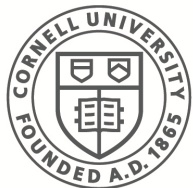


# Tech Privacy and Safety in Intimate Partner Violence

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**

**CORNELL  
TECH**

HOME OF THE  
**JACOBS  
INSTITUTE**



# Intimate Partner Violence (IPV) is a huge problem

25% of women      suffered **rape, physical violence**, and/or **stalking**  
11% of men      **by an intimate partner**

[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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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



OCDV runs Family Justice Centers  
One in each neighborhood of NYC

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



# 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



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

## 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

## 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

## Exposure of private information

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

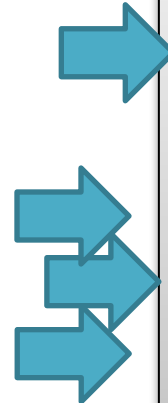


# Client Story #2

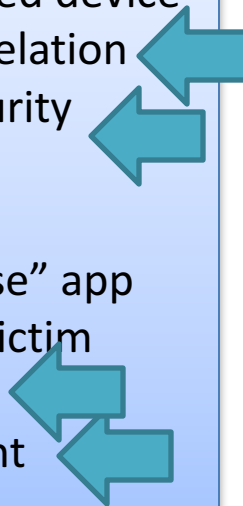
[Slide contents removed for privacy reasons]

# Four categories of common attacks


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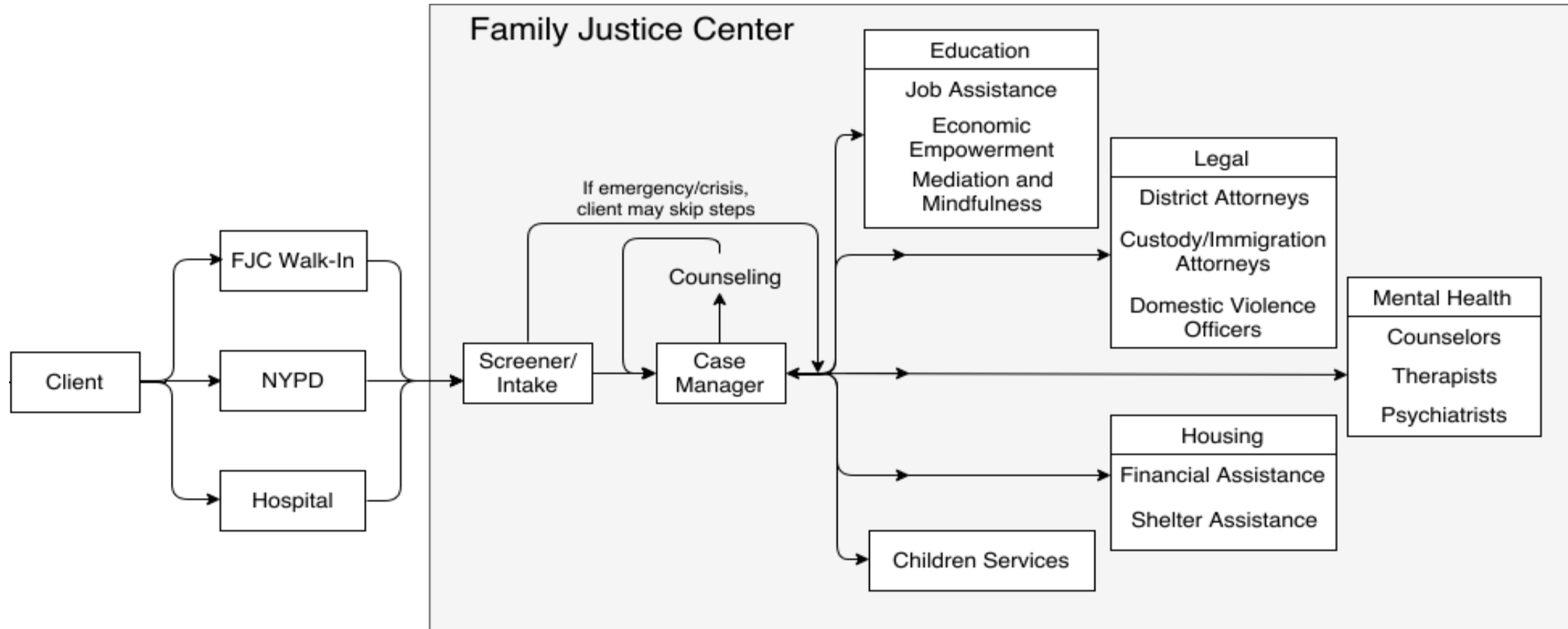
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- “Doxxing” victim
- Non-consensual intimate images
- Fake profiles/advertisements of sexual services

