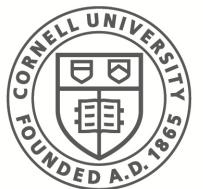


Tech Privacy and Safety in Intimate Partner Violence

Tom Ristenpart

Covering joint work with:

Rahul Chatterjee, Nicola Dell, Peri Doerfler,
Diana Freed, Sam Havron, Diana Minchala,
Karen Levy, Damon McCoy, Jackie Palmer



Cornell CIS
Computer Science



NYU

**TANDON SCHOOL
OF ENGINEERING**



Intimate Partner Violence (IPV) is a huge problem

25% of women

suffered **rape, physical violence, and/or stalking by an intimate partner**

11% of men

[National Intimate Partner and Sexual Violence Survey 2010-2012]

"38% of battered women will be victimized again within six months"

2006 poster by New York City Mayor's Office to Combat Domestic Violence (OCDV)



~360,000,000 Facebook users
~252,000,000 Android users

What role does technology play in IPV?

Prior work indicates tech abuse a problem in IPV

[Southworth et al. 2005, 2006, 2007]

[Melander 2010]

[Dimond et al. 2011]

[Burke et al. 2011]

[Woodlock 2016]

[Matthews et al. 2017]



Abusers exploiting technology:

- Harassing texts/messages
- GPS devices & spyware apps
- Victim accounts being “hacked”
- Physical device access
- ...

Our project

<https://ipvtechresearch.org>

Study the role of technology in IPV

(Re)design technology to improve victim safety and well-being



Nicki Dell



Karen Levy



Damon McCoy



Rahul Chatterjee



Peri Doerfler



Diana Freed



Sam Havron

Today's talk



**Year-long qualitative study
of IPV ecosystem in NYC**



**IPV spyware & anti-spyware
measurement study**

Freed, Palmer, Minchala, Levy, R., Dell

Digital Technologies and Intimate Partner Violence: A Qualitative Analysis with Multiple Stakeholders, CSCW 2017

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"A Stalker's Paradise": How Intimate Partner Abusers Exploit Technology, CHI, 2018

Best Paper Award

Chatterjee, Doerfler, Orgad, Havron, Freed, Levy, Dell, McCoy, R.
The Spyware Used in Intimate Partner Violence, Oakland, 2018

New York City Family Justice Centers



**Mayor's Office to
Combat Domestic
Violence**

Range of services for domestic violence, sex trafficking, and elder abuse victims:

- Civil / legal services
- Counseling & safety planning
- NYPD
- District Attorney's offices
- Access to emergency shelter
- Non-profit organizations

OCDV runs Family Justice Centers
One in each neighborhood of NYC



Year-long qualitative study: methods

Clients
(Survivors /
Victims)

11 focus groups with 39 women (English & Spanish)
ages 18-65 (average 42)
from 15 different countries
with range of education levels
most no longer living with abusive partner

Professionals

Semi-structured interviews with 50 professionals
female (45) and male (5)
case managers, social workers,
attorneys/paralegals, & police officers

Largest and most demographically diverse study to date

Year-long qualitative study: methods

39 hours of recordings
1,000+ pages of transcripts



The diagram illustrates a process flow. On the left, there are two lines of text: '39 hours of recordings' and '1,000+ pages of transcripts'. A blue curly brace is positioned above these two lines, grouping them together. To the right of the brace is the text 'Inductive coding'. A blue arrow points from 'Inductive coding' to the final text on the right. The final text is 'Code book covering major themes'.

Inductive coding

Code book covering major themes

- Facebook
- Abuser device access
- Privacy settings
- Control
- Location tracking
- Manipulation
- Physical abuse
- Escape
- Social media abuse

...

“The reason that I came today is because I’m hoping to let people know my story. Maybe this is going to help somehow, to help another person who is going through the same thing.”

– Client

Client Story #1

[Slide contents removed for privacy reasons]

Four categories of common attacks

Ownership-based

- Abuser owns device/account
- Shared account/device
- Buying children device
- Prevent use / destroy device
- Digitally control access
- Track location, monitor usage

Harmful messages or posts

- Call/text/message victim (from spoofed account)
- Post harmful content (e.g., threaten violence)
- Harass victim's friends/family
- Proxy harassment

Account/device compromise

- Physical access to unlocked device
- Force password / pin revelation
- Remotely “hack” via security questions / passwords
- Install spyware / “dual-use” app
- Track location, monitor victim
- Steal or delete info
- Lock victim out of account
- Impersonate victim

Exposure of private information

- Blackmail by threat of exposure
- “Doxxing” victim
- Non-consensual intimate images
- Fake profiles/advertisements of sexual services

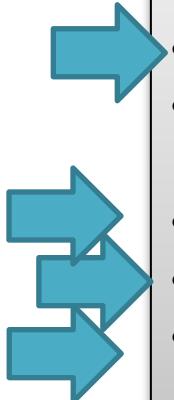
Client Story #2

[Slide contents removed for privacy reasons]

