Reverse-Engineering Censorship in China

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(Talk at Harvard Graduate School of Arts and Sciences Alumni Day 4/11/2015)

Based on joint work with Margaret Roberts
GaryKing.org
JenPan.com
Papers

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

- 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 ≈2,000,000 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?

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 & 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

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A big prize, but payable only if we have the goals right.

6/28
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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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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”

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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Collective Support for Environmental Lottery

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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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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%)

2. (Other) News

3. Government Policies

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What Types of Events Are Censored?

- Collective Action
- Criticism of Censors
- Pornography

Censorship Magnitude

- Policy
- News

Density

Censorship Magnitude
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
- Popular Book Published in Audio Format

Censorship Magnitude

- Collective Action
- Criticism of Censors
- Pornography

-0.2 0 0.1 0.3 0.5 0.7
Censoring Collective Action: Riots in Zengcheng
Censoring Collective Action: Ai Weiwei’s Arrest

Ai Weiwei arrested

Count Published
Count Censored

January to July
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
Censored: Collective Action Posts

Regardless of whether Supportive or Critical
Censored: Collective Action Posts
Regardless of whether Supportive or Critical

Ai Weiwei
Fuzhou Bombing
Inner Mongolia

Percent Censored

0.0 0.2 0.4 0.6 0.8 1.0
Criticize Support Criticize Support Criticize Support
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
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     - To learn: we tried every software option, read the documentation, and called customer support (!)
1. Randomized Experiment (for causal inferences)

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Mechanisms of Censorship
Mechanisms of Censorship

- Submit text for posting
  - Immediately held for review before publication
  - Post deleted during review
  - Account blocked

- Publish immediately
  - Post is removed (within 24 hours)

- Publish immediately
  - Post remains online
  - Post is published after review

Images:
- 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...
- You have been silenced by the administrator, the type of silence is forever!
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
- Publish immediately
  - Post remains online
  - Post is removed (within 24 hours)
- Post is published after review
- Post deleted during review
- Account blocked
- Published
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64% of websites review some content
40% of all submissions reviewed

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...

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Posts For v. Against Government: Zero Causal Effect
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

Censorship Difference (Pro − Anti)

-0.5 0.0 0.5 1.0

Panxu Protest

Tibetan Self-Immolations
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

Tibetan Self-Immolations
Posts For v. Against Government: Zero Causal Effect

Panxu Protest
Tibetan Self-Immolations
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Protests in Xinjiang
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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
Rental Tax
Posts For v. Against Government: Zero Causal Effect

[Diagram showing the comparison of censorship difference (Pro − Anti) across various topics such as Panxu Protest, Ai Weiwei Album, Tibetan Self-Immolations, Protests in Xinjiang, Corruption Policy, Eliminate Golden Week, Rental Tax, Yellow Light Fines.]
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect
Posts For v. Against Government: Zero Causal Effect

- 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
- Gender Imbalance
- Golden Week
- Rental Tax
- Stock Market Crash
- Investigation of Sichuan Vice Governor

Censorship Difference (Pro - Anti)
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
Eliminate Golden Week
Rental Tax
Yellow Light Fines
Stock Market Crash
Investigation of Sichuan Vice Governor
Gender Imbalance
Li Tianyi Scandal

Tibetan Self-Immolations
Protests in Xinjiang
Collective Action Events: Large Causal Effect
Collective Action Events: Large Causal Effect

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

Panxu Protest

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

Panxu Protest

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

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) #BostonBombings ⇛ #BostonStrong,
4) People hiding in plain sight,
5) Look-alike modeling,
6) Starting point for sophisticated automated text analysis
Evading Automated Review

Example Substitution 1:
Evading Automated Review

Example Substitution 1:

自由

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

Example Substitution 1:

自由 “Freedom”
Example Substitution 1:

自由  “Freedom”
Evading Automated Review

Example Substitution 1:

自由　“Freedom”

Example Substitution 2:

和　谐　“Harmonious [Society]” (official slogan)

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

Example Substitution 1:

自由
自由
“Freedom”

目田
目田
“Eye field”

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

Example Substitution 1:

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

Example Substitution 1: Homograph

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

Example Substitution 2:
Evading Automated Review

Example Substitution 1: Homograph

自由
目
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Example Substitution 2:

和谐
Evading Automated Review

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

Example Substitution 1:  **Homograph**

自由  “Freedom”  **CENSORED**

目田  “Eye field” (nonsensical)

Example Substitution 2:

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

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The same task:
(1) the analyst's job,
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(3) People hiding in plain sight,
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(5) Starting point for sophisticated automated text analysis
Evading Automated Review

Example Substitution 1: Homograph

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

Example Substitution 2:

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

Example Substitution 1: Homograph

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

Example Substitution 2:

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

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河蟹  “River crab” (irrelevant)
Evading Automated Review

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自由 自由
目田 “Freedom”
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Example Substitution 2: **Homophone (both sound like “hexie”)**

和谐 和谐
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“River crab” (irrelevant)
Evading Automated Review

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

和谐 和谐
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和谐 和谐
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河 蟹
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They can’t follow the conversation; our new keyword methods can!
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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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Conclusions

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For more information

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

![Graph showing censor trend from March 19 to April 18, 2011. The graph highlights a significant spike in censorship around April 3, 2011, indicating the arrest of Ai Weiwei.](image-url)
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:
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

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

Actual % censorship

Predicted % censor 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

% of Posts Censored

Jun 12 Jun 22 2011 Jul 02

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7

Placebo Test: Most extreme of all effects

31/28
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:
Predicting the South China Sea Peace Agreement

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

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

Actual % censorship

Jan 23 Jan 30 Feb 06 Feb 13
−0.2 0.0 0.2 0.4 0.6 0.8 1.0 2012

% of Posts Censored

Predicted % censor 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

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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></td>
<td>no</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>no</td>
</tr>
</tbody>
</table>
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
Censored Post (with Collective Action Potential)
Supporting the State

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