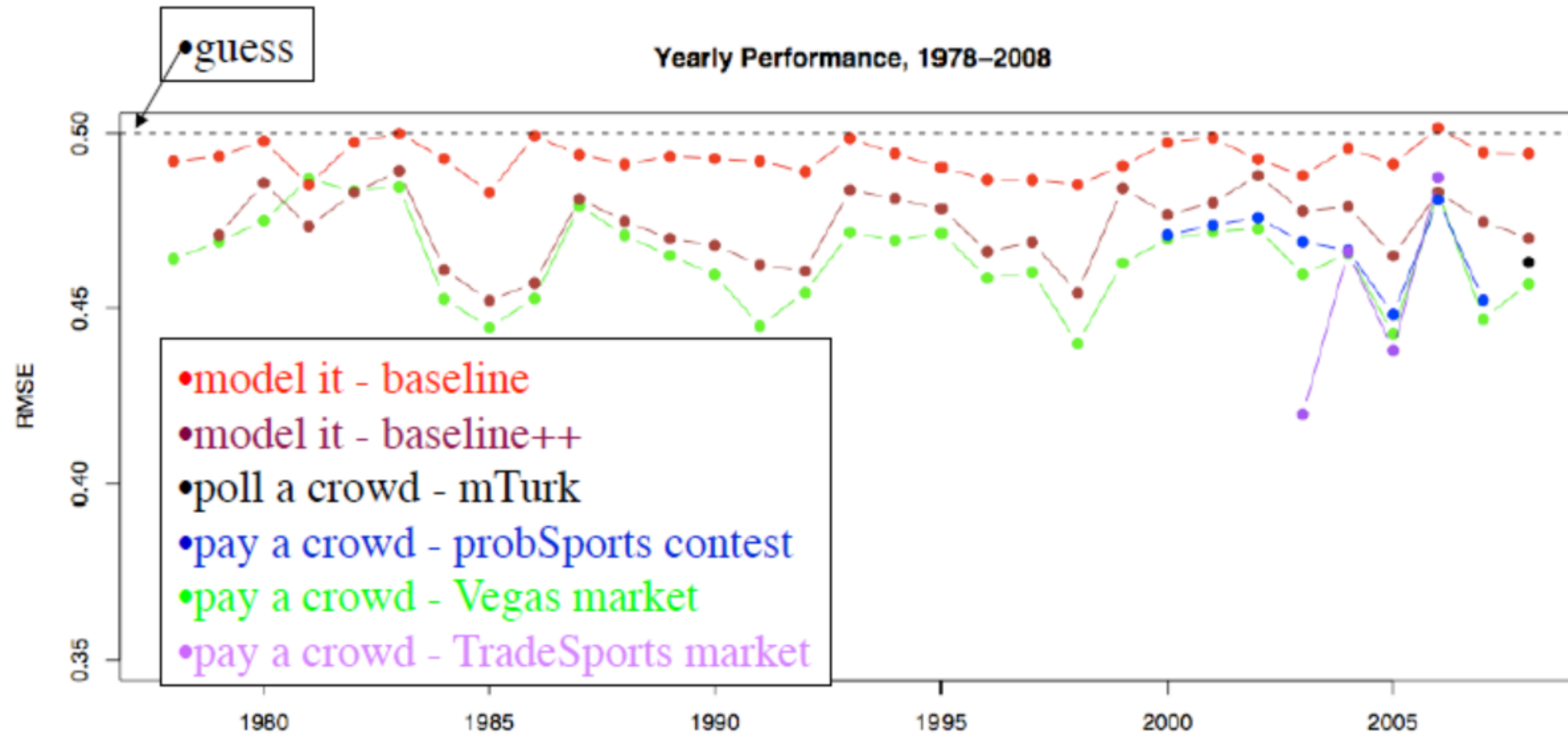
Likelihood of U.S. Recession

U.S. Recession during 2013	17.5 %
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2013-14 NFL Super Bowl - Likelihood to

