

# **From Attachments to SEO: Click Here to Learn More about Clickbait PDFs!**

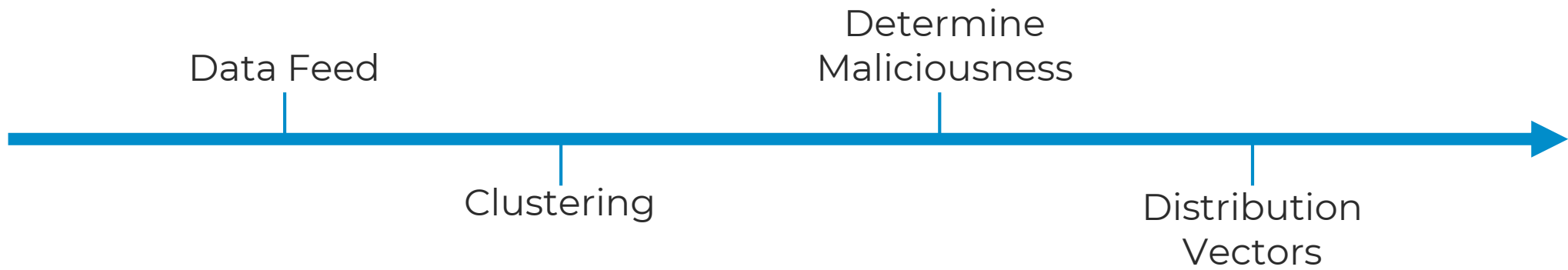
*LASER workshop @ ACSAC 2023*

Giada Stivala and Andrea Mengascini | December 2023 | Austin, TX



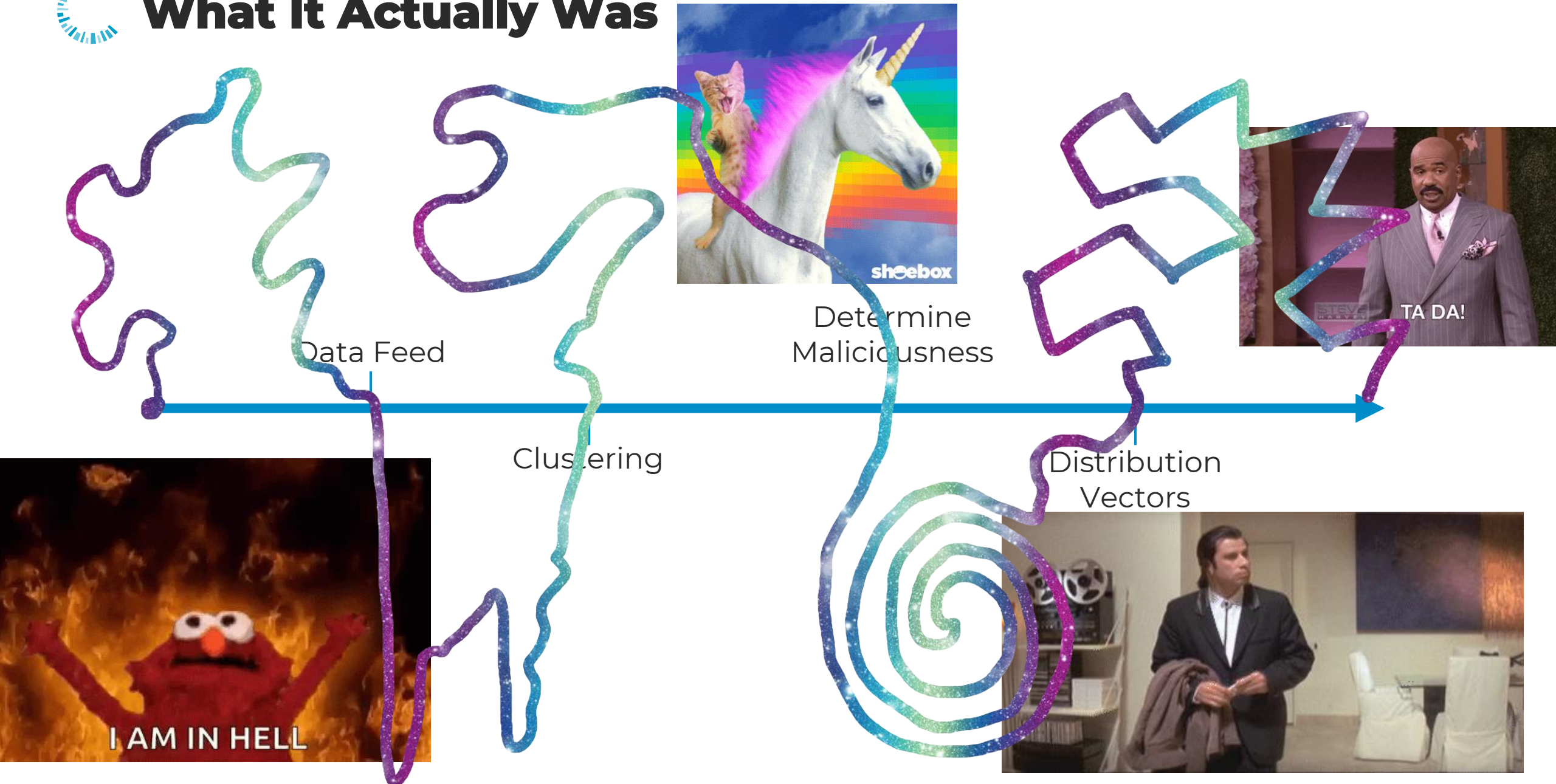


# How Does It Look Like





# What It Actually Was





# Introduction and Data Collection

**Intro & Dataset**

Manually-aided Clustering

Determining Maliciousness

SEO experiments

Lessons Learned



# Preliminary Study

Inspection of small sample of PDFs from industrial partner

- Malware [1–3]

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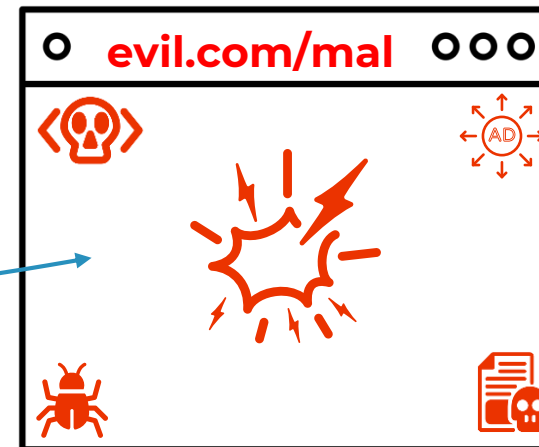
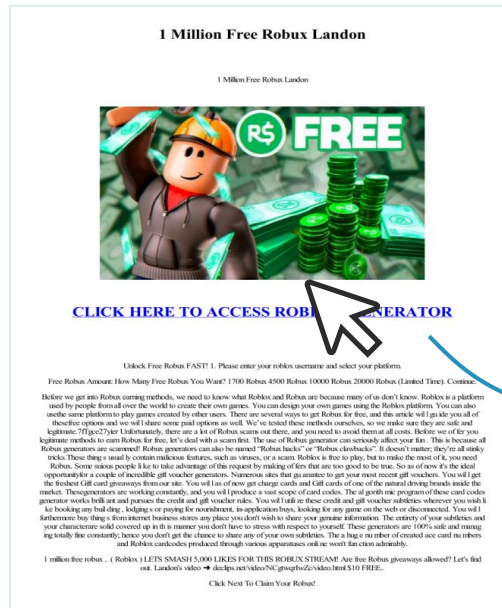
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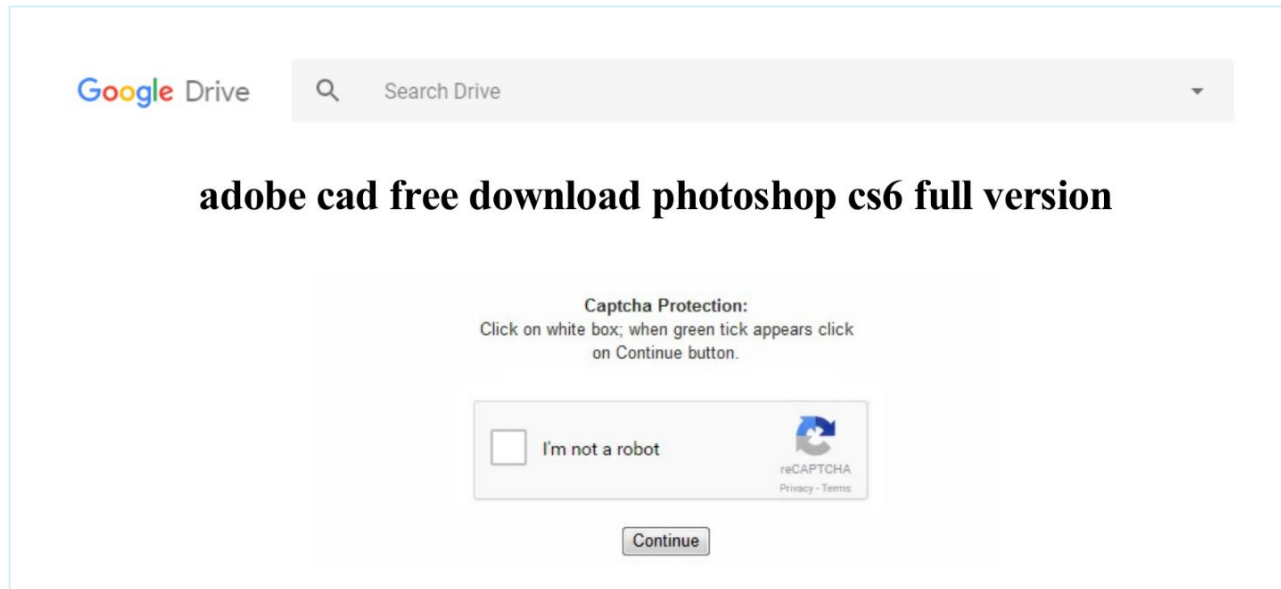




# Properties of Clickbait PDFs

Breakdown of a Clickbait PDF:

- PDF document



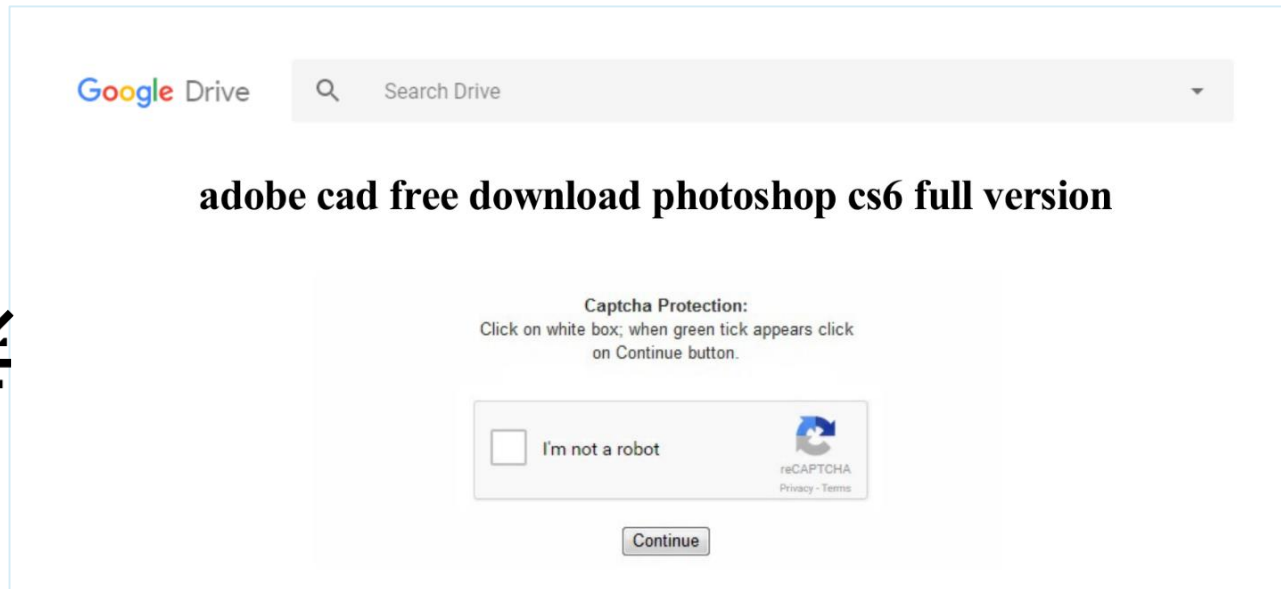




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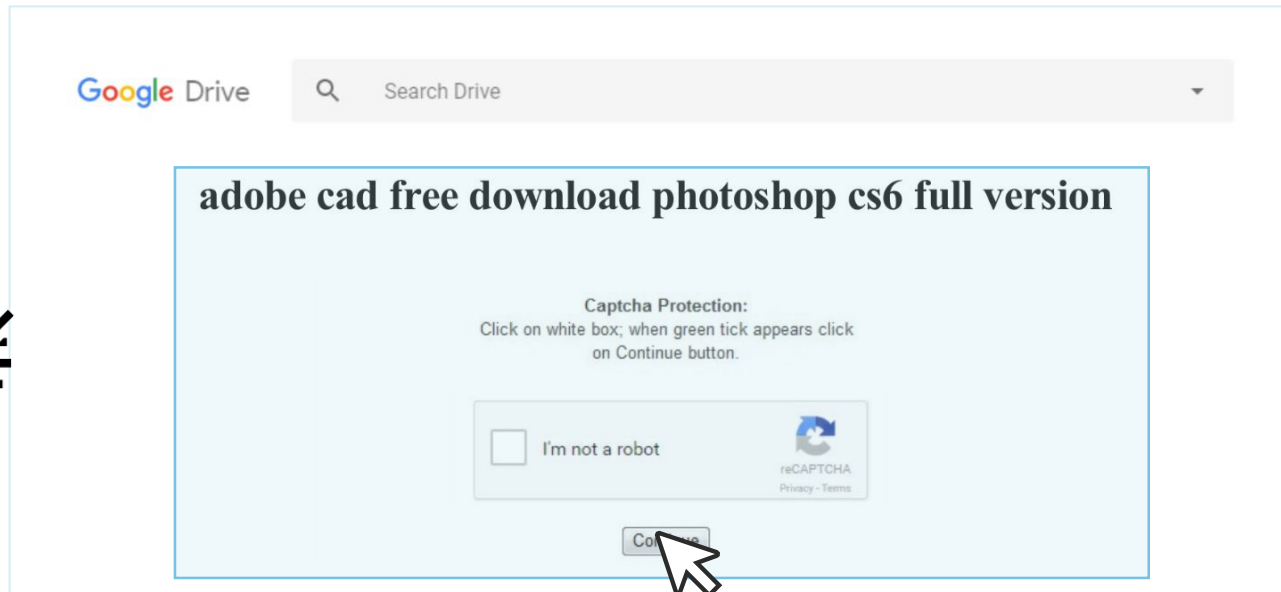




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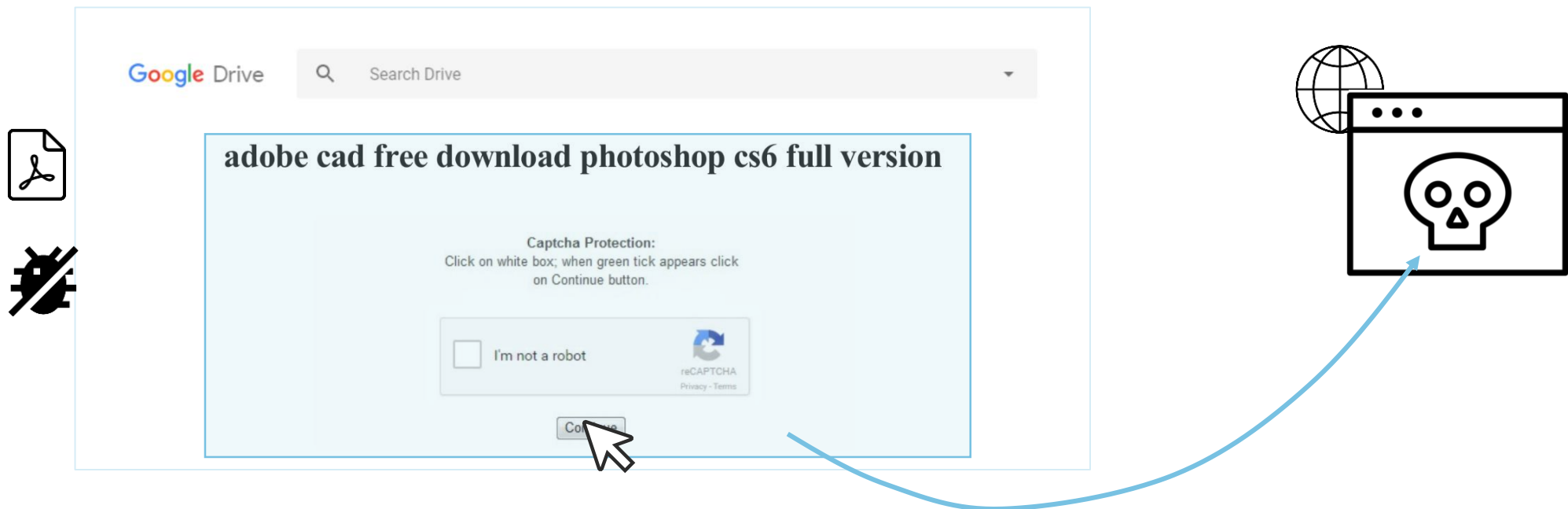




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# Data Collection

- Sample included ~500 PDFs over 2 months
  - Characterization of phenomenon needs lots of data



# Data Collection

- Sample included ~500 PDFs over 2 months
  - Characterization of phenomenon needs lots of data
  
- Collected PDFs daily from two industrial partners
  - 176,208 PDFs with unique SHA265
  - InQuest joined later, selected as had available PDFs





# Manually-aided Clustering

Intro & Dataset

**Manually-aided Clustering**

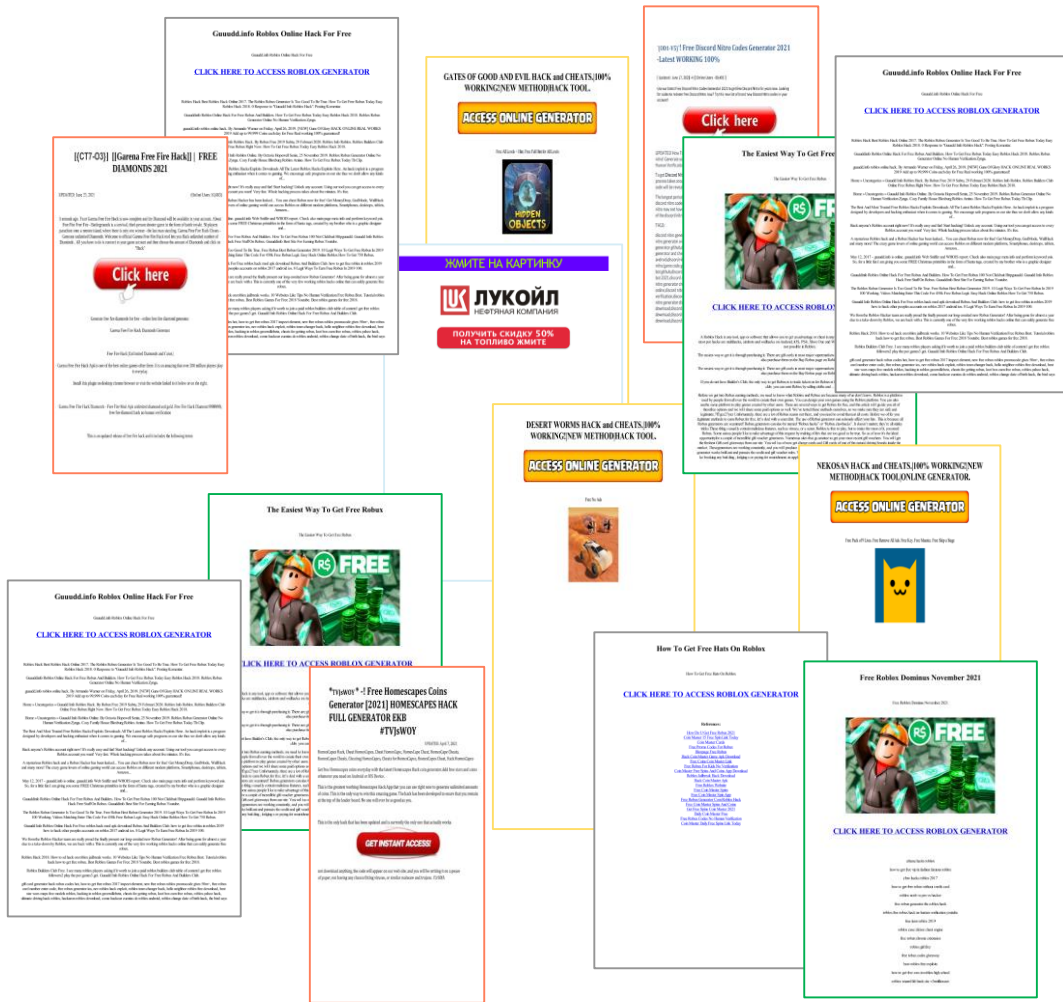
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# Characterizing Clickbait PDFs at Scale