Four categories of common attacks

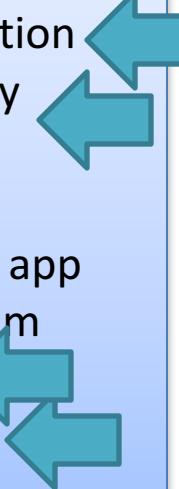
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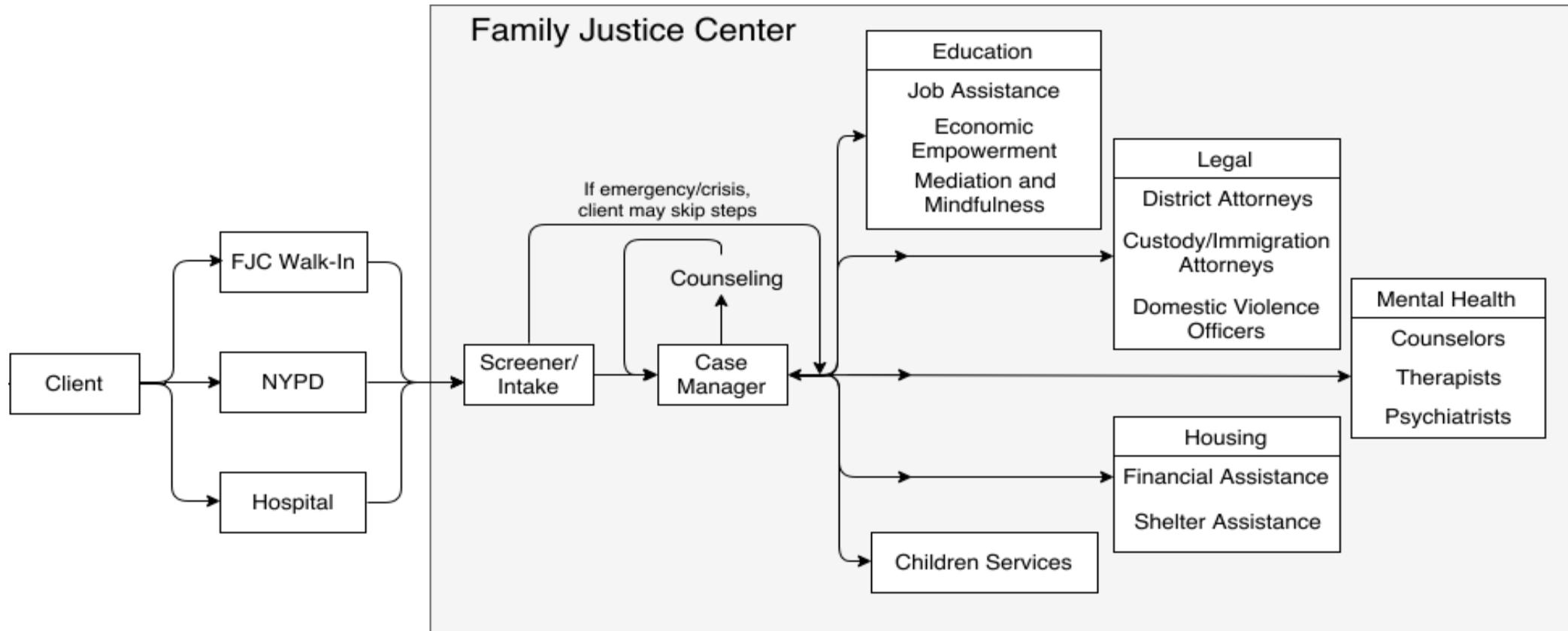


Exposure of private information

- Blackmail by threat of exposure
- “Doxing” victim
- Non-consensual intimate images
- Fake profiles/advertisements of sexual services

Non-technical infrastructure is not sufficiently helping victims and professionals with tech abuse

Clients and New York City Family Justice Centers



Number of technologists we met: 0

No best practices for evaluating tech risks

Victims, professionals feel they lack needed technology expertise

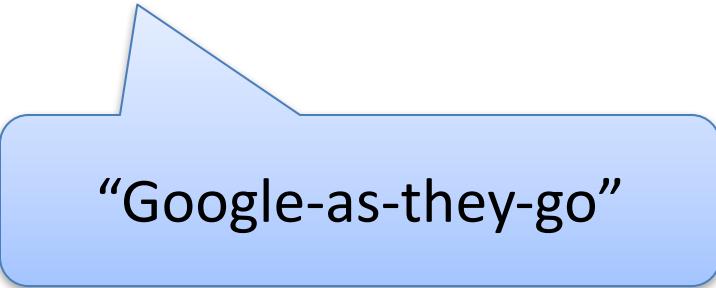
Victims overwhelmingly report having insufficient technology understanding to deal with tech abuse

“[The victim is] absolutely not savvy on technology.”
– Case manager

Abusers usually considered to be “more tech-savvy” than victims

Professionals overwhelmingly report having insufficient technology understanding to help with tech abuse

“I end up Googling it. And then I’ll deal with [the client]. But I think... I don’t know how to do it so we’ll just Google it together.” – Case manager

