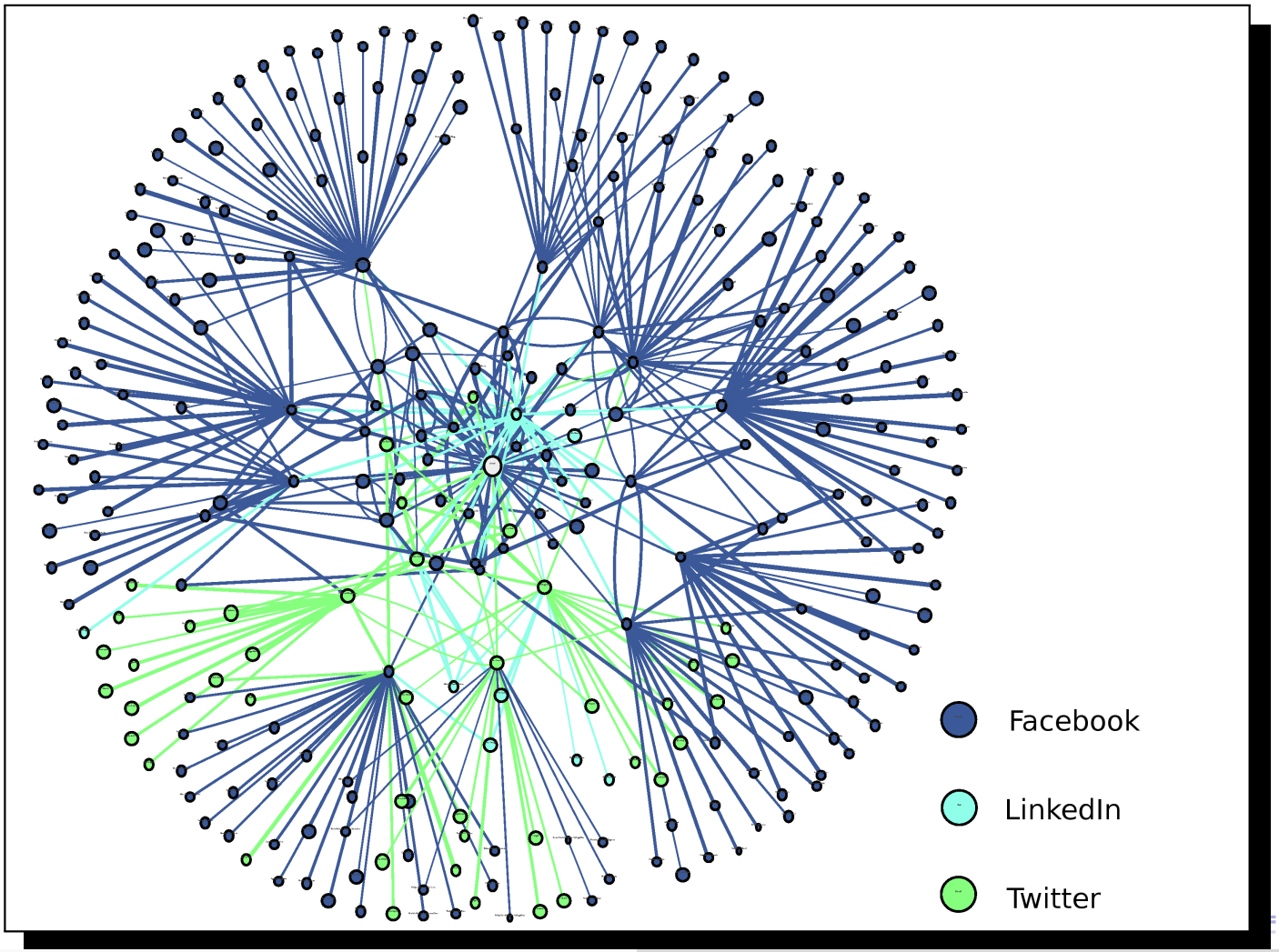
LeakedOut: the Social Networks You Get Caught In

José I. Orlicki

CoreLabs - Core Security Technologies
PhD program - ITBA
(BA-Con 2008 Buenos Aires)

October 8, 2008

Introduction - You are here!



Who am I

- I am 26 years old.
- I am from Buenos Aires, Argentina (where you are located).
- Computer scientist.
- Researcher at CoreLabs for 2 years. Core sells pen-test software and services.
- Phd student at ITBA.
- Main interests: Open Source Intelligence, Attack Simulation and Planning, Complex Network Analysis.
- Mostly harmless, interested in Social Networks after getting sucked into LinkedIn.

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- Open Source Intelligence (OSINT): processing public/leaked info to generate actionable intelligence. (Not GPL!)
- Centered on Internet, Search Engines, Social Network Services, IMs, Web 0.2, etc.
- Discusses a small prototype called Exomind.

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- You are allowed to talk hype after this talk, using expressions like Cloud Computing and Attention Economy.
- Fortunately understand real privacy and security threats to you and your organization.
- Bottom line: now with the Wikinomy and Web 0.2 there is a lot of public/leaked info available, you may need to measure the consequences !?!

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- So, involves OSINT, social engineering and binary exploits.

(FriendAds: check talk "Smartphones (in)security" at Ekoparty 2008, is about client-side binary exploits)

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- They use a rich set of entities like Person, Domain, Host, etc.
- Also PyMaltego library is being developed by the grugq, including client/server capabilities.

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- Multiple social/anything network system harvester and analyzer (Exomind):
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- Extra! Search Engine Based Chatbot.

Exomind design overview

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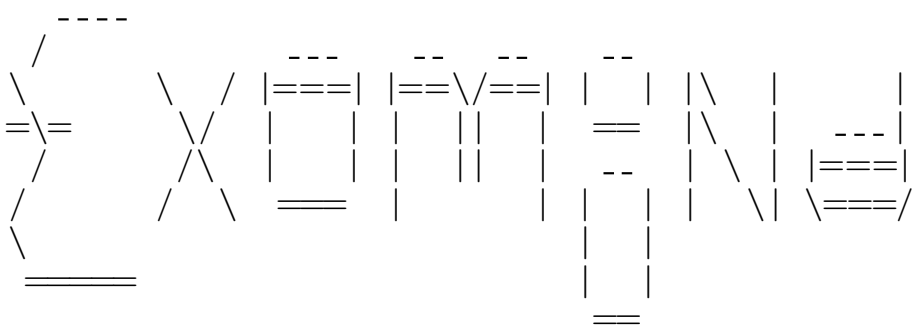
- `Exomind` class: a programmatic interface.
- `SQLGraph`: a graph abstraction over MySQL, similar to that of the `networkx` library (but persistent).
  - Simple entity model: `node`, `edge`, `node_attr` and `edge_attr`. Also attrs. have `type` and `count`.



