Reverse-Engineering Censorship in China\textsuperscript{1}

Gary King\textsuperscript{2}

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(Talk at Stanford University, Computer Science, Data Science 1/16/2016)

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

- An Observational Study:
  

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

- Methods:
  
  - General Purpose Computer-Assisted Clustering and Conceptualization (PNAS, 2011)
  - A Method of Automated Nonparametric Content Analysis for Social Science (AJPS, 2010)
  - Computer-Assisted Keyword and Document Set Discovery from Unstructured Text

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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Chinese Social Media: Fractured over 1,400+ sites
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(Plus 59% from Sina Blog)
What Could be the Goal?

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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A big prize, but payable only if we have the goals right.
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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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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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- Found **87 volume bursts** in our 85 topic areas
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**Collective Support for Environmental Lottery**

Count Published
Count Censored

- 0 20 40 60 80 100
- Jan Feb Mar Apr May Jun Jul
- ●
- ●
- ●
- ●
- ●
- ●
- ● ●
- ●
- ●
- ● ●
- ●
- ●
- ●
- ●
- ●...●
- ● ●
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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.

![Censorship Magnitude vs Density Chart]

Censorship Magnitude
Density
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Classification of Events Generating the Bursts

Event classification (each category can be +, −, or neutral comments about the state)

1. protest or organized crowd formation outside the Internet
2. individuals who have organized or incited collective action on the ground in the past;
3. topics related to nationalism or nationalist sentiment that have incited protest or collective action in the past.

(Inter-coder reliability: 98.9%)
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What Types of Events Are Censored?

<table>
<thead>
<tr>
<th>Censorship Magnitude</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-0.2</td>
</tr>
<tr>
<td>2</td>
<td>-0.1</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
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<td>8</td>
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<tr>
<td>12</td>
<td>0.4</td>
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- Policy
- News

- Collective Action
- Criticism of Censors
- Pornography
What Types of Events Are Censored?

- 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
- China Puts Nuclear Program on Hold
- Chinese Solar Company Announces Earnings
- EPA Issues New Rules on Lead
- Disney Announced Theme Park
- Chinese Solar Company Announces Earnings
- EPA Issues New Rules on Lead
- Disney Announced Theme Park
- Popular Book Published in Audio Format

Censorship Magnitude

- Policies
- News

Collective Action
Criticism of Censors
Pornography
-0.2 0 0.1 0.3 0.5 0.7
Censoring Collective Action: Riots in Zencheng

![Graph showing riots in Zencheng]

The graph above illustrates the trend of riots in Zencheng over a span of seven months, from January to July. The dark red line represents the count of published riots, while the black line indicates the count of censored riots. The peak in June highlights a significant increase in both published and censored riots, likely indicating a heightened level of collective action and corresponding censorship.
Censoring Collective Action: Ai Weiwei’s Arrest

Ai Weiwei arrested

Count Published
Count Censored

Jan Feb Mar Apr May Jun Jul
Low Censorship on Policy: One Child

Speculation of Policy Reversal at NPC

Count Published
Count Censored

Jan  Feb  Mar  Apr  May  Jun  Jul
Low Censorship on News: Power Prices

Power shortages
Gov't raises power prices to curb demand
“ReadMe” Algorithm Validated in Chinese
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Example: Labor Strikes, 2010 (Training set: 100; Test set: 900)
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Uncensored: Non-Collective Action Posts
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Regardless of whether Supportive or Critical
Uncensored: Non-Collective Action Posts
Regardless of whether Supportive or Critical
Censored: Collective Action Posts

<table>
<thead>
<tr>
<th>Percent Censored</th>
<th>Criticize</th>
<th>Support</th>
</tr>
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<td>0.0</td>
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</tr>
<tr>
<td>0.2</td>
<td>Inner Mongolia</td>
<td></td>
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<tr>
<td>0.4</td>
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</tr>
<tr>
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21/28
Censored: Collective Action Posts

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Censored: Collective Action Posts

Regardless of whether Supportive or Critical

- Ai Weiwei
- Fuzhou Bombing
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Percent Censored

Criticize | Support
---|---

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---|---
Additional Research Designs

1 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)

2 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(!)
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Mechanisms of Censorship
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Post remains online

Publish immediately

Post is removed (within 24 hours)

Submit text for posting

Immediately held for review before publication

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

Post is published after review

Post deleted during review

(Post reviewed then deleted)

Account blocked

You have been silenced by the administrator, the type of silence is forever!

