Call Me Maybe:
Understanding Nature and Risks of Sharing Mobile Numbers on Online Social Networks

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Motivation
How many of you have posted mobile numbers on Online Social Networks?

How many of you have seen mobile numbers being posted on Online Social Networks?
Sample posts

@hdfc_bank @HDFCBank_Cares U can also contact me on 91-978_81 regarding my deposits in Customer no. 20_. Y wre thy not auto renewed?

START CALLING NOW - Do you need contact number of Law minister? 998_72 - ______. Kundat. d.wud like2know what he did in disabled trust?

Hii friends nisha garg wants phone of friend only boys please call her on this number +91___099 she lives in gidderbaha (punjab) she studies in J.N Public school if you recharge her number she send you her nude pix on your email id.
Sample posts

Dr. @nitinchanwar

@hdfc_bank @HDFCBank_Cares U can also contact me on 91-9788060981 regarding my deposits in Customer no. 2010466. Y wre thy not auto renewed?

Hi friends nisha +91-09800000981 she lives in gidderbaha she send you help in
Sample posts

@hdfc_bank @HDFCBank_Cares U can also contact me on 91-978___81 regarding my deposits in Customer no. 20___Y were thy not auto renewed?

Aam__Ravi

START CALLING NOW - Do you need contact number of Law minister? 098___72 - ___

Am__val

November 18, 2012 at 4:42am via mobile

Hii friends nisha garg wants phone of friend only boys please call her on this number +91-___099
she lives in gidderbaha (punjab) she studies in J.N___Public school if you recharge her number she send you her nude pix on your email id.
Sample posts

@hdfc_bank @HDFCBank India also contact me on 91-9720___Y wre thy not

Aam_adi_Ravi

START CALLING NOW -
Do you need contact number of Law minister? 098_72 - 
Kamal.wud like2know what he did in disabled trust?

Am_syal

Hi friends nisha garg wants phone of friend only bcoz she lives in gidderbaha (punjab) she studies in J.N.U.
she send you her nude pix on your email id.
Is it a good idea?
Explore mobile number sharing behavior on Online Social Networks

• Focus on Indian Mobile Numbers
  “India has the second-largest telecom market in the world” – Economic Times

• Focus on two most popular social networks – Facebook & Twitter
Indian Mobile Number format

- 10 digit number, start with 7 / 8 / 9
- **Country code:** +91 ( Example: +91 9123456789 )
- **Trunk Code:** 0 ( Example: 0 9123456789 )

**No standard** way of sharing mobile numbers on OSN!

+91- 9123456789   91.91.23.456.789   0 9123456789
+91- 91-2345-6789   (91)23.456.789   (91234)56789
System architecture

Keyword selection

Facebook Graph API

Public users / posts with mobile numbers

Regex patterns

Category +91
Category 0
Category void

Indian Mobile Number Database

Twitter Stream API

Public Bio/Tweets with mobile numbers

Regex patterns

Category void
Category 0
Category +91

Mobile number validation

Keyword refining

Keyword selection

Data collection

Data validation
## Data statistics

**Twitter:** 12<sup>th</sup> October 2012 – 20<sup>th</sup> October 2013  
**Facebook:** 16<sup>th</sup> November 2012 – 20<sup>th</sup> April 2013

| Numbers          | Category +91 | Category 0 | Category void | Total       |
|------------------|--------------|------------|---------------|-------------|
| **Mobile Numbers** | Twitter: 885 | Twitter: 14,909 | Twitter: 25,566 | Twitter: 41,360 |
|                  | Facebook: 2,191 | Facebook: 8,873 | Facebook: 25,294 | Facebook: 36,358 |
|                  | 100%         | 85%        | 85%           |              |
| **User profiles** | Twitter: 1,074 | Twitter: 17,913 | Twitter: 31,149 | Twitter: 49,817 |
|                  | Facebook: 2,663 | Facebook: 9,028 | Facebook: 25,406 | Facebook: 36,588 |

85%
Analysis
Ownership Analysis
Ownership analysis

- Post
  - Frequent action words
    - Has 2nd/3rd person pronoun
      - Y
        - Has 1st person pronoun
          - N
            - Phrasal search
      - N
        - Bio/Name
          - Owner posted the number
    - Y
      - Non-owner posted the number
  - Y
    - Owner posted the number

Everyone prank call her "@Samoa_Ngo: 91 4657 instagr.am/p/Q1yK/"

NO Facebook for next 2 days!

If you want to contact me, call me @ +91-95098...
Users share their own mobile numbers on OSNs!
Source Analysis
Source analysis

Which applications are used to share mobile numbers on Twitter?

