Reverse Engineering Chinese Censorship

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(Talk at the Harvard Alumni Assembly, 20 September 2014)

1 Based on joint work with Jennifer Pan and Margaret Roberts
2 GaryKing.org
Papers

- An Observational Study:
  
  *How Censorship in China Allows Government Criticism but Silences Collective Expression*  
  *(American Political Science Review, May 2013)*

- Experimental and Participatory Studies:
  
  *Reverse Engineering Chinese Censorship*  
  *(Science, August 2014)*

Copies at GaryKing.org
Chinese Censorship

The largest selective suppression of human expression in history: implemented manually (within a few hours of posting), by \(\approx 200,000\) workers, located in government and inside social media firms. A huge censorship organization: (obviously) designed to suppress information (paradoxically) very revealing about the goals, intentions, and actions of the Chinese leadership.
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(Plus 59% from Sina Blog)
The Goals of Censorship make Social Media Actionable

What Could be the Goal?

1. Stop collective action

Implications: Social Media is Actionable!

Chinese leaders: measure criticism to judge local officials; censor to stop events with collective action potential. Thus, we can use criticism and censorship to predict:

- Officials in trouble, likely to be replaced
- Policies that generate dissent (and interest of leaders)
- Government action outside the Internet
- Dissidents to be arrested; peace treaties to sign; emerging scandals
- Disagreements between central and local leaders

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Our Observational Research Design: 5 Steps

1. Monitor 85 content areas over 6 months
2. Download each social media post, the instant it appears
3. Revisit each later to check if it was censored (carefully, from computers all over the world)
4. Repeat 11,382,221 times
5. Analyze with new methods of computer-assisted text analysis
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Censorship is not Ambiguous: Example Error Page

Sorry, the host you were looking for does not exist, has been deleted, or is being investigated.
Censorship is not Ambiguous: BBS Error Page

The page you requested is temporarily down. How about you go look at another page.

Jingjing, one of China’s cartoon internet police
The Censors are Fast; Our Automated Methods are Faster
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Example: Shanghai Subway Crash
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![Bar chart showing days until censorship and days after post was written with number censored]
Post Volume & Censorship are “Bursty”
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Collective Support for Environmental Lottery

---

Found 87 volume bursts in our 85 topic areas.

Identified real world event associated with each burst.

Our hypothesis: The government censors all posts in volume bursts associated with events with collective action potential (regardless of how critical or supportive of the state).
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Observational Test 1: Post Volume

Begin with our 87 volume bursts in 85 topics areas.

For each burst, calculate change in % censorship inside to outside each volume burst within topic areas – censorship magnitude.

If the goal of censorship is to stop collective action, we expect:

1. On average, % censored should increase during volume bursts.

2. Some bursts (associated with politically relevant events) should have much higher censorship.
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Classification of Events Generating the Bursts

1. Protest or organized crowd formation outside the Internet individual who have organized or incited collective action on the ground in the past; topics related to nationalism or nationalist sentiment that have incited protest or collective action in the past. (Inter-coder reliability: 98.9%)

2. Other News

3. Government Policies

4. 13/27
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Event classification (each category can be +, −, or neutral comments about the state)
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What Types of Events Are Censored?

![Graph showing the distribution of censorship magnitude by type of event.

- **X-axis:** Censorship Magnitude
- **Y-axis:** Density
- **Legend:**
  - Blue: Policy
  - Purple: News
  - Red: Collective Action
  - Orange: Criticism of Censors
  - Yellow: Pornography

The graph illustrates the density of censorship magnitude for different types of events, with peaks indicating higher occurrences of censorship at certain magnitude levels for each category.
What Types of Events Are Censored?

Censorship Magnitude

Popular Book Published in Audio Format
Disney Announced Theme Park
EPA Issues New Rules on Lead
Chinese Solar Company Announces Earnings
China Puts Nuclear Program on Hold
Gov't Increases Power Prices
Jon Hunstman Steps Down as Ambassador to China
News About Iran Nuclear Program
Indoor Smoking Ban Takes Effect
Popular Video Game Released
Education Reform for Migrant Children
Food Prices Rise
U.S. Military Intervention in Libya
Policies
News
Collective Action
Criticism of Censors
Pornography
-0.2 0 0.1 0.3 0.5 0.7

