Reverse-Engineering Censorship in China

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(Talk at American University 1/30/2015)

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1 Based on joint work with Jennifer Pan and Margaret Roberts
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 ≈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.
Chinese Censorship

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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
- 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 1,382,221 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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Days Until Censorship, Shanghai Subway Analysis

Days After Post Was Written
Number Censored
0 1 2 3 4 5 6 7
0 50 100 150 200

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10/1
**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 topic 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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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%)
Classification of Events Generating the Bursts

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 density of different types of events censored across various censorship magnitude levels. The x-axis represents the censorship magnitude, and the y-axis represents the density. The categories include policy, news, collective action, criticism of censors, and pornography. Each category is represented by a different color and shape.](image-url)
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
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- Popular Book Published in Audio Format
Censoring Collective Action: Riots in Zencheng
Censoring Collective Action: Ai Weiwei’s Arrest

Ai Weiwei arrested
Low Censorship on Policy: One Child

Speculation of Policy Reversal at NPC

Count Published

Count Censored

Jan Feb Mar Apr May Jun Jul
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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The diagram reflects the probability distribution across different categories of facts and opinions supporting employers or workers. The x-axis represents the categories: Facts Supporting Employers, Facts Supporting Workers, Opinions Supporting Workers, and Opinions Supporting Employers or Irrelevant. The y-axis shows the probability values ranging from 0.0 to 0.6. The data points indicate the distribution of probabilities for each category.
“ReadMe” Algorithm Validated in Chinese

Example: Labor Strikes, 2010 (Training set: 100; Test set: 900)
Uncensored: Non-Collective Action Posts

- One Child Policy
- Corruption Policy
- Food Prices Rise
Uncensored: Non-Collective Action Posts

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

One Child Policy  Corruption Policy  Food Prices Rise

Percent Censored

0.0  0.2  0.4  0.6  0.8  1.0
Criticize  Support  Criticize  Support  Criticize  Support
Censored: Collective Action Posts
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Additional Research Designs

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(!)
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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. Publish immediately
   - Post remains online

3. Post is removed (within 24 hours)
   - Post is published after review
   - 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)

4. Account blocked
   - You have been silenced by the administrator, the type of silence is forever!

Examples:

- 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...
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3. Obser-vational study
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4. Censored
   - Post deleted during review
     - (Post reviewed then deleted)
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4. Post is published after review
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Post published after review:

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Posting deleted during review:

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Account blocked:

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

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

Censorship Difference (Pro − Anti)
Posts For v. Against Government: Zero Causal Effect
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Panxu
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Tibetan
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Ai Weiwei
Album

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

-0.5 0.0 0.5 1.0

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Corruption Policy

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Protests in Xinjiang

Eliminate Golden Week

Protests in Xinjiang

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Censorship Difference (Pro − Anti)

-0.5 0.0 0.5 1.0

Panxu Protest
Ai Weiwei Album
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Eliminate Golden Week
Yellow Light Fines
Stock Market Crash

Tibetan Self-Immolations
Protests in Xinjiang
Rental Tax

24/1
Posts For v. Against Government: Zero Causal Effect
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-0.5 0 0.5 1

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

Panxu
Protest
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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- Ai Weiwei Album
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Evading Automated Review

Example Substitution 1:
- Homograph
  - 自
  - 自
  - "Freedom"
- 目
  - 目
  - "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
  - #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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Example Substitution 1:

自由 “Freedom”
Evading Automated Review

Example Substitution 1:

自由  “Freedom”
Evading Automated Review

Example Substitution 1:

自由
自由
“Freedom”

Example Substitution 2:

河蟹
和
谐
“River crab”
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Example Substitution 1:

自由  自由
目田  目田
“Freedom” “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  “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)
Evading Automated Review

Example Substitution 1: Homograph

自由 "Freedom"  
目田 "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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Example Substitution 2:

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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.
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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

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

% of Posts Censored
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

% of Posts Censored

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

% 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:
Predicting the South China Sea Peace Agreement

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Actual % censorship

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Jun. 25, Peace Agreement

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

% of Posts Censored

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

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

% of Posts Censored

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

Placebo Test:

Most extreme of all effects
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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>Free</td>
</tr>
<tr>
<td>yes</td>
<td>CENSORED</td>
</tr>
<tr>
<td>no</td>
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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

State Critique

Collective Action

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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。