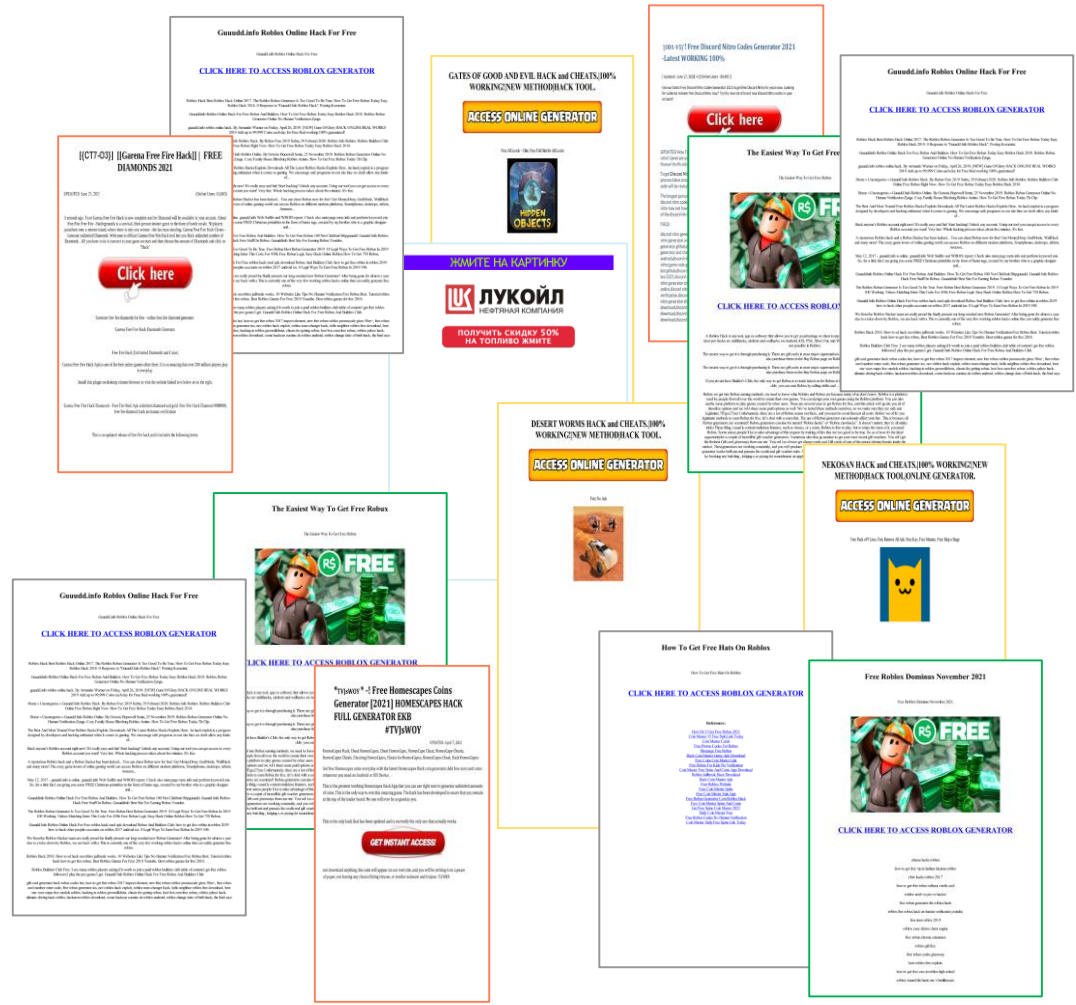


## Research Question 1:

- Identify and characterize PDFs linked to malicious activity
  - Find representative samples and their distribution



# Characterizing Clickbait PDFs at Scale



## Research Question 1:

- Identify and characterize PDFs linked to malicious activity
  - Find representative samples and their distribution
- Identify key features for meaningful PDF characterization





# Identify PDF Features: Text

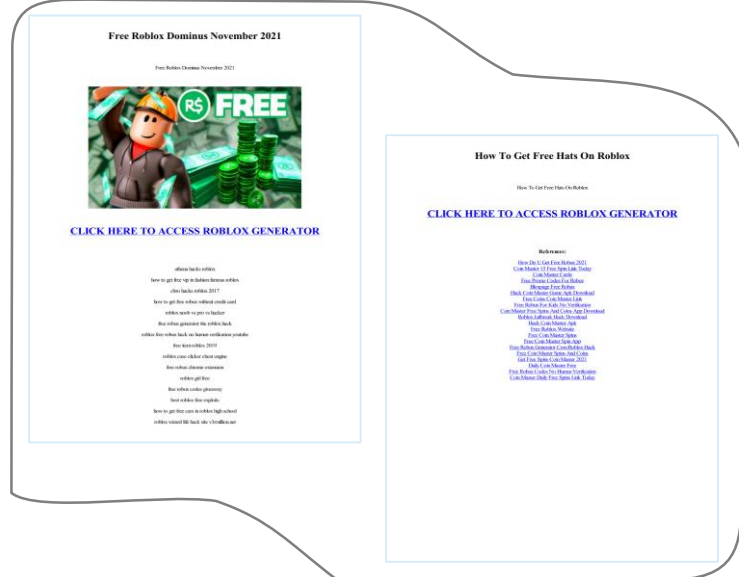
NLP-based techniques are ineffective

Visually-similar PDFs have different text

Text-only NLP: image context lost

Images contain text

Multiple languages together

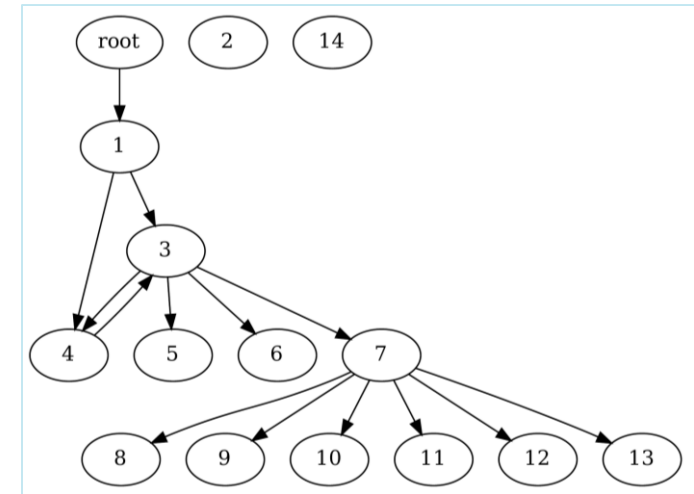




# Identify PDF Features: PDF Structure

PDF document structure similar to HTML Document Object Model

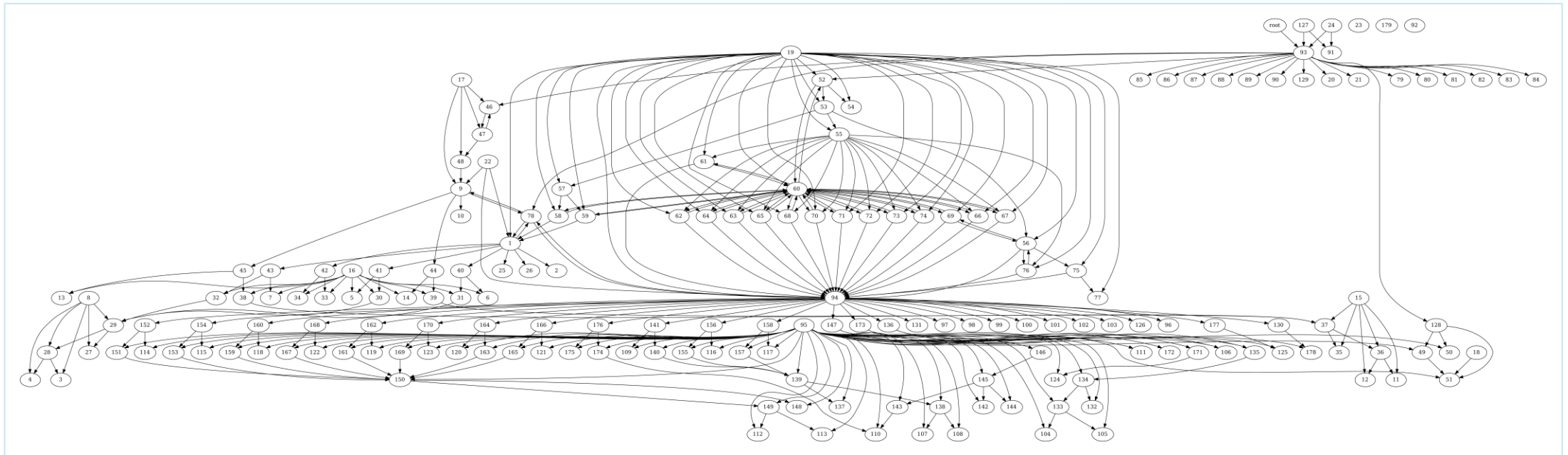
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  - Connections between nodes in the DOM





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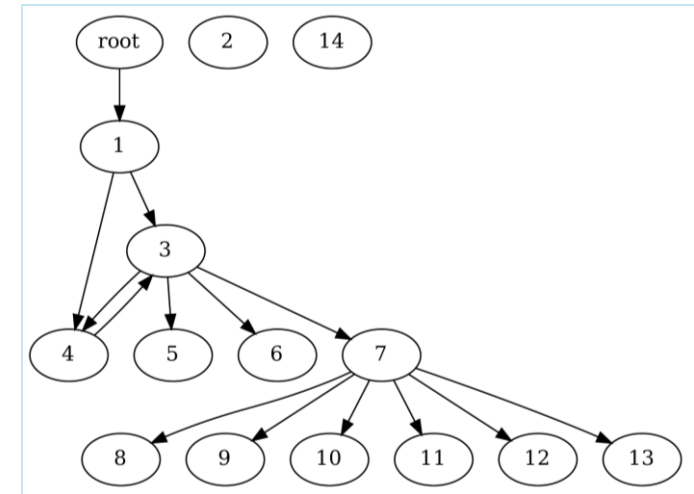




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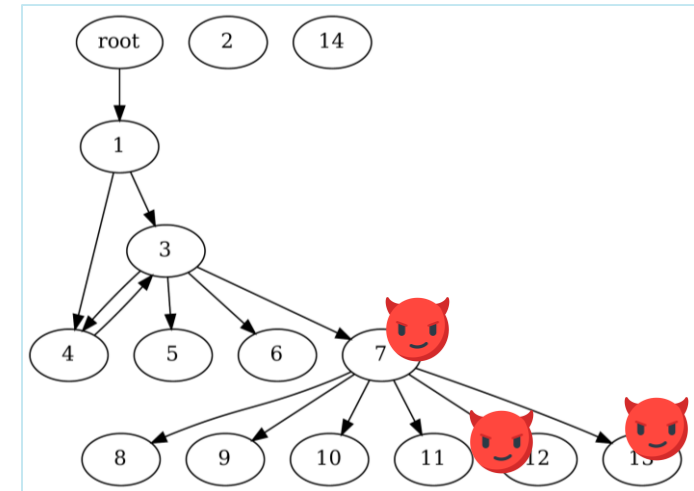
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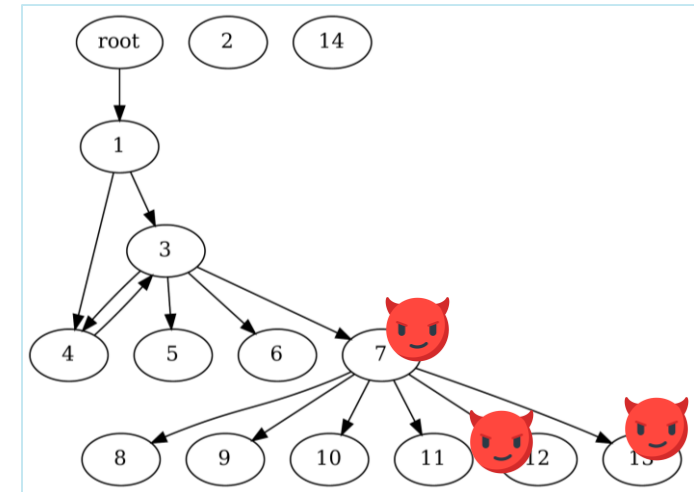
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  - **Distinguishing structural features** of clickbait PDFs?



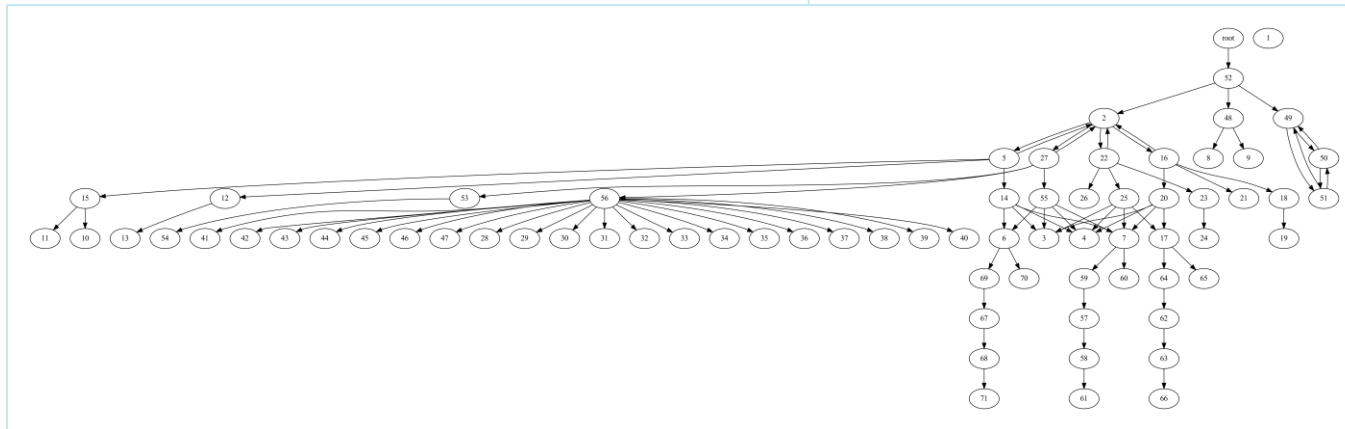
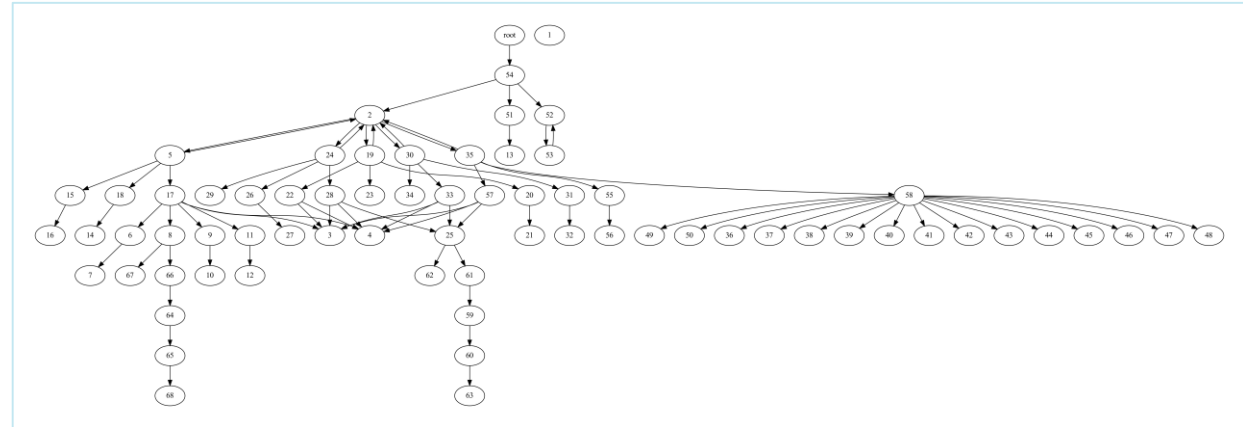
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- State-of-the-art algorithms [6, 7] select structures shared by input PDFs

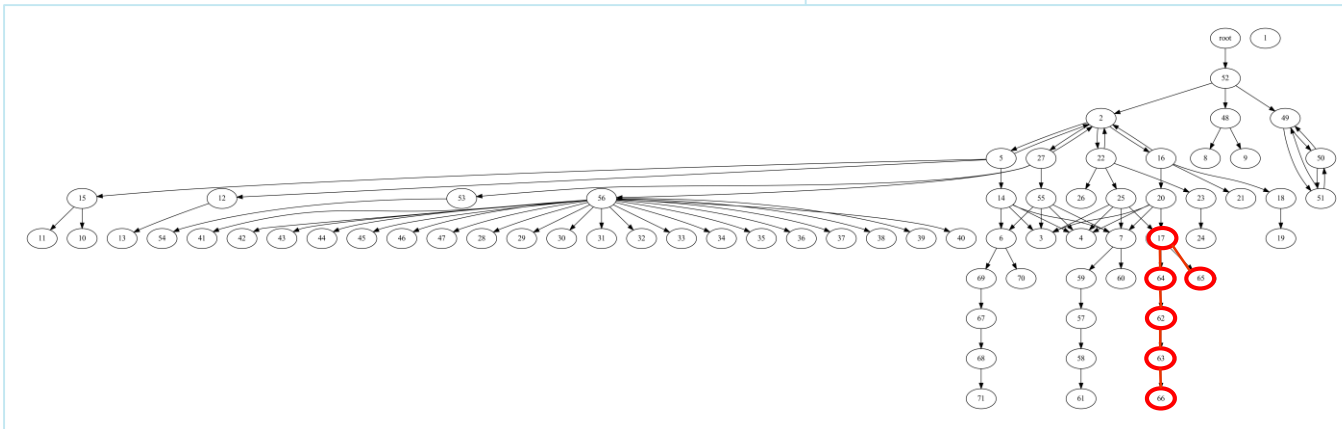
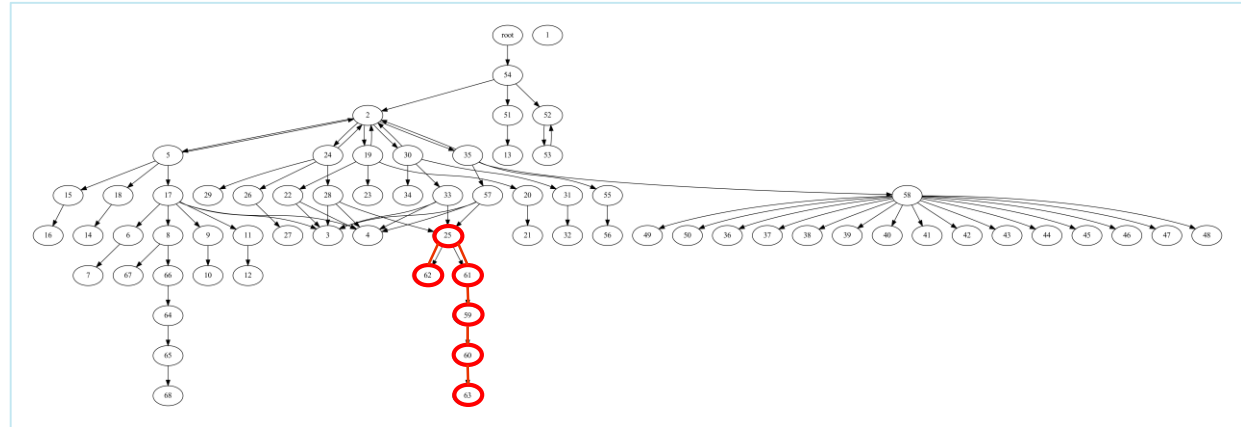


(toy example)