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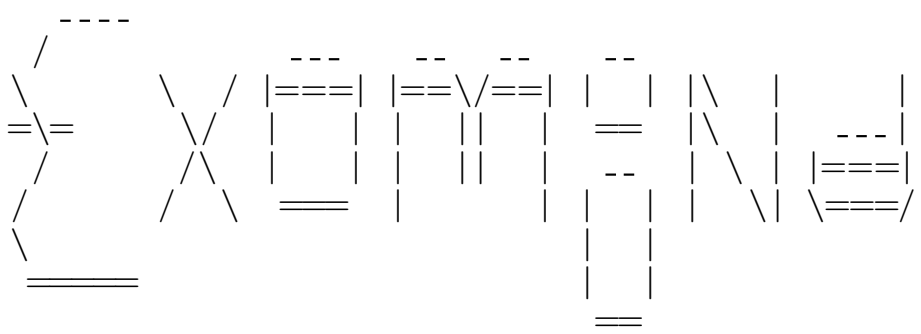

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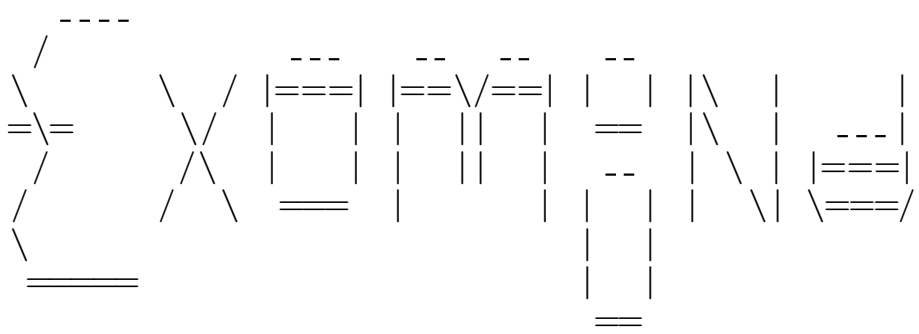

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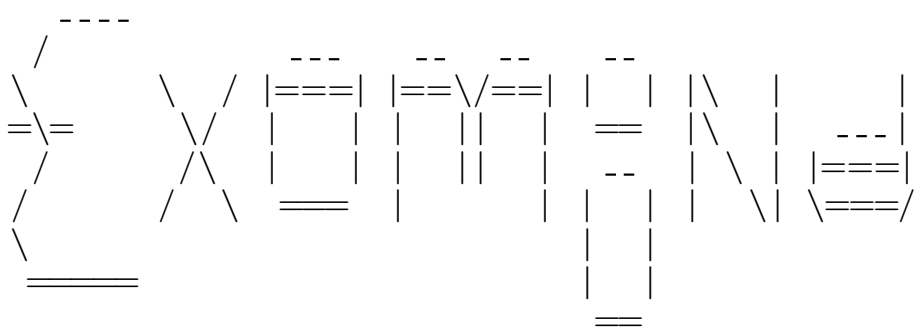

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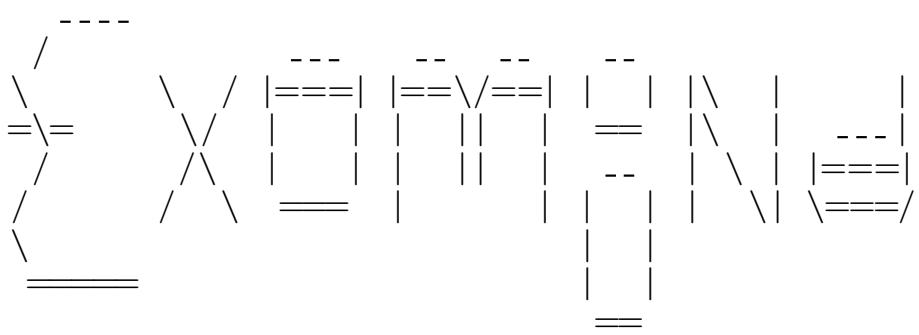

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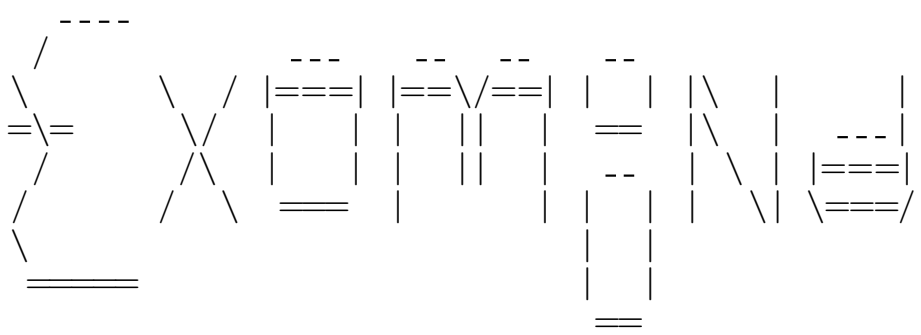
- `pygraphviz+networkx` for visualization [5].
- `msnlib` for IM chatbot example [6].



Bot Modules

Retrieve and format information but could also be interactive:

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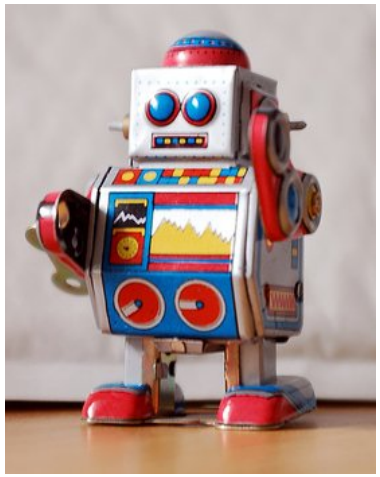

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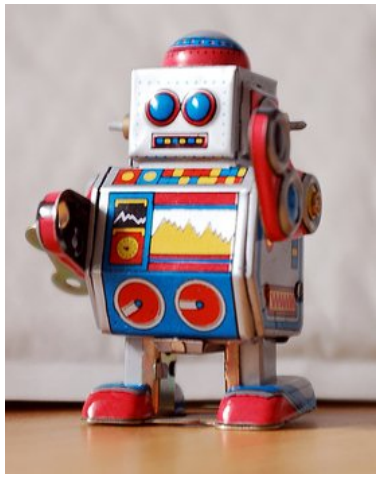

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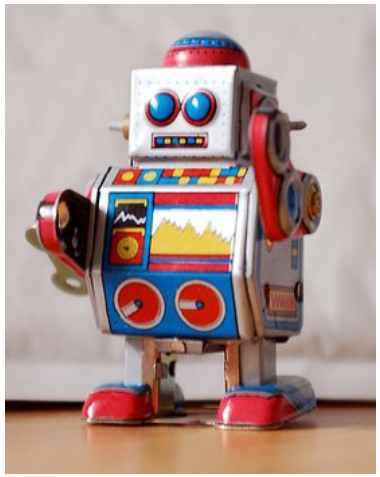

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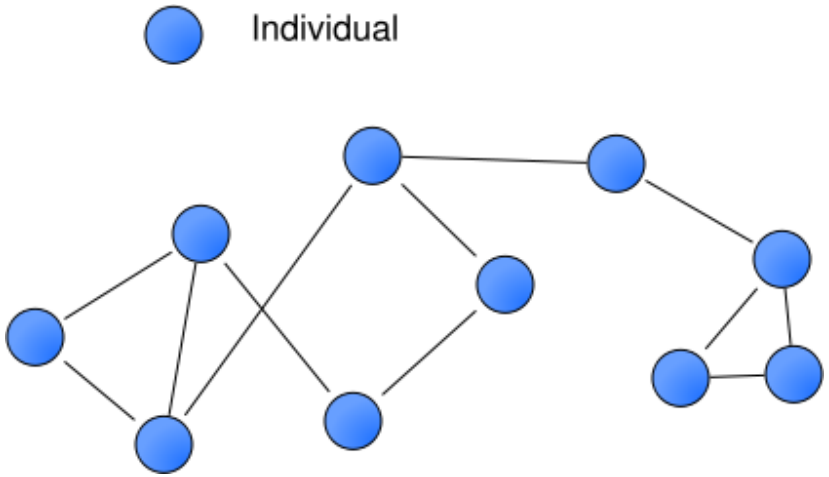
- ChatBot commands: contact people and semi/fully automatically talk to them.