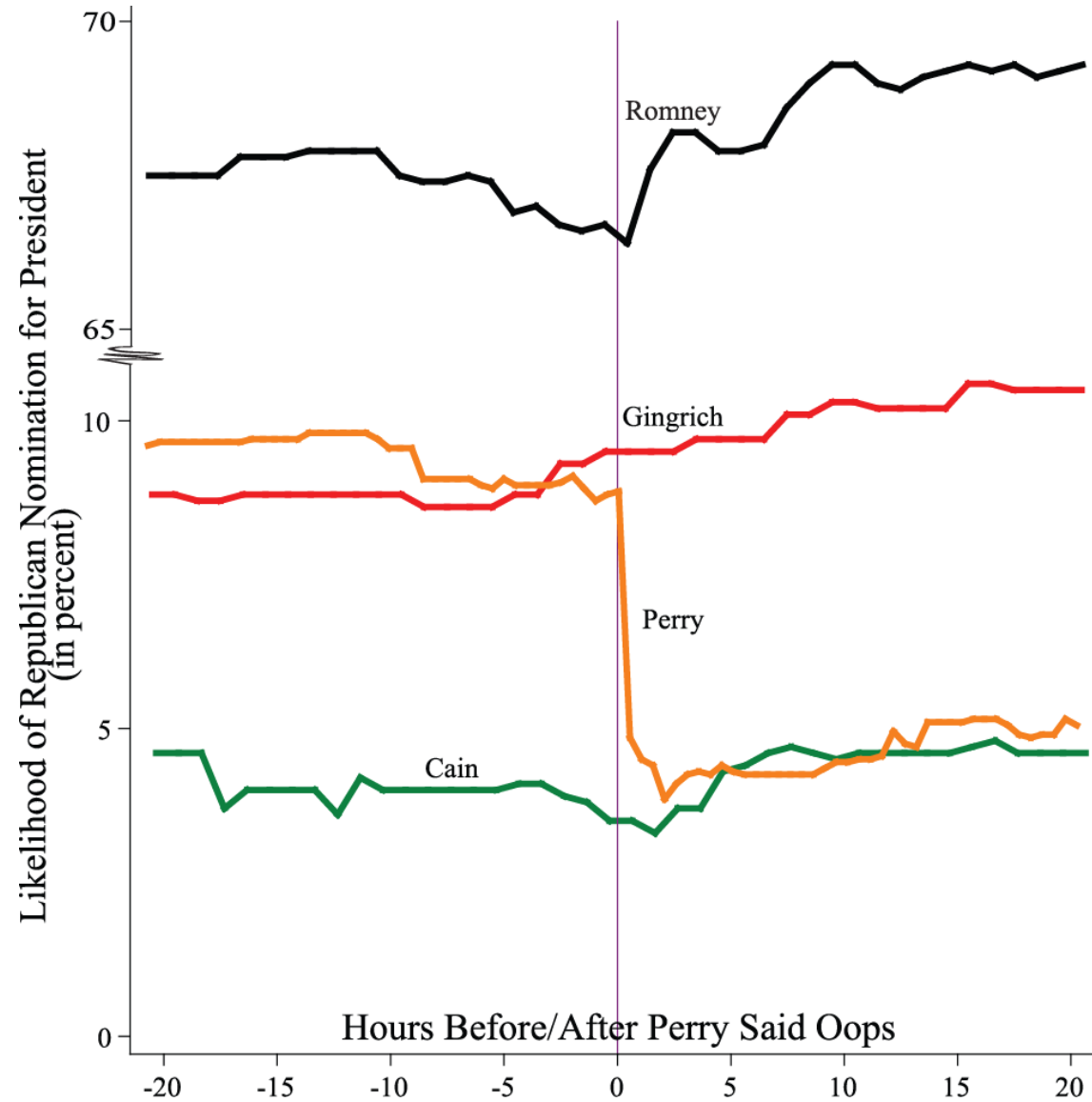


Accuracy



Real Time

1. Real-time reaction to big events.
2. Romney dominating when others led the polls.

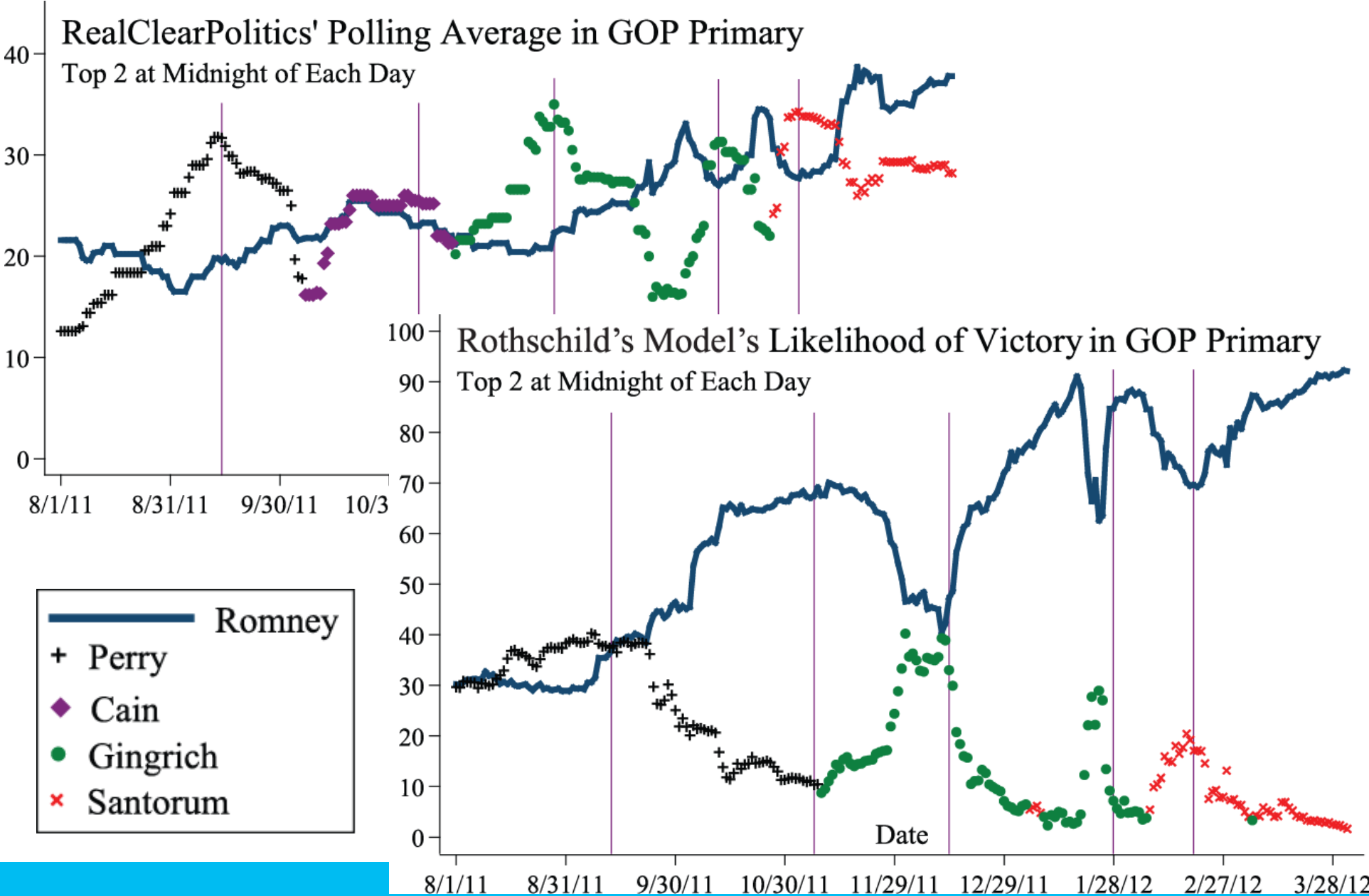


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- Prior to MI primary, Santorum favored in Ohio: leading polls by wide margin
- Within hours of Romney winning MI, our *OH* prediction swung to Romney
- New York Times Nate Silver's poll-based forecast a couple days behind at least