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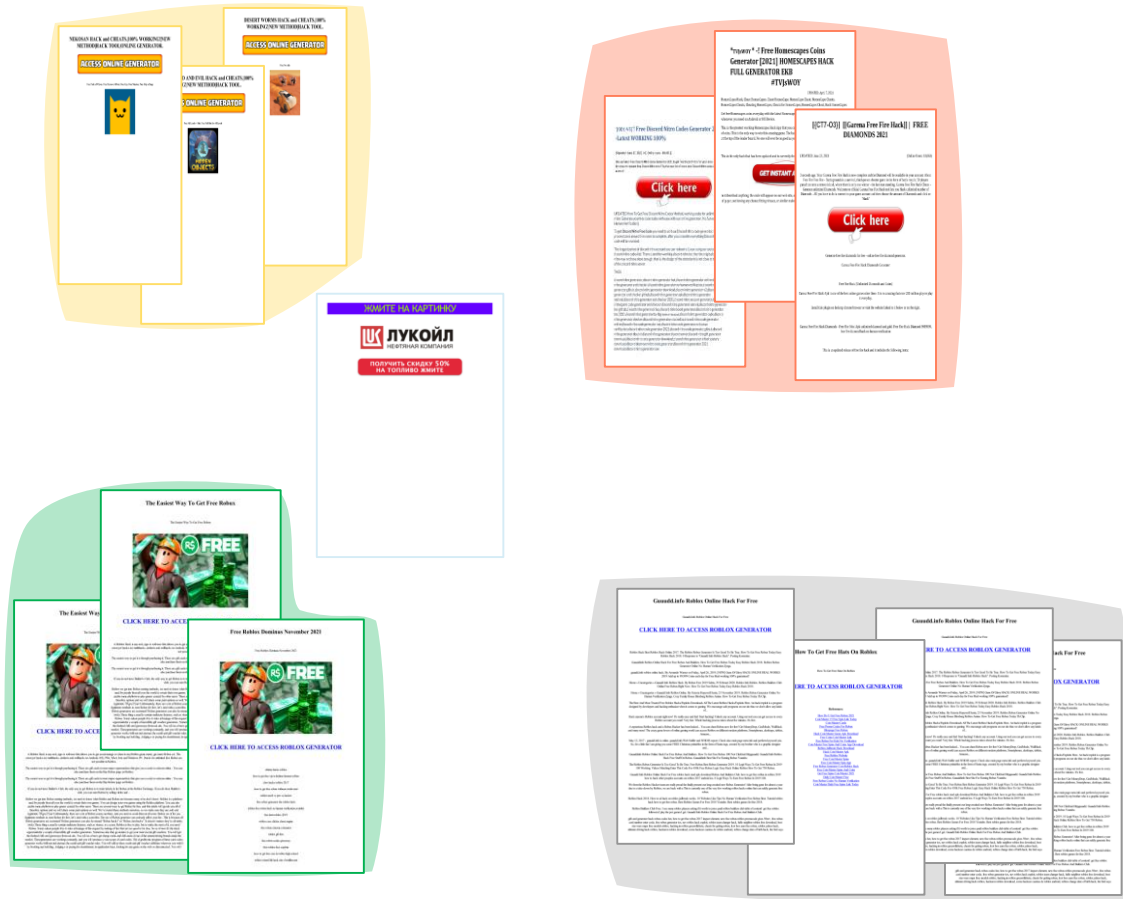




# Identify PDF Features: Visual Baits

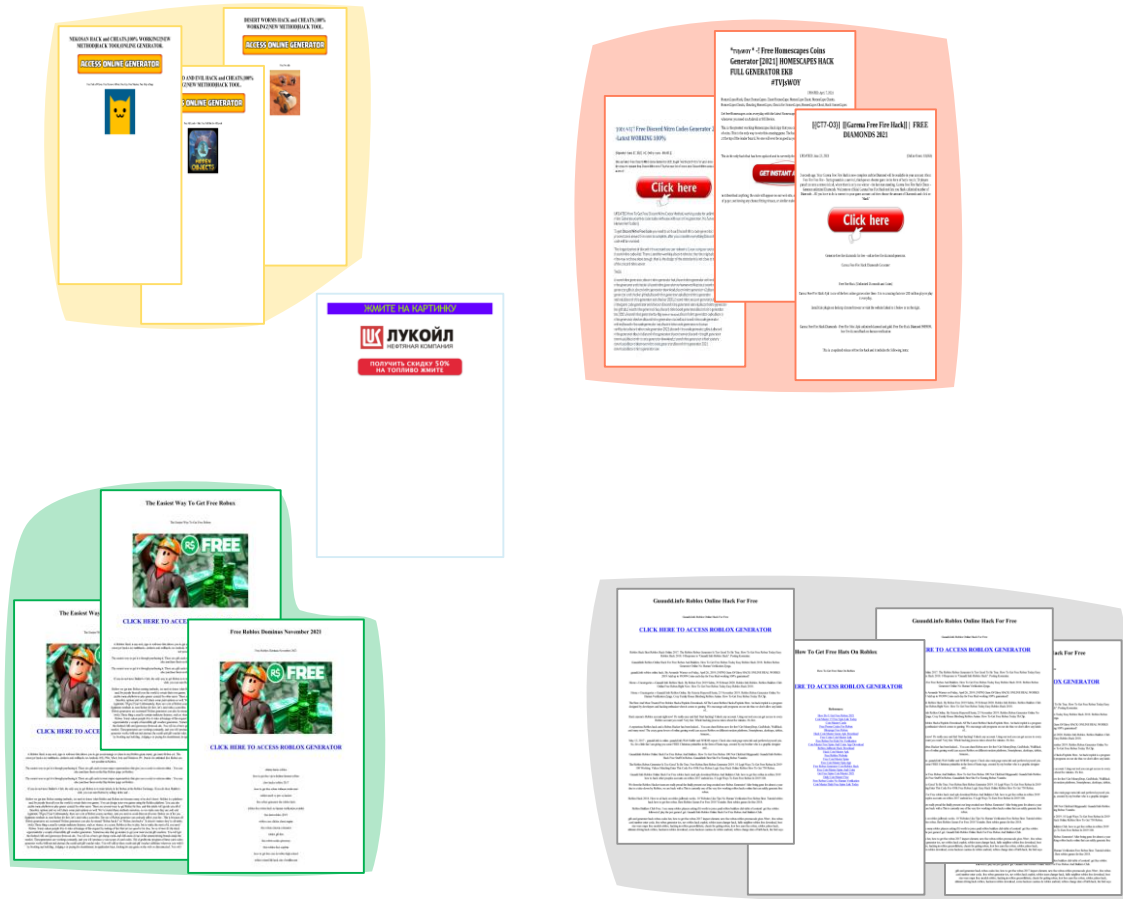
First pages show visual similarities

- Images tricking user into clicking: visual baits





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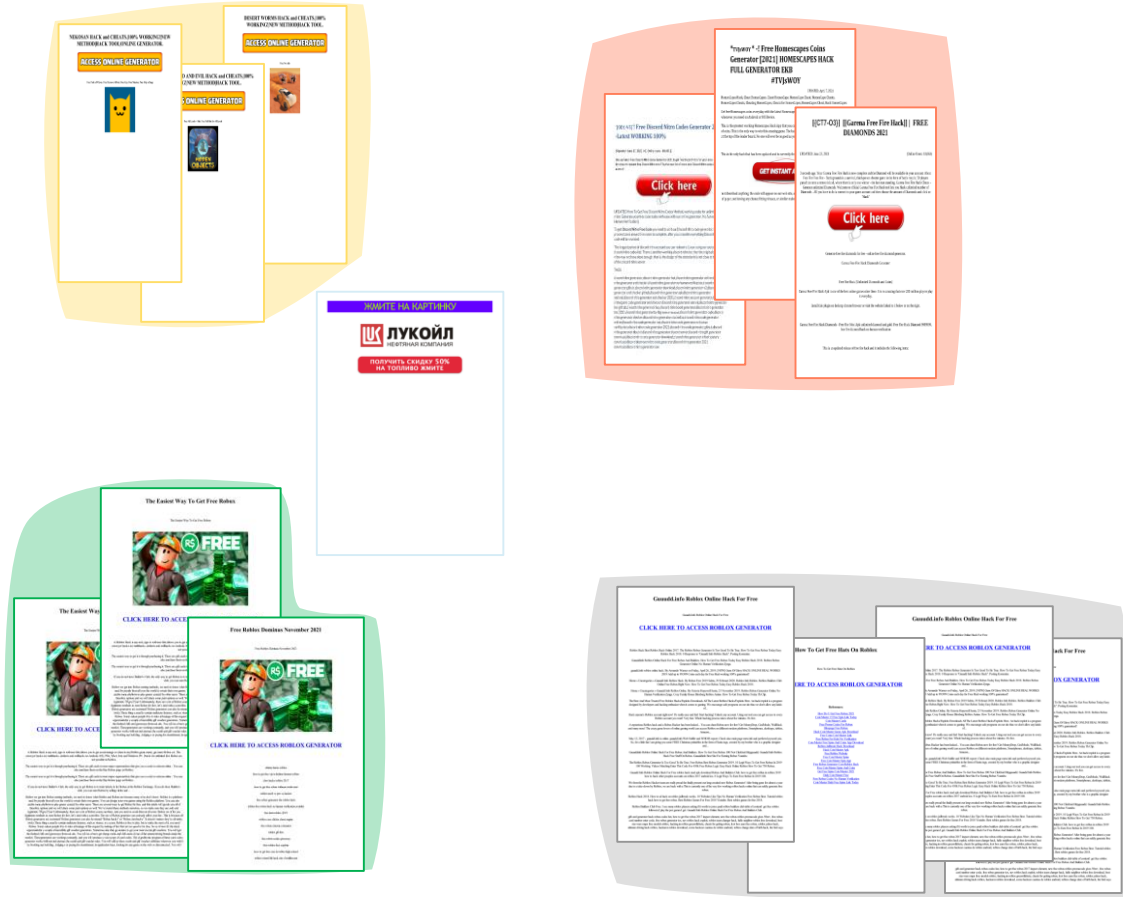
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Challenges:

- Unknown number of unique baits
- Unknown distribution across dataset



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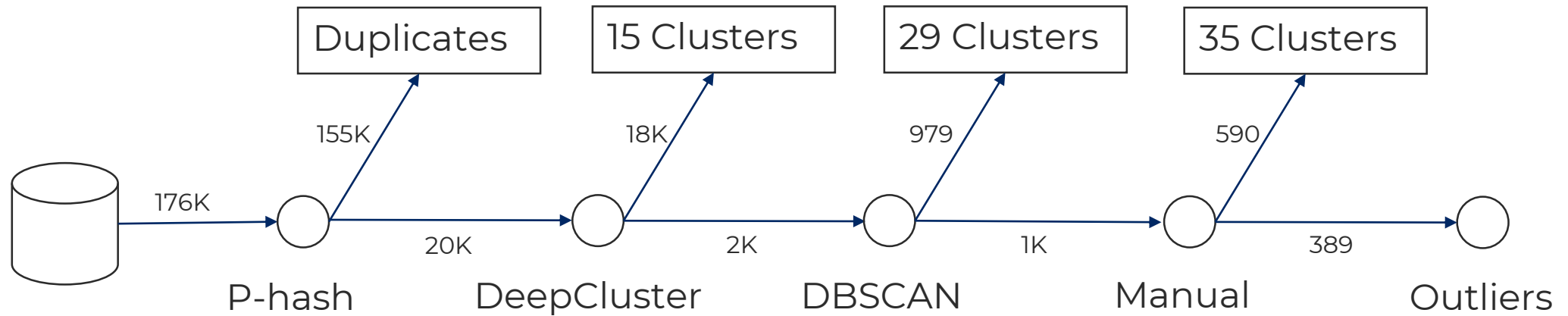
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➤ DeepCluster [8]: CNN with k-means clustering

[8] Caron, Mathilde, et al. "Deep clustering for unsupervised learning of visual features." ECCV 2018.



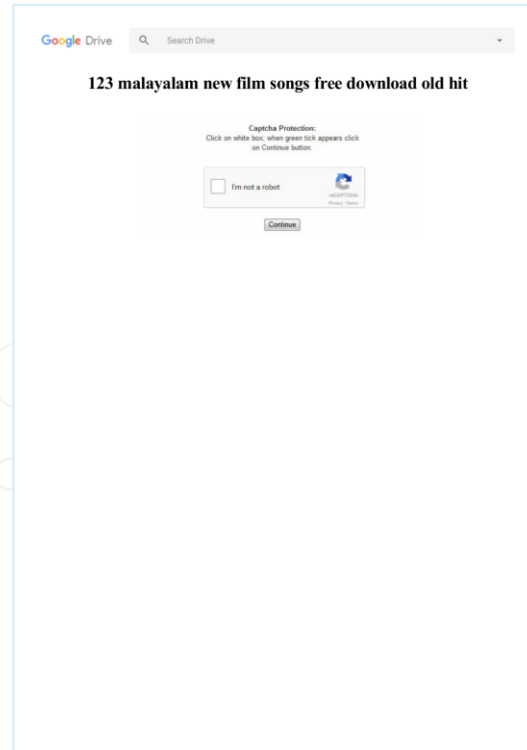
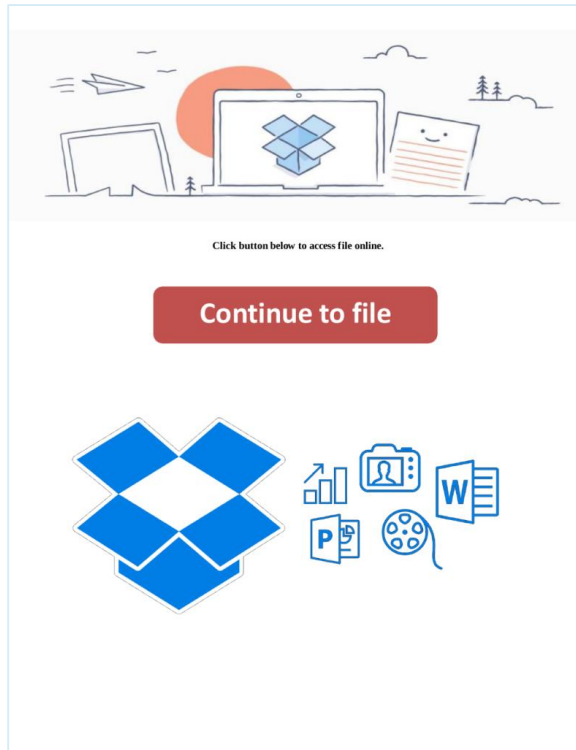
# Overview of Clustering Procedure



80 clusters, including Outliers



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SEO experiments

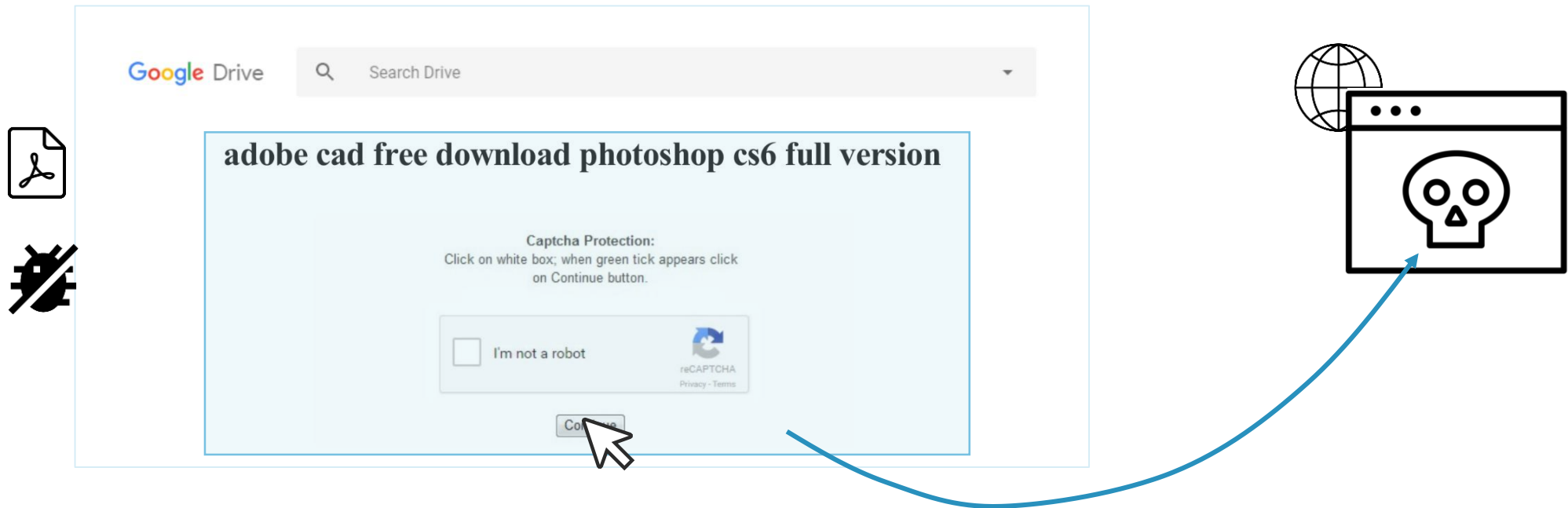
Lessons Learned



# Recap: Properties of Clickbait PDFs

Breakdown of a Clickbait PDF:

- PDF document
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- Uses social engineering to trick victims into clicking
- Leads to attack web pages

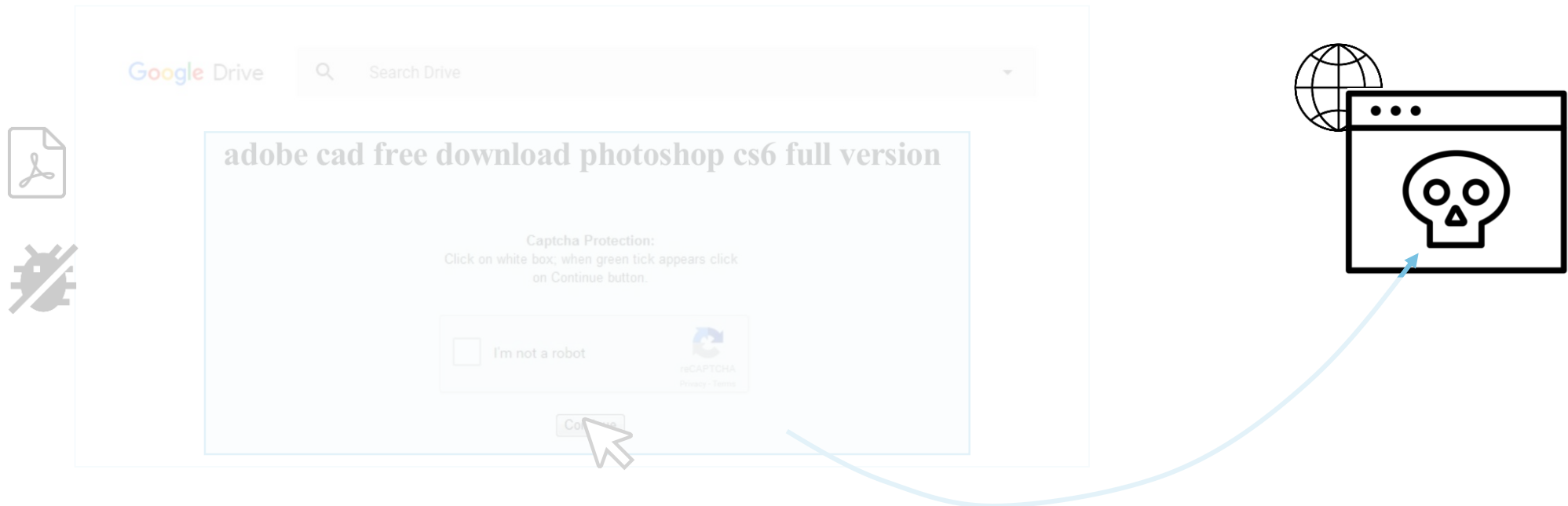




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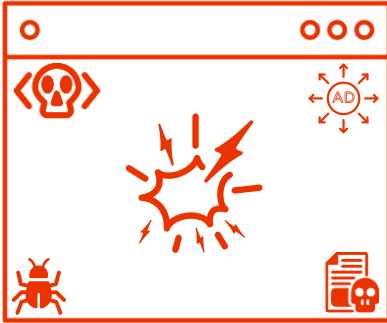
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- Verify **maliciousness** of **first-page** URL
  - Extract first-page clickable URLs



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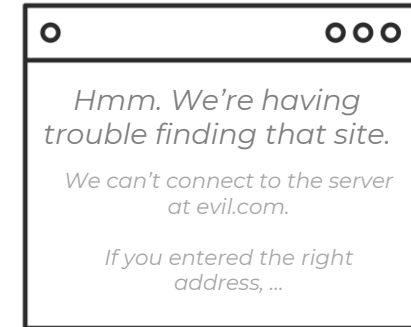
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Multiple attacks



