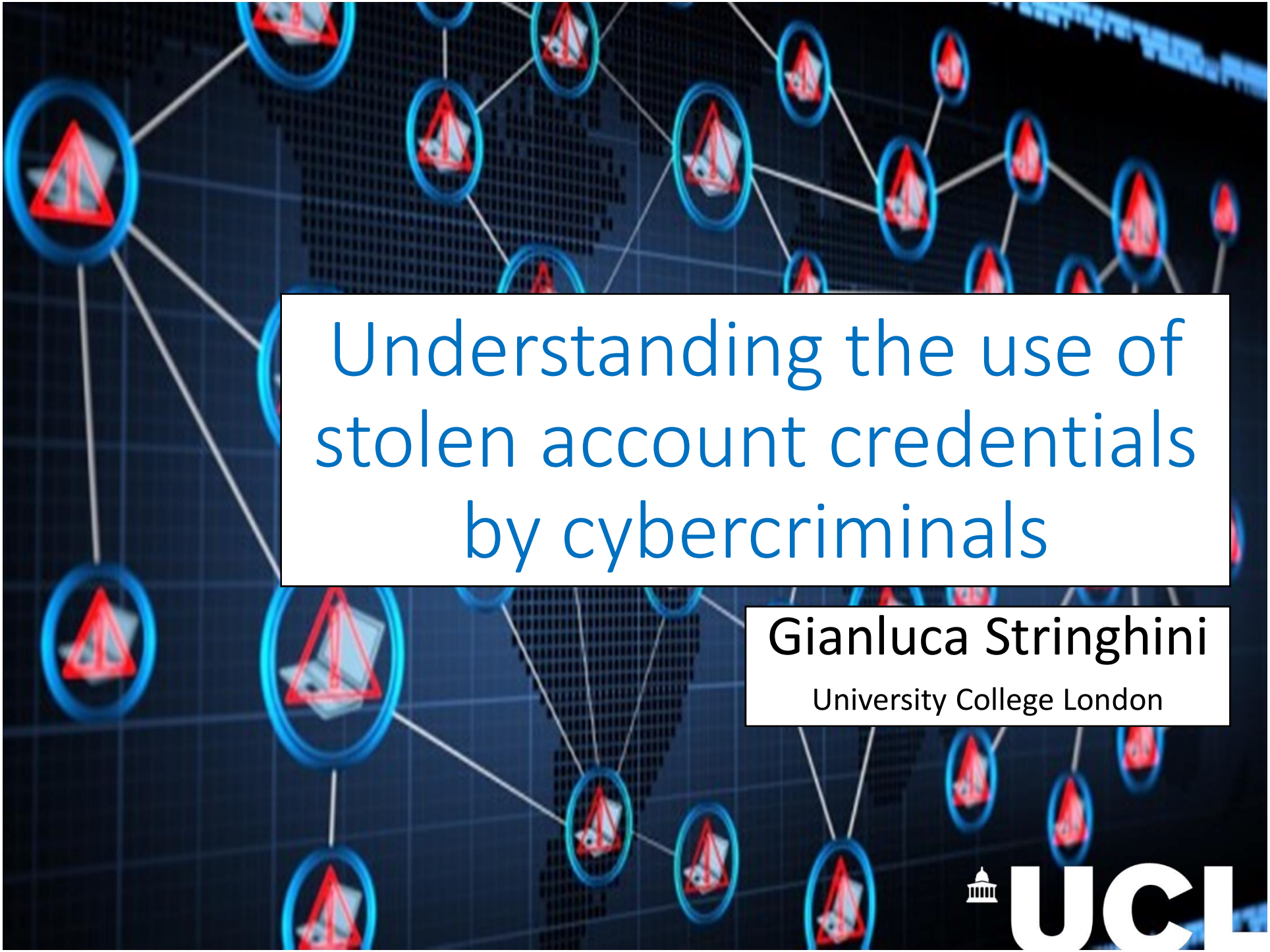

Understanding the use of stolen account credentials by cybercriminals

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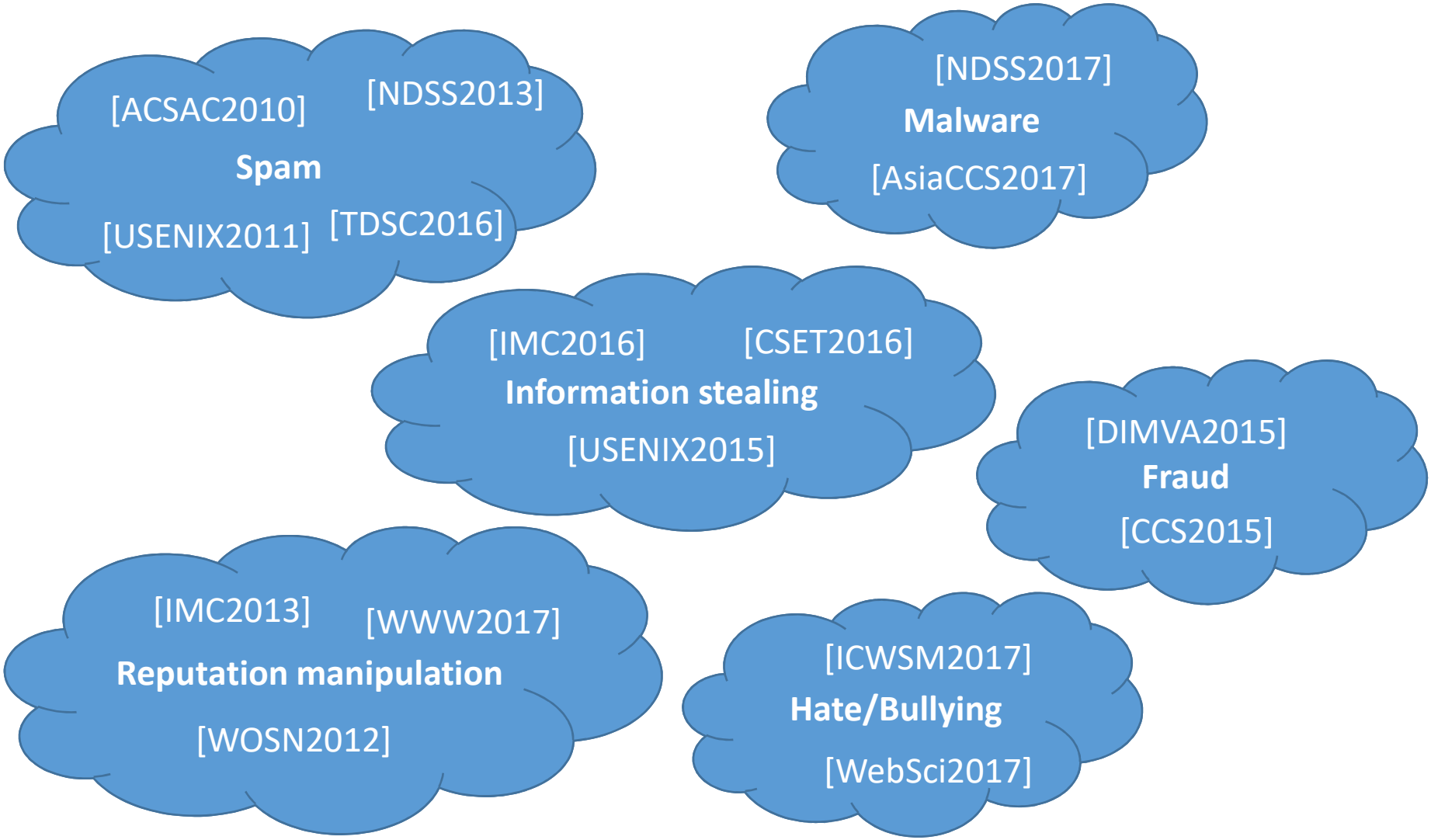
Abuse on online services



Compromised accounts

Credentials to online accounts get stolen by cybercriminals

- Phishing
- Data breaches

Question:
How are stolen credentials used by criminals in the wild?

