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Big Data & Online Campaigning: The State of the Art

Kyriakos Pierrakakis



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Obama '12

2012 Person of the Year: Barack Obama, the President

By Michael Scherer | Dec. 19, 2012

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Twenty-seven years after driving from New York City to Chicago in a \$2,000 Honda Civic for a job that probably wouldn't amount to much, Barack Obama, in better shape but with grayer hair, stood in the presidential suite on the top floor of the Fairmont Millennium Park hotel as flat screens announced his re-election as President of the United States. The networks called Ohio earlier than predicted, so his aides had to hightail it down the hall to join his family and friends. They encountered a room of high fives and fist pumps, hugs and relief.

The final days of any campaign can alter the psyches of even the most experienced political pros. At some point, there is nothing to do but wait. Members of Obama's team responded in the only rational way available to them — by acting irrationally. They turned neckties into magic charms and facial hair into a talisman and compulsively repeated past behaviors so as not to jinx what seemed to be working. In Boca Raton, Fla., before the last debate, they dispatched advance staff to find a greasy-spoon diner because they had eaten at a similar joint before the second debate, on New York's Long Island. They sent senior strategist David Axelrod a photograph of the tie he had to find to wear on election night: the same one he wore in 2008. Several staffers on Air Force



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Obama '12



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The Geek Squad: from left: **Michael Slaby**, a veteran of the 2008 effort, hired the tech and data teams and kept them on track; **Chris Wegrzyn** built the infrastructure and software behind the massive data operation; **Teddy Goff**, the digital director, ran social-media, online and mobile outreach; **Joe Rospars**, the architect of online fundraising for Howard Dean in 2004 and Obama in 2008, oversaw digital efforts; **Marie Ewald** focused on e-mail fundraising, helping raise \$690 million online



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The Geek Squad: from left: **Harper Reed**, the chief technology officer, tweeted "My boss is awesome" after Obama won; **Dan Wagner**, the chief analytics officer, oversaw a team of number crunchers five times the size of the 2008 group; **Dylan Richard** engineered much of the software behind the campaign; **Andrew Cluster** used analytics to develop new ways of targeting and predicting voter behavior



Nate Silver



Nate Silver



Kyriakos Pierrakakis

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Nathaniel Read "Nate" Silver is an American statistician, sabermetrician, psephologist, and writer. Silver first gained public recognition for developing PECOTA, a system for forecasting the performance ... [Wikipedia](#)

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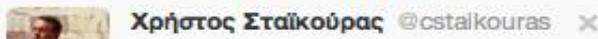
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Bayes' theorem

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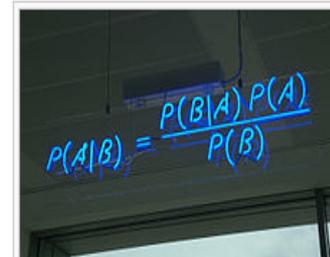
This article is about the theorem. For its application in legal evidence diagnostics and E-discovery, see Bayesian theory in E-discovery. For its application in marketing, see Bayesian theory in marketing. For other uses, see Bayes theorem (disambiguation).

In *probability theory* and *statistics*, **Bayes' theorem** (alternatively **Bayes' law**) is a theorem with two distinct interpretations. In the *Bayesian interpretation*, it expresses how a subjective degree of belief should rationally change to account for evidence. In the *frequentist interpretation*, it relates inverse representations of the probabilities concerning two events. In the Bayesian interpretation, Bayes' theorem is fundamental to *Bayesian statistics*, and has applications in fields including *science*, *engineering*, *economics* (particularly *microeconomics*), *game theory*, *medicine* and *law*. The application of Bayes' theorem to update beliefs is called *Bayesian inference*.

Bayes' theorem is named after *Thomas Bayes* (/ˈbeɪz/; 1701–1761), who first suggested using the theorem to update beliefs. His work was significantly edited and updated by *Richard Price* before it was posthumously read at the *Royal Society*. The ideas gained limited exposure until they were independently rediscovered and further developed by *Laplace*, who first published the modern formulation in his 1812 *Théorie analytique des probabilités*. Until the second half of the 20th century, the Bayesian interpretation was largely rejected by the mathematics community as unscientific^[*citation needed*]. However, it is now widely accepted. This may have been due to the development of computing, which enabled the successful application of Bayesianism to many complex problems.^[1]

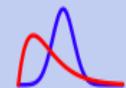
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 - 3.1.1 Simple form



The simple statement of Bayes' theorem

Bayesian statistics



Theory

Bayesian probability
Probability interpretations

Bayes' theorem
Bayes' rule · Bayes factor



Remember Bayes?