Evasion

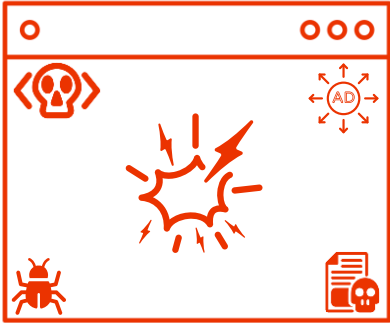


Attack page offline



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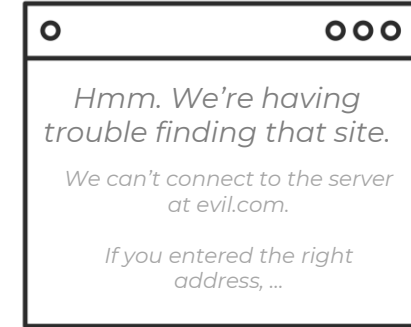
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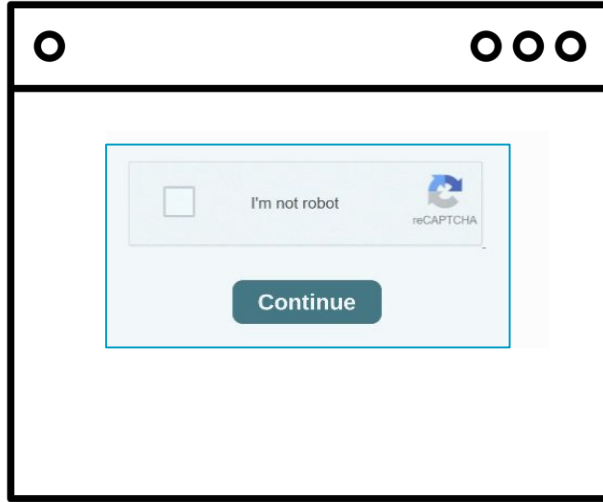


Attack page offline

*Develop a crawler to visit URLs and determine maliciousness!*



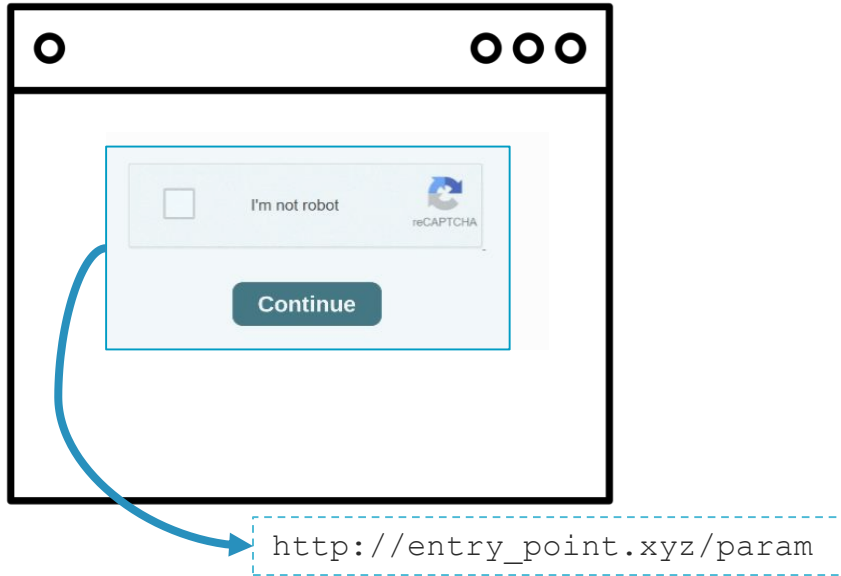
# Approach: Browser-based Crawler



Selenium-based crawler to navigate the redirection chain



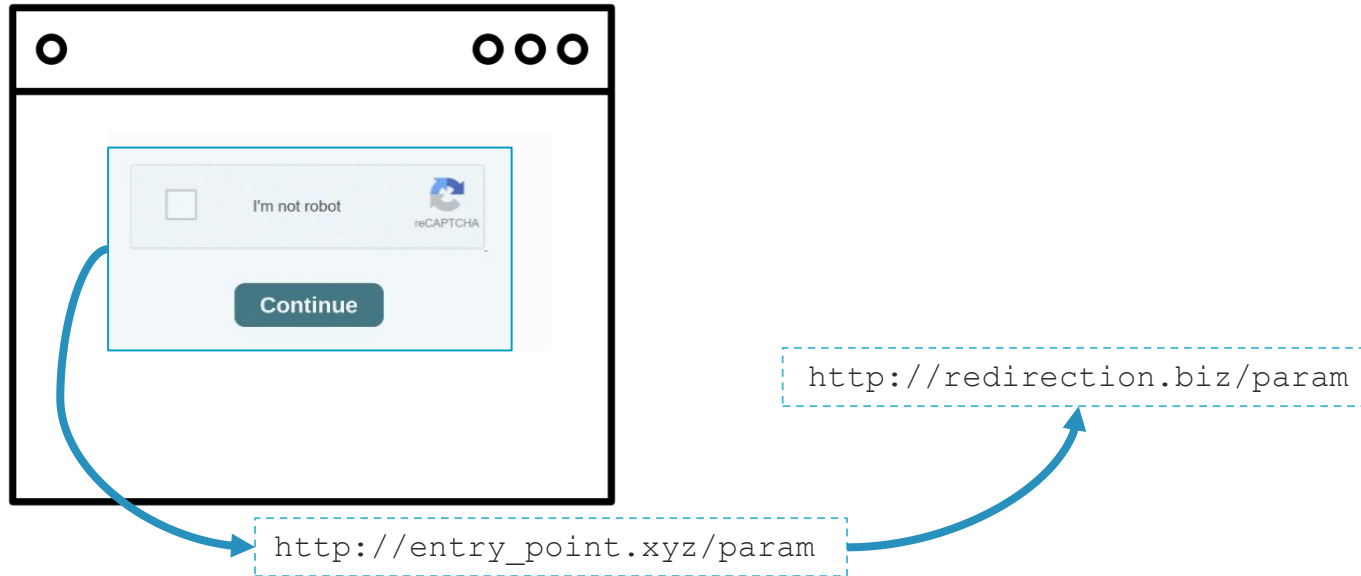
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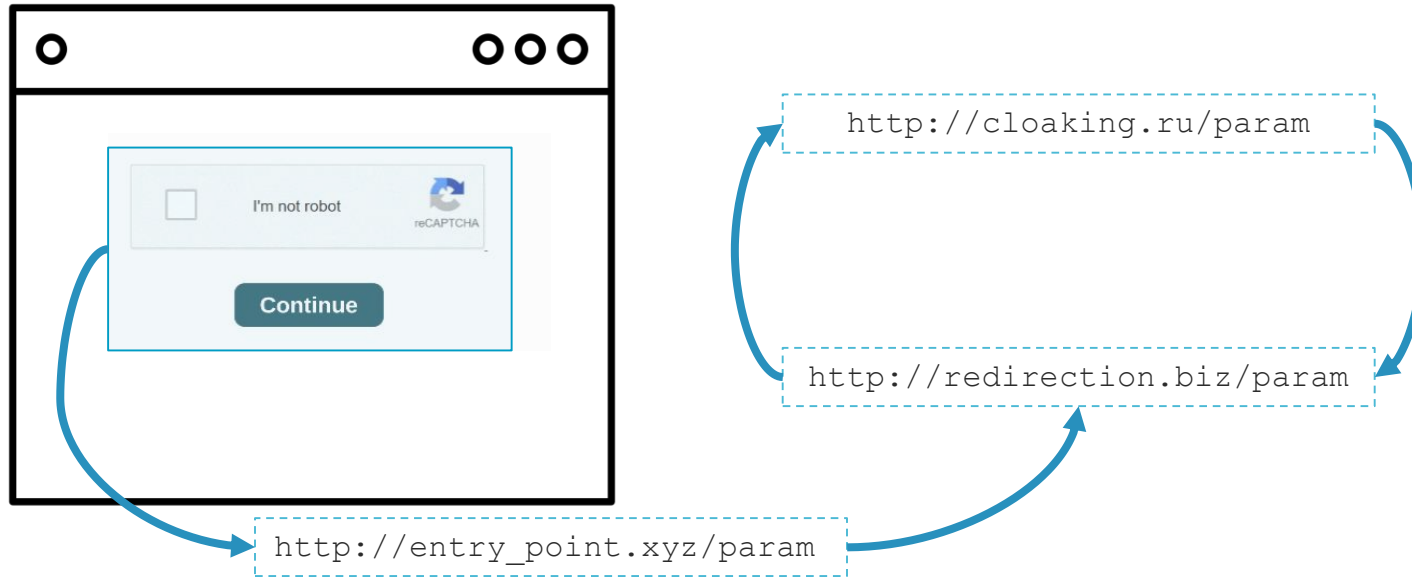
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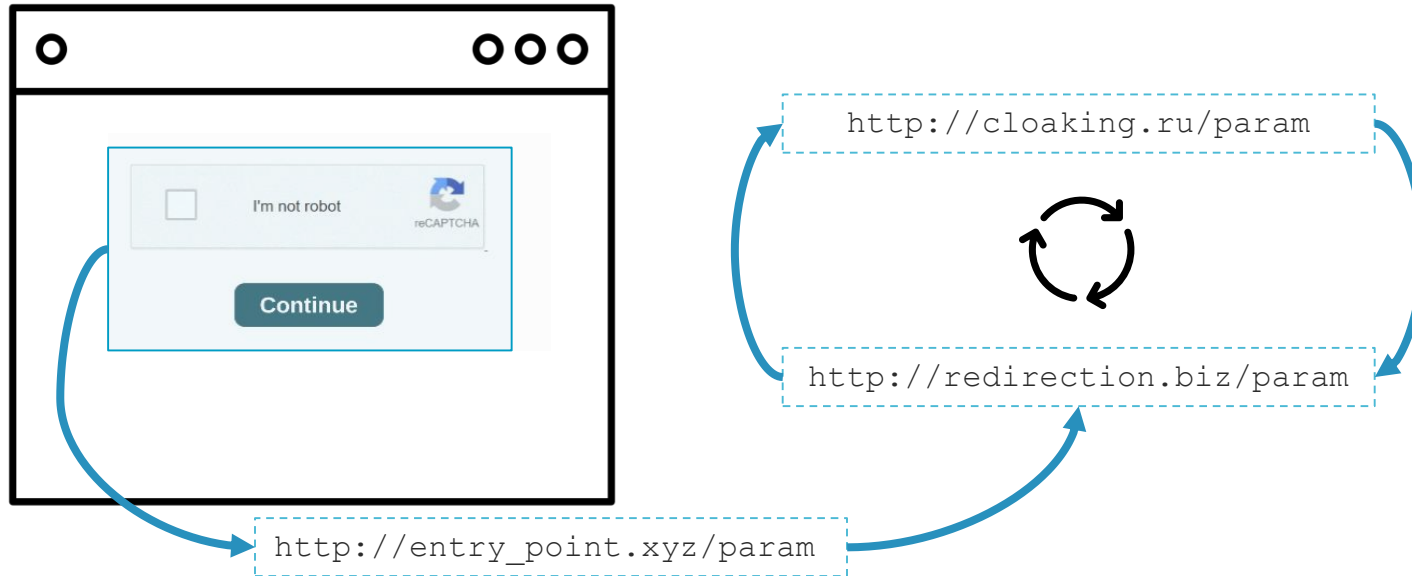
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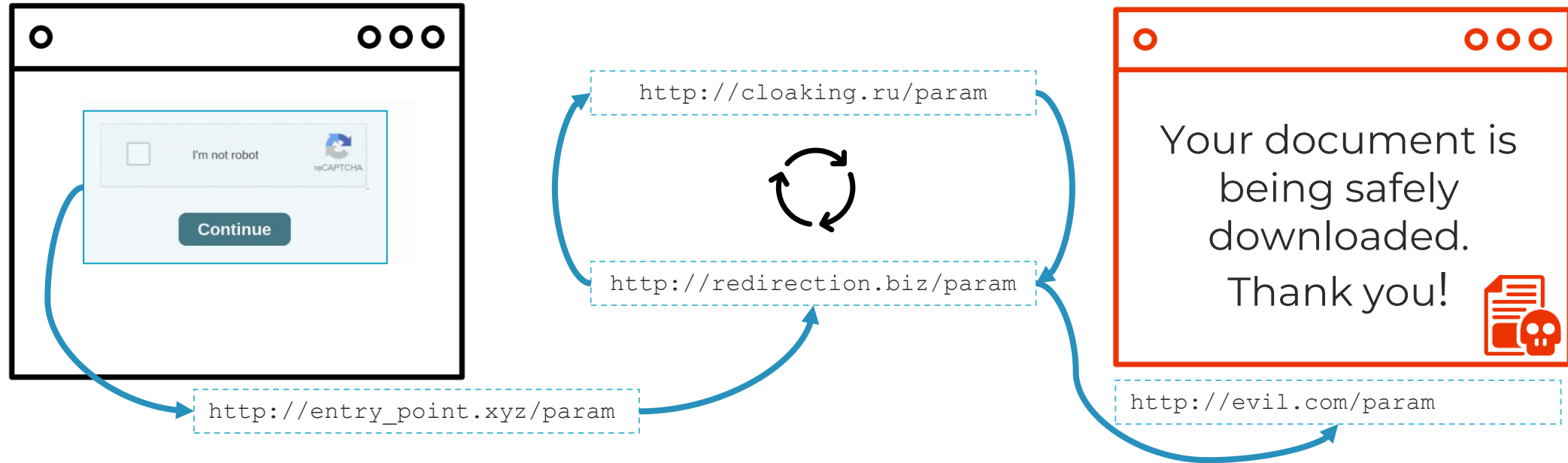


Selenium-based crawler to navigate the redirection chain





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Selenium-based crawler to navigate the redirection chain



# Approach: Browser-based Crawler (Didn't work)

- Challenges:
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- Challenges:
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  - User-agent filtering

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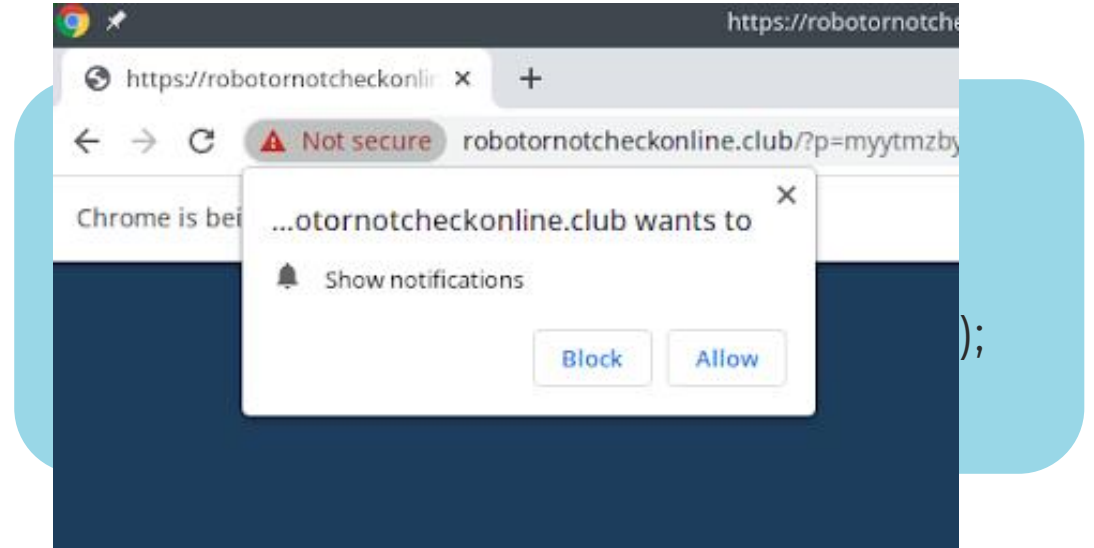
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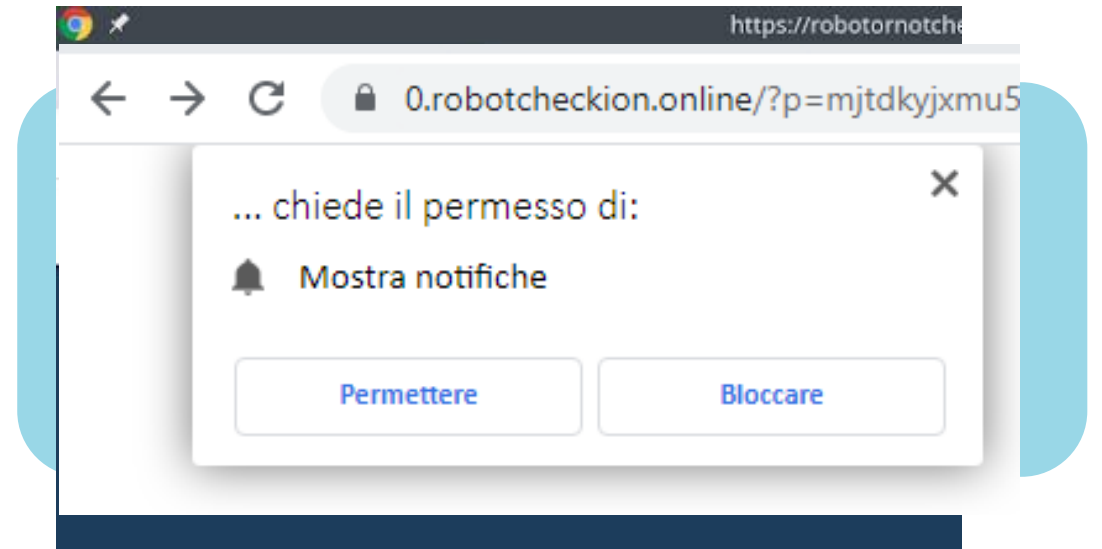
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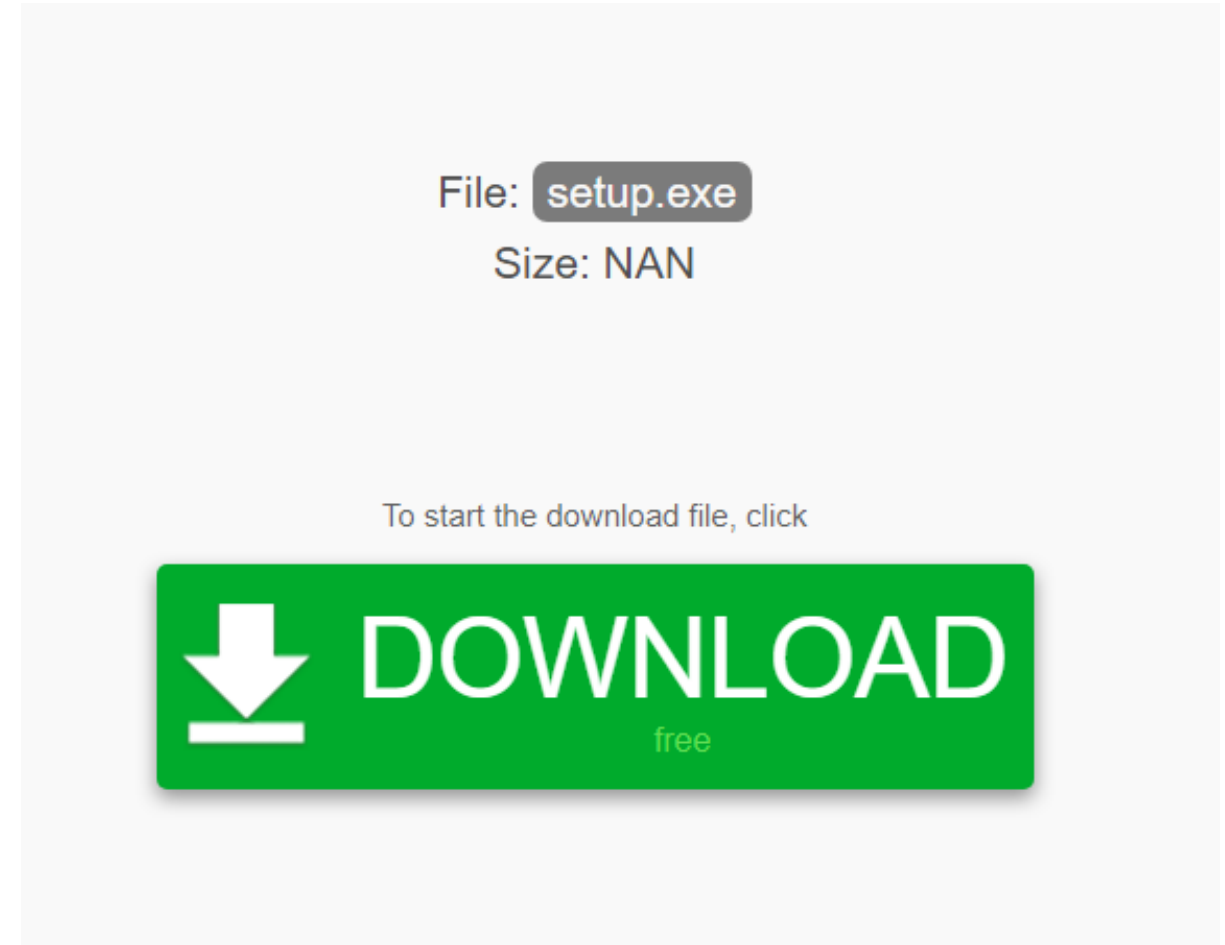
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  - "Click Here"