Expanders: Social Network Services

These bots include:

- Logic to detect the affiliation to the service.



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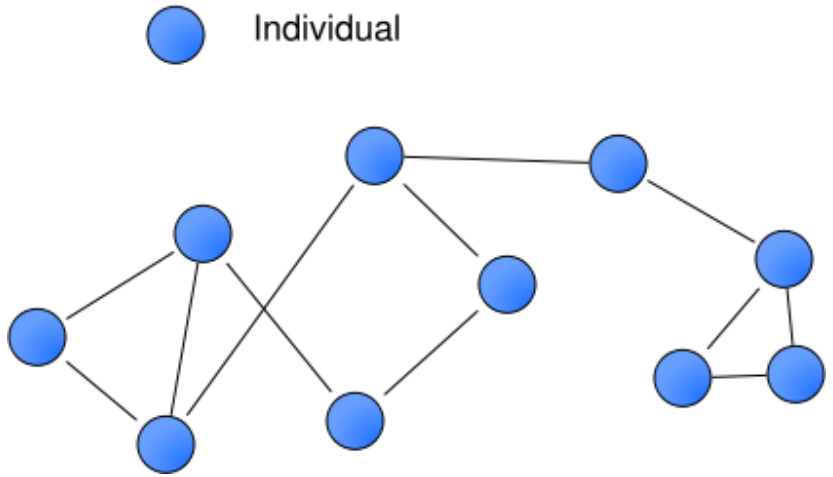

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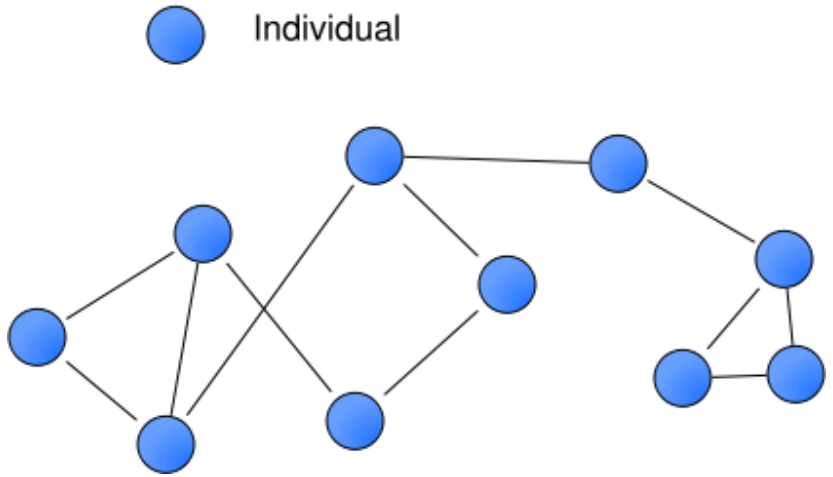
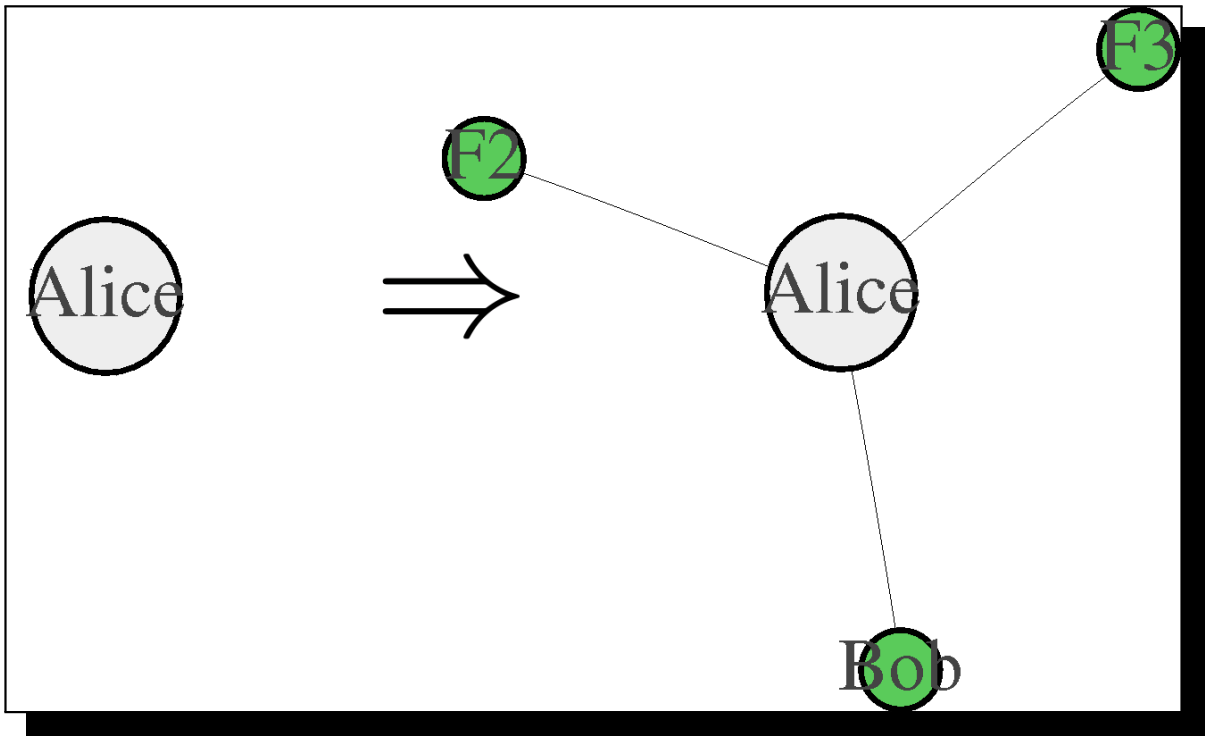
- Regex or html/xml parsing to locate the info.