**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

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

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

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

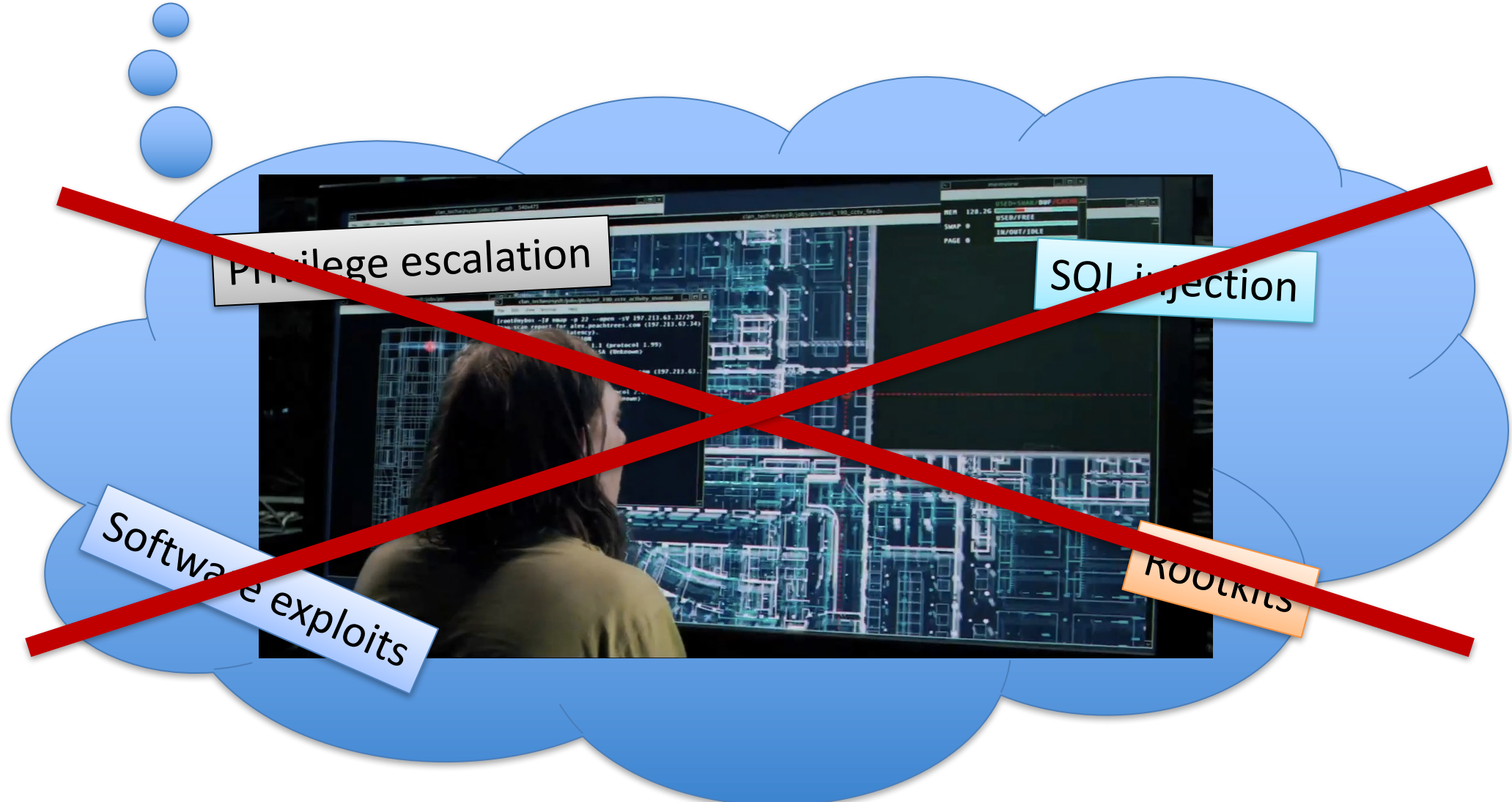
*“I end up Googling it. And then I’ll deal with [the client]. But I think... I don’t know how to do it so we’ll just Google it together.”* – Case manager

“Google-as-they-go”