Bayes' rule

Bayes' rule really involves nothing more than the manipulation of conditional probabilities. Remember that the joint probability of two events, A & B , can be expressed as

$$P(AB) = P(A|B)P(B) \quad (1)$$

$$= P(B|A)P(A) \quad (2)$$

In Bayesian probability theory, one of these “events” is the hypothesis, H , and the other is data, D , and we wish to judge the relative truth of the hypothesis given the data. According to Bayes' rule, we do this via the relation

$$P(H|D) = \frac{P(D|H)P(H)}{P(D)} \quad (3)$$

The term $P(D|H)$ is called the *likelihood* function and it assesses the probability of the observed data arising from the hypothesis. Usually this is known by the



AF 447

The Lessons of AF 447: Did Faulty Computer Indicator Reinforce Pilot Errors?

By *Gerald Traufetter*

The pilots of Air France flight AF 447, which crashed into the Atlantic three years ago, ignored basic rules of flying, but were also misled by faulty computer indicators. Experts say pilots have become excessively accustomed to automated flying and need to learn how to fly planes by hand.

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Photo Gallery: The Mystery of Air France Flight 447



REUTERS

Brazilian Navy sailors pick a piece of debris from Air France flight AF447 out of the Atlantic Ocean a week after the crash happened on June 1, 2009



Nate Silver, Bayesian

One of the most important notions in probability and statistics is Bayes' Theorem, and it can be a little difficult to understand.

It involves negotiating probabilities of conditional events to find out what is really going on.

In his new book, *The Signal and the Noise*, FiveThirtyEight's founder Nate Silver gives the single most coherent explanation of Bayes' Theorem out there.

Here's how it goes:

Suppose you are living with a partner and come home from a business trip to discover a strange pair of underwear in your dresser drawer. You will probably ask yourself: what is the probability that your partner is cheating on you?

In order to figure this out probabilistically, you'll need to estimate a few probabilities.

The first, "y" is **the probability that the underwear appeared because you are in fact being cheated on.**

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

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Howard Dean. @GovHowardDean. I am a physician & former 6 term Gov. of Vermont. Ran for President in 2004 & founded @DFAaction. As DNC chair started ...

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Governor **Howard Dean** is a Senior Strategic Advisor and Independent Consultant for the Government Affairs practice at McKenna Long & Aldridge LLP.

[Howard Dean's Scream - YouTube](#)

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Howard Dean

Howard Brush Dean III is an American politician and physician from Vermont. He served six terms as the 79th Governor of Vermont and ran unsuccessfully for the 2004 Democratic presidential nomination. Wikipedia

Born: November 17, 1948 (age 64), [New York City](#)

Height: 5' 9" (1.75 m)

Spouse: [Judith Steinberg Dean](#)

Education: [Yale University](#), [Albert Einstein College of Medicine](#), [St. George's School](#), [Newport](#)

2004 presidential candidacy

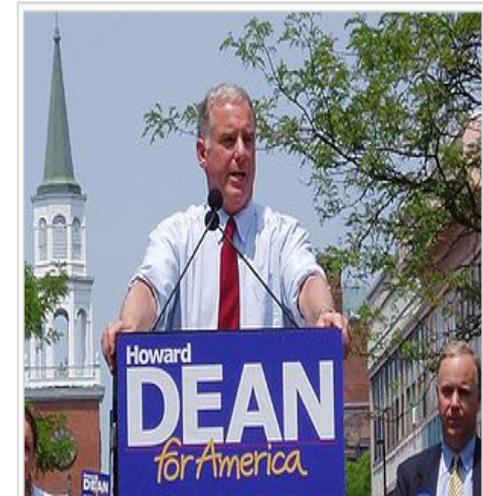
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Main article: [Howard Dean presidential campaign, 2004](#)

Dean began his bid for President as a "long shot" candidate. *ABC News* ranked him eighth out of 12 in a list of potential presidential contenders in May 2002. In March 2003 he gave a speech strongly critical of the Democratic leadership at the [California State Democratic Convention](#) that attracted the attention of grassroots party activists and set the tone and the agenda of his candidacy. It began with the line: "What I want to know is what in the world so many Democrats are doing supporting the President's unilateral intervention in Iraq?"