Expander

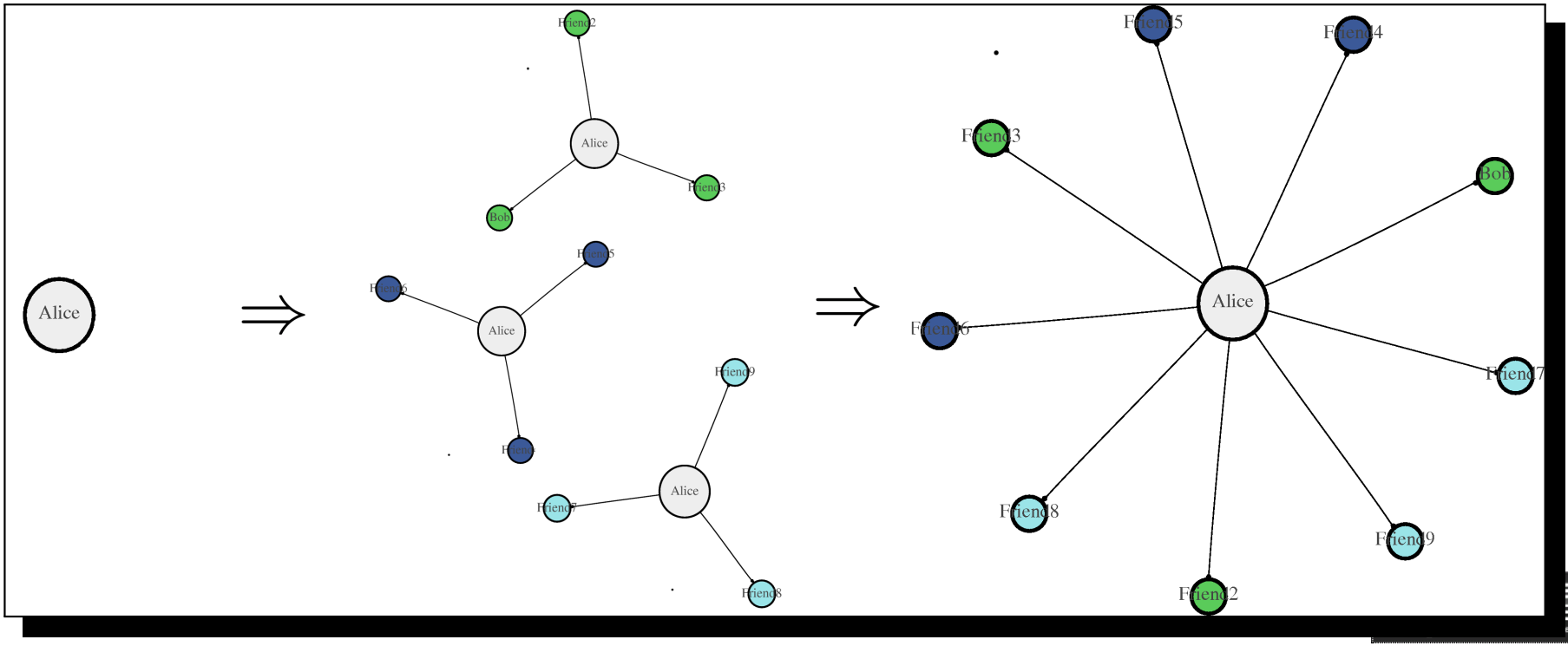
For example, for ViralBuddy service you can implement `ViralBuddyBot` that expands `Alice`:



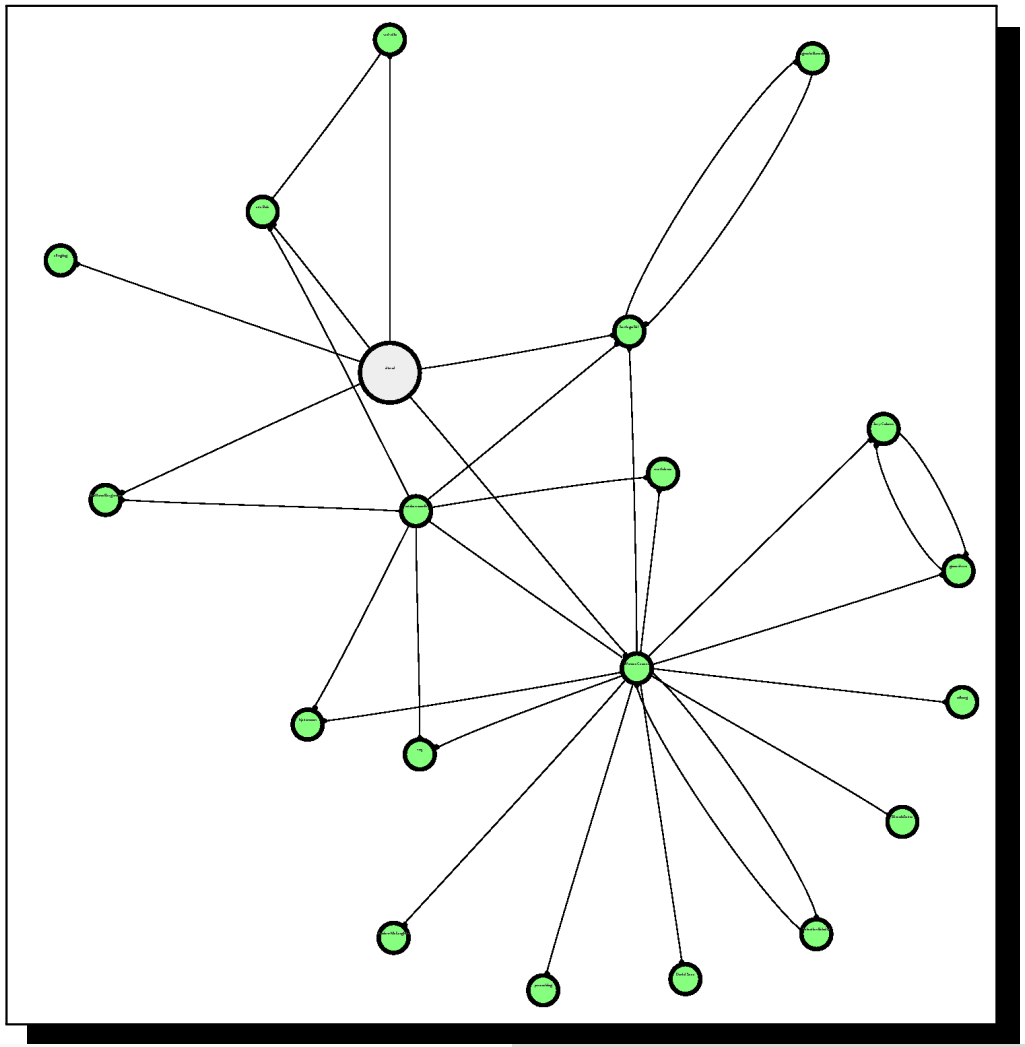
Plus extra attributes for `Alice`, each friend and each separate link.

