Reverse-Engineering Censorship in China

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(Talk at USC Marshall School of Business, 10/17/2014)

1Based on joint work with Jennifer Pan and Margaret Roberts
2GaryKing.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 ≈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 (and 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.
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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
## The Censors are Fast; Our Automated Methods are Faster

Example: Shanghai Subway Crash

<table>
<thead>
<tr>
<th>Days Until Censorship</th>
<th>Days After Post Was Written</th>
<th>Number Censored</th>
</tr>
</thead>
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10/28
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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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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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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?
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- 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
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- Popular Book Published in Audio Format

Censorship Magnitude

- Collectives Action
- Criticism of Censors
- Pornography
Censoring Collective Action: Riots in Zencheng

![Graph showing count of published and censored riots in Zencheng from January to July. The graph highlights a significant increase in censored riots in June.]
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
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 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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One Child Policy  Corruption Policy  Food Prices Rise

Percent Censored

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</tbody>
</table>

- Ai Weiwei
- Inner Mongolia
- Fuzhou Bombing
Censored: Collective Action Posts

Regardless of whether Supportive or Critical
Censored: Collective Action Posts
Regardless of whether Supportive or Critical
Additional Research Designs

Randomized Experiment (for causal inferences)
Selected 100 top social media sites (\(\sim\) 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(!)
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Mechanisms of Censorship
Mechanisms of Censorship

1. Submit text for posting
   - Immediately held for review before publication
   - Post is published after review
   - Post deleted during review
   - Account blocked

2. Publish immediately
   - Post remains online

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

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

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

6. Publish immediately
   - 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...

7. Publish immediately
   - You have been silenced by the administrator, the type of silence is forever!
Mechanisms of Censorship

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  - Administrator has set up review for new topics, your post will be shown after it has passed review.
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- Publish immediately
  - Post published after review
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- 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...

- Censored
  - Sorry, the host you were looking for does not exist, has been deleted, or is being investigated
  - (Post reviewed then deleted)
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Observational study

64% of websites review some content

40% of all submissions reviewed
Posts For vs. Against Government: Zero Causal Effect
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

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

-0.5 0.0 0.5 1.0
Censorship Difference (Pro − Anti)

Panxu
Protest

Tibetan
Self−Immolations

Ai Weiwei
Album

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

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

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

Censorship Difference (Pro − Anti)

Panxu Protest
Tibetan Self-Immolations
Ai Weiwei Album
Protests in Xinjiang
Corruption Policy
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
- Corruption Policy
- Tibetan Self-Immolations
- Protests in Xinjiang
- Eliminate Golden Week
- Yellow Light Fines
- Rental Tax
- Golden Week
- Rental Tax
Posts For v. Against Government: Zero Causal Effect

- Panxu Protest
- Ai Weiwei Album
- Tibetan Self-Immolations
- Corruption Policy
- Protests in Xinjiang
- Eliminate Golden Week
- Yellow Light Fines
- Rental Tax
- Stock Market Crash
- Corrupt Policy
- Eliminate Golden Week
- Rental Tax
- Stock Market Crash
Posts For v. Against Government: Zero Causal Effect

Censorship Difference (Pro − Anti)

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Ai Weiwei Album
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Gender Imbalance
Posts For v. Against Government: Zero Causal Effect
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)
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Censorship Difference (CA Event − Non-CA Event)

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Panxu

Tibetan
Self-Immolations
Collective Action Events: Large Causal Effect

- Panxu Protest
- Tibetan Self-Immolations
- Ai Weiwei Album

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

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(3) People hiding in plain sight,
(4) Look-alike modeling,
(5) Starting point for sophisticated automated text analysis
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
“Freedom”

目由
目田

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

Example Substitution 1:

自由 “Freedom”  
目田 “Eye field”
Evading Automated Review

Example Substitution 1:

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

Example Substitution 1: Homograph

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

Example Substitution 1: Homograph

自由
自由
自
自由

“Freedom”
“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

Example Substitution 1: Homograph

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目  “Eye field” (nonsensical)

Example Substitution 2:

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

Example Substitution 1: Homograph

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Evading Automated Review

Example Substitution 1: Homograph

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Example Substitution 2:

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河 蟹 　 “River crab” (irrelevant)
Evading Automated Review

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

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目 田 目 田 “Eye field”

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Evading Automated Review

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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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Conclusions

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For more information

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

<table>
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<th>Date</th>
<th>% of Posts Censored</th>
<th>Predicted % Censorship</th>
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<tr>
<td>Apr 18</td>
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<td>Mar. 29, 5 days prior</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Apr. 3, Ai Weiwei Arrested</td>
<td>1.0</td>
<td></td>
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</table>
Censorship to Preempt Collective Action: Ai Weiwei’s Arrest

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

Actual % censorship

0.0 0.2 0.4 0.6 0.8 1.0
% of Posts Censored
Mar 19 Mar 29 Apr 08 Apr 18

0.0 0.2 0.4 0.6 0.8 1.0
2011

Predicted % censor trend based on 3/19–3/29 data

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

Placebo Test:

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

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

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
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

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Predicting the South China Sea Peace Agreement

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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

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

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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

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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.

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。