Censorship Magnitude

Protests in Inner Mongolia
Pornography Disguised as News
Baidu Copyright Lawsuit
Zengcheng Protests
Pornography Mentioning Popular Book
Ai Weiwei Arrested
Collective Anger At Lead Poisoning in Jiangsu
Google is Hacked
Localized Advocacy for Environment Lottery
Fuzhou Bombing
Students Throw Shoes at Fang BinXing
Rush to Buy Salt After Earthquake
New Laws on Fifty Cent Party

U.S. Military Intervention in Libya
Food Prices Rise
Education Reform for Migrant Children
Popular Video Game Released
Indoor Smoking Ban Takes Effect
News About Iran Nuclear Program
Jon Hunstman Steps Down as Ambassador to China
Gov't Increases Power Prices
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Chinese Solar Company Announces Earnings
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Censorship Magnitude
Censoring Collective Action: Riots in Zengcheng
Censoring Collective Action: Ai Weiwei’s Arrest

![Graph showing the count of published and censored articles about Ai Weiwei's arrest from January to July.](image)

Ai Weiwei arrested
Low Censorship on Policy: One Child
Low Censorship on News: Power Prices

Power shortages
Gov't raises power prices to curb demand
Censored: Collective Action Posts

<table>
<thead>
<tr>
<th>Percent Censored</th>
<th>Criticize</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>19/27</td>
<td></td>
</tr>
<tr>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
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Inner Mongolia
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Censored: Collective Action Posts

Regardless of whether Supportive or Critical
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Randomized Experiment (for causal inferences)

- Selected 100 top social media sites (≈87% of blogs, >500M Users, geographically diverse)
- Created 2 accounts on each (from inside China all over the country)
- Wrote 1,200 unique social media posts (CA/not CA, Pro/Anti)
- Submitted posts randomly assigned to type
- Checked on censorship (from computers in many countries)

Participatory Study (for descriptive inferences)

- Current method of learning how they censor: ask (carefully!)
- Our goal: change our sources' incentives
- Procedure: create our own social media website in China
  - Bought URL; contracted with firms for servers & software; posted and censored ourselves
  - To learn: we tried every software option, read the documentation, and called customer support(!)
Additional Research Designs

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  - Bought URL; contracted with firms for servers & software; posted and censored ourselves
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Additional Research Designs

1. Randomized Experiment (for causal inferences)

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   Created 2 accounts on each (from inside China all over the country)
   Wrote 1,200 unique social media posts (CA/not CA, Pro/Anti)
   Submitted posts randomly assigned to type
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2. Participatory Study (for descriptive inferences)

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Mechanisms of Censorship
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1. Submit text for posting
   - Immediately held for review before publication
2. Post remains online
   - Post is removed (within 24 hours)
3. Publish immediately
   - Post is published after review
4. Censored
   - Post deleted during review
   - Account blocked
   - You have been silenced by the administrator, the type of silence is forever!
5. Published
   - The government goes on about anti-corruption everyday, but is it doing anything? Today, it's Guo Yongxiang from Sichuan... All officials are corrupt, it's only those who have offended someone that are investigated...
   - By 2020 China will have 30 million bare branches (extra men), this is a critical situation. Behind it is the fact that every year more boys than girls are born, which is due to the one-child policy. Over the years, the one-child policy has created many social problems...
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Submit text for posting

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Administrator has set up review for new topics, your post will be shown after it has passed review.

- Post deleted during review

(Post reviewed then deleted)

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- Sorry, the host you were looking for does not exist, has been deleted, or is being investigated

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Obsevational study

- 64% of websites review some content
- 40% of all submissions reviewed
Posts For v. Against Government: Zero Causal Effect
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Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

Panxu Protest
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

Panxu Protest

Tibetan Self-Immolations
Posts For v. Against Government: Zero Causal Effect
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-0.5 0.0 0.5 1.0
Censorship Difference (Pro − Anti)

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Protests in Xinjiang
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro - Anti)

-0.5 0.0 0.5 1.0

Panxu Protest
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Corruption Policy

Tibetan Self-Immolations
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-0.5 0.0 0.5 1.0

Panxu Protest

Ai Weiwei Album

Corruption Policy

Tibetan Self-Immolations

Protests in Xinjiang

Eliminate Golden Week

Protests in Xinjiang
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect

![Graph showing the relationship between different events and their corresponding censorship differences. The graph includes events such as Panxu Protest, Ai Weiwei Album, Tibetan Self-Immolations, Protests in Xinjiang, Corruption Policy, Eliminate Golden Week, Yellow Light Fines, Rental Tax, and Yellow Light Fines. The graph displays the censorship difference (Pro - Anti) for each event, with most events having a difference close to zero, indicating no significant causal effect.](image-url)
Posts For v. Against Government: Zero Causal Effect