- Facebook: 32%
- Twitterfeed: 26%
- Google: 26%
- LinkedIn: 11%
- TweetDeck: 5%

Which applications are used to share mobile numbers on Facebook?

- Facebook mobile: 50%
- Facebook for iPhones: 15%
- Facebook for Android: 14%
- Photos: 8%
- HootSuite: 12%
- Twitterfeed: 1%

Users posted same mobile numbers on multiple OSNs!
Topographical Analysis
Topographical analysis

Indian Mobile number

XXXX - NNNNNNN

Network operator       Subscriber number

Telecom Zone/Circle

Metro (High density)           A Circle (Largest population coverage)            B Circle            C Circle (Smallest population coverage)
### Topographical analysis

| Telecom Circle  | Category       | # of Mobile Numbers |
|-----------------|----------------|---------------------|
| Delhi           | Metropolitan   | 582                 |
| Mumbai          | Metropolitan   | 312                 |
| Karnataka       | “A” Circle     | 233                 |
| Punjab          | “B” Circle     | 226                 |
| Rajasthan       | “A” Circle     | 171                 |
| Andhra Pradesh  | “B” Circle     | 164                 |
| Kerala          | “A” Circle     | 158                 |
| Maharashtra     | “A” Circle     | 140                 |
| Gujarat         | “A” Circle     | 135                 |
| Tamil Nadu      | “A” Circle     | 102                 |

Users of **metropolitan cities** in India actively posted mobile numbers on OSNs!
Risk Assessment
Risk of Collation

Methodology

1. **Mobile Number**
2. **Store in Phone Address Book**
3. **Install and open WhatsApp**

Sample Status

- “www.facebook.com/iakrfi***”
- “100% Single”
- “New BBM Pin: 25C7xxxx”
- “No longer in India. UK: # +44 75xx 81xxxx US#610xxxxxxx as of June 10”
## Risk of Collation

| Details              | User 1                                      | User 2                                      |
|----------------------|---------------------------------------------|---------------------------------------------|
| **Mobile Number**    | +9199xxxx2708                              | +9198xxxx5485                              |
| **Full Name**        | x Gambhir                                  | xxxxxx Jeswani                             |
| **Age**              | 23                                          | 53                                          |
| **Gender**           | Male                                        | Male                                        |
| **Father’s Name**    | xx Gambhir                                  | x x Jeswani                                |
| **Address**          | ***, xxxx Bagh, Delhi                       | ***, Mig Flats, xxxxx Vihar Phase-I         |
| **ID**               | Voter ID: NLNxxx5696                        | Driving License: DL/04/xxx/222668           |
| **Shared by Owner?** | No                                          | Yes                                         |

### OCEAN: Open Government Data Repository

8 Delhi Users Identified Uniquely
Risk Communication
IVR System

Mobile Number Database

Audio Files

Java Application

FreeSWITCH

Gateway

MySQL

Call Log (2,492)
Callee Decision Tree

Call the Number

- Call not picked
  - 0.35 (867)

- Call picked
  - 0.65 (1625)

Listen message

- 0.61 (988)
- 0.52 (509)
- 0.48 (479)

Listen Options

- Didn’t know
  - 0.21 (107)
  - 0.23 (47)

- Posted purposefully
  - 0.20 (102)
  - 0.77 (60)

- Leave Feedback
  - 1.0 (47)

- Disconnect the Call
  - 0.59 (300)

Posted purposefully

- Disconnect the Call
  - 0.59 (300)

Disconnect the Call

- 0.39 (637)

- 0.21 (107)

- 0.77 (60)

- Disconnect the Call
  - 1.0 (47)
“Thank you for information, I have deleted, I will not post my number online.”

“I want to know how to remove my number and I don't know, I haven't put my number purposely but if it is there, where exactly it is there I would also like to know that. Please get in touch with me asap. Thank you!”

“It is a very nice process that you are doing and making people aware about online frauds and telephone number frauds but your system is basically calling business houses”
Take

Aways
Take Aways

• Most **users share** their own mobile numbers on OSNs.

• Users post same **mobile numbers on multiple OSNs**.

• A publicly shared mobile number can expose sensitive details (**age, ID, family details** and **full address**) of its owner, from multiple sources.

• We should **communicate the risks** of sharing mobile numbers online, to their owners.
  
  Few users were unaware of the online presence of their number.
Future work

Build technological, people and process oriented solutions to forewarn users and raise the awareness towards risks of exposing mobile numbers leaks.
Thank You!
Questions?

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