- Steal sensitive information
- Send spam
- Sell the credentials on the black market

How can we answer this question?

No data available: we aren't Google, Facebook etc.

- From the outside, we can only see spam

In 2014, a paper by Google shed some light on these topics, but their focus was narrow and they left many questions unanswered

We decided to **collect data ourselves** and to **enable the research community to better understand the ecosystem of stolen account credentials**

Gmail “honey” accounts

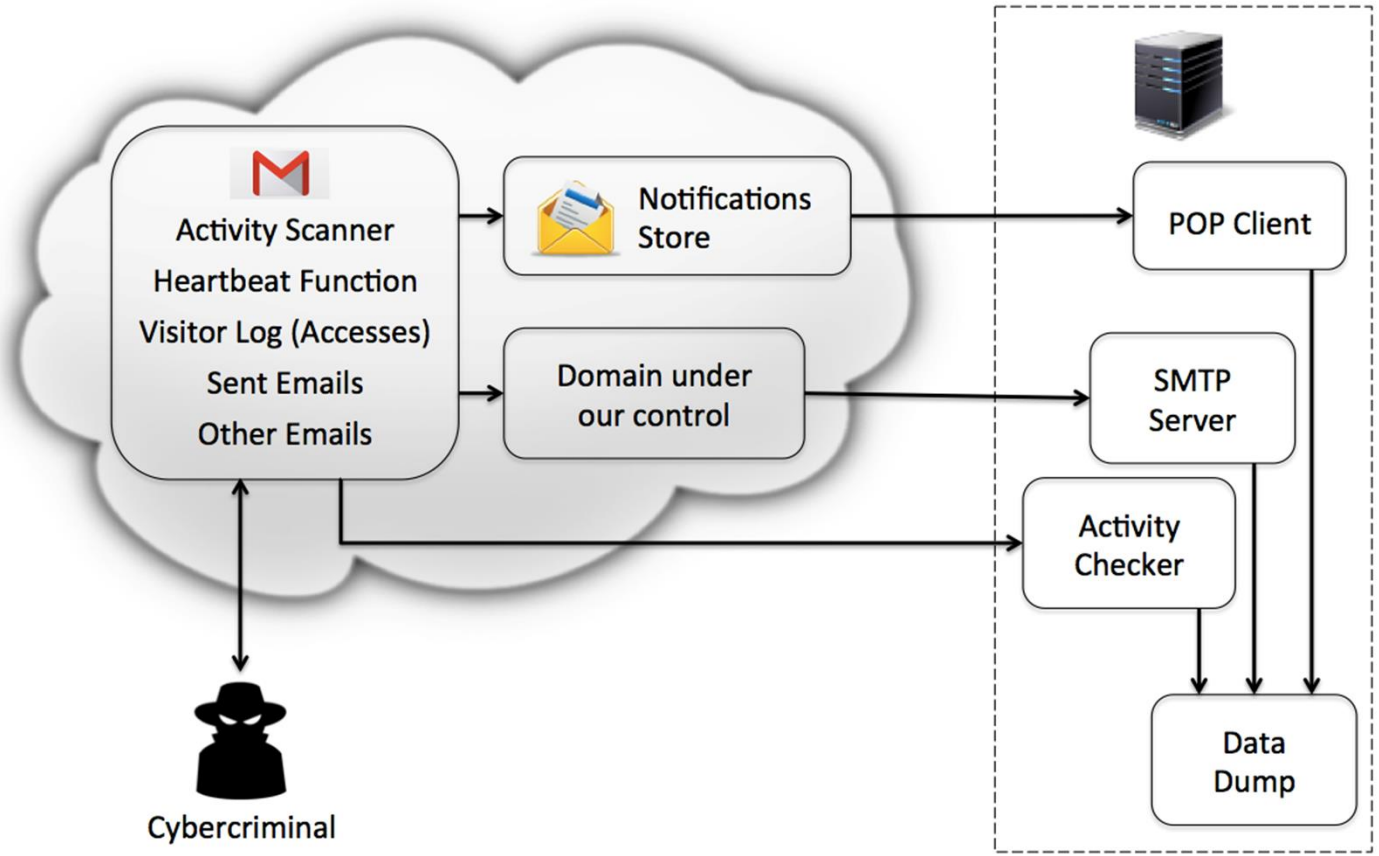
Google allows to enhance the functionality of accounts by setting up **Google App Scripts**