Multiple Social Networks Fusion

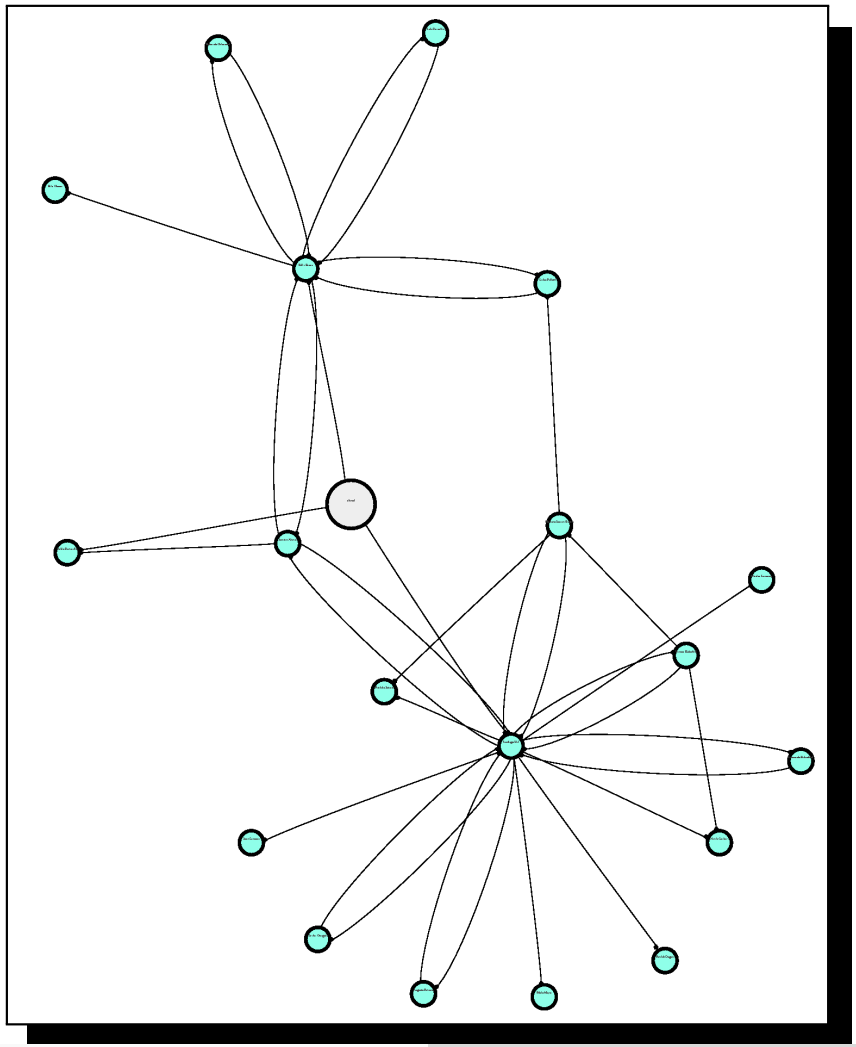
`Alice` contacts from various social networks can be merged together:



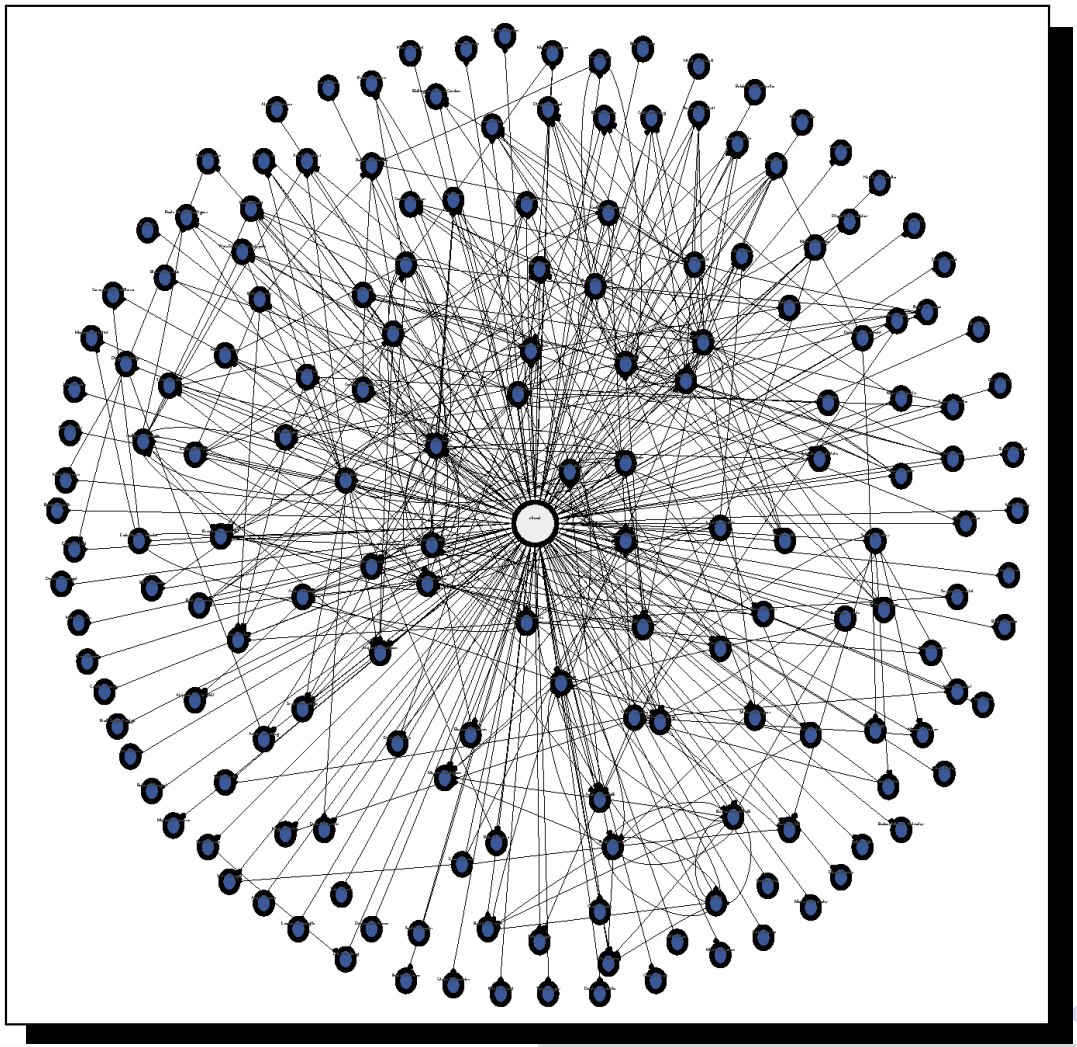
Twitter Following



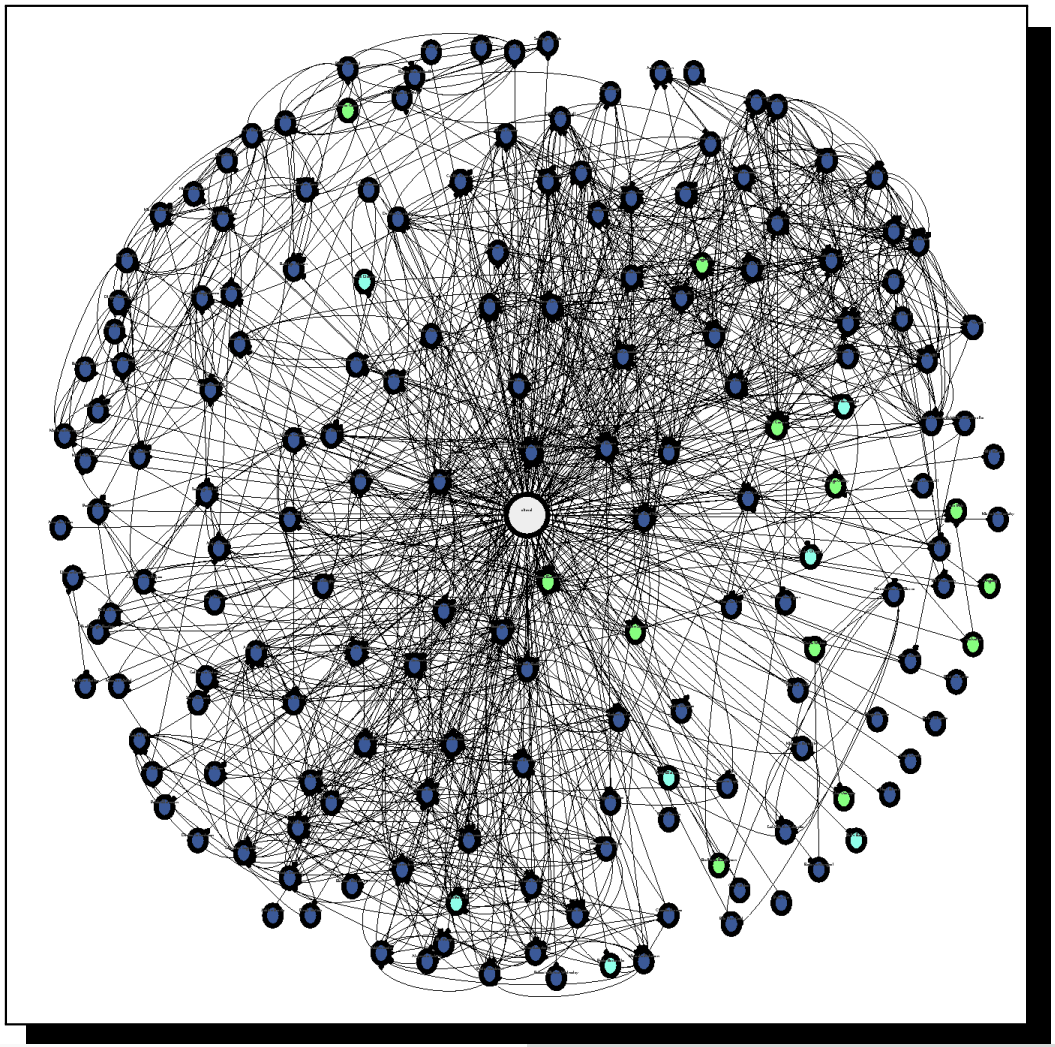
LinkedIn Recommendations



Facebook Friends



When crawled together...



Examples

```
>>> all_expanders()
LinkedInBot::recommendations
LinkedInBot::also_viewed
GraphBot::neighbors
GraphBot::with_all
SearchEngineBot::domain_to_emails
SearchEngineBot::name_to_self_emails
SearchEngineBot::name_to_emails_strong
SearchEngineBot::domain_to_emails_strong
SearchEngineBot::name_to_emails
SearchEngineBot::vocabulary
FacebookBot::friends
TwitterBot::following
TwitterBot::followers
TwitterBot::favorites
```

Recursive Regex Matching

General and unstructured information coming from search engine results (`SearchEngineBot`) can be retrieved and processed with specific purposes.

- Phones.
- Physical Addresses.
- E-mails (prototype).

```
comments. Main Content. English Wikipedia references for Coresecurity.com 1-10 of
10 ...From: CORE Security Technologies Advisories *advisories@coresecurity.com* ... Cor
Security Technologies Advisory http://www.coresecurity.com Axis Network ...Gerardo
Richarte and CoreLabs. *gera@coresecurity.com*. MD5 to be considered . ... \xa1Gracias!
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/oss.coresecurity.com/uhooker/release/1.2/uhooker_v1.2.zip (zip) checkout the doc pages
because Im constantly posting new stuff like sample scripts ...Advisory URL: http:/
/www.coresecurity.com/?action=item&amp;id=2035 ... http://www.coresecurity.com/files
/attachments/CORE-2007-1004-VLC-tutoria ...Browser Defender site report for coresecurity
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Recursive Regex Matching (cont.)

To harvest specific data from search engines snippets or full pages your need powerful (*and a lot of!*) regular expression to link data.

- E-mail: firstlastname user@domain.com. E.g., if you have the user:

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```

- Iterate, if near assume related and define Expander!

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- `sleep_module_gets`: sleep after this number of ops.
- Famous line `Press Enter to continue:` can be included in your bots to incorporate human interaction (and slow down!).

Demo1: targeted email crawling!

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- But at least we can filter, only precise information will be allowed.
- How? Use a universal reference corpus, some big search engine!

Search Engine Hits

If I am impersonating `Alice Smith`, is contact `Bob Johnson` a good target?

- If `Bob` has a very common name: NO.
- If `Bob` is not very related to `Alice`: NO.

$$h(\texttt{alice smith}) = 289,000$$

$$h(\texttt{bob johnson}) = 861,000$$

$$h(\texttt{alice smith,bob johnson}) = 825$$

Search Engine Hits (cont.)

Normalize the # of hits (h) and transform them into entropy (!):

- Total pages: $M = 21,910,000,000$

Results **1** - **10** of about **21,910,000,000** for **a**. (**0.13** seconds)

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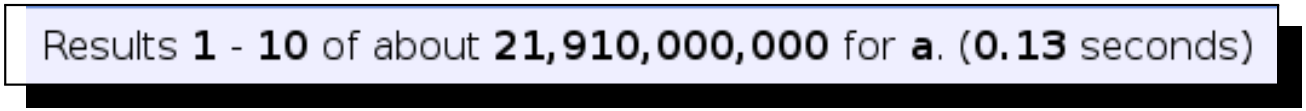

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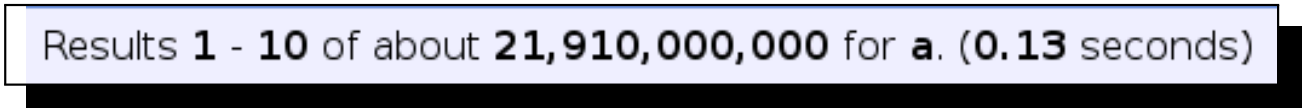

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- Bob's fraction: $\frac{861{,}000}{21{,}910{,}000{,}000} \simeq 3.929 \cdot 10^{-5}$

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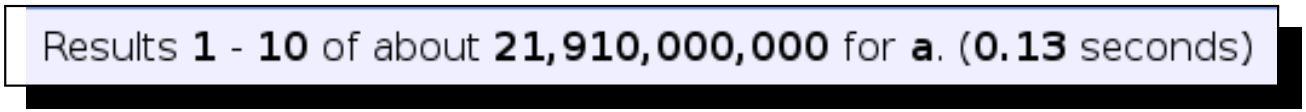

- Max. entropy (1 hit): $-\log_2 M \simeq 34.35$ bits
- Bob's fraction: $\frac{861{,}000}{21{,}910{,}000{,}000} \simeq 3.929 \cdot 10^{-5}$
- Entropy: $-\log_2(3.929 \cdot 10^{-5}) \simeq 14.635$ bits

Search Engine Hits (cont.)

Normalize the # of hits (h) and transform them into entropy (!):

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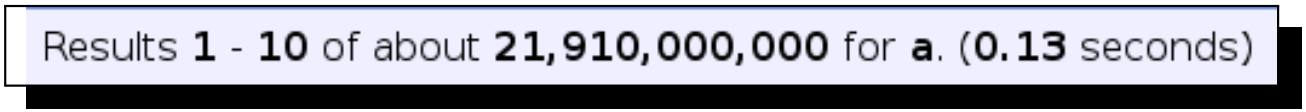

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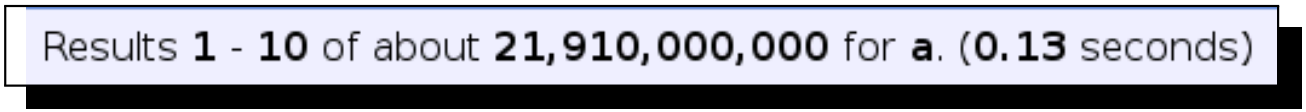

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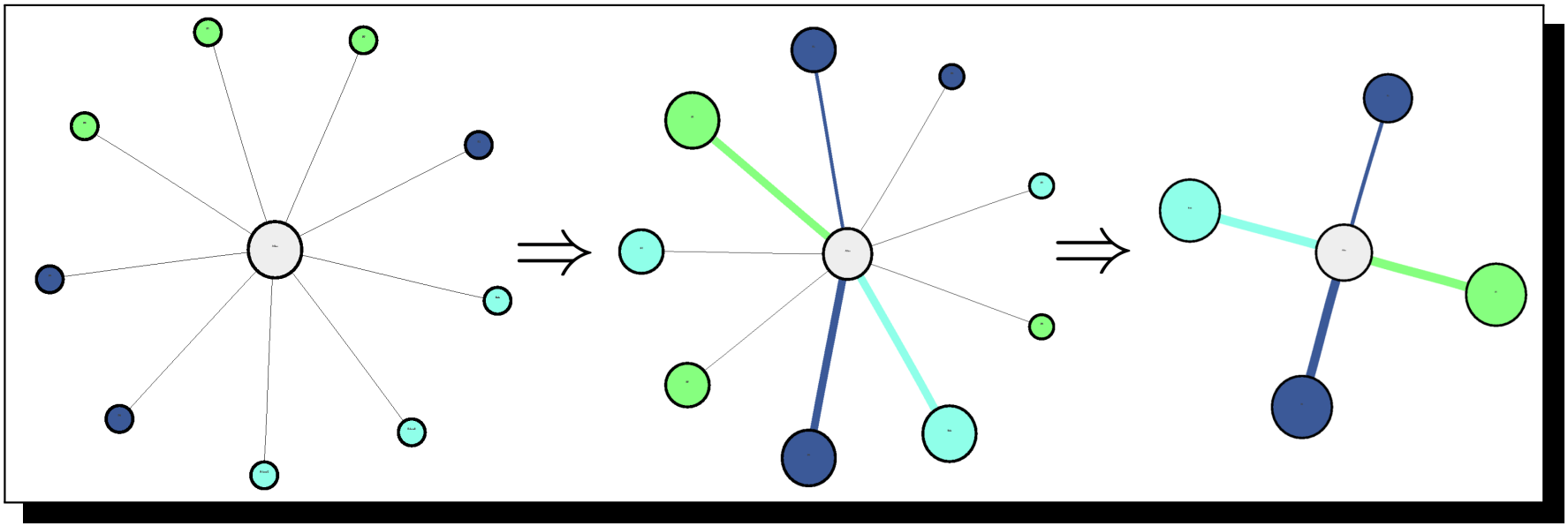
- If for example 0.5 is a chosen threshold, Bob is dropped!

Normalized Google Distance

Same with links. Hits $h(x)$ and $h(x,y)$ are more useful if normalized (where $p(x) = \frac{h(x)}{M}$ and $p(x|y) = \frac{p(x,y)}{p(y)}$):

- Jaccard distance: $\frac{h(x,y)}{h(x)+h(y)-h(x,y)}$
- *NGD* is more robust! [7]:
$$\frac{\max\{-\log_2 p(x|y), -\log_2 p(y|x)\}}{\max\{-\log_2 p(x), -\log_2 p(y)\}} = \frac{\max\{\log_2 h(x), \log_2 h(y)\} - \log_2 h(x,y)}{\max\{-\log_2 h(x), -\log_2 h(y)\}}$$
- $NGD(\textit{Alice Smith}, \textit{Bob Johnson}) \simeq 0.545$ if, for example, 0.5 is our chosen threshold, the link to Bob is dropped, he's is not a good target!

Weighting and filtering result



Observation: A context can be set to restrict the corpus! E.g. `security`, `argentina`. etc.

Weigh Scales in Exomind