That summer, his campaign was featured as the cover article in *The New Republic* and in the following months he received expanded media attention. His campaign slowly gained steam, and by autumn of 2003, Dean had become the apparent frontrunner for the Democratic nomination, performing strongly in most polls and outpacing his rivals in fundraising. This latter feat was attributed mainly to his innovative embrace of the Internet for campaigning, using [Meetup.com](#) to track supporters and encourage grassroots participation in the campaign. The majority of his donations came from individual Dean supporters, who came to be known as *Deanites*, or, more commonly, *Deaniacs*, a term coined to describe meetup participants, who passed out campaign materials supporting Dean and the broader movement.^{[18][19]} (Critics often labeled them "Deany Boppers", or "Deanie Babies", a reference to his support from young activists.) Following Dean's presidential campaign, some Deaniacs remained engaged in the political process through [Democracy for America](#) and similar locally-oriented organizations.

During his presidential campaign, [conservative](#) critics labeled Dean's political views as those of an extreme [liberal](#); however in [Vermont](#), Dean, long known as a staunch advocate of fiscal restraint, was regarded as a moderate. Many left-wing critics who supported fellow Democrat [Dennis Kucinich](#) or independent [Ralph Nader](#) charged that, at heart, Dean was a "[Rockefeller Republican](#)"—socially liberal, while fiscally conservative.^{[20][21]}



Howard Dean declared his candidacy for the 2004 Democratic Party presidential nomination on June 23, 2003, in Burlington, Vermont 



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The [MoveOn](#) family of organizations gives real Americans a voice in a political process dominated by big money and armies of lobbyists. With over 7 million members across America - from carpenters to stay-at-home moms to business leaders - we work together to realize the progressive promise of our country.

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"Love Makes a Family"



In 2011, over 18 million people saw Zach Wahls defend marriage equality on behalf of his family in front of the Iowa Legislature. Hundreds of MoveOn families submitted photos, joining Zach and his family in sending out this simple holiday greeting and creating this video and online campaign called "Love Makes a Family."



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Joe Trippi, Campaign Manager

- Longtime political operative Joe Trippi cheers the innovations of Obama 2008, saying they restored the primacy of the individual voter.
- “Technology has given politics back its soul”





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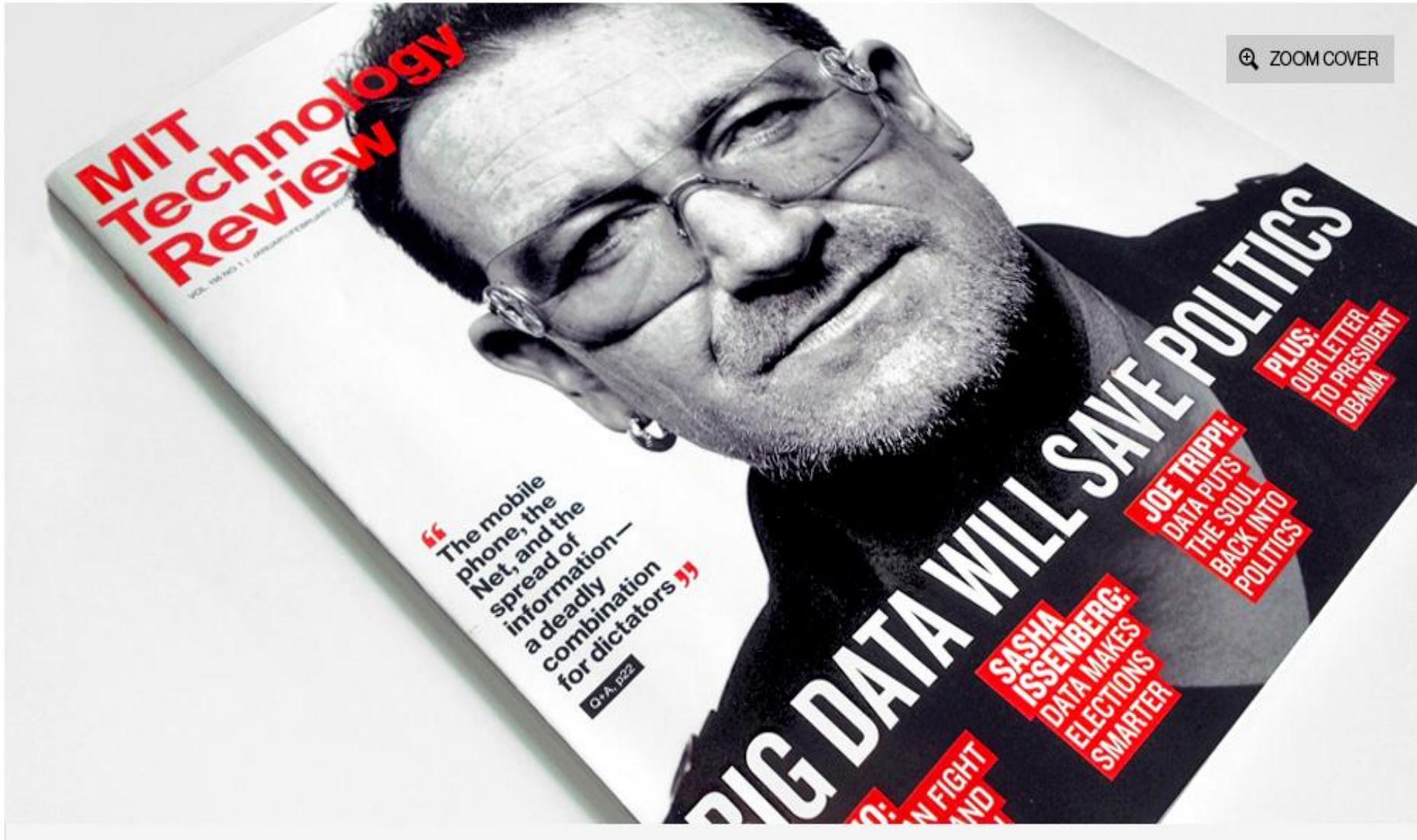
Born to Foreign Service parents, Nicco spent his early years in Asia and Africa before graduating from the College of William and Mary in Virginia with a bachelor's degree in government. He then worked for several high-profile advocacy organizations where he pioneered the use of social media as a galvanizing force for fundraising. As webmaster for Governor Howard Dean's 2004 presidential bid, Nicco and the campaign team popularized the use of technology and social media that revolutionized political fundraising and reshaped American politics. Subsequently, he co-