We can use this functionality to **set up honeypots!**

- Monitor which emails are opened
- Monitor which emails are sent
- Monitor durations of accesses, OS, browser
- Monitor locations of accesses

We can then leak credentials and have criminals use them

Our system (publicly available)



We asked Google to monitor the accounts on their side too

How does the outlet of a leak influence criminal activity? [IMC2016]

Corporate webmail honey accounts (100 accounts)

- Belonging to a fictitious company
- Populated using the Enron dataset

We leaked the credentials through three outlets

- Paste sites
- Underground forums
- Information stealing malware

We monitored activity to the accounts for 7 months, receiving 329 accesses

Types of accesses

Curious – just check if accounts are real

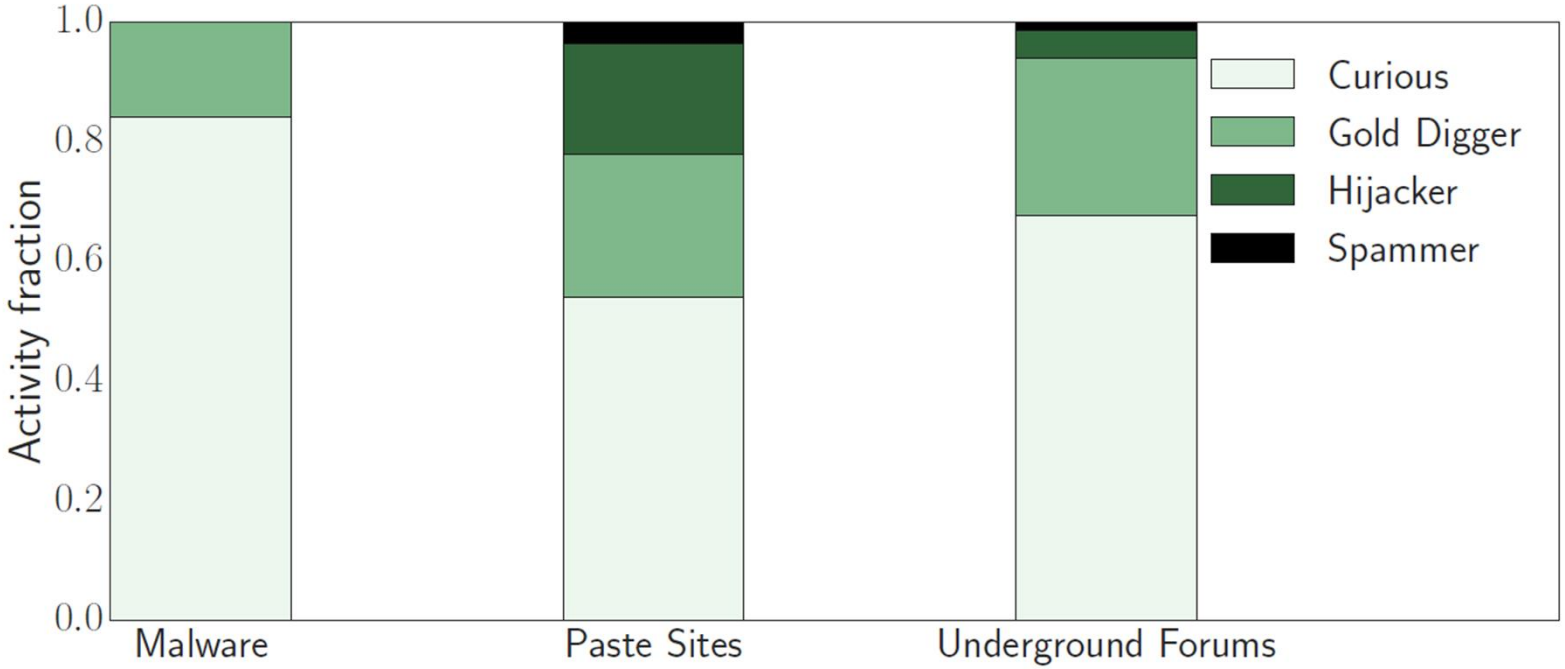
Gold Diggers – look for sensitive information

