Reverse-Engineering Censorship in China

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

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

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

- **Methods:**
  
  - General Purpose Computer-Assisted Clustering and Conceptualization (PNAS)
  - A Method of Automated Nonparametric Content Analysis for Social Science (AJPS)
  - 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 ≈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)
The Goals of Censorship make Social Media Actionable

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 & censorship to predict:

Officials in trouble, likely to be replaced

Policies that generate dissent (& interest of leaders)

Government action outside the Internet

Dissidents to be arrested; peace treaties to sign; emerging scandals

Disagreements between central and local leaders

⇝

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

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).
Post Volume & Censorship are “Bursty”

- Found 87 volume bursts in our 85 topic areas
Post Volume & Censorship are “Bursty”

- Found **87 volume bursts** in our 85 topic areas
- Identified **real world event** associated with each burst

Collective Support for Environmental Lottery

- Count Published
- Count Censored
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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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![Censorship Magnitude vs Density](image-url)
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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
   individuals 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%)
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What Types of Events Are Censored?

- Collective Action
- Criticism of Censors
- Pornography
- Policy
- News

Censorship Magnitude
Density
0 2 4 6 8 10 12
-0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

Censorship Magnitude

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

-0.2 0 0.1 0.3 0.5 0.7

Censorship Magnitude

Collective Action
Criticism of Censors
Pornography

Policies
News

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 Huntsman 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
Popular Book Published in Audio Format
Censoring Collective Action: Riots in Zencheng

[Graph showing the count of published and censored riots over time from January to July.]
Censoring Collective Action: Ai Weiwei’s Arrest

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
“ReadMe” Algorithm Validated in Chinese
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Example: Labor Strikes, 2010 (Training set: 100; Test set: 900)
“ReadMe” Algorithm Validated in Chinese

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Uncensored: Non-Collective Action Posts

Percent Censored

- 0.0
- 0.2
- 0.4
- 0.6
- 0.8
- 1.0

Criticize

- Support

Criticize

- Support

One Child Policy

Corruption Policy

Food Prices Rise
Uncensored: Non-Collective Action Posts

Regardless of whether Supportive or Critical
Uncensored: Non-Collective Action Posts
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Percent Censored

One Child Policy
Corruption Policy
Food Prices Rise

Criticize   Support
Criticize   Support
Criticize   Support
<table>
<thead>
<tr>
<th>Percent Censored</th>
<th>Criticize</th>
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Ai Weiwei, Inner Mongolia, Fuzhou Bombing
Censored: Collective Action Posts

Regardless of whether Supportive or Critical
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Regardless of whether Supportive or Critical

Percent Censored

0.0 0.2 0.4 0.6 0.8 1.0

Criticize Support Criticize Support Criticize Support

Ai Weiwei Fuzhou Bombing Inner Mongolia
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

1. Randomized Experiment (for causal inferences)

- Selected 100 top social media sites (~87% of blogs, >500M Users, geographically diverse)
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Mechanisms of Censorship
Mechanisms of Censorship

Publish Immediately

- Post remains online
- 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...

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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Mechanisms of Censorship

- 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 is removed (within 24 hours)
    - Sorry, the host you were looking for does not exist, has been deleted, or is being investigated

- Publish immediately
  - Post remains online

- 64% of websites review some content
- 40% of all submissions reviewed

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

- 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...

- 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...
Posts For v. Against Government: Zero Causal Effect
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Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect

Panxu Protest
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect
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
- Corruption Policy
- Protests in Xinjiang

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

- Panxu Protest
- Ai Weiwei Album
- Tibet Self-Immolations
- Protests in Xinjiang
- Corruption Policy
- Eliminate Golden Week

Censorship Difference (Pro – Anti)
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

- Panxu Protest
- Ai Weiwei Album
- Tibetan Self-Immolations
- Corruptions in Xinjiang
- Eliminate Golden Week
- Rental Tax
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

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

-0.5 0 0.5 1.0
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

- Panxu Protest
- Ai Weiwei Album
- Tibetan Self-Immolations
- Protests in Xinjiang
- Corruption Policy
- Eliminate Golden Week
- Yellow Light Fines
- Rental Tax
- Stock Market Crash
- Investigation of Sichuan Vice Governor
- Gender Imbalance
Posts For v. Against Government: Zero Causal Effect
Collective Action Events: Large Causal Effect
Collective Action Events: Large Causal Effect
Collective Action Events: Large Causal Effect

Panxu Protest

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

Panxu Protest
Collective Action Events: Large Causal Effect
Collective Action Events: Large Causal Effect
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
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
(BostonBombings ⇝ BostonStrong),
(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” (censored)
Evading Automated Review

Example Substitution 1:

自由
自由

“Freedom”

censored
Evading Automated Review

Example Substitution 1:

自由
目田

“Freedom”
“Eye field”

(CENSORED)
Evading Automated Review

Example Substitution 1:

自由
自 由

“Freedom”

目田
目 田

“Eye field” (nonsensical)
Evading Automated Review

Example Substitution 1: Homograph

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

Example Substitution 1: Homograph

自由
自 由
“Freedom”  (censored)

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

Example Substitution 1: Homograph

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

Example Substitution 2:
Evading Automated Review

Example Substitution 1: Homograph

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

Example Substitution 2:

和谐
Evading Automated Review

Example Substitution 1: Homograph

自由
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“Eye field” (nonsensical)

Example Substitution 2:

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

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

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和谐 和谐
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Evading Automated Review

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

Example Substitution 2:

和谐 和谐 “Harmonious [Society]” (official slogan) (censored)
河蟹 河蟹
Evading Automated Review

Example Substitution 1: Homograph

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

Example Substitution 2:

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

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Evading Automated Review

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自由

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Example Substitution 2: Homophone (both sound like “hexie”)

和谐

“Harmonious [Society]” (official slogan)

河蟹

“River crab” (irrelevant)
Evading Automated Review

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自由
自由
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目
目
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河蟹
“River crab” (irrelevant)

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Evading Automated Review

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Evading Automated Review

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河蟹  “River crab” (irrelevant)

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The same task: (1) the analyst’s job, (2) language drift (#BostonBombings ⇝ #BostonStrong),
Evading Automated Review

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“Harmonious [Society]” (official slogan)
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“River crab” (irrelevant)

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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

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.
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For more information

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

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

% of Posts Censored
Actual % censorship
Predicted % censorship trend based on 3/19–3/29 data

Placebo Test:
Most extreme of all effects
30/28
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

Placebo Test:

Most extreme of all effects

30/28
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

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

![Graph showing predicted and actual censorship]

Jun. 20, 5 days prior
Jun. 22, Peace Agreement

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

Actual % censorship

Jun. 25, Peace Agreement

Placebo Test: Most extreme of all effects

31/28
Predicting the South China Sea Peace Agreement

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

Placebo Test:

- Most extreme of all effects

Jun. 20, 5 days prior
Jun. 25, Peace Agreement
Predicting the South China Sea Peace Agreement

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
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

Placebo Test: Most extreme of all effects 32/28
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:
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

<table>
<thead>
<tr>
<th>State Critique</th>
<th>Collective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>State Critique</th>
<th>Collective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>Free</td>
</tr>
<tr>
<td>yes</td>
<td>Censored</td>
</tr>
<tr>
<td>no</td>
<td>Free</td>
</tr>
<tr>
<td>no</td>
<td>Censored</td>
</tr>
</tbody>
</table>
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.