```
>>> all_weigh_scales()
SearchEngineBot::jaccard_distance
SearchEngineBot::se_hits
SearchEngineBot::normalized_se_entropy
SearchEngineBot::normalized_se_distance
SearchEngineBot::hits_distance
GraphBot::obfuscate
>>>
```

Weigh scales can apply transformations on node neighborhoods, for example `GraphBot::obfuscate` encrypts the data collected. Also to blindly detect possible leaked links...

Demo2: Network blind reconstruction! Brute-forcing each possible link!

Using the Data Collected

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```
add_node_attr('Bob_Johnson', Attributes.TAG, 'best')
add_node_attr('Bob_Johnson', Attributes.TAG, 'reverse')
add_node_attr('Bob_Johnson', Attributes.TAG, 'engineer')
add_node_attr('Bob_Johnson', Attributes.TAG, 'security')
```

Vocabulary Impersonation

If the fuzzy profile is centered on written word of the target node, we are collecting his/her vocabulary. Use common patterns:

- `...Alice said...`,
- `...posted by Alice...`,
- `...Alice wrote...`.

```
list: [('co-founder', 6L), ('sets', 7L), ('technical', 8L), ('direction', 6L),
('company', 17L), ('responsible', 5L), ('overseeing', 5L), ('development', 3L),
('managed', 4L), ('catch', 4L), ('chief', 43L), ('techology', 3L), ('officer', 40L),
('talk', 4L), ('new', 8L), ('class', 3L), ('vulnerability', 15L), ('thats', 2L),
('talks', 2L), ('recent', 3L), ('update', 2L), ('interview', 6L), ('said', 98L), ('view',
5L), ('information', 4L), ('provided', 3L), ('free', 4L), ('public', 8L), ('search', 5L),
('listing', 4L), ('friends', 5L), ('photos', 6L), ('videos', 6L), ('join', 5L),
('attacker', 2L), ('remotely', 1L), ('execute', 1L), ('code', 12L), ('exploit', 9L),
('bugs', 10L), ('user', 4L), ('interaction', 3L), ('releasing', 1L), ('customers', 1L),
('week', 7L), ('technology', 39L), ('flaw', 9L), ('demonstrates', 1L), ('writes', 1L),
('discusses', 1L), ('security', 37L), ('threats', 2L), ('tools', 4L), ('importance', 1L),
('presentation', 3L), ('titled', 2L), ('esteemed', 2L), ('reply',...
```

Vocabulary Impersonation (cont.)