- Use the information
- Set a price tag

Spammers – send spam

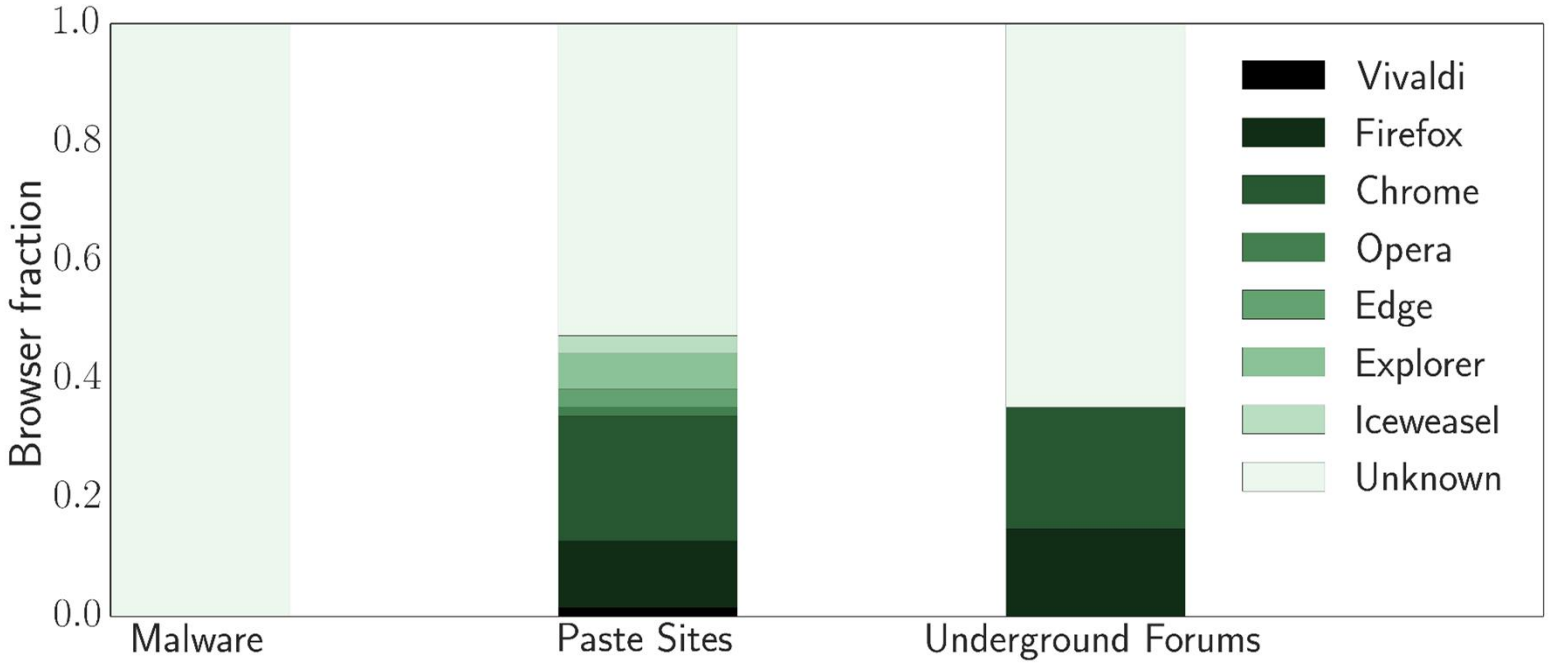
Hijackers – change the password locking the owner out

Influence of leak outlet on activity



Accesses of credentials leaked through malware are the “stealthiest”