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

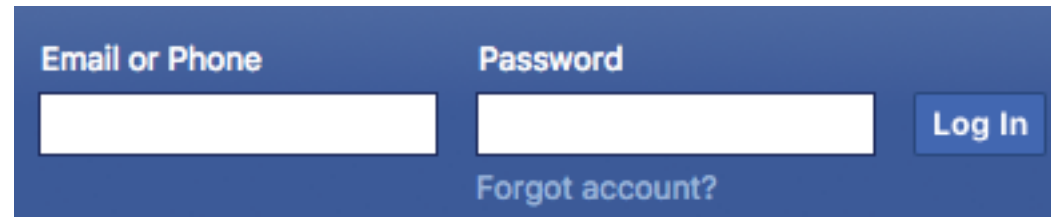
**Technical mechanisms are failing, too:  
Context of IPV undermines existing security tools**

*“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



The image shows a login interface on a blue background. It features two white input fields: the first is labeled 'Email or Phone' and the second is labeled 'Password'. To the right of the password field is a blue button with the text 'Log In'. Below the password field is a link that says 'Forgot account?'.

## 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



Year-long qualitative study  
of IPV ecosystem in NYC



IPV spyware & anti-spyware  
measurement 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



<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)

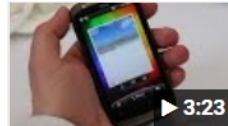
[How to Spy on My Husband's Cell Phone Without Touching It?](https://besttrackingapps.com/spy-on-your-spouse/)

<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=LBTF2jEEeCo)



<https://www.youtube.com/watch?v=LBTF2jEEeCo>

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 ...](https://smstrackers.com/Tracking-My-Partner)

[smstrackers.com](https://smstrackers.com/Tracking-My-Partner) · [Tracking My Partner](https://smstrackers.com/Tracking-My-Partner)

The popularity of mobile **spy** software is increasing every passing day as worried wives 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](https://guestspy.com/can-spy-husband-cell-phone-without-touching-cell/)

[guestspy.com/can-spy-husband-cell-phone-without-touching-cell/](https://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**

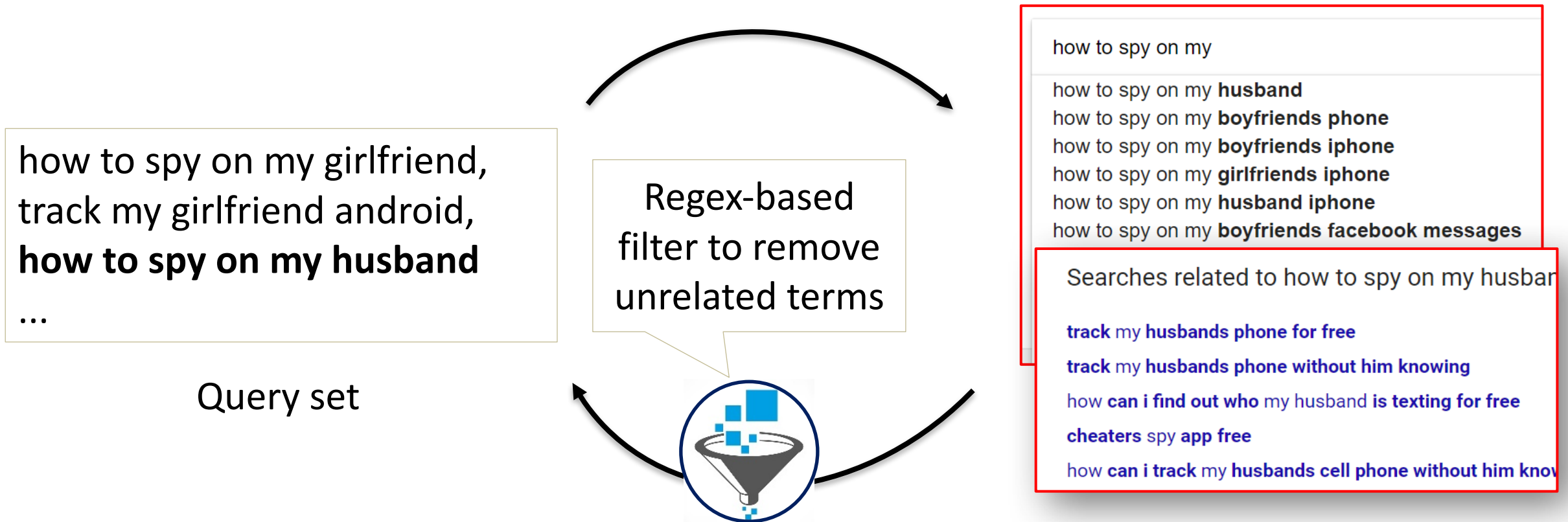
how **can i track** my **husbands cell phone** without him knowing and for free

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  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  **iTunes**