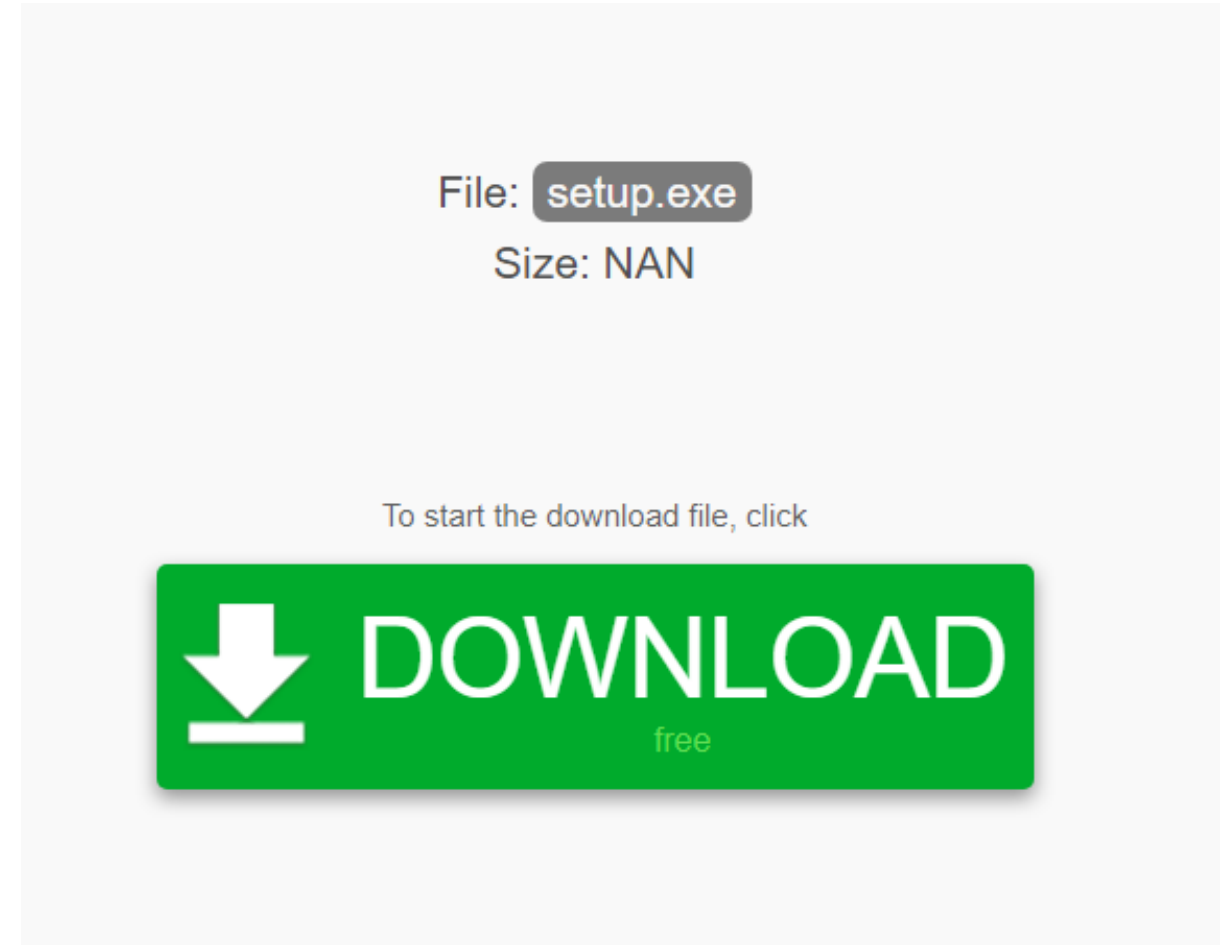




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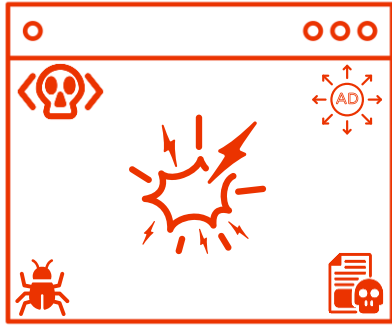
Cat and mouse game







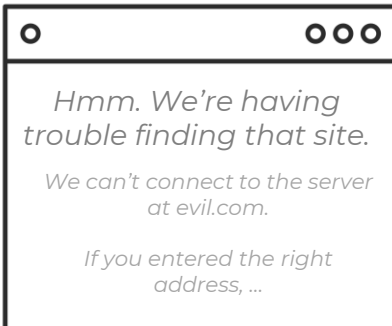
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Attack page offline

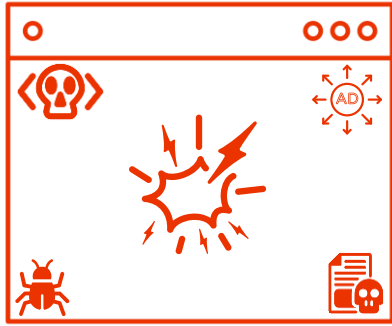
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Hybrid approach to URL analysis:

- Third-party URL analysis service w/ historical records
- Manual analysis



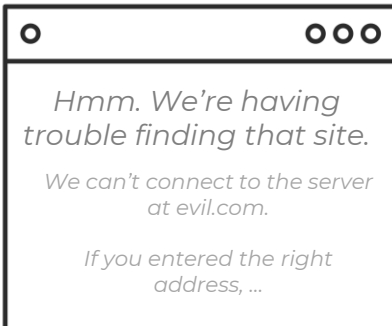
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  - VirusTotal Premium: 20K URL analysis reports
- Manual analysis
  - 722 URLs validated

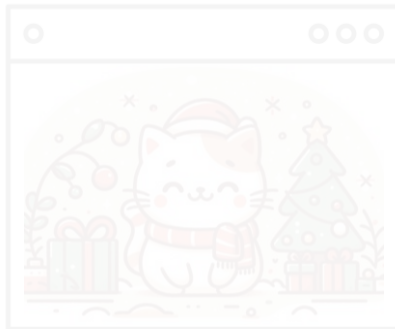


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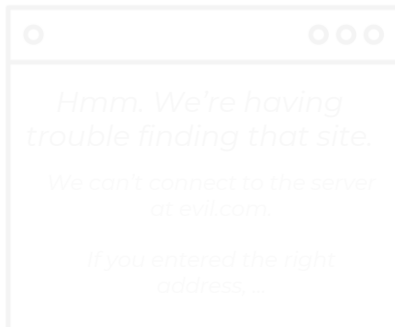


Multiple attacks

44 clusters lead to Web attacks



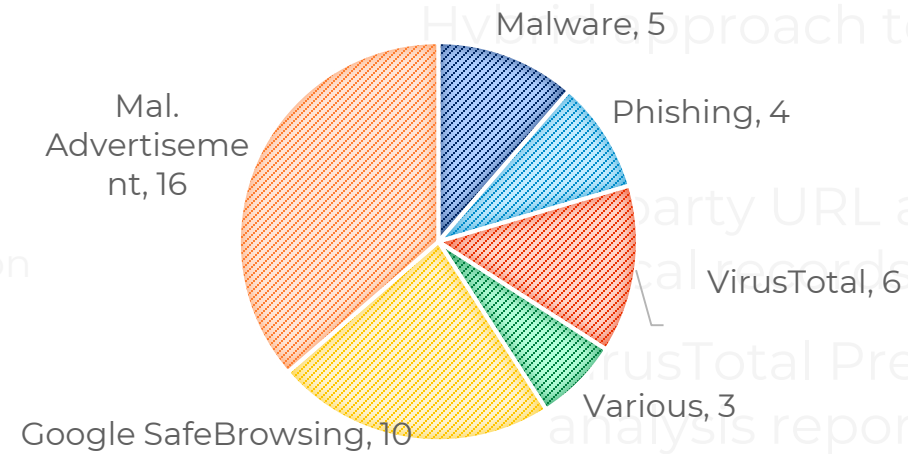
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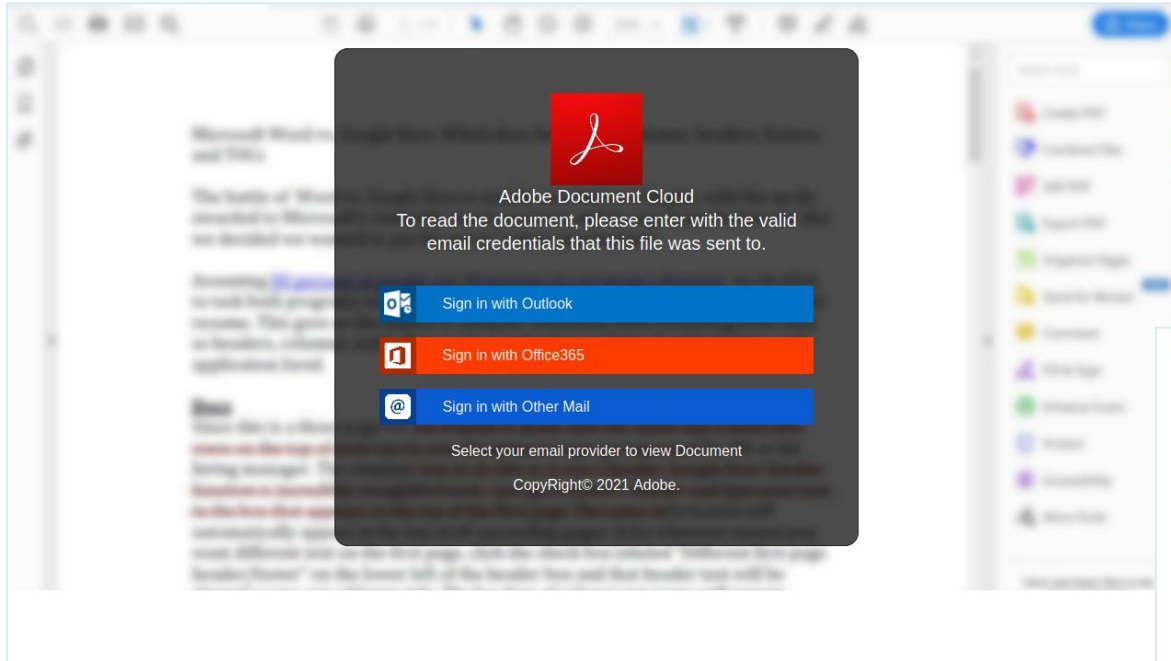


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- Manual analysis
  - 722 URLs validated

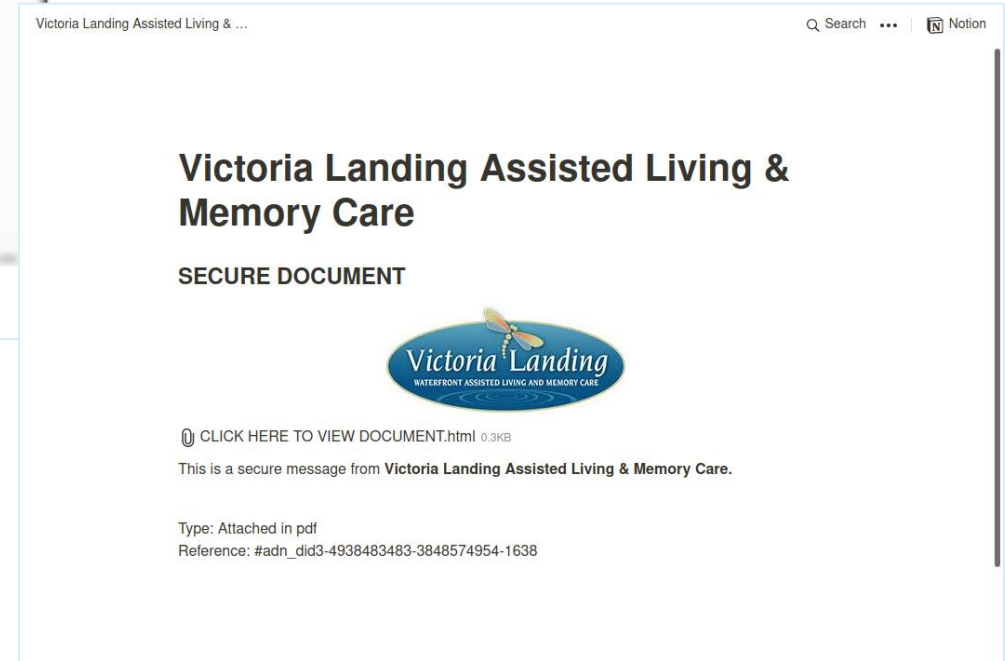


# Observed Attacks: Phishing, Malware



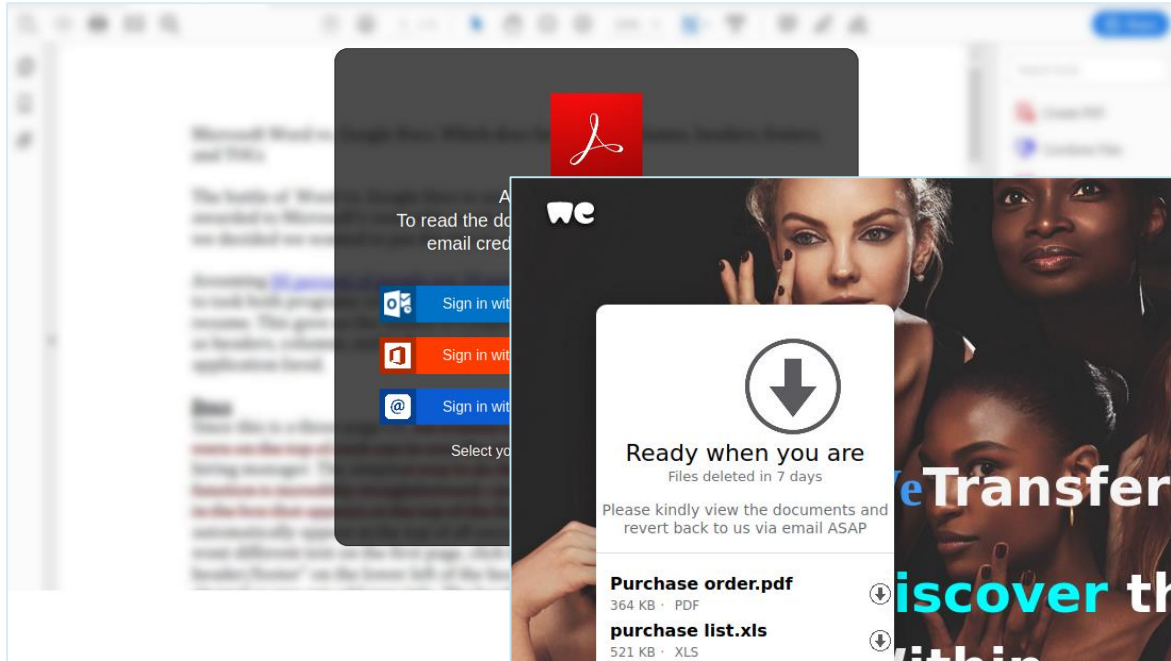
Phishing attacks

Malicious file download



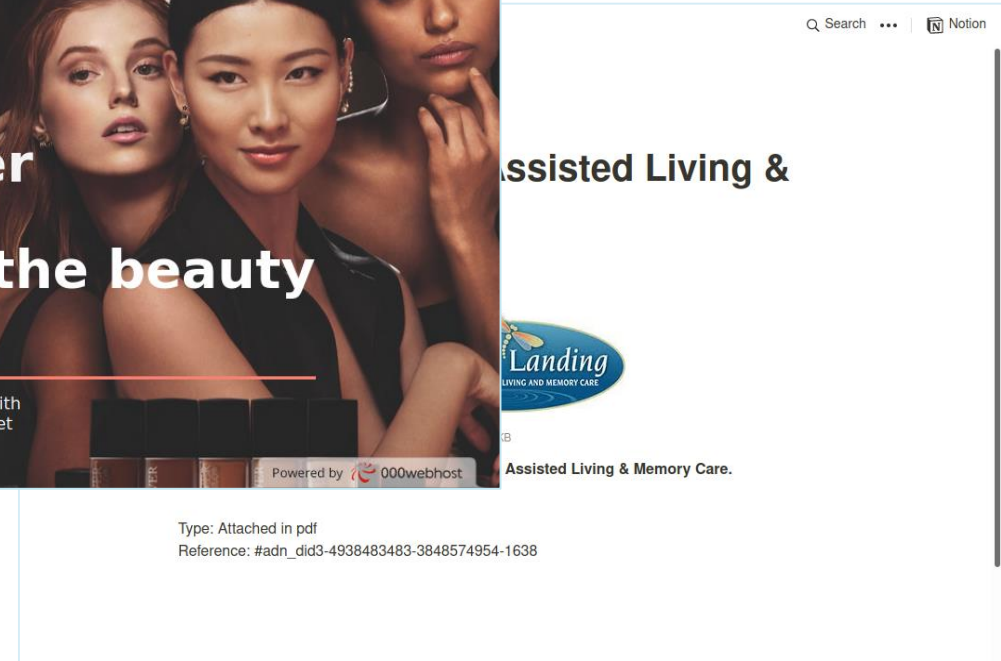


# Observed Attacks: Phishing, Malware



Phishing attacks

Malicious file download





# Observed Attacks: Data Harvesting


**Firefox-Suchwettbewerb 2021**

## Sie haben die milliardste Suche getätigt

Unser letzter Gewinner war Heike Brandstättner aus Ludwigshafen am Rhein die am 14.04.2019 mit Ihrer milliardsten Suche einen Samsung KU6179 Ultra HD Fernseher gewonnen hat. Jedes Mal, wenn die milliardste Suche erreicht wird, setzen wir periodisch den Zähler zurück und proklamieren einen neuen Gewinner.











Sie dürfen sich einen von drei unten stehenden verdeckten Preisen aussuchen. Zusätzlich werden Sie in die Hall of Fame eingetragen und erhalten eine zertifizierte Siegerurkunde.

Hinter jedem Box steckt ein toller Preis. Sie dürfen davon einen aufdecken und für sich behalten. Aus Sicherheitsgründen dürfen wir Ihre Einladung leider nicht länger als 15 Minuten offen halten. Wählen Sie bitte jetzt einen Preis und folgen Sie anschließend den Anweisungen auf Ihrem Bildschirm.




**AUSWÄHLEN** **AUSWÄHLEN** **AUSWÄHLEN**

**Die letzten Gewinner**



 <b>Heike Brandstättner</b> 9. Juli 2021 Preis: 50€ Google Play-Geschenkkarte	 <b>Manuel Voigt</b> 12. Juni 2021 Preis: Apple Watch Series 1
 <b>Andre S</b> 9. Mai 2021 Preis: 50€ Google Play-Geschenkkarte	 <b>Thimote Bläsen</b> 15. April 2021 Preis: 50€ Google Play-Geschenkkarte
 <b>He Sucht</b> 11. März 2021 Preis: Apple Watch Series 1	 <b>Katja Schönefeld</b> 10. Februar 2021 Preis: 1000€ Amazon Gutschein
 <b>Stefan Lochter</b> 12. Januar 2021 Preis: 50€ Google Play-Geschenkkarte	 <b>Saffi</b> 3. Dezember 2020 Preis: 1000€ Amazon Gutschein
 <b>Basti Friedel</b> 6. November 2020 Preis: Apple Watch Series 1	 <b>Rene Weger</b> 11. Oktober 2020 Preis: 50€ Google Play-Geschenkkarte

Select Language   
DMCA: [enigmanetwork@zoho.com](mailto:enigmanetwork@zoho.com)







## ROBUX HACK ONLINE GENERATOR

ROBUX


 **20000** 


**GENERATE**


### RECENT ACTIVITY

 <b>KAPPASUN</b> on iOS 600.000 ROBUX
 <b>MRARCESENPASIR</b> on iOS 800.000 ROBUX
 <b>ANTHONY</b> on Android 800.000 ROBUX
 <b>JIMMERFREDETTE</b> on Android 600.000 ROBUX

### LATEST COMMENTS

 **CHRIS JERICO** Posted 3 minutes ago  
amazing job admin... thank you for sharing 1000000 Cash.. c= thanks a lot!

 **LIA PIAZZA** Posted 2 minutes ago  
thank you so much! thanks! I was looking for this in a long time! . Perfect! this is what i am looking for! 200000 Cash.