Some accesses are stealthier than others



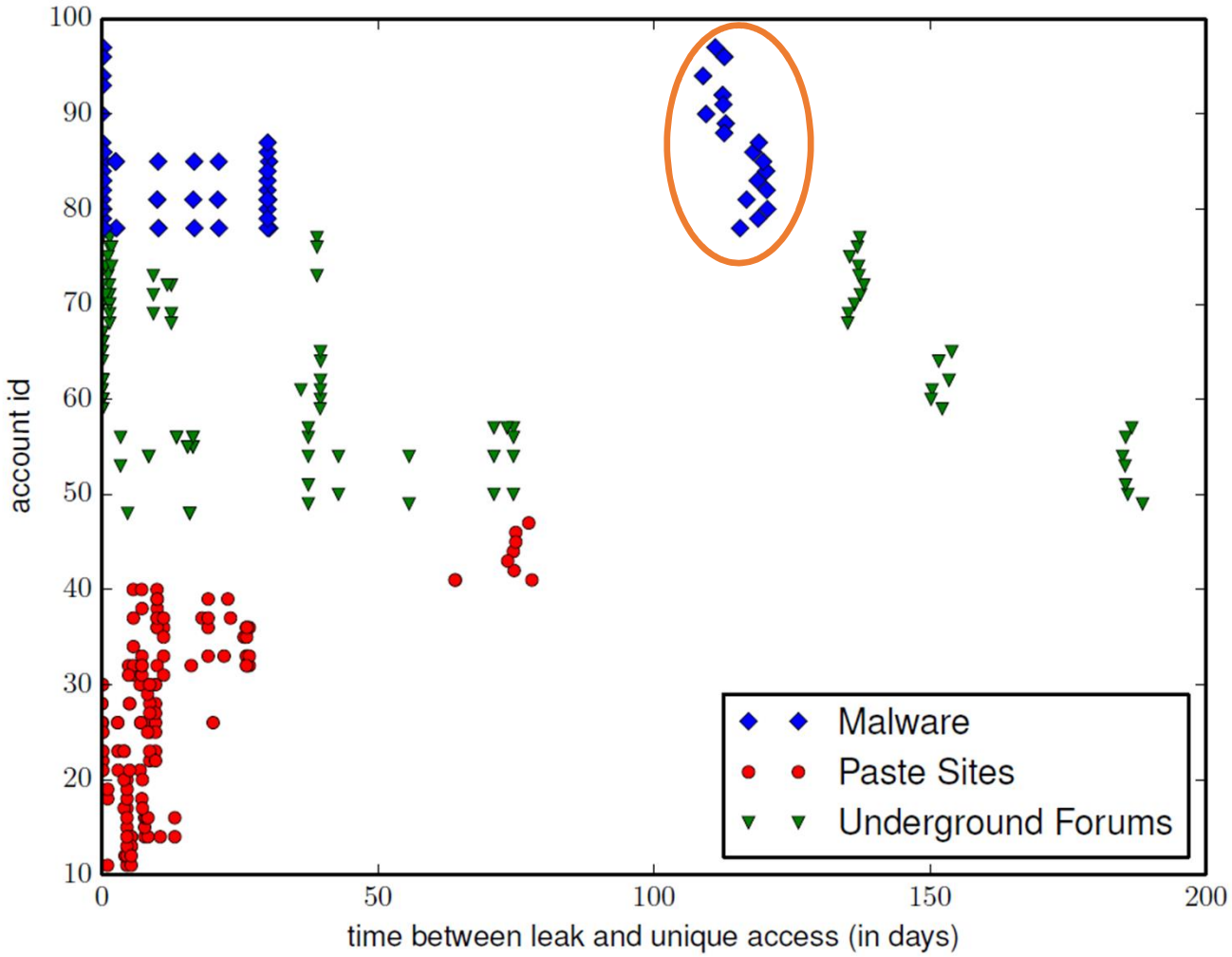
What are “gold-diggers” looking for?