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...

Sorry, the host you were looking for does not exist, has been deleted, or is being 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...
Mechanisms of Censorship

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

Panxu Protest

Tibetan Self-Immolations

Ai Weiwei Album

Protests in Xinjiang

Censorship Difference (Pro - Anti)

-0.5 0.0 0.5 1.0
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

-0.5 0.0 0.5 1.0

Panxu Protest

Tibetan Self-Immolations

Ai Weiwei Album

Protests in Xinjiang

Corruption Policy

24/28
Posts For v. Against Government: Zero Causal Effect
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-0.5 0.0 0.5 1.0
Censorship Difference (Pro − Anti)

Panxu Protest
Ai Weiwei Album
Corruption Policy
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Eliminate Golden Week
Yellow Light Fines
Rental Tax

24/28
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Censorship Difference (Pro − Anti)

-0.5 0.0 0.5 1.0

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

24/28
Posts For v. Against Government: Zero Causal Effect

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Protests in Xinjiang
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Rental Tax
Investigation of Sichuan Vice Governor
Posts For v. Against Government: Zero Causal Effect
Collective Action Events: Large Causal Effect
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Panxu
Protest

Censorship Difference (CA Event − Non-CA Event)
Collective Action Events: Large Causal Effect
Collective Action Events: Large Causal Effect

Panxu Protest
Tibetan Self-Immolations

Censorship Difference (CA Event − Non-CA Event)
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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
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”

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Evading Automated Review

Example Substitution 1:

自由  “Freedom”
Evading Automated Review

Example Substitution 1:

自由
自由
Freedom
“Freedom”

目田
目田
“Eye field”

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Evading Automated Review

Example Substitution 1:

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

Example Substitution 1: Homograph

自 由
“Freedom” (censored)

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

Example Substitution 1: Homograph

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

Example Substitution 1: Homograph

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

Example Substitution 2:
Evading Automated Review

Example Substitution 1: Homograph

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

Example Substitution 2:

和谐
Evading Automated Review

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自由
“Freedom”
自由
目
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Example Substitution 2:

和谐
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和谐  和谐
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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, government analysis, sentiment analysis, investments, news, advertising, etc.
Conclusions

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For more information

GaryKing.org
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

![Graph showing percentage of posts censored over time. The graph has two sections: Mar. 29, 5 days prior, and Apr. 3, Ai Weiwei Arrested. The graph shows an increase in the percentage of posts censored from Mar. 19 to Apr. 18, with a notable increase starting on Apr. 3.]
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

Placebo Test:

Most extreme of all effects
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

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

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7
% of Posts Censored
Jun 12 Jun 22 Jul 02
2011

Placebo Test: Most extreme of all effects
31/28
Predicting the South China Sea Peace Agreement

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

Actual % censorship

Placebo Test:

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

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7
% of Posts Censored

Jun 12 Jun 22 Jul 02
2011
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

Placebo Test: Most extreme of all effects
Censorship Pre-empting Collective Action: Wang Lijun’s Demotion
Censorship Pre-empting Collective Action: Wang Lijun’s Demotion

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

Actual % censorship

Predicted % censorship trend based on 1/18–1/28 data
Censorship Pre-empting Collective Action: Wang Lijun’s Demotion

Actual % censorship

Predicted % censorship trend based on 1/18–1/28 data

Placebo Test:
Censorship Pre-empting Collective Action: Wang Lijun’s Demotion

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

Actual % censorship

Predicted % censorship trend based on 1/18–1/28 data

Placebo Test: Most extreme of all effects
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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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
### Censored Post (with Collective Action Potential)

**Supporting the State**

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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.