![Graph showing the comparison of posts for and against government actions](image-url)

- Panxu Protest
- Ai Weiwei Album
- Corruption Policy
- Tibetan Self-Immolations
- Protests in Xinjiang
- Eliminate Golden Week
- Yellow Light Fines
- Rental Tax
- Stock Market Crash

The graph illustrates the censorship difference (Pro - Anti) for various government actions.
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

-0.5 0.0 0.5 1.0

Panxu Protest
Ai Weiwei Album
Corruption Policy
Tibetan Self-Immolations
Protests in Xinjiang
Eliminate Golden Week
Yellow Light Fines
Rental Tax
Stock Market Crash
Investigation of Sichuan Vice Governor

Rental Tax

Investigation of Sichuan Vice Governor
Posts For v. Against Government: Zero Causal Effect

Panxu Protest
Ai Weiwei Album
Corruption Policy
Eliminate Golden Week
Yellow Light Fines
Stock Market Crash
Investigation of Sichuan Vice Governor
Gender Imbalance

Tibetan Self-Immolations
Protests in Xinjiang
Rental Tax

Posts For v. Against Government: Zero Causal Effect
Collective Action Events: Large Causal Effect
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Censorship Difference (CA Event − Non-CA Event)

Panxu Protest

Tibetan Self-Immolations
Collective Action Events: Large Causal Effect

Censorship Difference (CA Event - Non-CA Event)

- Panxu Protest
- Tibetan Self-Immolations
- Ai Weiwei Album
Collective Action Events: Large Causal Effect

- Panxu Protest
- Tibetan Self-Immolations
- Ai Weiwei Album
- Protests in Xinjiang

Censorship Difference (CA Event - Non-CA Event)
Evading Automated Review

Example Substitution 1: Homograph
自
由
“Freedom”
目
田
“Eye field”
(nonsensical)

Example Substitution 2: Homophone (both sound like “hexie”)
和
谐
“Harmonious [Society]” (official slogan)
河
蟹
“River crab”
(irrelevant)

They can’t follow the conversation; our new keyword methods can!

The same task:
(1) the analyst’s job,
(2) language drift
(3) People hiding in plain sight,
(4) Look-alike modeling,
(5) Starting point for sophisticated automated text analysis

24/27
Evading Automated Review

Example Substitution 1:
Evading Automated Review

Example Substitution 1:

自由
Evading Automated Review

Example Substitution 1:

自由 “Freedom”
Evading Automated Review

Example Substitution 1:

自由  “Freedom”

They can't follow the conversation; our new keyword methods can!
Evading Automated Review

Example Substitution 1:

自由 “Freedom” 自由

Example Substitution 2:

和 “Harmonious [Society]” （official slogan）
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Evading Automated Review

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自由
目田
“Freedom”
“Eye field”

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Example Substitution 1:

自由  “Freedom”
目田  “Eye field” (nonsensical)
Evading Automated Review

Example Substitution 1: Homograph

自由 自由
自由 “Freedom” (censored)
目 田 目 田
目 田 “Eye field” (nonsensical)
Evading Automated Review

Example Substitution 1: Homograph

自由
“Freedom”
(“Eye field” (nonsensical))
Evading Automated Review

Example Substitution 1:  **Homograph**

自由  “Freedom”  (censored)
目田  “Eye field”  (nonsensical)

Example Substitution 2:
Evading Automated Review

Example Substitution 1: Homograph

自由 自由 “Freedom”
目田 目田 “Eye field” (nonsensical)

Example Substitution 2:

和谐
Evading Automated Review

Example Substitution 1: Homograph

自由  自由
自由
自由
“Freedom” (censored)

例句  “Eye field” (nonsensical)

Example Substitution 2:

和谐  和谐
和谐
和谐
“Harmonious [Society]” (official slogan)
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自由
自由
“Freedom” (nonsensical)

目田
目田
“Eye field”

Example Substitution 2:

和谐
和谐
“Harmonious [Society]” (official slogan)

河蟹
河蟹
“River crab”
Evading Automated Review

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目田
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Example Substitution 2:

和谐
河蟹
“Harmonious [Society]” (official slogan)
“River crab” (irrelevant)
Evading Automated Review

Example Substitution 1: Homograph

自由
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Conclusions

The Chinese people: Individually free, Collectively in Chains

Social Media (analyzed the right way):
Enables detailed, continuous, predictive monitoring of every Chinese government, leader, policy, dissident, scandal, company, etc.
Predicts state actions when other sources are silent
Applicable to other countries