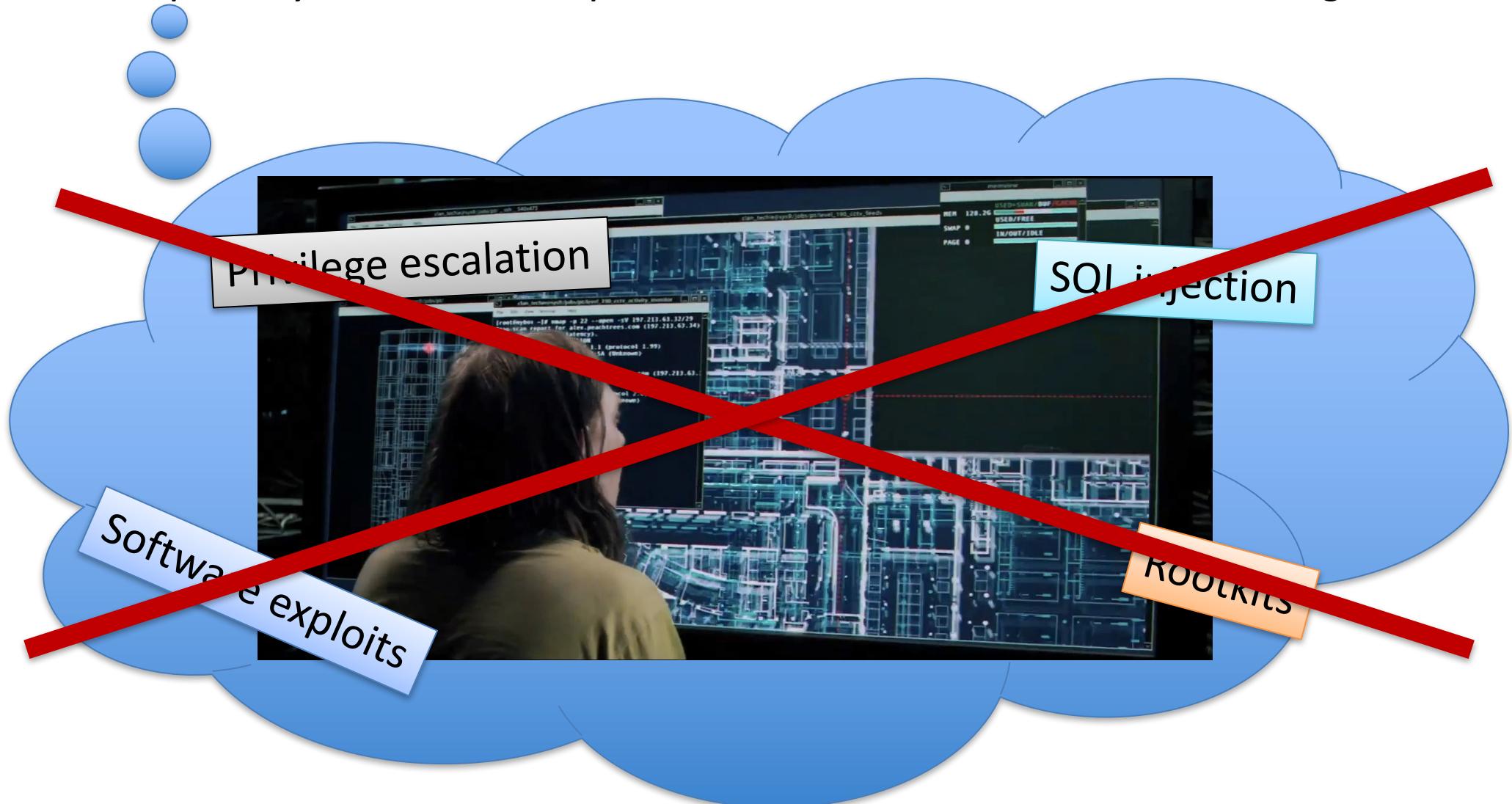


“Google-as-they-go”

Non-technical infrastructure is not sufficiently helping victims and professionals with tech abuse

**Technical mechanisms are failing, too:
Context of IPV undermines existing security tools**

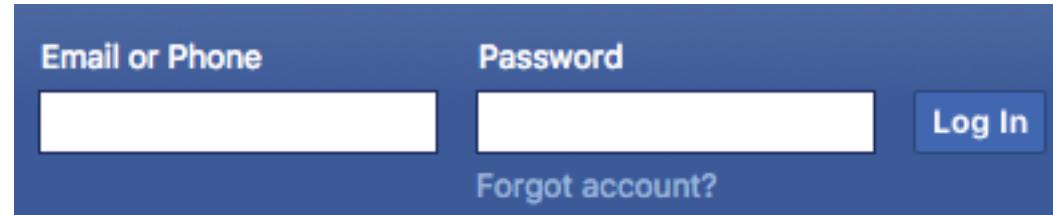
*“They’ll hack into their phones and they’ll hack into their accounts.
Especially with intimate partner victimization.”* – Case manager



Attacks not technically sophisticated, but succeed because threat models don't match threats

Threat models specify:

- (1) Who are Attacker and Victim
- (2) Attacker's capabilities & goals



Conventionally:

Attacker is stranger on internet who

- Doesn't know victim personally
- Connects from elsewhere (not victim's computer, home)

IPV:

Attacker is intimate partner who

- Knows victim personally, can guess or compel disclosure of password
- May connect from victim's computer or same home
- May own the account / device

Attacks not technically sophisticated, but succeed because threat models don't match threats

Dealing with fake accounts:

“A lot of fake Facebook profiles very obviously belong to the abuser but [the survivors] have no way to prove it.”

– Counselor

Detection of abusive content:

“[The abuser] will post something on Facebook, sometimes in code language ... They'll say things that they know is a threat, but you might not think it's a threat at first if you're just looking at it.”

– Attorney

“Obvious” solutions often don’t work due to context

“Delete your Facebook completely. Delete everything so he doesn’t have access to you this way. Just throw away your phone and get a new phone.”

– Social worker

Why can’t you just:

Shut off contact with abuser

Get new devices

Get off social media

Because:

Legally obligated to communicate
(shared custody of children)

Abuser pays for phones, family plan,
and/or children’s devices

Need it to get support from friends/family

Escalation a frequently mentioned complication

Abuse severity increases due to attempts by victim to block tech abuse

“Clients are much more at risk when they actually separate from their abusers because he suddenly no longer has any control over that victim. So often the only thing left is through the phone, so he’s going to start harassing you, calling, texting. If you change your number, now he’s most likely going to go crazy. So that’s when he’s going to start stalking you any way he can.”