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Big Data & Politics





Joe Trippi

- “As Sasha Issenberg describes at length in “A More Perfect Union, big data gave Obama 2012 the names of all 69 million people who voted for the candidate in 2008 and allowed the campaign to rebuild that winning coalition, vote by vote. Big data told the campaign which voters were undecided, and even which voters with otherwise Republican attitudes could be swayed to vote for the president. The campaign spent over \$100 million developing the biggest network of people in political history. Millions of Americans heard from other Americans about issues that mattered to them. Those conversations were more powerful than the billions of dollars spent on TV ads. It requires no hyperbole to say that Obama 2012 changed everything.”
- **Source: <http://www.technologyreview.com/featuredstory/508831/how-technology-has-restored-the-soul-of-politics/>**



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The New Methods



The CTO of Obama's 2008 campaign, and the CTO of Obama's 2012 campaign.



New Methods

- Message= f (machine)
- Machine = f (methods)
- Obama 2012 → New Methods
- New squad convened from multinational ad agencies, corporate consultancies and high-tech start-ups.
- Goals were the same as ever: money in the bank, door knocks, phone calls, voter registrations, voters at the polls.
- **Methods bordered on the revolutionary: Data crunchers created algorithms for predicting the likelihood that someone would respond to specific types of requests to accomplish each of those goals.**
- Vast quantities of information were collected and then employed to predict just which television shows various target voters in certain cities were watching at just what time of day — the better to decide where to place TV ads.



New Methods

- Facebook, which was an afterthought in 2008, became the new electronic telephone call, employed to persuade more than 600,000 Obama supporters to reach out to 5 million swing-state friends online with targeted messages in the days before the election.
- Geek squad also invented new ways to fundraise.
- Refined meet-the-candidate lotteries into an art form, invented a system for texting dollars from a mobile phone that required entering only a single number and experimented with the language of e-mail pitches until they stung.
- Obama was able to raise \$690 million online in 2012, up from about \$500 million in 2008. More than \$200 million of that came in donations of \$200 or less, a 10% increase over the history-making frenzy of 2008. In a campaign that big super-PAC money was supposed to dominate, Obama's operation proved that many small efforts were more powerful than a few big ones.