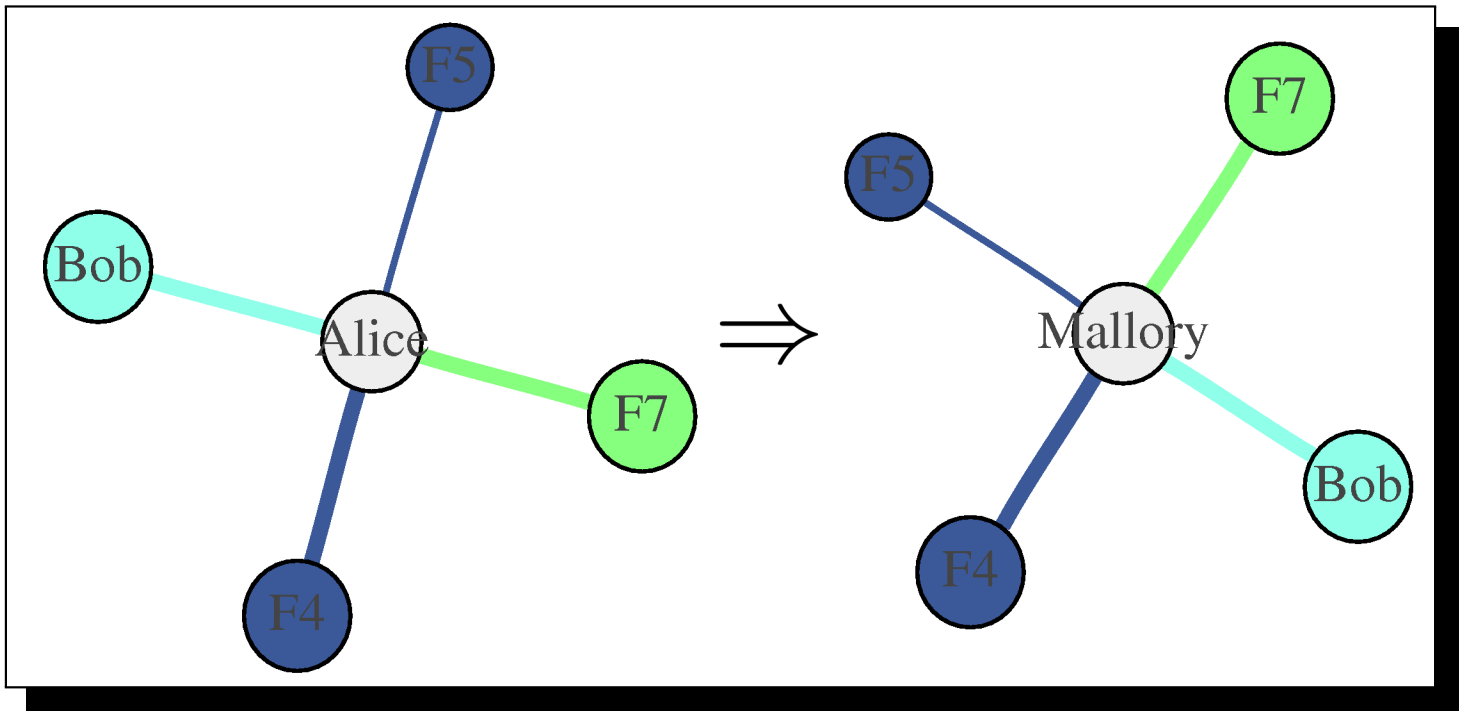
(Previous fun with languages at [8]).

- Module called *Dino*, based on a thesaurus and lacking ambiguity checks at this moment ;(, NLP hackers needed.

Bob: tell me
(Fake Alice: *tell* me that)
After vocabulary translation!
Fake Alice: state me that
Bob: tell me
(Fake Alice: *do* your friends *put* money in your *pocket*?)
After!
Fake Alice: execute your friends risk money in your collect?

Social network infiltration

`Mallory` wants to automatically impersonate `Alice` and interact with her contact `Bob`, possibly leveraging stolen credentials. Any channel available.



Social network infiltration (cont.)

In `Exomind` is included a MSN chatbot infiltration:

- `Mallory` uses `Alice` nickname.
- Possible MSN users a retrieved from `Alice` contacts collected.
- Initial messages send every N seconds.
- Manual or automatic responses using the Movie Chatbot or Eliza, and the vocabulary collected.

Search Engine Chatbot

What would Google (Search) say it it can talk? Question Answering systems exists [9] but we want an informal chat. Movie scripts: more or less structured format [10].

- Query `chatline` or `chatline[:-1]` until answers are found.

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- Extract all possible answers from the snippets.
- Choose a random subset, say 20.
- (optional!) Measure the Google Distance and choose the best 5 answers.
- Choose the most used in the subset.
- Voilà!

(You can use Google Translate if you want to change the language.)

Demo3: Search Engine Movie Chatbot!

Conclusion/Countermeasures

- It's a small world.
- Don't use your real name on the web (in the attention economy information is currency, don't give it away!).
- Don't accept strangers on your social network (in the social economy contacts are currency, don't give away your friends or yourself!).
- Use internal messaging for private issues of your organization.
- Analyze your social networks with `Exomind`! [11]

Final Questions?

Thanks!

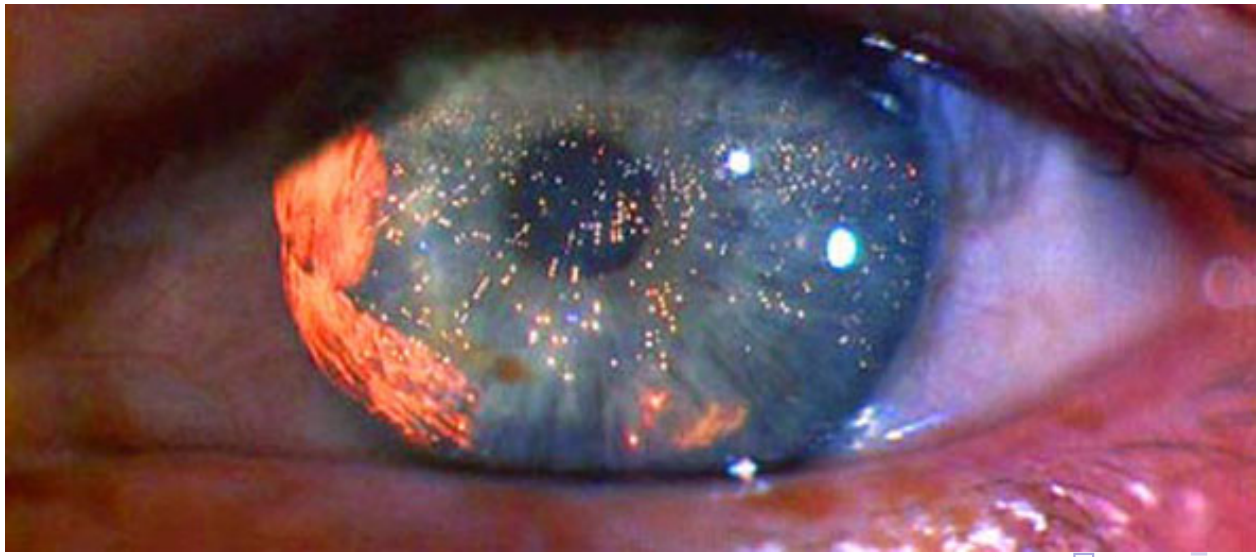
Aure: webapps and python discussions.

Alfred: LaTeX template.

Beto: Consulting stats.

ITBA team: scientific environment.

Core team: food, shelter and creative hacking environment.



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10 www.imsdb.com

11 Exomind tool, downloads soon at corelabs.coresecurity.com