– Social Worker

Some victims **want** (limited) communication to track state of mind of abuser

Recap of qualitative study

- Tech abuse widespread, causing immense harm
- Attacks are multi-faceted and persistent
- Non-technical approaches need improvements
- Attacks not technically sophisticated but undermine threat models

Solutions will need to take into account full socio-technical context

Today's talk



Mayor's Office to
Combat Domestic
Violence

Year-long qualitative study
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The Spyware Used in Intimate Partner Violence, Oakland, 2018

Intimate partner surveillance (IPS): the spyware problem

“An abusive partner kicked in our front door and wound up in the lobby of our building by tracking her phone . . . it was some secondary application that the abuser had put on it and knew exactly where she was. He literally kicked our front door open. We called the police . . . it was scary.” – Case manager



Spy On Your Girlfriend's Cell Phone Without Touching It

Cheating Partner?

Spy on their phone secretly!

 SPYMASTER
PRO

<https://www.spymasterpro.com/>

“State-of-the-art” for detection of spyware is poor

“Like, ‘My phone is very hot – the battery disappears constantly. Well, I just need a new phone.’ No. Probably someone has spyware on your phone”

– Attorney

Spyware detection via conversation with victims:

- (1) *“some sort of a glitch in the phone”*
- (2) Seems only plausible way abuser could get information

Occasionally victim goes to store to have professional look at it

Not a good option for many victims

No prior work investigating IPV spyware

We provided first study of IPS-relevant apps

~4000 IPS-relevant apps:

- Some are overt spyware
- Most are *dual-use*

Abundant resources
(blogs, videos, forums, etc.)
to help abusers with IPS

Current anti-spyware doesn't
flag IPS-relevant apps as threat

Some developers promote IPS,
others condone it

Spyware ecosystem currently
empowering abusers and failing victims

How do abusers find IPS-relevant apps?

Need large number of query terms that an abuser might use

→ How to spy on my husband

All Videos Shopping News Images More Settings Tools

About 11,700,000 results (0.44 seconds)

How to Spy on My Husband's Cell Phone Without Touching It?
<https://besttrackingapps.com/spy-on-your-spouse/> ▾
Dec 15, 2017 - Hundreds of people wonder "how to spy on my husbands cell ... How Can I Track My Husbands Cell Phone Without Him Knowing and for Free?
So, How to Spy on My ... · How to Catch a Cheating ... · How Can I Track My ...

How to Spy on My Husband's Phone Without Him Knowing! - YouTube
 <https://www.youtube.com/watch?v=LBTf2jEEdCo> ▾
Aug 18, 2016 - Uploaded by Richard Smith
Cell Phone **Spying** Software - Track Anyone Via Phone With Ease .This is the BEST Monitoring Software and ...

How can i spy on my husband cell phone without touching his cell ...
[smstrackers.com › Tracking My Partner](http://smstrackers.com/tracking-my-partner) ▾
The popularity of mobile **spy** software is increasing every passing day as worried wifes want to confirm that their **husbands** are absolutely honest with them at all ...

How can I spy on my husband cell phone without touching ... - Guestspy
guestspy.com/can-spy-husband-cell-phone-without-touching-cell/ ▾
Jan 10, 2017 - How can I **spy on my husband** cell phone without touching his cell. GuestSpy is a strong tracking tool with a few attributes that are truly ...

Blogposts comparing spy apps

Video how-to guides

Ad funnels for spy apps

Spy app websites

Search engines give query suggestions

how to spy on my

how to spy on my **husband**

how to spy on my **boyfriends phone**

how to spy on my **boyfriends iphone**

how to spy on my **girlfriends iphone**

how to spy on my **husband iphone**

how to spy on my **boyfriends facebook messages**

how to spy on my **husband phone**

how to spy on my **son's iphone**

how to spy on my **bf phone**

how to spy on my **wifi network**

Searches related to how to spy on my husband

[track my husbands phone for free](#)

[track my husbands phone without him knowing](#)

[how can i find out who my husband is texting for free](#)

[cheaters spy app free](#)