Data as Institutional Advantage

- Exactly what that team of dozens of data crunchers was doing was a closely held secret. “They are our nuclear codes,” campaign spokesman Ben LaBolt would say when asked about the efforts.
- Around the office, data-mining experiments were given mysterious code names such as Narwhal and Dreamcatcher.
- The team worked at a remove from the rest of the campaign staff, in a windowless room at the north end of the vast headquarters office.
- The “scientists” created regular briefings on their work for the President and top aides in the White House’s Roosevelt Room, but public details were in short supply as the campaign guarded what it believed to be its biggest institutional advantage over Mitt Romney’s campaign: its data.



Creating a Megafile

- Obama 2008: too many databases.
- Volunteers making phone calls through the Obama website were using lists that differed from the lists used by callers in the office.
- Get-out-the-vote lists were never reconciled with fundraising lists. It was like the FBI and the CIA before 9/11.
- Over the first 18 months → a single massive system that could merge the information collected from pollsters, fundraisers, field workers and consumer databases as well as social-media and mobile contacts with the main Democratic voter files.
- The new megafile didn't just tell the campaign how to find voters and get their attention; it also allowed the number crunchers to run tests predicting which types of people would be persuaded by certain kinds of appeals.
- Call lists in field offices, for instance, didn't just list names and numbers; they also ranked names in order of their persuadability.



Key factors

- 75% of the determining factors were basics like age, sex, race, neighborhood and voting record.
- Consumer data about voters helped round out the picture.
- “We could [predict] people who were going to give online. We could model people who were going to give through mail. We could model volunteers,”
- “In the end, modeling became something way bigger for us in ’12 than in ’08 because it made our time more efficient.”
- Early on, for example, the campaign discovered that people who had unsubscribed from the 2008 campaign e-mail lists were top targets, among the easiest to pull back into the fold with some personal attention.
- The strategists fashioned tests for specific demographic groups, trying out message scripts that they could then apply. They tested how much better a call from a local volunteer would do than a call from a volunteer from a non–swing state like California.



E-mail & metrics

- The new megafile also allowed the campaign to raise more money than it once thought possible.
- A large portion of the cash raised online came through an intricate, metric-driven e-mail campaign in which dozens of fundraising appeals went out each day.
- Many of the e-mails sent to supporters were just tests, with different subject lines, senders and messages.
- Inside the campaign, there were office pools on which combination would raise the most money, and often the pools got it wrong. Michelle Obama's e-mails performed best in the spring, and at times, campaign boss Messina performed better than Vice President Joe Biden.
- In many cases, the top performers raised 10 times as much money for the campaign as the underperformers.



Simulations & Facebook

- It was this database that helped steady campaign aides in October 2012.
- “We ran the election 66,000 times every night,” said an official, describing the computer simulations the campaign ran to figure out Obama’s odds of winning each swing state. “And every morning we got the spit-out — here are your chances of winning these states. And that is how we allocated resources.”
- In the final weeks of the campaign, people who had downloaded an app were sent messages with pictures of their friends in swing states. They were told to click a button to automatically urge those targeted voters to take certain actions, such as registering to vote, voting early or getting to the polls.
- The campaign found that roughly 1 in 5 people contacted by a Facebook pal acted on the request, in large part because the message came from someone they knew.



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-NEA Senior Campaign Specialist, Kristofer Garcia