# 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

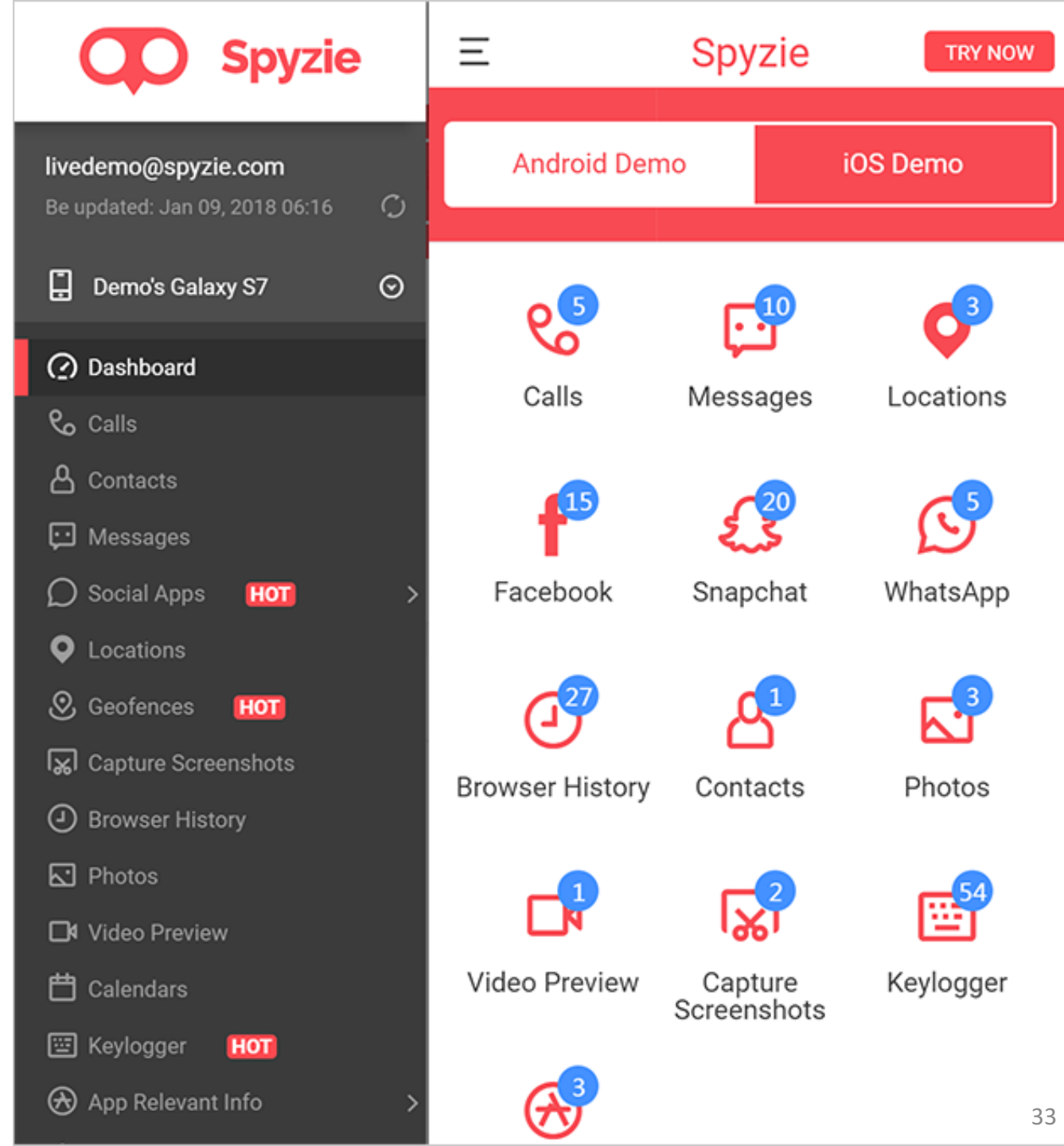
Whole process takes ~5 min

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  
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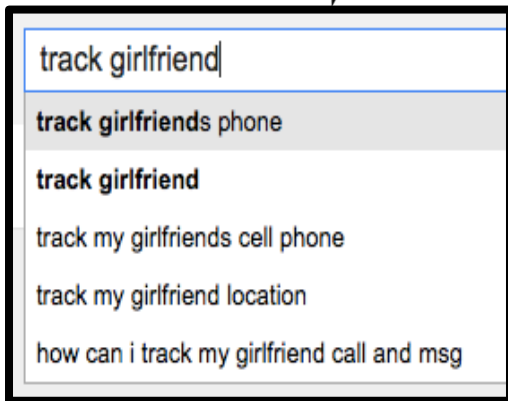
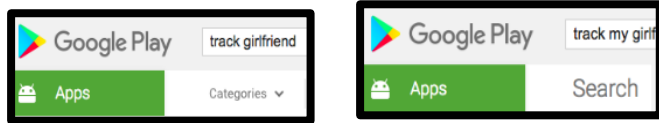