GOP Primary: Polls vs Markets



Betfair = Predictions x100

- Presidential – National
- Presidential – State-by-state
- Presidential – Electoral College
- Senate
- House
- Gubernatorial



PredictWiseQ = Predictions ¹⁰⁰

- “Predict (almost) anything”
- 22% chance Romney will win in Iowa but Obama will win the national election
- 75.7% chance the same party will win both Michigan and Ohio
- 48.3% chance Obama gets 300 or more Electoral College votes
- 12.3% chance Obama will win between 6 and 8 states that begin with the letter M
- Path of blue from Canada to Mexico



A combinatorial question: How pivotal was Ohio?

- Day after 1st debate (October 4)
- If Obama wins Ohio, 90% chance he'll win the election
- If Obama wins Florida, 95%; Virginia, 92%
- If Romney wins Ohio, 41% he'll win election; Florida, 32%; Virginia 31%
- If October jobs report bleak, will Romney win?
- Beyond horse race



PredictWiseQ

- In theory, combo PM yields billions (in this case, 18 quadrillion) more predictions “for free”. What about in practice?
- A combinatorial prediction market for the election:
- Fully working beta & field test
Approximates a #P-hard problem
 - Sep 16 – Nov 6, 2012
 - 680 users; 437 made at least one trade
 - 3137 trades in all 23 possible prediction categories
 - 514 distinct security types were bought
261 of these were traded by a unique user
 - Empirical paper to appear in ACM EC'13
 - Market maker algorithm details in ACM EC'12



WiseQ Game – Elections 2012 (Beta)

MAKE A PREDICTION

President Senate Governors Trending My Portfolio My Leagues Forum FAQ

Welcome,
pennock!
[Logout](#)

MAKE A PREDICTION

Make a prediction on:

President – 2 States Same

State: Ohio

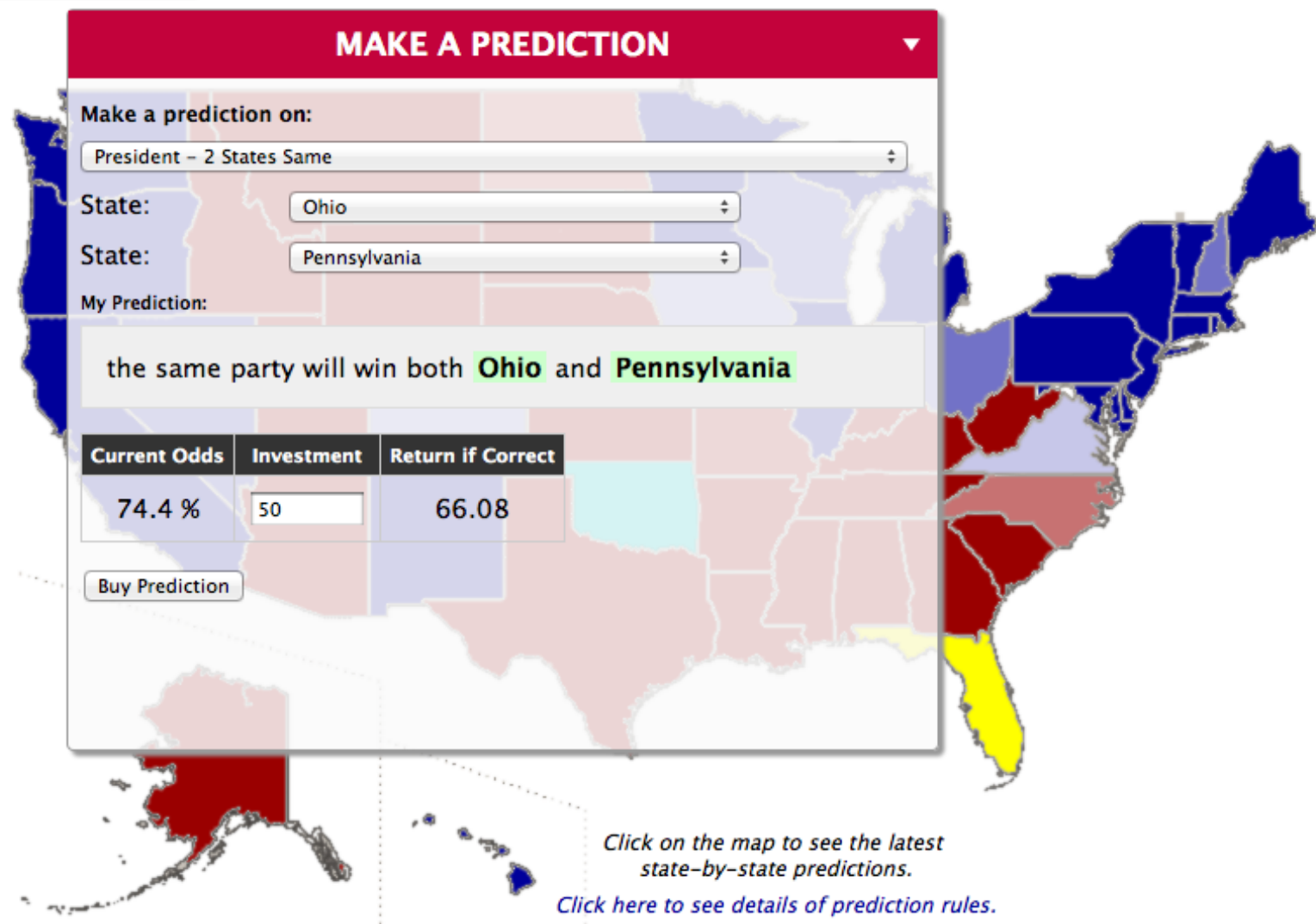
State: Pennsylvania

My Prediction:

the same party will win both **Ohio** and **Pennsylvania**

Current Odds	Investment	Return if Correct
74.4 %	50	66.08

[Buy Prediction](#)