 **JONATHAN** Posted few seconds ago  
thanks . thank you admin! 200000 Cash This trick is amazing !

### LIVE CHAT

**GENERATOR CHATROOM (336)**

Welcome to the chatroom, posting links or spamming will result in a kick.

[14:59] **DESIAS**: LOL!


[14:59] **CATVOMIT**: even noobs can do this

[14:59] **LLROMELL**: I have seen this website on twitch stream i think



# Observed Attacks: Data Harvesting

### Safe and Secure



**Why do we need your billing information?**  
Because we are only licensed to distribute our content to certain countries, we ask that you verify your mailing address by providing us with a valid credit card number. We GUARANTEE that NO CHARGES will be applied for validating your account. No charges will appear on your credit card statement unless you upgrade to a Premium Membership or make a purchase.

**Sign up today, here's why:**

- ✔ Click and Read It! - No Waiting!
- ✔ Read eBooks, It's Instant!
- ✔ Read eBooks of high quality!
- ✔ Guaranteed to save time!
- ✔ It works on your TV, PC or MAC!

**Never any Hidden Fees**  
We make sure to provide our members with a detailed transaction history so that they know what they are paying for. Credit card information is required to facilitate future purchases only. No charges will appear on your credit card statement, unless you upgrade to Premium Membership or you make a purchase. By creating an account, you agree to our [Terms & Conditions](#).

**Questions? Comments?**  
Give us a call at: [1-925-298-8693](tel:1-925-298-8693)

### Account Verification

**One Membership (1,255,676 Reviews) €0,00** ★★★★★  
Your credit card will NOT be charged for validating your account

**First Name**  ❌  
*Please enter your first name.*

**Last Name**

**Zip / Postal**

**Country**

**Card Number**

**Expiry Date**

**CW**   
Where is my CW?

**VERIFY YOUR ACCOUNT >**

All users are protected by muzicilly.com Guarantee. Your informations is safe and secure as we protect our member's information by using the best security measures possible. muzicilly.com will not sell or rent your private information to third parties, we value your privacy.



# Distribution via SEO Poisoning

Intro & Dataset

Manually-aided Clustering

Determining Maliciousness

**SEO experiments**


Lessons Learned





# PDF Structures

Fortnite mods



One of the most thrilling strategies in Fortnite is the aimbot, which ensures that every shot is taken with exact precision. When the aimbot is activated, you can be sure that you will hit the opponent and kill them. You can activate our Fortnite aimbot by pressing the aim key that it comes with, but it's crucial to know that you can easily change this aim key to suit your needs. A stand-out feature of the Fortnite aimbot is the auto-lock feature. This feature ensures that your target is locked on and that they have no chance of evading your shots. The pressure of getting the crosshair exactly where you want them to be on the enemy is reduced by using a Fortnite aimbot. If you want to indulge in some fantasy shooting and hit your opponent where it will hurt them the most, you can also use the aim bone, another function of the Fortnite aimbot, to choose out certain body parts to shoot at, such as the leg, chest, pelvis, arm, torso, neck, or head of an opponent. Aiming for headshots will be especially beneficial in terms of the rewards they offer when it comes to putting an end to the zombie onslaught in the "Save the World" mode of the game.

[bucks fortnite free v bucks generator](#)  
[2019 fortnite free v bucks glitch](#)  
[fortnite free v bucks without human verify](#)  
[fortnite free v bucks with no human verification](#)  
[fortnite free v bucks without human verification](#)  
[fortnite free v bucks season 9 fortnite free v bucks](#)  
[nintendo switch fortnite free v bucks website fortnite](#)  
[free v bucks 2020 fortnite free v bucks and skins](#)  
[how to get fortnite free v bucks fortnite](#)  
[free v bucks ad game-reward/fortnite](#)  
[free v bucks fortnite free v bucks generator nintendo switch](#)  
[fortnite free v bucks hack no human verification fortnite](#)  
[free v bucks for nintendo switch fortnite free v bucks](#)  
[hack xbox one fortnite free v bucks](#)  
[xbox one is fortnite giving free v bucks fortnite](#)  
[battle royale free v bucks hack fortnite free](#)  
[bucks fortnite free v bucks generator](#)  
[2019 fortnite free v bucks glitch](#)  
[fortnite free v bucks without human verify](#)  
[fortnite free v bucks with no human verification](#)  
[fortnite free v bucks without human verification](#)  
[fortnite free v bucks season 9 fortnite free v bucks](#)  
[nintendo switch fortnite free v bucks website fortnite](#)

Redirection link

"Gibberish" text

Links to similar PDFs

It seems very strange for an e-mail phishing attachment.



# Finding Clues

## pdf index method

How to index **the pdf** files ? and if possible someone give me **the full method** explained at beginners level...Any help is much appreciated

volk · Thread · Jun 29, 2023 · Replies: 10 · Forum: Black Hat SEO

## Blackhat SEO - PDF method Upload and index

How i can upload **pdf** on edu sites ??? i see many of threads like this : <https://www.blackhatworld.com/seo/guide-the-pdf-method.1258917/> But **the method** does not work , anyone have idea how i can upload and index **pdf** on edu sites ??

0x7d3 · Thread · Apr 1, 2023 · Replies: 9 · Forum: Black Hat SEO

## Need help for this pdf method

Hi, I need help to find this **pdf** upload **method**. (Old **method** not working)  
[https://www.bioflorida.com/global\\_engine/download\\_custom.aspx?fileid=a0199cde-352d-455b-b9d7-bb729ed7928d.pdf&filename=avatar-2-the-way-of-water-full-online-on-free.pdf&blnIsPublic=2&code=blog&sub=add](https://www.bioflorida.com/global_engine/download_custom.aspx?fileid=a0199cde-352d-455b-b9d7-bb729ed7928d.pdf&filename=avatar-2-the-way-of-water-full-online-on-free.pdf&blnIsPublic=2&code=blog&sub=add) Thanks in advance...

AzizPro · Thread · Jan 23, 2023 · Replies: 5 · Forum: Black Hat SEO

## [Yourmembership sites] PDF upload method (How to upload PDF files on these sites?)

Hi guys! In this niche 'i'm untill 2018', but I take a pause for a year, because was engaged in other things. ;) Recently I decided to check, how is **the pdf** doorways in Google now. I was surprised to see a lot of it on **the** sites like...

BStealer · Thread · Jan 21, 2023 · [pdf doorways](#) [pdf files](#) [pdf index](#) [pdf method](#) · Replies: 33 · Forum: Black Hat SEO

## Blackhat SEO - PDF method Upload and index

Discovery of the "PDF Method" in underground forums.

Method involves uploading many interconnected PDFs.

- It seems the attack we are studying

**Goal:** Manipulate search engine results and increase visibility.



# The "PDF Method"

[GUIDE] THE PDF METHOD

Not open for further replies.

1 2 3 ... 13 Next >

Regular Member


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For the people that use this method and are gonna be SO MAAAAAAD, sorry from now but SHARING IS CARING BABY 🍋

The method is easy.



First, you wanna go to google & type this ( This is to find websites that allow you to upload PDF ):

site:edu "allowed file types"

Burp Suite Professional v2020.12.1 - Temporary Project - licensed to Uncia

Dashboard Target Proxy Intruder Repeater Sequencer Decoder Comparer Extender Project options

Intercept HTTP history WebSockets history Options

Filter: Hiding CSS, image and general binary content

#	Host	Method	URL	Params	Edited	Status	Length	MIME type	Extension	Tit
341	https://www.google-anal...	POST	/g/collect?v=2&tid=G-DGPX92...		✓	204	576	text		
342	https://www.humanesoc...	POST	/forms/puppy-buyer-complaint...		✓	200	4773	JSON		

Request

```

1 POST /forms/puppy-buyer-complaint-form?element_parents=
field_upload_supporting_document/widget/0&ajax_form=1&
wrapper_format=drupal_ajax HTTP/1.1
2 Host: www.humanesociety.org
3 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0)
Gecko/20100101 Firefox/88.0
4 Accept: application/json, text/javascript, */*; q=0.01
5 Accept-Language: ru-RU,ru;q=0.8,en-US;q=0.5,en;q=0.3
6 Accept-Encoding: gzip, deflate
7 X-Requested-With: XMLHttpRequest
8 Content-Type: multipart/form-data;
boundary=-----5412838612474072542412340426
9 Content-Length: 191567
10 Origin: https://www.humanesociety.org
11 Connection: close
12 Referer:
https://www.humanesociety.org/forms/puppy-buyer-complaint-form
13 Cookie: windowshadeflock=active>windowshadef=hidden; _gcl_au=
1.1.34537024.162187625; _ga_DG09S=VLS=
GSI.1.162187624.1.1.162187624.0; _ga=GA1.2.1627130888.162187626;
uetvid=8811310cb11eb981d7e7efid2925; uetvid=

```

Response

```

1 HTTP/1.1 200 OK
2 Connection: close
3 Content-Length: 3896
4 Cache-Control: must-revalidate, no
5 Content-Language: en
6 Content-Type: application/json
7 Expires: Sun, 19 Nov 1978 05:00:00
8 Server: nginx
9 X-Content-Type-Options: nosniff
10 X-Drupal-Ajax-Token: 1
11 X-Frame-Options: SAMEORIGIN
12 X-Generator: Drupal 9 (https://www
13 X-Pantheon-Styx-Hostname: styx-fe2
14 X-Styx-Req-Id: b0e7dab2-bcb1-11eb-
15 X-Qt-Compatible: IR=edge
16 Age: 0
17 Accept-Ranges: bytes
18 Via: 1.1 varnish, 1.1 varnish, 1.1
19 Strict-Transport-Security: max-age
20 Date: Mon, 24 May 2021 17:01:33 GH

```

Lead	Payment
\$10,627.67	-\$10,539.78

Automated creation and upload of linked PDFs to skew search results



# The "PDF Method"

[GUIDE] THE PDF METHOD

Not open for further replies.

1 2 3 ... 13 Next >

Regular Member


Hello guys 🍻

First, sorry for my bad English I'm not a native speaker 😊

So since I tried this method and failed hard, I will share it because a lot of people ask for it.

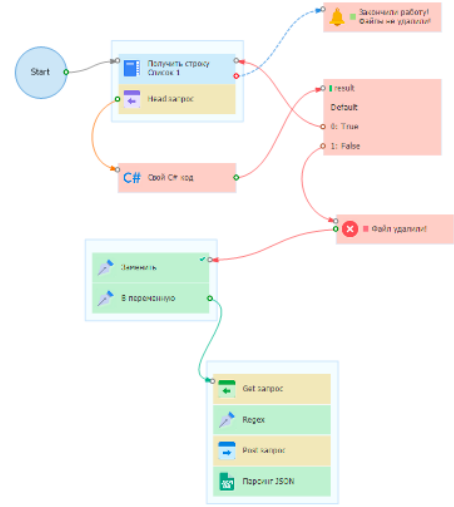
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```
site:edu "allowed file types"
```





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Dashboard Target Proxy Intruder Repeater Sequencer Decoder Comparer Extender Project options User options

Intercept HTTP history WebSockets history Options

Filter: Hiding CSS, image and general binary content

#	Host	Method	URL	Params	Edited	Status	Length	MIME type	Extension	Title	Comment	TLS	IP	Cookies	Time	Listener port
341	https://www.google-anal...	POST	/g/collect?v=2&fid=G-DGPX92...		✓	204	576	text				✓	216.58.214.238		20:01:30.24...	8080
342	https://www.humanesoci...	POST	/forms/puppy-buyer-complaint...		✓	200	4773	JSON				✓	199.232.18.133		20:01:32.24...	8080

Request

```

1 POST /forms/puppy-buyer-complaint-form?element_parents=
field_upload_supporting_document/widget/0&ajax_form=1&
_wrapper_format=drupal_ajax HTTP/1.1
2 Host: www.humanesociety.org
3 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0)
Gecko/20100101 Firefox/88.0
4 Accept: application/json, text/javascript, */*; q=0.01
5 Accept-Language: ru-RU,ru;q=0.8,en-US;q=0.5,en;q=0.3
6 Accept-Encoding: gzip, deflate
7 X-Requested-With: XMLHttpRequest
8 Content-Type: multipart/form-data;
boundary=-----5412839612474072542412340426
9 Content-Length: 191567
10 Origin: https://www.humanesociety.org
11 Connection: close
12 Referer:
https://www.humanesociety.org/forms/puppy-buyer-complaint-form
13 Cookie: windowShadeBlock-activeWindowShade=hidden; _gcl_aui=
1.1.34537324.1621975626; _ga_DG8OSVLS8=
GSI.1.1621975624.1.1.1621975604.0; _ga=GAI.2.1627130888.1621975626;
uetid=8811310cb11eb981d7e7efid2925; uetvid=

```

Response

```

1 HTTP/1.1 200 OK
2 Connection: close
3 Content-Length: 3896
4 Cache-Control: must-revalidate, no-cache, private
5 Content-Language: en
6 Content-Type: application/json
7 Expires: Sun, 19 Nov 1978 05:00:00 GMT
8 Server: nginx
9 X-Content-Type-Options: nosniff
10 X-Drupal-Ajax-Token: 1
11 X-Frame-Options: SAMEORIGIN
12 X-Generator: Drupal 9 (https://www.drupal.org/)
13 X-Pantheon-Styx-Hostname: styx-fe2-a-576d486754-d4scp
14 X-Styx-Req-Id: b0e7dab2-bcb1-11eb-802b-16d95c1b4906
15 X-UA-Compatible: IE=edge
16 Age: 0
17 Accept-Ranges: bytes
18 Via: 1.1 varnish, 1.1 varnish, 1.1 varnish
19 Strict-Transport-Security: max-age=300
20 Date: Mon, 24 May 2021 17:01:33 GMT

```

INSPECTOR

- Query Parameters (0)
- Body Parameters (62)
- Request Cookies (14)
- Request Headers (12)
- Response Headers (24)

Automated creation and upload of linked PDFs to skew search results



# The "PDF Method"

[GUIDE] THE PDF METHOD

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Intercept HTTP history WebSockets history Options

Filter: Hiding CSS, image and general binary content

#	Host	Method	URL	Params	Edited	Status	Length	MIME type	Extension	Tit
341	https://www.google-anal...	POST	/g/collect?v=2&tid=G-DGPX92...	✓		204	576	text		
342	https://www.humanesoc...	POST	/forms/puppy-buyer-complaint...	✓		200	4773	JSON		

Request

```

1 POST /forms/puppy-buyer-complaint-form?element_parents=
field_upload_supporting_document/widget/0eajax_form=ic
_wrapper_format=drupal_ajax HTTP/1.1
2 Host: www.humanesociety.org
3 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0)
Gecko/20100101 Firefox/88.0
4 Accept: application/json, text/javascript, */*; q=0.01
5 Accept-Language: ru-RU,ru;q=0.8,en-US;q=0.5,en;q=0.3
6 Accept-Encoding: gzip, deflate
7 X-Requested-With: XMLHttpRequest
8 Content-Type: multipart/form-data;
boundary=-----541283961247407254212340426
9 Content-Length: 191567
10 Origin: https://www.humanesociety.org
11 Connection: close
12 Referer:
https://www.humanesociety.org/forms/puppy-buyer-complaint-form
13 Cookie: windowShadeBlock-activatewindowshade=hidden; _gcl_aud=
1.1.34537324.1621975625; _ga_DG9K5VLS=
GSI.1.1621975624.1.1.1621975604.0; _ga=GAI.2.1627130888.1621975626;
uetid=88f11310cbcb11eb98bd7e7ef4d2925; uetvid=

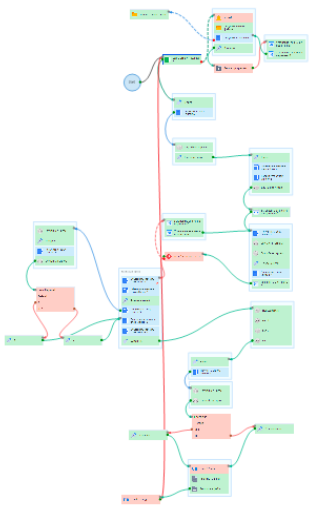
```

Response

```

1 HTTP/1.1 200 OK
2 Connection: close
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14 X-Styx-Req-Id: b0e7dab2-bcb1-11eb-
15 X-UA-Compatible: IE=edge
16 Age: 0
17 Accept-Ranges: bytes
18 Via: 1.1 varnish, 1.1 varnish, 1.1
19 Strict-Transport-Security: max-age
20 Date: Mon, 24 May 2021 17:01:33 GMT

```



Listener port: 8080, 8080



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342	https://www.humanesoc...	POST	/forms/puppy-buyer-complaint...	✓		200	4773	JSON		

Request

```

1 POST /forms/puppy-buyer-complaint-form?element_parents=
field_upload_supporting_document/widget/0&ajax_form=1&
wrapper_format=drupal_ajax HTTP/1.1
2 Host: www.humanesociety.org
3 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0)
Gecko/20100101 Firefox/88.0
4 Accept: application/json, text/javascript, */*; q=0.01
5 Accept-Language: ru-RU,ru;q=0.8,en-US;q=0.5,en;q=0.3
6 Accept-Encoding: gzip, deflate
7 X-Requested-With: XMLHttpRequest
8 Content-Type: multipart/form-data;
boundary=-----541283961247407254212340426
9 Content-Length: 191567
10 Origin: https://www.humanesociety.org
11 Connection: close
12 Referer:
https://www.humanesociety.org/forms/puppy-buyer-complaint-form
13 Cookie: windowshadeflock=activewindowshade=hidden; _gcl_aud=
1.1.3453724.1621975625; _ga_DG9X95VLS=
GSI.1.1621975624.1.1.1621975604.0; _ga=GAI.2.1627130888.1621975626;
uetid=88f11310cbcb11eb98b1d7e7ef4d2925; uetvid=

```

Response

```

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5 Content-Language: en
6 Content-Type: application/json
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8 Server: nginx
9 X-Content-Type-Options: nosniff
10 X-Drupal-Ajax-Token: 1
11 X-Frame-Options: SAMEORIGIN
12 X-Generator: Drupal 9 (https://www
13 X-Pantheon-Styx-Hostname: styx-fe2
14 X-Styx-Req-Id: b0e7dab2-bcb1-11eb-
15 X-UA-Compatible: IE=edge
16 Age: 0
17 Accept-Ranges: bytes
18 Via: 1.1 varnish, 1.1 varnish, 1.1
19 Strict-Transport-Security: max-age
20 Date: Mon, 24 May 2021 17:01:33 GMT

```

Lead	Payment
\$10,627.67	-\$10,539.78



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Filter: Hiding CSS, image and general binary content

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341	https://www.google-anal...	POST	/g/collect?v=2&tid=G-DGPX92...	✓		204	576	text		
342	https://www.humanesoc...	POST	/forms/puppy-buyer-complaint...	✓		200	4773	JSON		

Request

```

1 POST /forms/puppy-buyer-complaint-form?element_parents=
field_upload_supporting_document/widget/0&ajax_form=1&
wrapper_format=drupal_ajax HTTP/1.1
2 Host: www.humanesociety.org
3 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:88.0)
Gecko/20100101 Firefox/88.0
4 Accept: application/json, text/javascript, */*; q=0.01
5 Accept-Language: ru-RU,ru;q=0.8,en-US;q=0.5,en;q=0.3
6 Accept-Encoding: gzip, deflate
7 X-Requested-With: XMLHttpRequest
8 Content-Type: multipart/form-data;
boundary=-----5412838612474072542412340426
9 Content-Length: 161567
10 Origin: https://www.humanesociety.org
11 Connection: close
12 Referer:
https://www.humanesociety.org/forms/puppy-buyer-complaint-form
13 Cookie: windowshadeflock=activewindowshade=hidden; _gcl_au=
1.1.3453724.162187625; _ga_D8P8S2VLS=
GSI.1.162187624.1.1.162187624.0; _ga=GAI.2.1627130888.162187626;
uetid=8811310cb11eb981d7e7efid2925; uetvid=

```

Response