# Finding on-store IPS-relevant apps

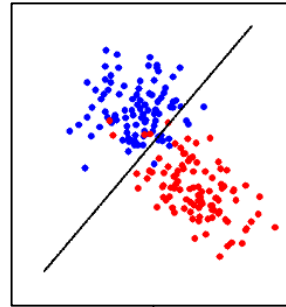
Apps distributed in official application stores

Snowball searching over  
3 months on Play Store



Prune using  
ML classifier

15,000+  
apps



~4,500  
apps

Filter using  
human verifier



Found  
**3,500+**  
apps usable  
for IPS

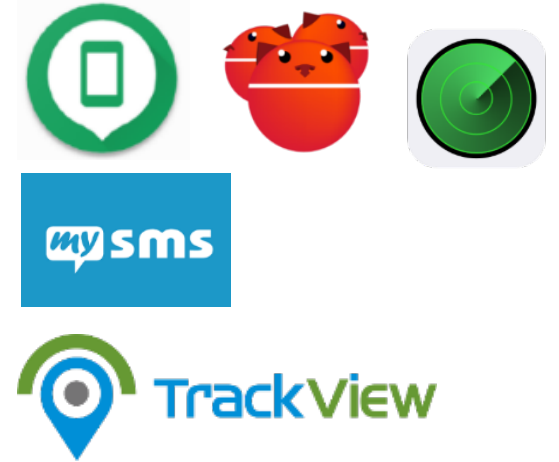
Looks at app title, description,  
permissions, and genre as  
reported in Play Store