CURRENT ODDS

OK President

REPUBLICAN
99.9 %

DEMOCRAT
0.1 %

YOUR POINTS

EXPECTED RETURN
1011.5

AVAILABLE
799.9

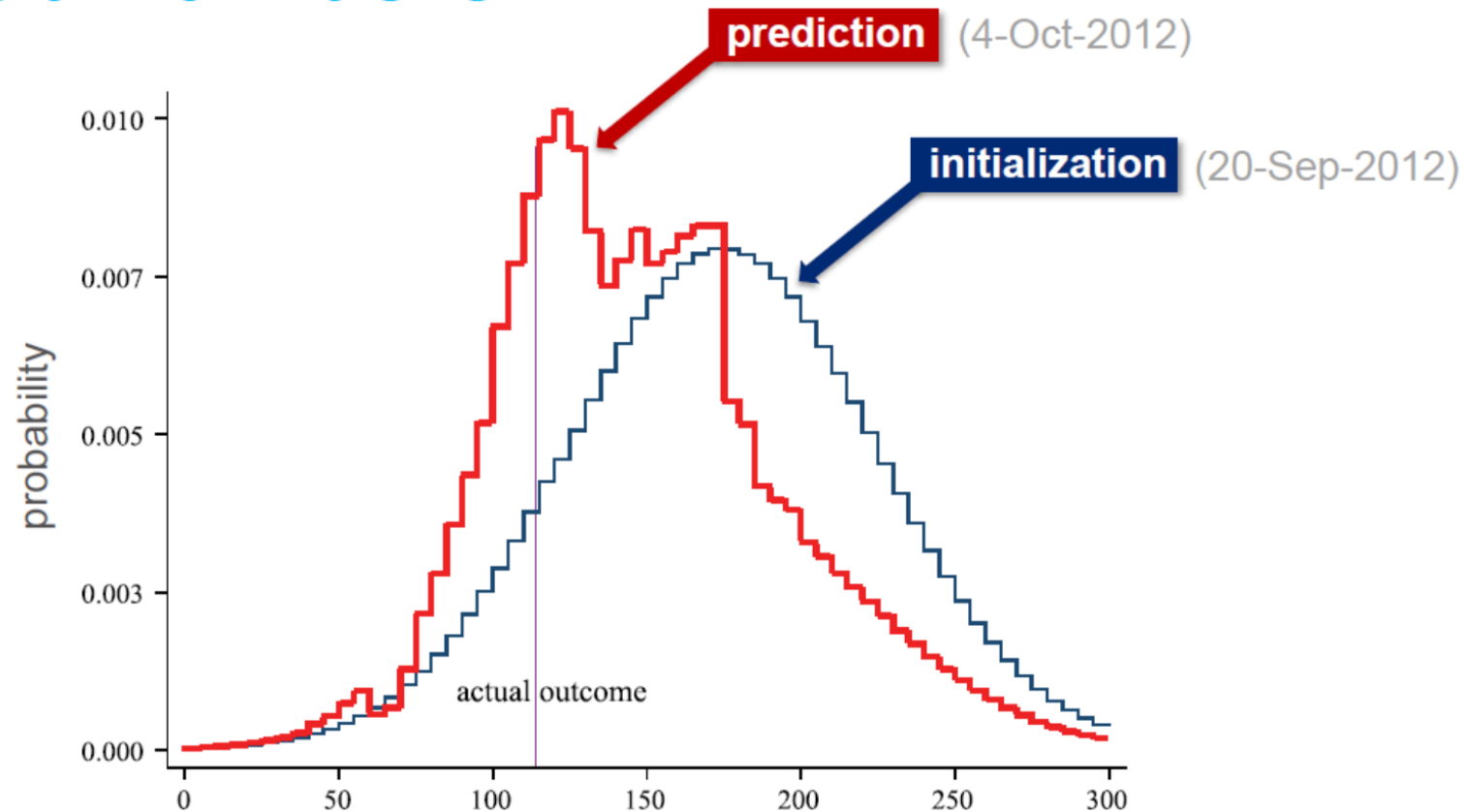
WISEQ SCORE
102.19

[My Portfolio »](#)

*Click on the map to see the latest state-by-state predictions.
[Click here to see details of prediction rules.](#)*

Output: Full distributions

job numbers



Job Numbers for September 2012
(released 5-Oct-2012)



Speakers

Sanmay Das, Associate Professor, Washington University in St. Louis, CS. Machine learning & computational social science. NSF CAREER award. Program chair AMMA, workshops chair ACM EC. A.B. Harvard, Ph.D. MIT.

Robin Hanson, Associate Professor, George Mason University. Prediction market pioneer (“father”). Principal architect of first internal corporate markets and the first web markets. Developed new technologies for conditional, combinatorial, and intermediated trading. Ph.D. Caltech.

Nicolas Lambert, Assistant Professor, Stanford GSB. Microeconomic theory, with focus on information economics and electronic commerce. Economist with a computer science background. ACM EC Best Paper 2008. Ph.D. Stanford.



Prediction Engine

Nicolas

Robin

Sanmay

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- From a crowd;

R, S

Historical data

- How? Polling;

- Scoring rules;

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Prediction markets

N, S

- Devil in User interface;

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R, S