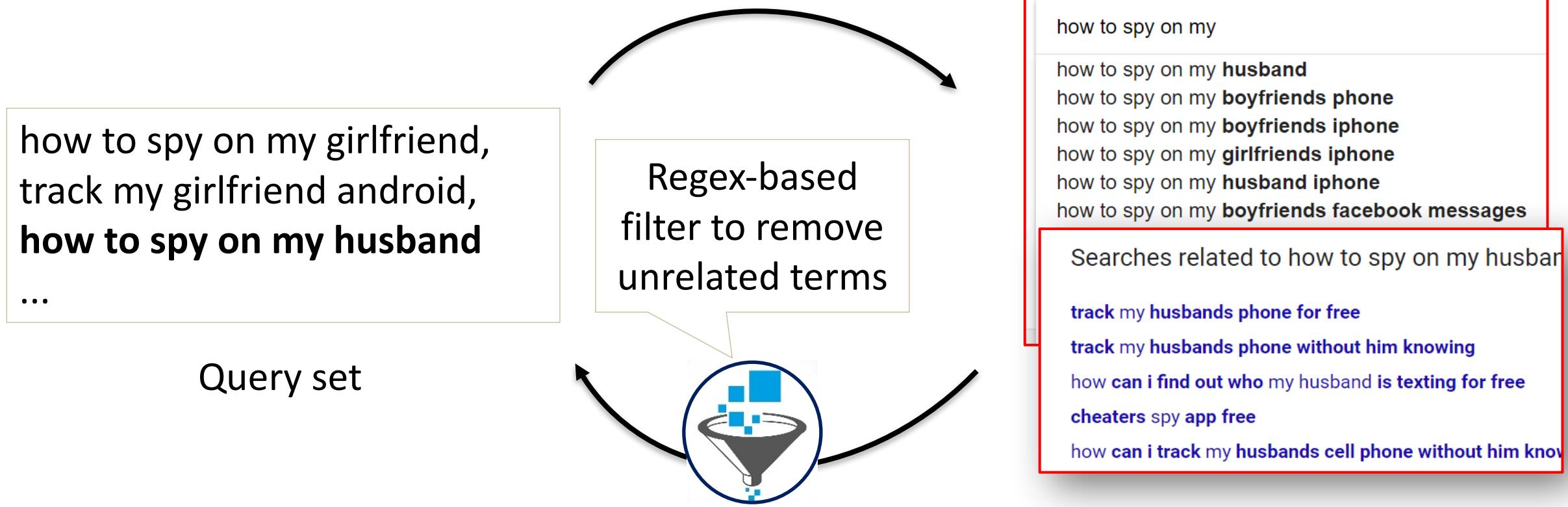
[how can i track my husbands cell phone without him knowing and for free](#)

[how to hack my husbands whatsapp](#)

[how can i track my husbands phone location](#)

[spy on cell phone without touching target phone](#)

“Snowball” searching



Stop when no new query term found
or size of query set $\geq 10,000$

Abundant resources for conducting IPS

- Crawled **Google** and  (and **iTunes**) using snowball search
- We found:

23 off-store
spyware apps



3,500+ IPS-relevant
apps in 

(smaller study)
451 IPS-relevant
apps in 



A typical off-store spyware app



All-Inclusive Mobile Phone Spy

- ✓ Spy on all iOS and Android devices
- ✓ Track SMS, Call logs, App chats, GPS etc.
- ✓ No Rooting or Jailbreaking required
- ✓ Invisible mode, monitor the activity remotely

Real-time + historical

Covert

Remotely record audio,
video, and alter settings



Source: <https://www.spyzie.com/ad/phone-spy.html>

Smooth (ab)user experience with off-store spyware

How-to guides

Installing is easy

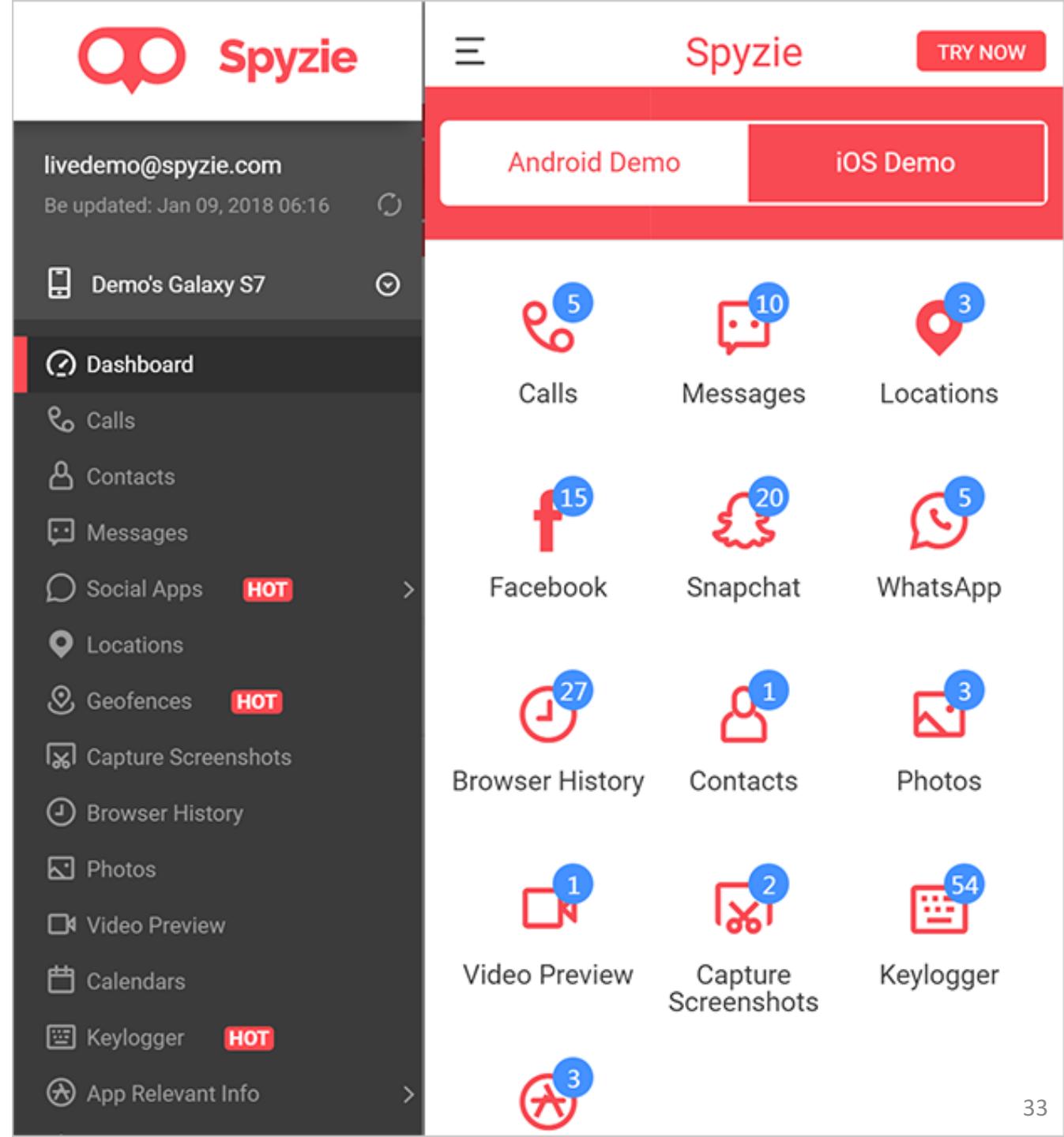
Whole process takes ~5 min

On victim's device:

No app icon, no notification

On abuser end:

Fancy web UI or apps



Abundant resources for conducting IPS

23 off-store
IPS-relevant apps



3,500+ IPS-relevant
apps in  Google play

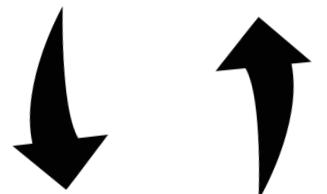
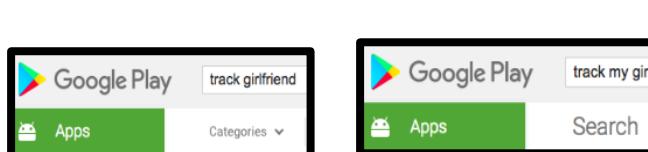
(smaller study)
451 IPS-relevant
apps in  iTunes



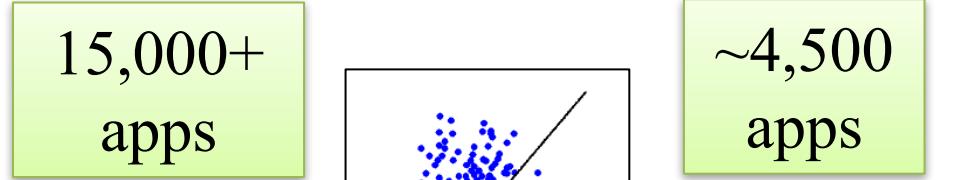
Finding on-store IPS-relevant apps

Apps distributed in official application stores

Snowball searching over
3 months on Play Store



Prune using
ML classifier



~4,500
apps

Filter using
human verifier



Found
3,500+
apps usable
for IPS

Looks at app title, description,
permissions, and genre as
reported in Play Store

Smaller study (2 weeks)
on iTunes App Store:
451 IPS-relevant apps

Taxonomy of on-store apps

Personal tracking

- Find my phone or Anti-theft
- Automatic call recorder
- Automatic data/SMS syncing
- Phone control
- Personal safety



Mutual tracking

- Find-my-family / friend
- Couple tracking



Subordinate tracking

- Employee tracking
- Parental control

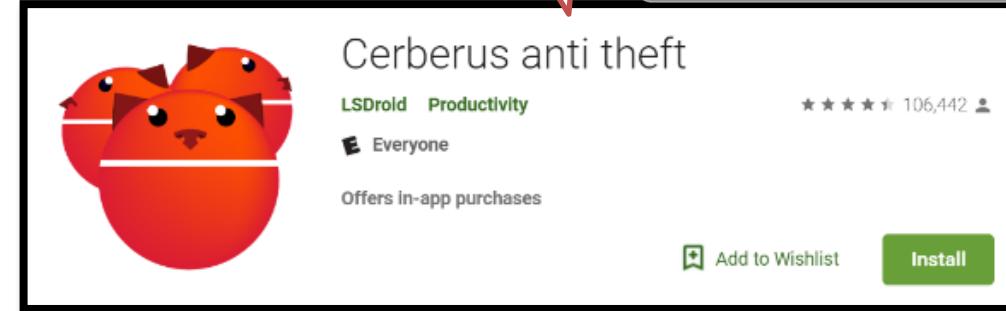


Seemingly innocuous apps used for IPS

*“I’m looking for an app I can install on my wife’s phone that is **hidden** so that I can see **where she is or has been** via cell towers or gps.”*

*“[Install] **Cerberus** from the market. Once installed and configured, can be **set to be invisible in the app drawer**. You can also **record audio** and **take pictures remotely** with it! Be sure to **silence the camera** first though!”*

Dual-use app



Types of IPS-relevant apps

Overt spyware apps
(typically off-store)

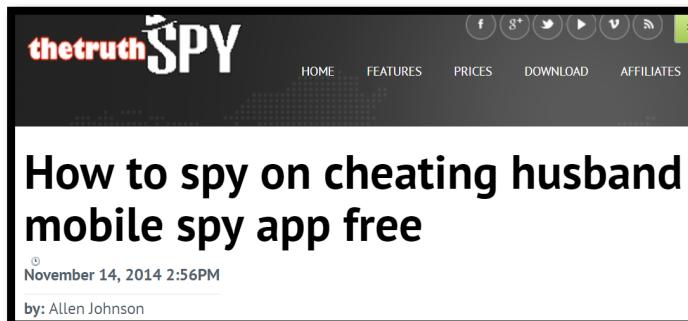


Dual-use apps
(typically on-store)



Are app developers complicit in IPS?