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

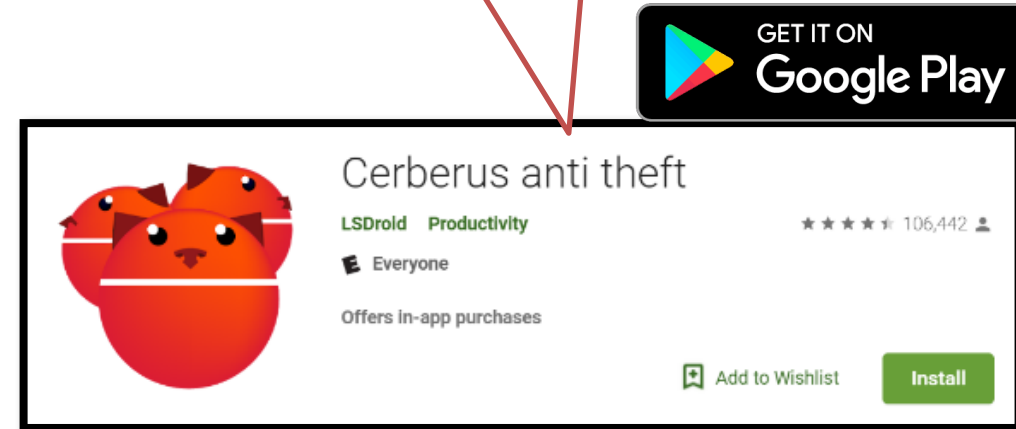


# Seemingly innocuous apps used for IPS

*“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

**thetruthSPY**  
HOME FEATURES PRICES DOWNLOAD AFFILIATES

## How to spy on cheating husband mobile spy app free

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