New statistical methods widely applicable beyond China:
Following conversations when people try to evade authorities, use language creatively, achieve political purposes, etc.
Predicting action on the ground
Understanding large volumes of text in any language
Applications to brand monitoring, intelligence analysis, sentiment analysis, investment advice, news provision, etc.
Conclusions

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The Spectacular Success of Quantitative Social Science

Develops methods & the infrastructure of science: Affects numerous application areas
Changes the social sciences: Studying problems ⇝ solving them
Leads a social revolution: across every area of society

What university research has had the biggest impact on you?
The genetics revolution? The Higgs-like particle? Exoplanets? The Mars rovers? Doubling life expectancy in the last century?...

Quantitative social science (aka “big data,” “data analytics,” “data science” applied to people): transformed most Fortune 500 firms; established new industries; improved government; increased human expressive capacity (social media); changed political campaigns; transformed public health; changed legal analysis; impacted crime and policing; reinvented economics; transformed sports; set standards for evaluating public policy; etc. etc. etc.
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  - Changes the social sciences: Studying problems → solving them
  - Leads a social revolution: across every area of society
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Gary King

King@Harvard.edu
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

<table>
<thead>
<tr>
<th>Date</th>
<th>% of Posts Censored</th>
<th>Actual % Censorship</th>
<th>Predicted % Censorship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar 19</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
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<tr>
<td>Mar 29</td>
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<tr>
<td>Apr 08</td>
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<tr>
<td>Apr 18</td>
<td>0.6</td>
<td>0.6</td>
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</tr>
<tr>
<td>2011 Mar. 29, 5 days prior</td>
<td></td>
<td></td>
<td></td>
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<td>Apr 3, Ai Weiwei Arrested</td>
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Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

Mar. 29, 5 days prior
Apr. 3, Ai Weiwei Arrested

Actual % censorship
Predicted % censorship trend based on 3/19–3/29 data
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

Placebo Test:
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

Placebo Test: Most extreme of all effects
Predicting the South China Sea Peace Agreement
Predicting the South China Sea Peace Agreement

![Graph showing the prediction and actual censorship rates from June 12 to July 2.](image)

- **Jun. 20, 5 days prior**
- **Jun. 25, Peace Agreement**

**Predicted % censorship trend based on 6/10–6/20 data**

**Actual % censorship**

**Placebo Test:** Most extreme of all effects
Predicting the South China Sea Peace Agreement

Jun. 20, 5 days prior
Jun. 25, Peace Agreement

Predicted % censor trend based on 6/10–6/20 data

Actual % censorship

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Jan. 28, 5 days prior
Feb. 2, Wang Lijun demoted

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Uncensored Posts (w/o Collective Action Potential)
Critical of the State
Uncensored Posts (w/o Collective Action Potential)
Critical of the State

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<th>Collective Action</th>
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<tr>
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</tr>
<tr>
<td></td>
<td>CENSORED</td>
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<tr>
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<tr>
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Uncensored Posts (w/o Collective Action Potential)
Critical of the State

This is a city government [Yulin City, Shaanxi] that treats life with contempt, this is government officials run amuck, a city government without justice, a city government that delights in that which is vulgar, a place where officials all have mistresses, a city government that is shameless with greed, a government that trades dignity for power, a government without humanity, a government that has no limits on immorality, a government that goes back on its word, a government that treats kindness with ingratitude, a government that cares nothing for posterity...
Censored Post (with Collective Action Potential)
Supporting the State
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Censored Post (with Collective Action Potential)
Supporting the State

The bombing led not only to the tragedy of his death but the death of many government workers. Even if we can verify what Qian Mingqi said on Weibo that the building demolition caused a great deal of personal damage, we should still condemn his extreme act of retribution. The government has continually put forth measures and laws to protect the interests of citizens in building demolition. And the media has called attention to the plight of those experiencing housing demolition. The rate at which compensation for housing demolition has increased exceeds inflation. In many places, this compensation can change the fate of an entire family.

爆炸案造成他本人和多名政府工作人员死伤的悲剧，即使钱明奇在微博里所称拆迁造成的个人损失是属实的，我们也应谴责他的极端报复行为。政府在连续出台保护被拆迁者利益的政策法规，媒体也在为公平对待被拆迁者大声疾呼，各地拆迁补偿款的上升速度，大多高于商品房售价上升的速度，在不少地方，补偿款已经足以改变一个家庭的命运。