Some developers are promoting IPS



How to spy on cheating husband mobile spy app free

November 14, 2014 2:56PM
by: Allen Johnson



How to Spy on My Cheating Wife

You can find out if your wife is cheating on you. However, hiring a private detective to spy on your wife to find out the truth may cost hundreds or thousands of dollars and may or may not produce results. The man everybody thinks they are...



HelloSpy | Home | Features | Plans & Pricing | Sign Up | How To Install | **Uses**

Mobile Spy App for Personal Catch Cheating Spouses

Home > Uses > HelloSpy for Business

Cheating by the numbers...

One of the unpleasant truths most married individuals are ignorant of is the surprisingly high occurrence of extramarital affairs. In a study by Joan D. Atwood & Limor Schwartz, 2002, by the Journal of Couple & Relationship, 55% of married women and 50-60% of married men in extramarital sex at some time or another in their relationship. If that is not alarming enough, Spyzie puts the average nonpaternity rate at above 33 children in every thousand are not the man everybody thinks they are...



Others are condoning IPS

- Advertising affiliate sites promote IPS

Ultimate monitoring software for parental control

Remotely track and control any activity of kids on all smartphones & computers

BUY NOW or VIEW DEMO

Features listed on mspy.com:

- WhatsApp
- Calls, SMS
- Compatibility
- Quick installation, user friendly interface
- 24/7 multi-language support

catchthemtoday.com

catch a cheater app Mobile Tracker Free spy phone app Track My Boyfriend Track My Girlfriend Track My Husband

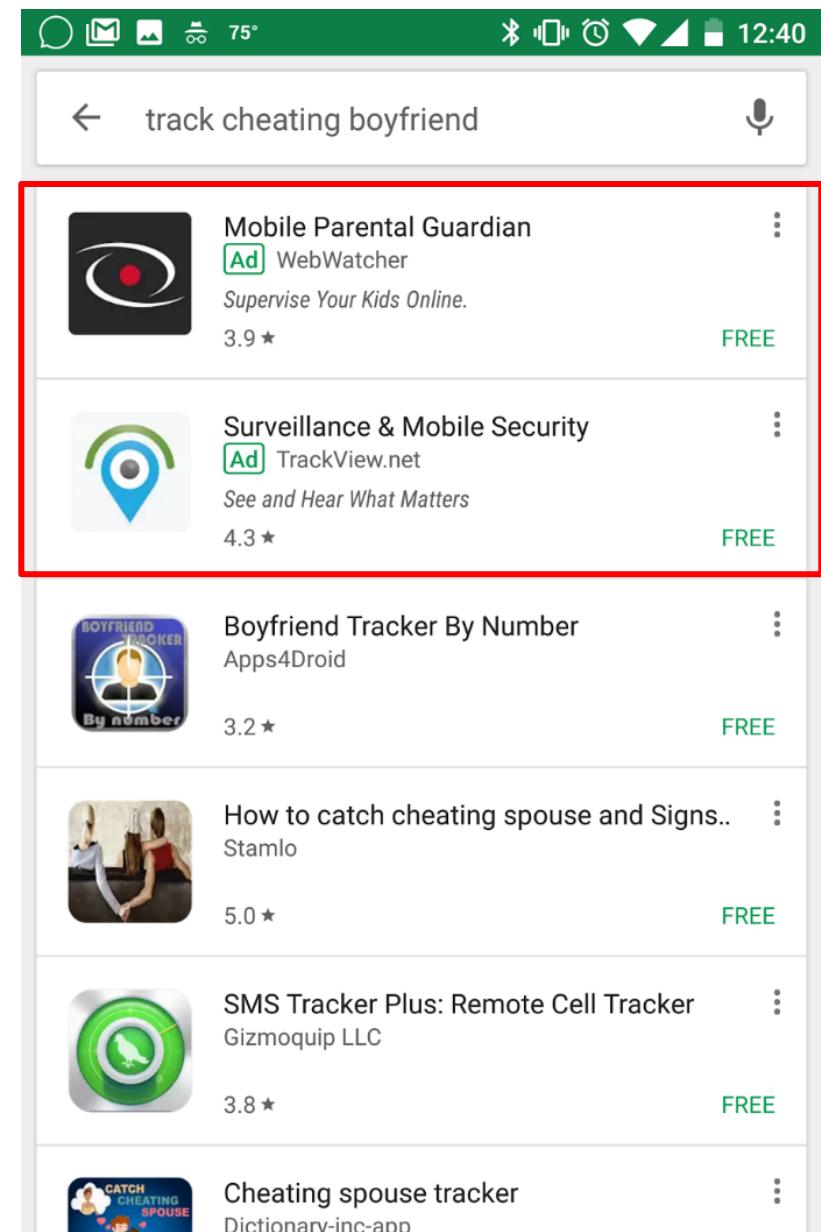
Track My Wife

CATCH THEM TODAY!

Links only to ↪

Others are condoning IPS

- Advertising affiliate sites promote IPS
- Paid ads served on IPS-related search terms



Others are condoning IPS

- Advertising affiliate sites promote IPS
- Paid ads served on IPS-related search terms
- Contacted customer support for 11 apps
 - 6 on-store and 5 off-store
 - posing as an abuser

9 responses:

8 condoned IPS
1 admonished
against IPS use

Jessie:

Hi, If I use this app to track my husband, will he know that I am tracking him?

WebWatcher:

For Android monitoring the app can be hidden from the home screen ...

