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

Prachi Jain, Paridhi Jain, Ponnurangam Kumaraguru (PK)
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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 91-978888881 regarding my deposits in Customer no. 2088888888. Why were they not auto renewed?

START CALLING NOW - Do you need contact number of Law minister? 09876543211. I heard you did wud like to know what he did in disabled trust?

Hii friends nisha garg wants phone of friend only boys please call her on this number +91-9998889999. 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_Cares U can also contact me on 91-9786050981 regarding my deposits in Customer no. 20194008...Y wre thy not auto renewed?
Sample posts

Dr. Hanwar
@hdfc_bnk @HDFCBank_Cares U can also contact me on 91-97888881 regarding my deposits in Customer no. 202. Why not auto renewed?

Aam Ravi
@...
START CALLING NOW - Do you need contact number of Law minister? 09876543210

Amval
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

- Dr. Hanwar
  @hdfc_bank @HDFCBank also contact me on 91-97_... Y wre thy not...
  8:08 PM - 14 Apr 13

- Aam Aadmi Ravi
  START CALLING NOW - Do you need contact number of Law minister? 098_...72 -
  Kms cod. wud like2know what he did in disabled trust?
  10:56 PM - 12 Oct 12

- Anil Balwal
  Hii friends nisha garg wants phone of friend only bcoz she li... she sends you her nude pix on your email id.
  November 18, 2012 at 4:42am via mobile
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
Methodology
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

Mobile number validation

Indian Mobile Number Database

Keyword selection

Twitter Stream API

Public Bio/Tweets with mobile numbers

Regex patterns

Category void
Category 0
Category +91

Data collection

Data validation
## Data statistics

**Twitter:** 12\textsuperscript{th} October 2012 – 20\textsuperscript{th} October 2013  
**Facebook:** 16\textsuperscript{th} November 2012 – 20\textsuperscript{th} April 2013

<table>
<thead>
<tr>
<th>Numbers</th>
<th>Category +91</th>
<th>Category 0</th>
<th>Category void</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Twitter</td>
<td>Facebook</td>
<td>Twitter</td>
<td>Facebook</td>
</tr>
<tr>
<td>Mobile Numbers</td>
<td>885</td>
<td>2,191</td>
<td>14,909</td>
<td>8,873</td>
</tr>
<tr>
<td></td>
<td><strong>100%</strong></td>
<td><strong>85%</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User profiles</td>
<td>1,074</td>
<td>2,663</td>
<td>17,913</td>
<td>9,028</td>
</tr>
<tr>
<td></td>
<td><strong>49,817</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Analysis
Ownership Analysis
Ownership analysis

Post

Frequent action words

Has 2nd / 3rd person pronoun

Has 1st person pronoun

Non-owner posted the number

Phrasal search

Bio / Name

Owner posted the number

NO Facebook for next 2 days!

If you want to contact me, call me @ +91-9502
**Ownership Analysis: Results**

<table>
<thead>
<tr>
<th>Social Network</th>
<th>Mechanism</th>
<th>Mobile Numbers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twitter: Owner</td>
<td>Bio</td>
<td>155</td>
<td>291/885 (33%)</td>
</tr>
<tr>
<td></td>
<td>Tweet</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td>Non-owner</td>
<td>Tweet</td>
<td>18</td>
<td>18/885 (0.02%)</td>
</tr>
<tr>
<td>Facebook: Owner</td>
<td>Post</td>
<td>468</td>
<td>485/2191 (22%)</td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Non-owner</td>
<td>Message</td>
<td>25</td>
<td>25/2191 (0.01%)</td>
</tr>
</tbody>
</table>

*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: 12%
- Facebook for Android: 14%
- Photos: 15%
- HootSuite: 8%
- 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

<table>
<thead>
<tr>
<th>Telecom Circle</th>
<th>Category</th>
<th># of Mobile Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi</td>
<td>Metropolitan</td>
<td>582</td>
</tr>
<tr>
<td>Mumbai</td>
<td>Metropolitan</td>
<td>312</td>
</tr>
<tr>
<td>Karnataka</td>
<td>“A” Circle</td>
<td>233</td>
</tr>
<tr>
<td>Punjab</td>
<td>“B” Circle</td>
<td>226</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>“A” Circle</td>
<td>171</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>“B” Circle</td>
<td>164</td>
</tr>
<tr>
<td>Kerala</td>
<td>“A” Circle</td>
<td>158</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>“A” Circle</td>
<td>140</td>
</tr>
<tr>
<td>Gujarat</td>
<td>“A” Circle</td>
<td>135</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>“A” Circle</td>
<td>102</td>
</tr>
</tbody>
</table>

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

Methodology

- Mobile Number
- Store in Phone Address Book
- 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

<table>
<thead>
<tr>
<th>Details</th>
<th>User 1</th>
<th>User 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Number</td>
<td>+9199xxxx2708</td>
<td>+9198xxxx5485</td>
</tr>
<tr>
<td>Full Name</td>
<td>x Gambhir</td>
<td>xxxxxx Jeswani</td>
</tr>
<tr>
<td>Age</td>
<td>23</td>
<td>53</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Male</td>
</tr>
<tr>
<td>Father’s Name</td>
<td>xx Gambhir</td>
<td>x x Jeswani</td>
</tr>
<tr>
<td>Address</td>
<td>*** , xxxx Bagh, Delhi</td>
<td>*** , Mig Flats, xxxxx Vihar Phase-I</td>
</tr>
<tr>
<td>ID</td>
<td>Voter ID: NLNxxxx5696</td>
<td>Driving License: DL/04/xxx/222668</td>
</tr>
<tr>
<td>Shared by Owner?</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### 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 picked: 0.65 (1625)
  - Call not picked: 0.35 (867)

- **Listen message**
  - Listen Options: 0.52 (509)
    - Didn’t know: 0.21 (107)
      - Leave Feedback: 0.23 (47)
    - Posted purposefully: 0.77 (60)

- **Disconnect the Call**
  - 0.61 (988)
  - 0.48 (479)
  - 0.39 (637)

**FORM 1**

- Didn’t know: 0.23 (47)
- Posted purposefully: 0.77 (60)

**Disconnect the Call**
- 0.59 (300)
- 0.20 (102)
- 0.21 (107)
- 0.52 (509)

**Leave Feedback**
- 1.0 (47)

**Disconnect the Call**
- 0.61 (988)
- 0.48 (479)
- 0.39 (637)
“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 publically 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?

prachi1107@iiitd.ac.in
paridhij@iiitd.ac.in
pk@iiitd.ac.in