 **Spyzie**

## 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.

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

## Mobile Spy App for Personal Catch Cheating Spouses

Home Uses HelloSpy for Bussiness

### Cheating by the numbers...

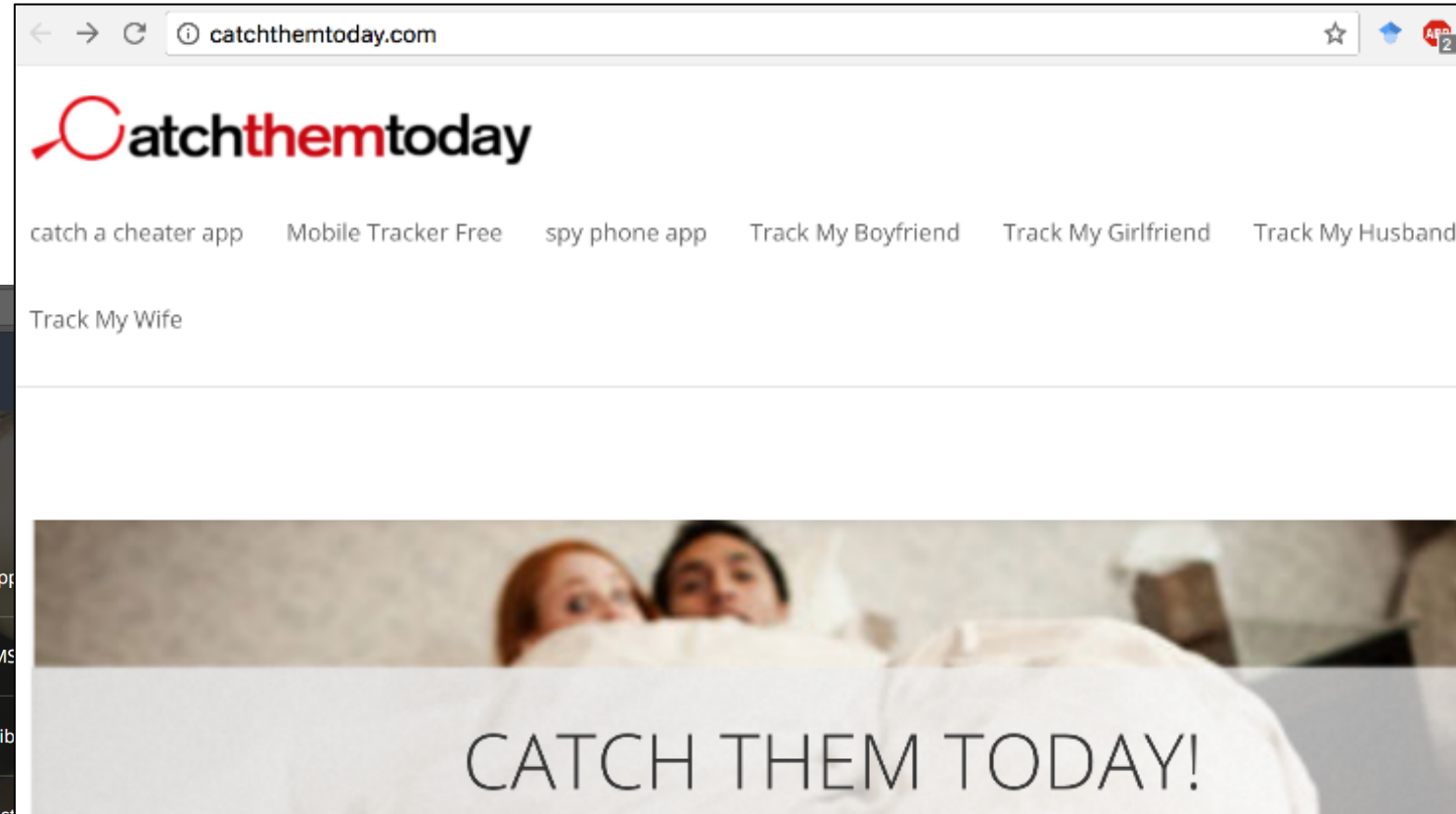
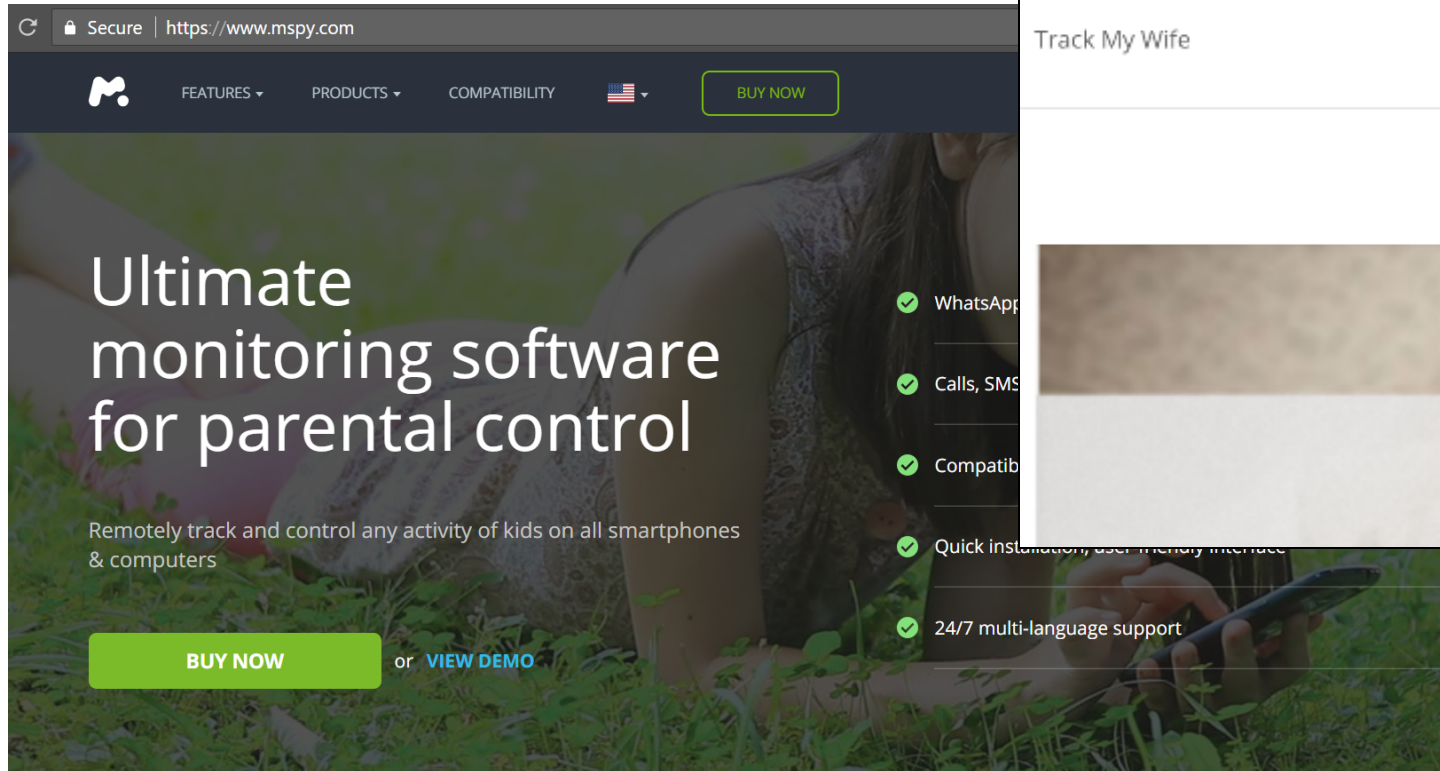
One of the unpleasant truths most married individuals are aware of is the surprisingly high occurrence of extramarital affairs.