So far:

1. Thousands of IPS-relevant apps are available
2. Plenty of how-to blogs, videos, and online forums for abusers
3. Some developers promote IPS

Disclosure with Google

We communicated our findings to Google. Google has

- tightened enforcement to disallow any couple tracking apps and taken action against the apps that violate  policies
- taken action against  videos that violate their policies
- extended restrictions on ad-serving and Play Store search

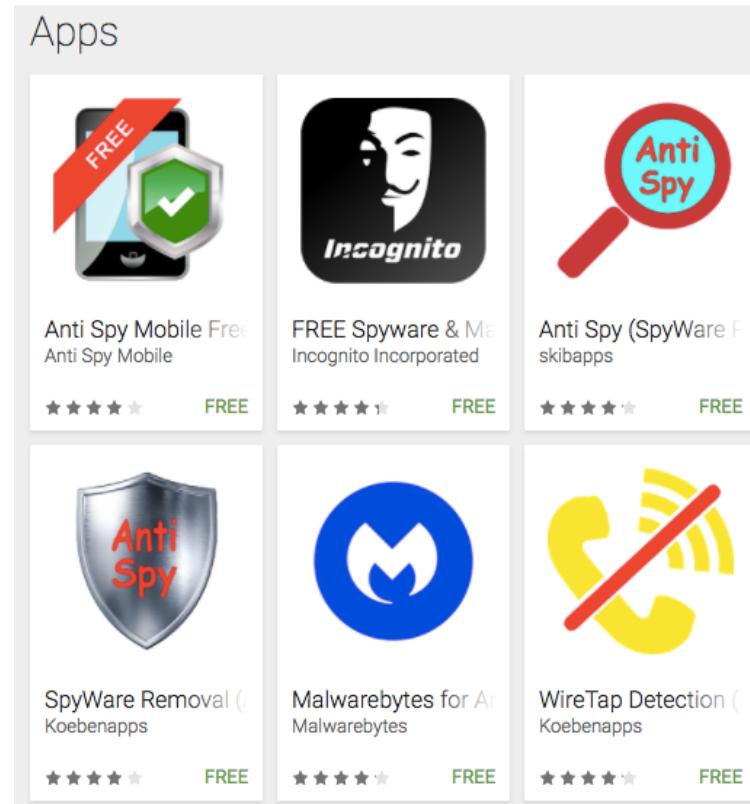
Dual-use apps will/should remain on stores:
we need detection tools to help (potential) victims

What about existing detection tools?

Snowball searching on Play Store with terms such as “anti-spyware” and “spyware removal”

Found 40 apps on Play Store advertising anti-spyware capabilities

7 brand-name anti-virus systems



What about existing detection tools?

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Some of the <i>best</i> -performing tools	Detection rate for on-store IPS tools (276 apps)	Detection rate for off-store IPS tools (20 apps)	False positive rate for benign apps (100 apps)
McAfee Mobile	2%	90%	0%
Norton Mobile	13%	70%	2%
Anti Spy Mobile	47%	95%	12%
Anti Spy (skibapps)	36%	73%	10%

“Dual-use” apps not necessarily malicious outside IPV (or similar) context

Prohibitively high false positive rates (e.g., flag Gmail and Facebook apps)

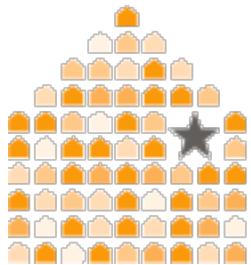
Recap of spyware study

- Large ecosystem of IPS apps
- Dual-use apps used widely & a significant challenge
- Developers condone IPS even when official website does not
- Existing anti-spyware insufficient at detecting tools

Our project moving forward



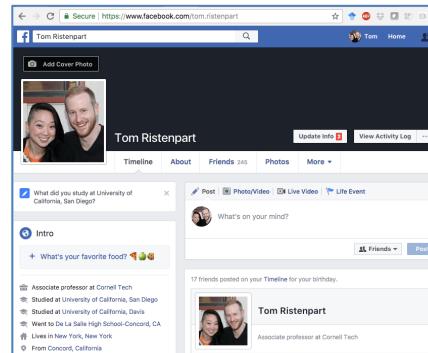
Mayor's Office to
Combat Domestic
Violence



NNEDV
NATIONAL NETWORK
TO END DOMESTIC
VIOLENCE



Spyware detection &
safety planning procedures



Understanding the UI-bound
adversarial model

Abuse Assessment Screen

Instructions: Circle Yes or No for each question

1. Have you ever been emotionally or physically abused by your partner to you?
2. Within the last year, have you been hit, slapped, kicked or otherwise someone?

If YES, who? (Circle all that apply)

Tech abuse assessments,
training materials,
policy & legal



Nicki Dell



Karen Levy



Damon McCoy



Diana Freed



Rahul Chatterjee

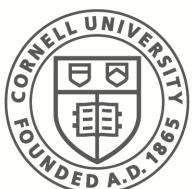


Peri Doerfler

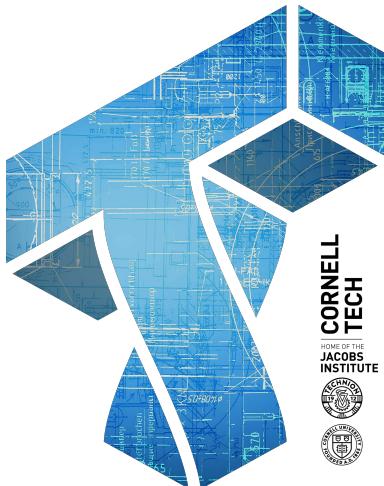


Sam Havron

Also: Diana Minchala, Jackie Palmer



Cornell CIS
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NYU

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OF ENGINEERING**

<https://ipvtechresearch.org>