Mostly financial or account information

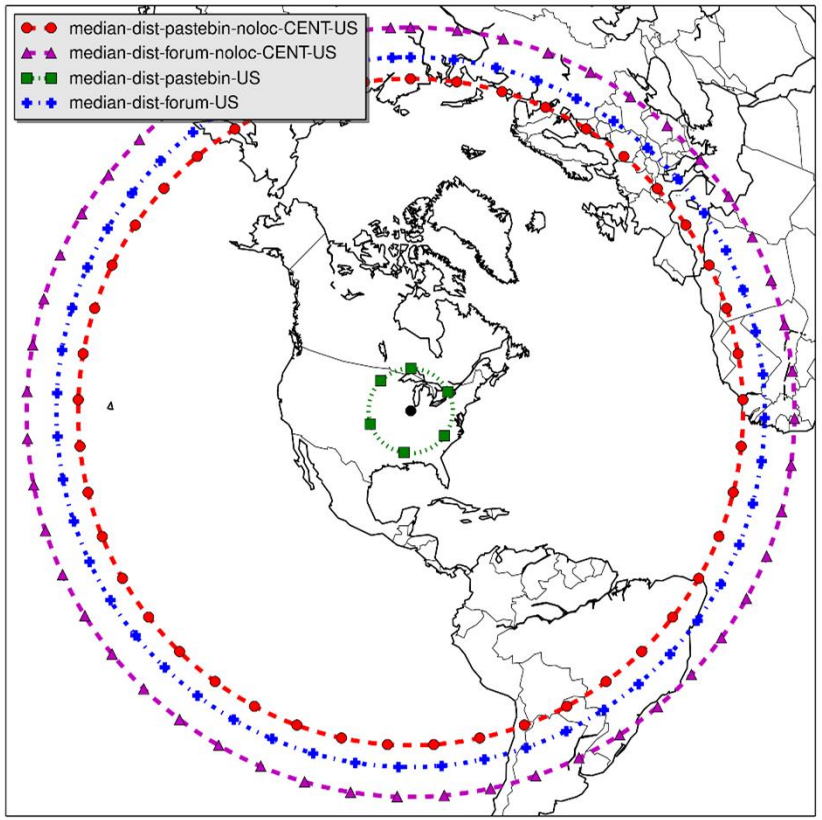
Popular words are:

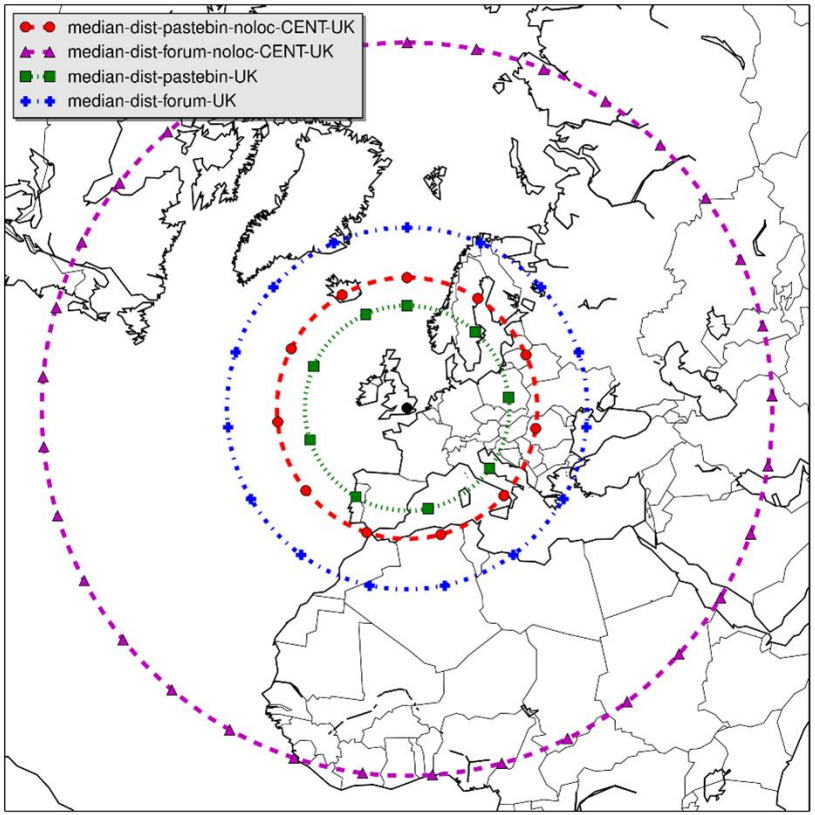
- Seller
- Account
- Payment
- Bitcoin

Timeline of account accesses



How does information on the location of the account owner influence accesses? [IMC2016]





How does the language of an account influence criminal activity? [arxiv]

We created 30 accounts in three different languages

- 10 English accounts
- 10 Greek accounts
- 10 Romanian accounts

We hid fake email invoices for banking institutions in each account

Summary of findings:

- Criminals are **more likely** to find the hidden sensitive information in the Greek accounts
- Criminals **spend more time** on Greek accounts

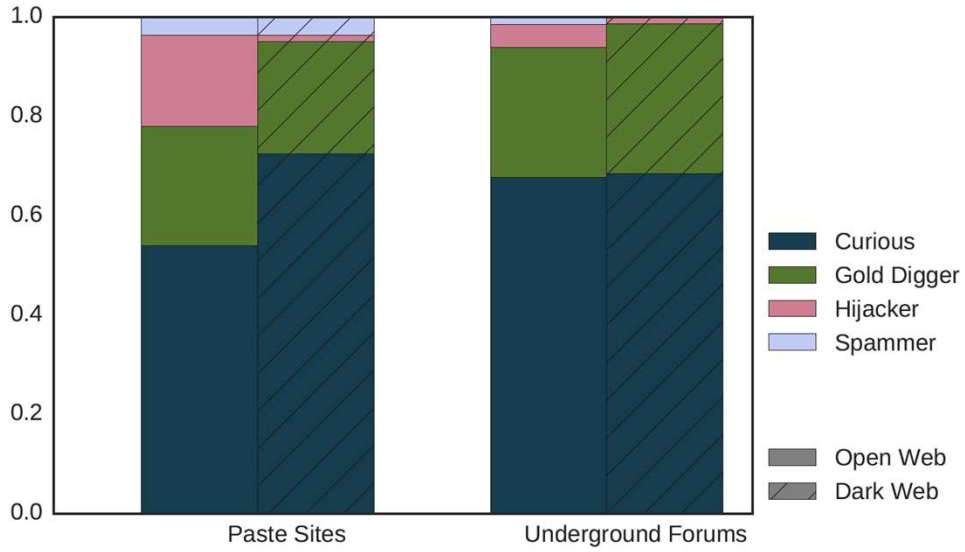
Possible explanation: if criminals do not understand the language of an account, they use **automated translation** tools

How does leaking credentials on the Dark Web affect criminal activity? [under submission]

We replicated the surface Web experiment on the Dark Web (paste sites and forums)

Some preliminary results:

- Dark Web accesses receive **many more accesses** than surface Web ones
- Dark Web accesses show a **higher degree of sophistication**



Conclusion

- We released a honeypot system that allows you to **design your own experiments** to better understand the modus operandi of cybercriminals
- We shed some light on the way that stolen Gmail accounts are used in the wild
- We also developed a honeypot version for Google Spreadsheets

References:
[1] J. Onaolapo, E. Mariconti, G. Stringhini. **What Happens After You are Pwnd: Undertsanding the Use of Stolen Webmail Credentials in the Wild**. In IMC 2016
[2] M. Lazarov, J. Onaolapo, G. Stringhini. **Honey Sheets: What Happens to Leaked Google Spreadsheets?** In USENIX CSET 2016
[3] E. Bernard-Jones, J. Onaolapo, G. Stringhini. **Email Babel: Does Language Affect Criminal Activity in Compromised Webmail Accounts?** On Arxiv.

Questions?

Code available at:
https://bitbucket.org/gianluca_students/gmail-honeypot

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