A study by Joan D. Atwood & Limor Schwartz, 2002, by the Journal of Couple & Relationship Studies, revealed that 55% of married women and 50-60% of married men have had extramarital sex at some time or another in their relationship. If that is not alarming enough, a recent study puts the average nonpaternity rate at above 1%, which means that in other words, 33 children in every thousand are not the man everybody thinks they are...



# Others are condoning IPS

- Advertising affiliate sites promote IPS

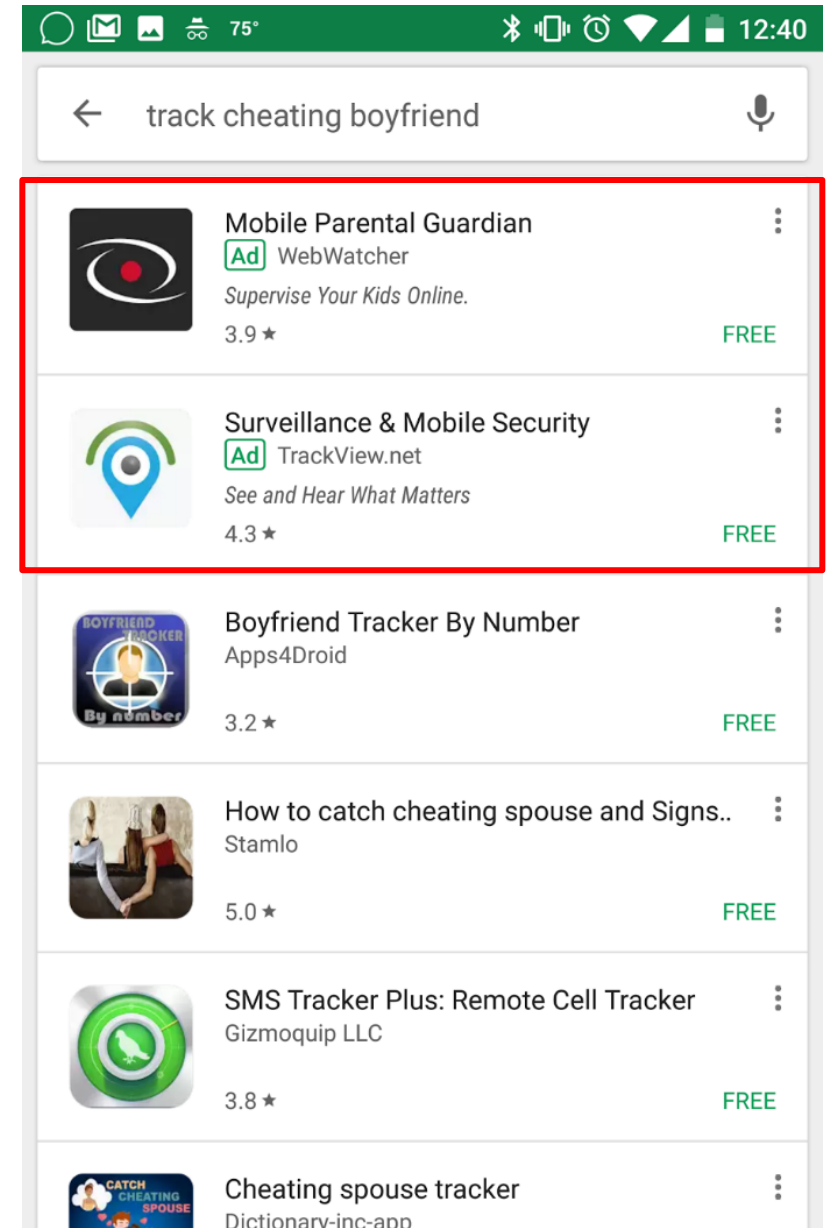


Links only to



# 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

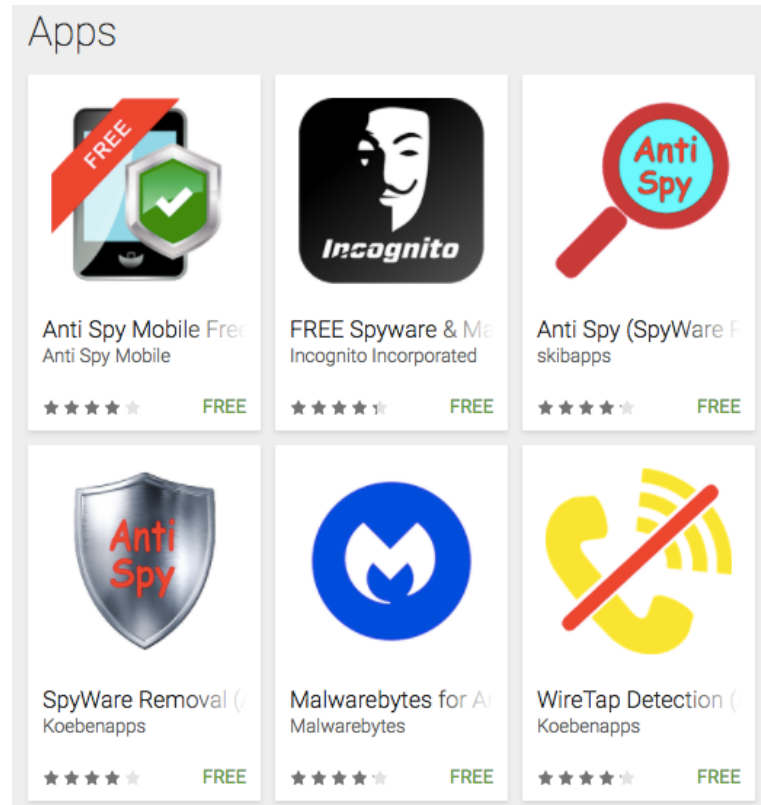
Dual-use apps will/should remain on stores:  
we need detection tools to help (potential) victims

# 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?

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

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)

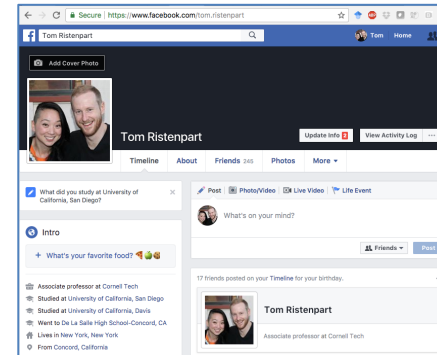
# Recap of spyware study

- 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



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

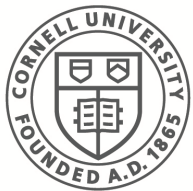


Peri Doerfler



Sam Havron

Also: Diana Minchala, Jackie Palmer



Cornell CIS  
**Computer Science**



**NYU**

**TANDON SCHOOL  
OF ENGINEERING**

<https://ipvtechresearch.org>