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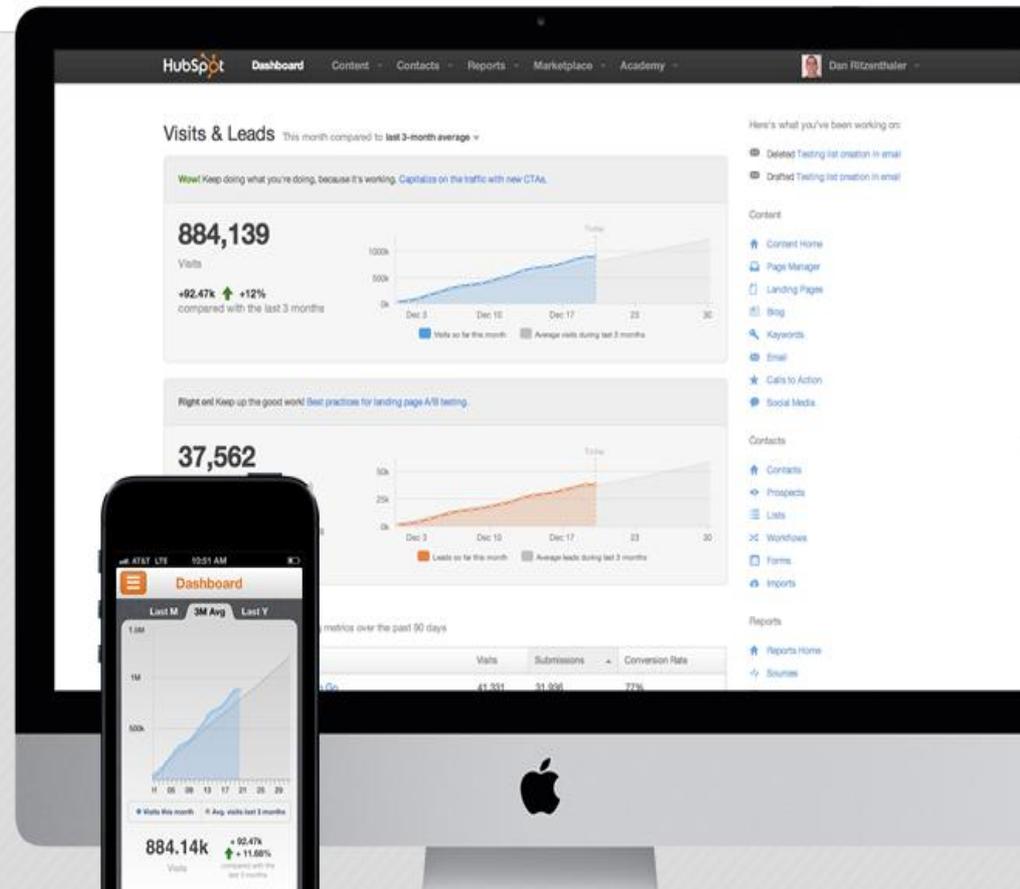
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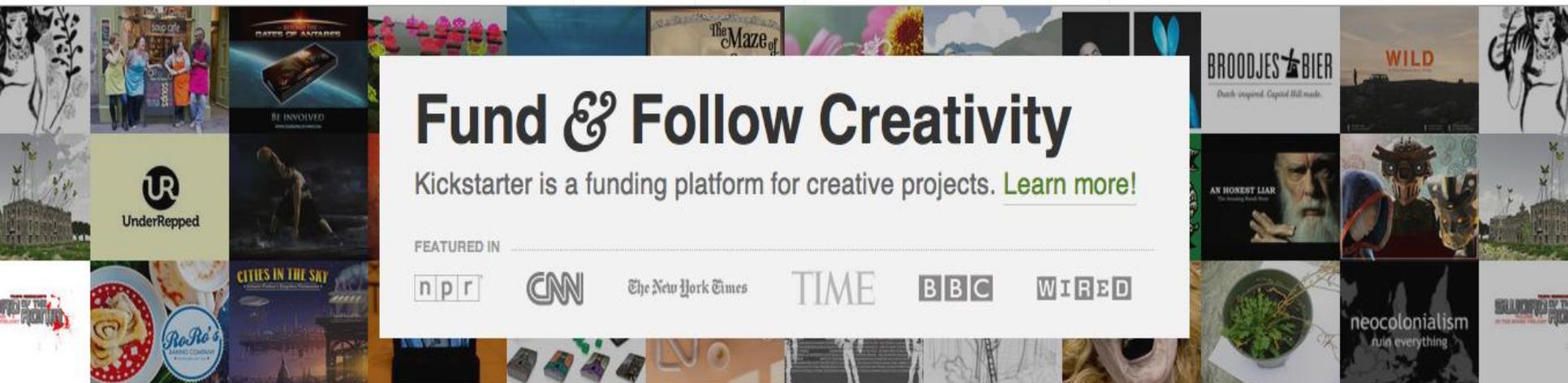
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$F = \frac{Gm_1m_2}{d^2}$ $E = MC^2$ $f(x)$
 $(1 + \frac{1}{n})$ $Ax = Ab$

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Some Afterthoughts

- How much of this survives for future Democrats when Obama exits the stage?
- Obama's advisers are quick to say it won't be around for others to tap. Too much of the Obama coalition, they say, is about Obama himself. It might reject anyone who tries to take up his mantle in a few years. "This organization is not transferable," says a senior campaign adviser. "The next nominee on either side is going to have to build their own coalition."
- Obama 2008 & Obama 2012 → Proprietary!
- EU Privacy laws → Stringent, might not adapt too quickly
- However, Obama 2012 insights do have applicability for EU elections