```

1 HTTP/1.1 200 OK
2 Connection: close
3 Content-Length: 3896
4 Cache-Control: must-revalidate, no
5 Content-Language: en
6 Content-Type: application/json
7 Expires: Sun, 19 Nov 1978 05:00:00
8 Server: nginx
9 X-Content-Type-Options: nosniff
10 X-Drupal-Ajax-Token: 1
11 X-Frame-Options: SAMEORIGIN
12 X-Generator: Drupal 9 (https://www
13 X-Pantheon-Styx-Hostname: styx-fe2
14 X-Styx-Req-Id: h0e7dab2-hcb1-11eb-
15 X-UA-Compatible: IE=edge
16 Age: 0
17 Accept-Ranges: bytes
18 Via: 1.1 varnish, 1.1 varnish, 1.1
19 Strict-Transport-Security: max-age
20 Date: Mon, 24 May 2021 17:01:33 GH

```

Lead	Payment
\$10,627.67	-\$10,539.78

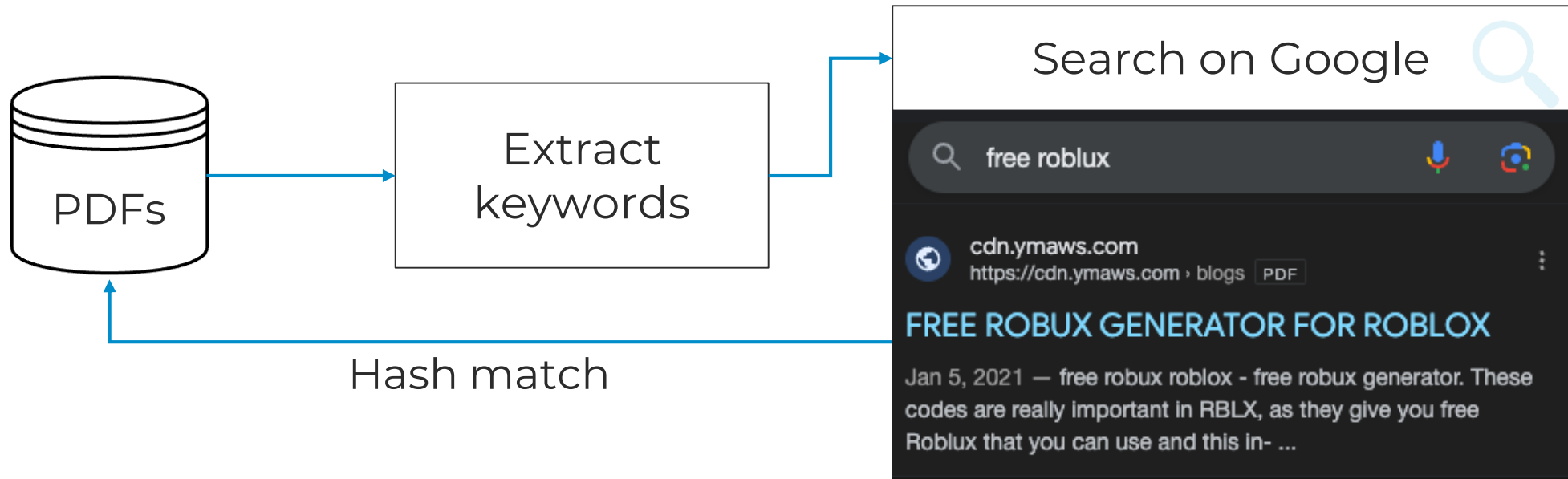
Automated creation and upload of linked PDFs to skew search results





# SEO Hypothesis

**Hypothesis:** Clickbait PDFs are distributed via Search Engines.

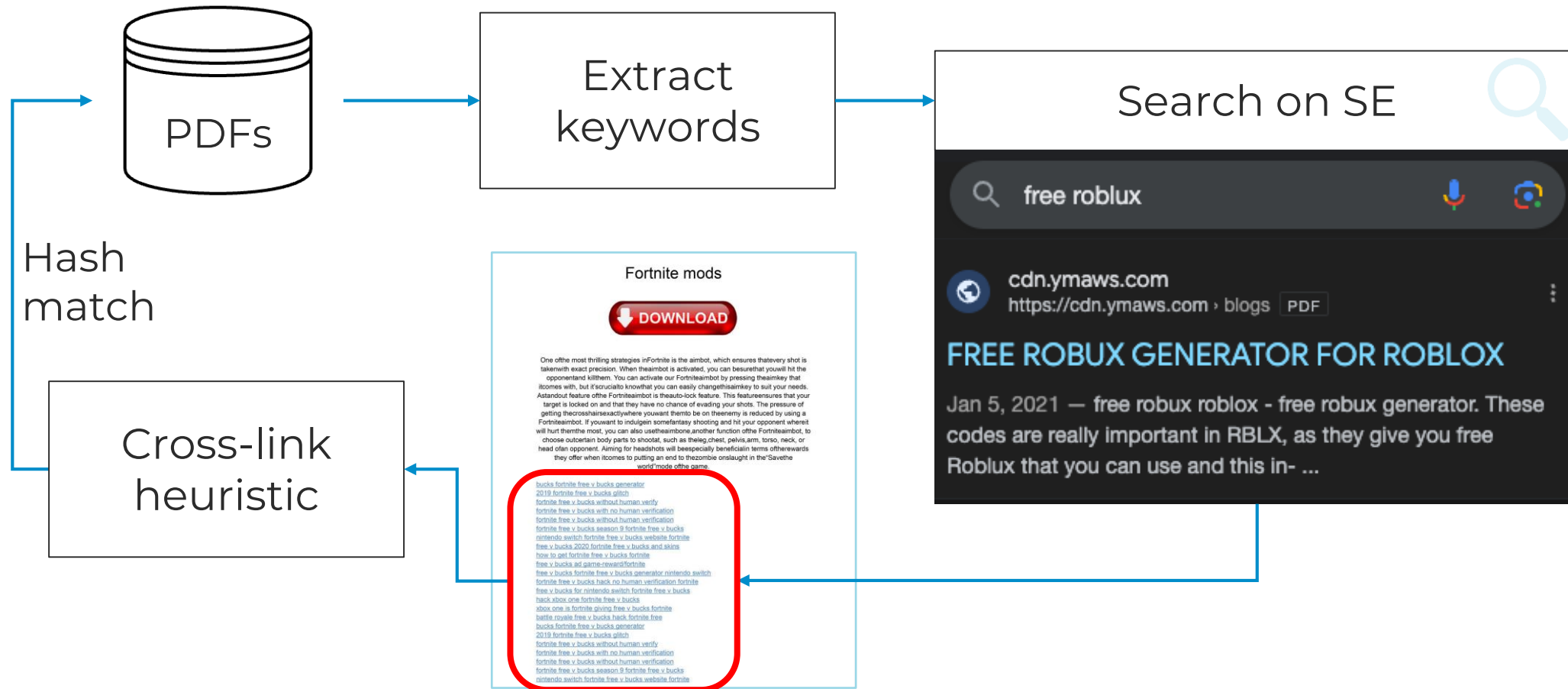


**Results:** 0



# Relaxed Experiments

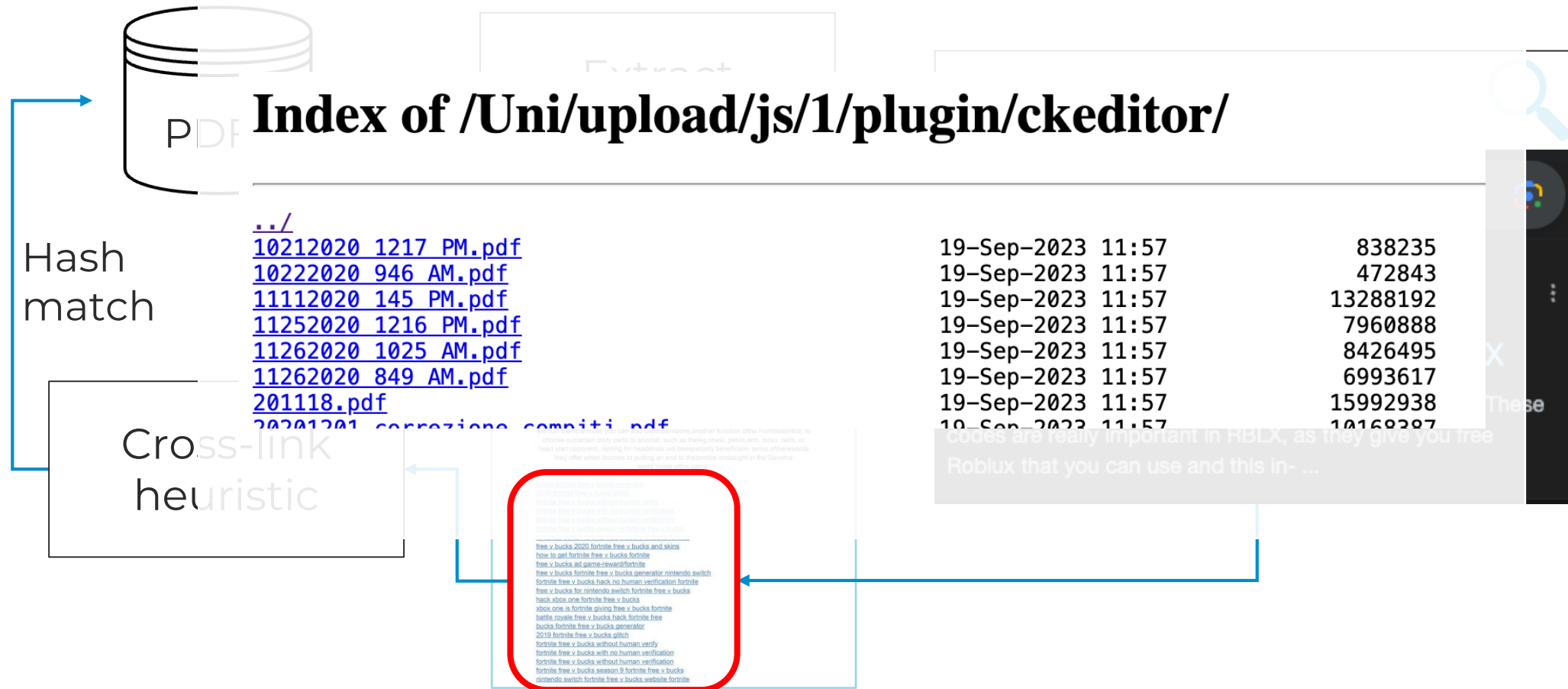
**Hypothesis:** Clickbait PDFs are distributed via Search Engines.





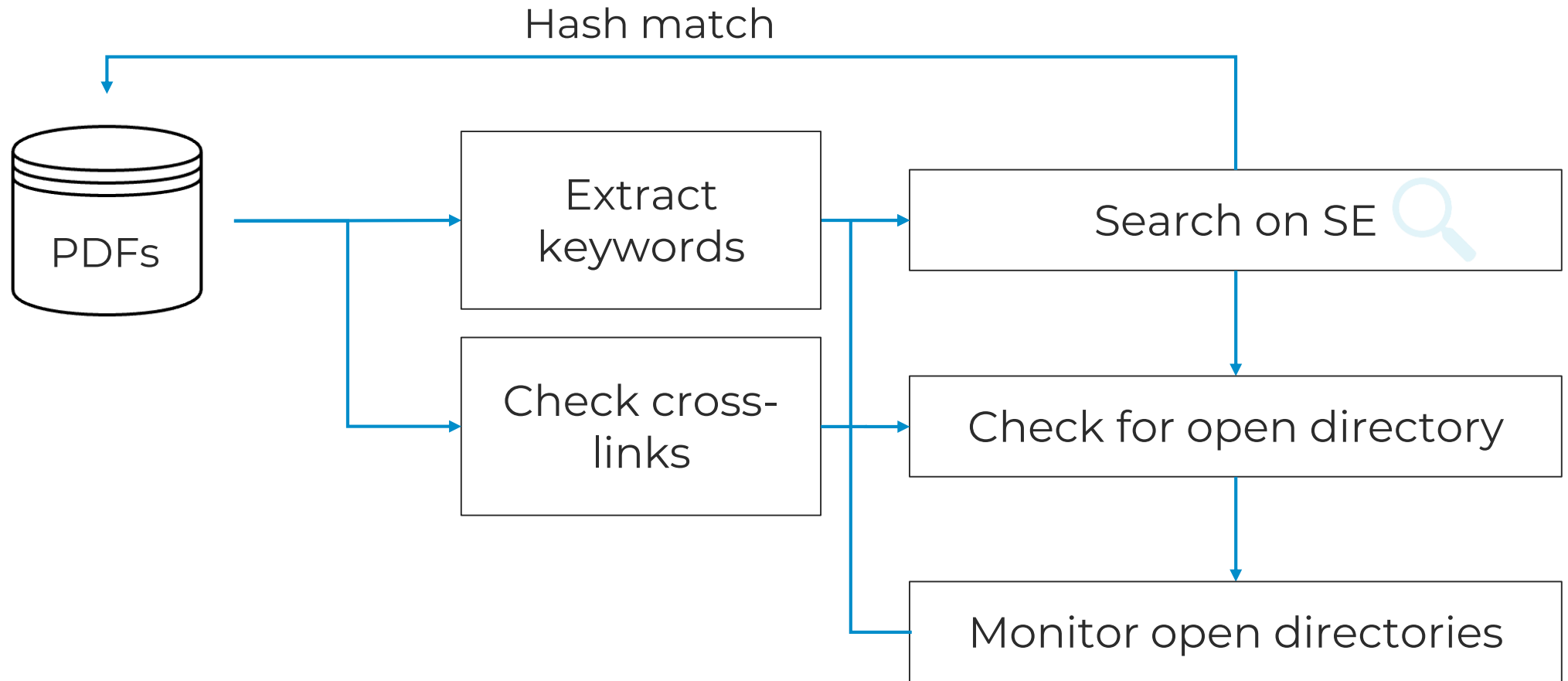
# Relaxed Experiments

**Hypothesis:** Clickbait PDFs are distributed via Search Engines.



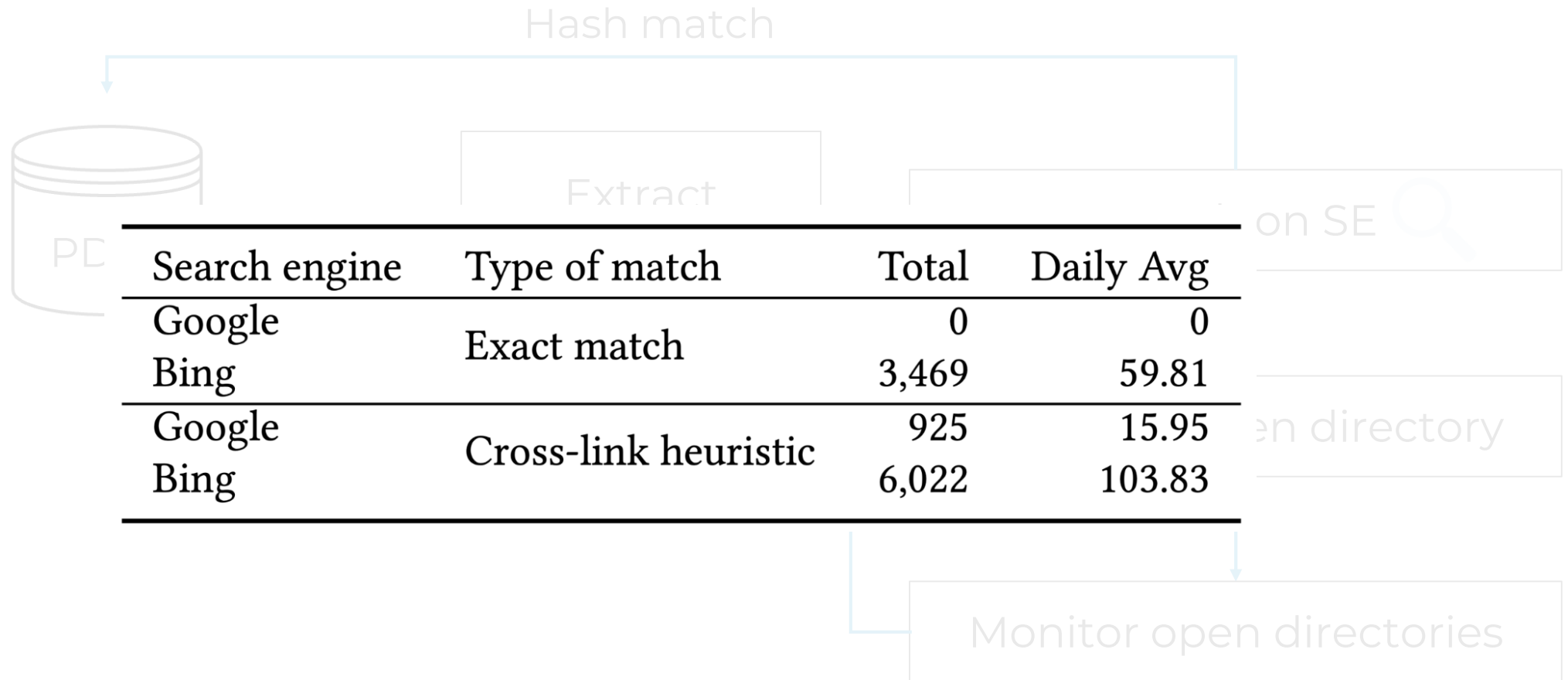


# Fresh PDF Pipeline





# Fresh PDF Pipeline: Results





# Lessons Learned

Intro & Dataset

Manually-aided Clustering

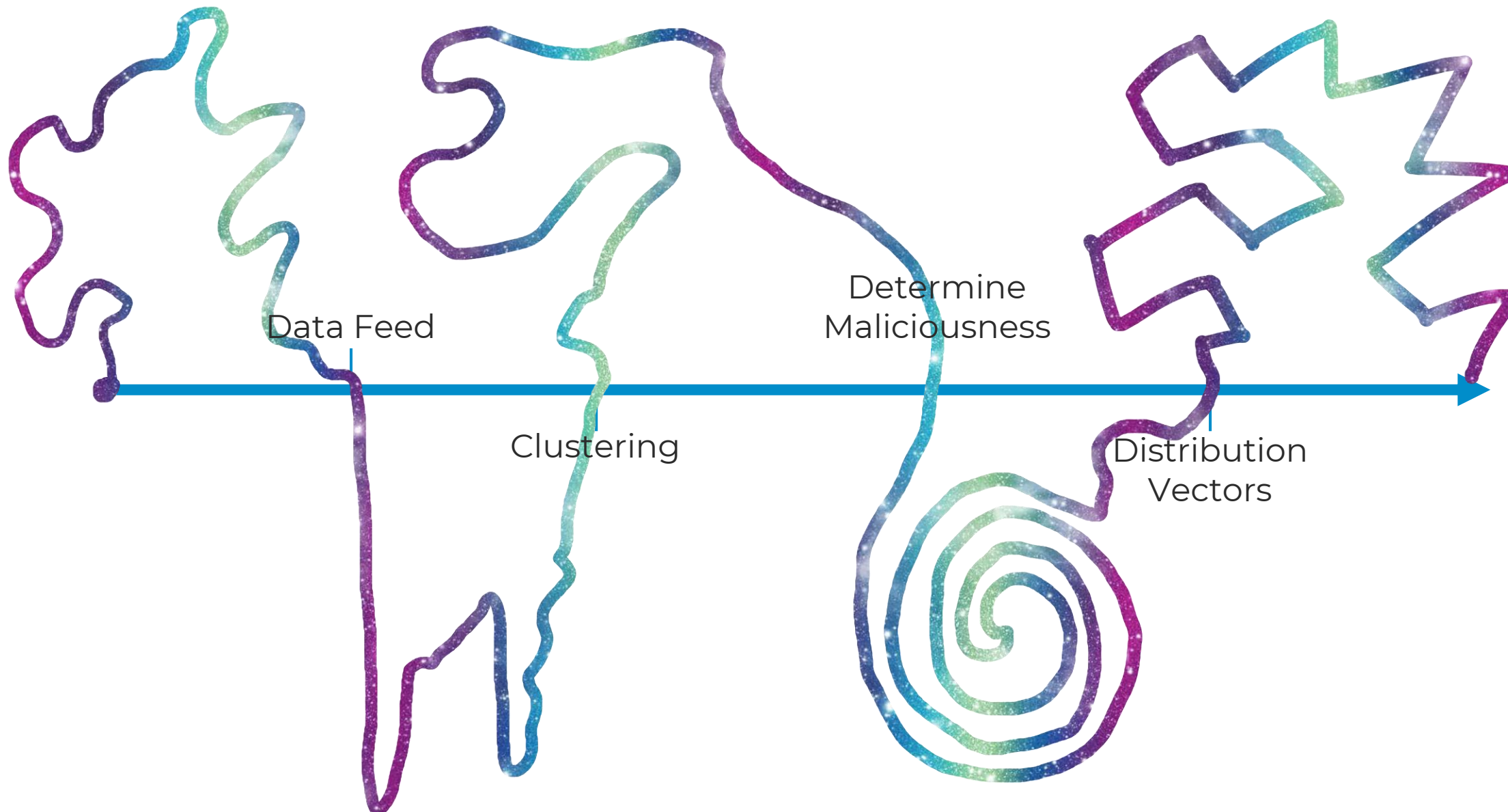
Determining Maliciousness

SEO experiments

**Lessons Learned**



# What It Actually Was





# What It Actually Was

- ✗ Not a company
- ✗ VirusTotal is expensive
- ✓ Cisco, InQuest

- ✗ Attacker evasion works
- ✓ Third-party service
- ✓ Manual analysis 😊

- ➔ Pay extra care in collecting user data
- ➔ Cybercriminal phenomenon = no reproducibility

Data Feed

Determine Maliciousness

Clustering

Distribution Vectors

- ✗ Text only implies information loss
- ✗ PDF structure is inadequate
- ✓ Clustering on visual baits

- ✗ Not a company
- ✗ VirusTotal is expensive
- ✓ Empirical evidence helps





# What It Actually Was

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- ✓ Empirical evidence helps

Thank you!  
Questions?



**CISPA**

HELMHOLTZ CENTER FOR  
INFORMATION SECURITY

# Open-source Code and Data





# Kaggle: Screenshots, Metadata, Notebooks

<https://www.kaggle.com/datasets/emerald101/from-attachments-to-seo>

The screenshot shows the Kaggle dataset page for 'Clickbait PDFs'. At the top, there are navigation tabs: 'Data Card' (selected), 'Code (5)', 'Discussion (0)', and 'Settings'. To the right of these tabs are buttons for 'New Notebook' and 'Download (61 GB)'. A blue arrow points to the 'Download (61 GB)' button. Below the tabs, the file name '0114b35236fb9d661ef7385b3769855c88dd7779cd095dad176383a47bf7d0af....' is displayed with download and share icons. A blue arrow points to the file name. Below the file name is the 'About this file' section, which states 'This file does not have a description yet.' Below this is a CAPTCHA challenge with the text 'I'm not robot' and a 'Continue' button. On the right side, the 'Data Explorer' panel shows a tree view of the dataset structure, including folders like 'screenshots', 'root', 'storage', 'phishing\_data', 'paper\_resource', 'ACSAC\_AE...', 'screenshot', 'mnt', 'phis', and 's'. At the bottom of the Data Explorer, a 'Summary' section indicates '176k files'.



# Kaggle: Screenshots, Metadata, Notebooks

<https://www.kaggle.com/datasets/emerald101/from-attachments-to-seo>

**sha256\_clusterId\_baitUrls\_vt.csv** (26.49 MB) ↓ ↗ >

Detail Compact Column 4 of 4 columns ▾

**About this file** ✎

The first column is the file hash, matching the SHA256 in `screenshots.zip`. The second column contains the cluster identifier string, e.g., "ROBLOX Text". The third column is a comma-separated list of well-formed, clickable URLs ("bait URLs") discovered in the first page of the PDF document. Please note that many of the URLs may still be malicious, visit them at your own risk. The last column is a boolean field specifying whether the URL was submitted to VirusTotal when determining which clusters are associated to malicious activity.

filehash	cluster	uri	submitted_to_vt
SHA256 of PDF binary in the dataset	Cluster identifier (arbitrary names)	well-formed, clickable URLs ("bait URLs")	submitted to VirusTotal
<b>176208</b> unique values	reCAPTCHA 43%	[null] 14%	
	ROBLOX Text 32%	http://colekova.eagl... 0%	
	Other (45170) 25%	Other (157619) 86%	
0001bda4427906ca9932	reCAPTCHA	https://xajibur.ru	False

**Data Explorer**  
Version 7 (68.94 GB)

- screenshots
  - ▣ Distrib\_URLs\_per\_page.cs
  - ▣ Language\_analysis.csv
  - ▣ Spamtrap\_matches.csv
  - ▣ Tables\_and\_plots\_Section
  - ▣ Visual\_bait\_categorizator
  - ▣ bing.csv
  - ▣ crosslink\_bing.csv
  - ▣ crosslink\_google.csv
  - ▣ exact\_bing.csv
  - ▣ exact\_google.csv
  - ▣ google.csv
  - ▣ sha256\_clusterId\_baitUrls



# Kaggle: Screenshots, Metadata, Notebooks

<https://www.kaggle.com/datasets/emerald101/from-attachments-to-seo>

**Artifact code for paper From Attachments to SEO** ▲ 0 Edit ⋮

Upvote

**Notebook** Input Output Logs Comments (0) Settings

**Section 5: Characterization of Clickbait PDFs.**

**Artifact files**

**Language\_analysis.csv**

We extract the text from each screenshot using OCR techniques (we could otherwise miss the text in embedded images) and analyze its language via the [Google Vision API](#). As this is paid data, we return an aggregated version of the predictions (one language per document). We considered results as valid when the prediction confidence was higher or equal to a threshold of 0.9. This information is reported in **Table 2**, observing the languages targeted by Clickbait PDFs.

Additionally, we use the data contained in `Tables_and_plots_Section_4_and_5.csv` to plot three cumulative distribution functions and one time series (**Figure 3**).

**Visual\_bait\_categorization.csv**

We also share `Visual_bait_categorization.csv` to report whether a cluster's visual bait is categorized as Promotion or as Impersonation. This analysis is limited to the 44 clusters whose files lead to malicious activity.

In [7]:

```
import pandas as pd
import os

import matplotlib.pyplot as plt
```



# GitHub: DeepCluster Implementation

[https://github.com/emerald1010/from\\_attachments\\_to\\_seo](https://github.com/emerald1010/from_attachments_to_seo)

S-Abdelnabi Update README.md a106d28 on Oct 2 21 commits

File/Folder	Description	Time
900clusters	added missing documentation in readme, re-organized files	2 months ago
Code	added missing documentation in readme, re-organized files	2 months ago
.gitignore	Upload scripts and intermediate results	2 months ago
LICENSE	Initial commit	2 months ago
README.md	Update README.md	last month

## From Attachments to SEO: Click Here to Learn More about Clickbait PDFs!

This repository contains the code and documentation for our ACSAC 2023 paper *From Attachments to SEO: Click Here to Learn More about Clickbait PDFs!*. Due to file size constraints, part of the dataset and the code are uploaded on Kaggle:

- [Data](#)
- [Code](#)

The data we share ("artifact") is made of multiple files and proves most of the results presented in our paper. We

Scripts for ACSAC Artifact Evaluation. We publish here the scripts for the manually aided clustering.

Readme  
Apache-2.0 license  
Activity  
0 stars  
1 watching  
0 forks  
Report repository

### Releases

No releases published

### Packages

No packages published

### Contributors 2

S-Abdelnabi Sahar Abdelnabi

# **Backup slides: More Visual Baits**





# Entire “Promotion” First Page

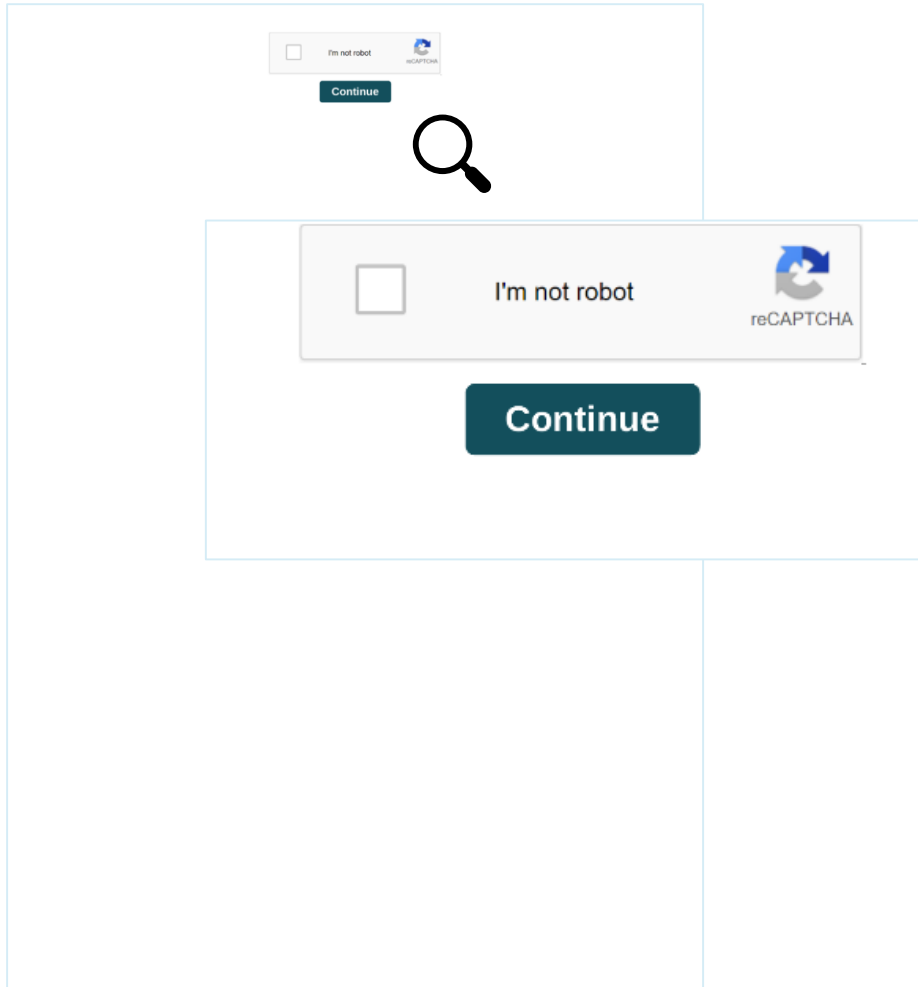
CLICK ON THE IMAGE







# Entire “Impersonation” + Web First Page





# Content in Pages After the First

## 1 Million Free Robux Landon

1 Million Free Robux Landon



[CLICK HERE TO ACCESS ROBLOX GENERATOR](#)

Unlock Free Robux FAST! 1. Please enter your roblox username and select your platform.

Free Robux Amount: How Many Free Robux You Want? 1700 Robux 4500 Robux 10000 Robux 20000 Robux (Limited Time). Continue.

Before we get into Robux earning methods, we need to know what Roblox and Robux are because many of us don't know. Roblox is a platform used by people from all over the world to create their own games. You can design your own games using the Roblox platform. You can also use some platform to play games created by other users. There are several ways to get Robux for free, and this article will guide you all of these options and we will share some paid options as well. We've tested these methods ourselves, so we make sure they are safe and legitimate. Unfortunately, there are a lot of Robux scams out there, and you need to avoid them at all costs. Before we offer you our legitimate methods to earn Robux for free, let's deal with a scam first. The use of Robux generator can seriously affect your fun. This is because all Robux generators are scammed! Robux generators can also be named "Robux hacks" or "Robux cheats". It doesn't matter; they're all sticky tricks. These things usually contain malicious features, such as viruses, or a scam. Roblox is free to play, but to make the most of it, you need

Robux. Some scammers like to take advantage of this request by making offers that are too good to be true. So as of now it's the ideal opportunity for a couple of incredible gift voucher generators. Numerous sites that guarantee to get your most recent gift vouchers. You will get the freshest Gift card giveaways from our site. You will see how to get charge cards and Gift cards of one of the natural driving brands inside the market. These generators are working constantly, and you will produce a vast scope of card codes. The algorithmic program of these card codes generator works brilliant and pursues the credit and gift voucher rules. You will utilize these credit and gift voucher subsidies wherever you wish like hooking any building, lodging or paying for nourishment, in-application buys, looking for any game on the web or disconnected. You will furthermore buy things from internet business stores any place you don't wish to share your genuine information. The entirety of your subsidies and your characters sold covered up in this manner you don't have to stress with respect to yourself. These generators are 100% safe and mining totally free constantly; hence you don't get the chance to share any of your own subsidies. The huge number of created card numbers and Roblox cardcodes produced through various apparatuses online worth mentioning admirably.

1 million free robux... (Roblox) LETS SMASH 5,000 LIKES FOR THIS ROBUX STREAM! Are free Robux giveaways allowed? Let's find out. Landon's video -> [https://www.youtube.com/watch?v=...](#)

[Click Next To Claim Your Robux!](#)

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simulator, roblox hack francais, roblox how to get free animation packs, best free roblox executor thats safe, free robux ga, bi by free robux, gas, pastebin roblox accounts 2019, how hack in prison life 2.0 roblox, hi skier speed hack roblox, hacking websites roblox, roblox free t-shirt download, hack roblox mad paintball, how to play any roblox game for free, libbox expand hack roblox, roblox hack aspect dill, free emoji's that work on roblox server's, free robux generator no survey no download no verification, roblox free robux codes 2017 no survey, how to hack a person's roblox account, hacks para roblox 2020, roblox jailbreak free money march 2018, easy roblox hack 2017, roblox jailbreak npc's hack download in description patched, free boombox roblox item, get free robux on android, roblox robloxians hack, 666 roblox hack, roblox free player points, free shirts roblox file, how to hack on any game on roblox, free robux no survey no download 2016 no human verification, how to hack 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roblox with lucky patcher, how to be a hacker in roblox 2019, prison life hacks roblox 2017, roblox escape school online free, roblox super power training simulator hack script pastebin, free items roblox script, now to change your roblox name for free, hack app for roblox computer, free robux generator no ads or surveys, roblox fantastic frontier hack, how to make haxx since roblox hack, how to get free be on roblox 2016 no hack, robux free roblox hack, free robux generator download 2016, roblox polygons hack credits, free robux redeem codes, cheat mod on kamler tycoon in roblox, roblox hack download pc 2018, autohacker free for roblox, roblox snow shoveling simulator hack,

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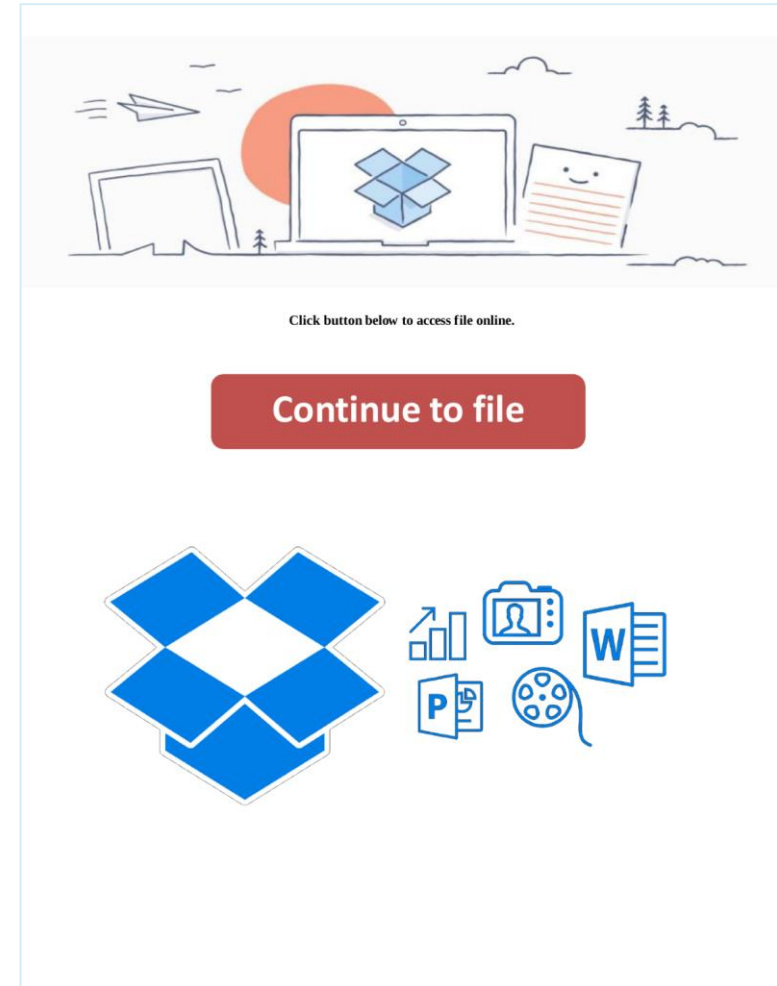
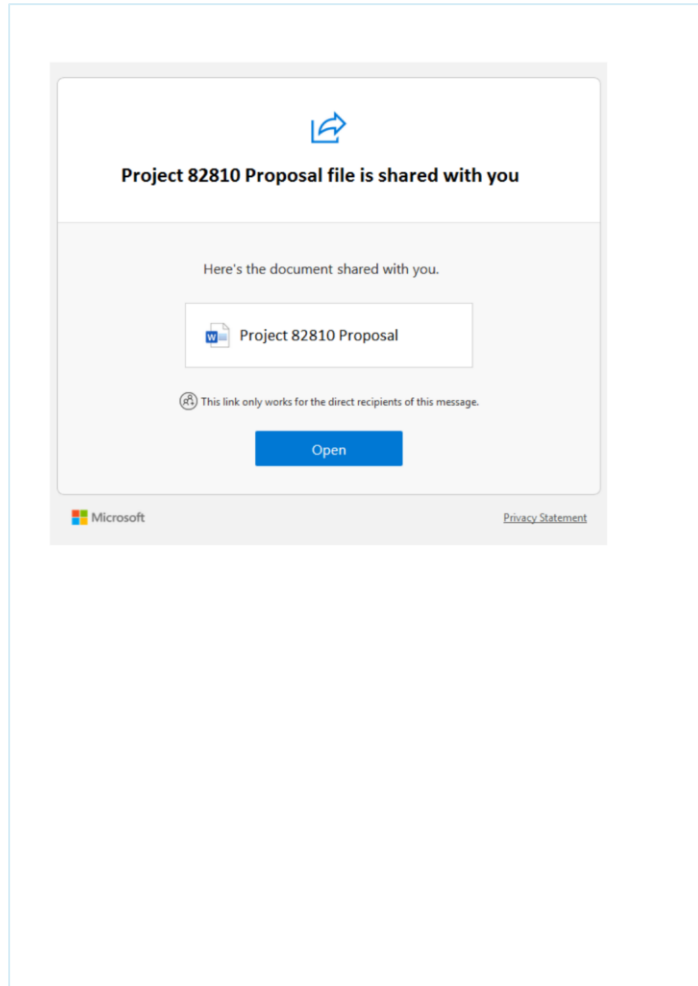
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Use our latest Free Discord Nitro Codes Generator 2021 to get free Discord Nitro for years now. Looking for codes to redeem free Discord Nitro now? Try this new list of brand new Discord Nitro codes in your account!

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UPDATED How To Get Free Discord Nitro Codes Method, working codes for unlimited discord nitro! Generate your free code today with ease with our online generator. [No Survey or Human Verification].

To get Discord Nitro Free Code you need to visit our Discord Nitro code generator, the whole process takes around 5 minutes to complete, after you complete everything Discord free Nitro code will be revealed.

The longest period of discord nitro account you can redeem is 1 year using our exclusive discord nitro codes list! There is another working discord nitro bot that the original discord nitro may not have done enough, that is, the design of the attendants is not close to the culture of the discord nitro server.

TAGS:  
discord nitro generator ,discord nitro generator bot,discord nitro generator online,discord nitro generator and checker ,discord nitro generator no human verification,discord nitro generator github,discord nitro generator download,discord nitro generator v2,discord nitro generator and checker github,discord nitro generator apk,discord nitro generator android,discord nitro generator and checker 2021,discord nitro account generator ,discord nitro/game code generator and checker,discord nitro generator sat,al,discord nitro generator bot github,discord nitro generator buy,discord nitro boost generator ,discord nitro generator bot 2021,discord nitro generator by the name ,discord nitro generator code,discord nitro generator checker ,discord nitro generator cracked,to,discord nitro code generator online,discord nitro code generator bot,discord nitro code generator no human verification,discord nitro code generator 2021,discord nitro code generator github,discord nitro generator discord,discord nitro generator discord server,discord nitro gift generator download,discord nitro code generator download,discord nitro generator x final scenery download,discord destroyer nitro code generator,discord nitro generator 2021 download,discord nitro generator.exe

**Free Among Us Mod Menu Generator [UPDATED] AMONG US HACK FULL GENERATOR Iii IOS android PC by KXcF**

[UPDATED: NEW DATE] (Online Users: 9103)

\*Grovels Among Us Hack Always Imposter 2021 working script + Cheats Codes for all skins unlock IOS android PC, Remingtontanqiao version. Wondering what are the working Among Us hacks in IOS and Android now? Read on for the Among Us hack script list guide! We have classified this Among Us Hack cheat list into four tiers: S5 Tier(Best), S Tier(Good), A Tier(Average to Good), and B Tier(Least Recommended). In each tier, we have assigned Among Us mod in three specific roles; the damage dealers, utility characters with useful abilities and good damage, and the supporters with crowd control skills, healing skills, and buff skills.

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among us hack ios, (phone ,pad unlock everything and always be imposter/mod menu. Among us hacks - how to get free pets and skins in among us with no ads on ios / android. Among Us Hack PC Many Features, Impostor and more. [new] among us hack download | pc and mac os download among us mod menu working [2021]. Among us hack,among us hacked apk,among us hack script,among us hack download,among us hacked version,among us hack always impostor,among us Among Us Hack Script: %Updated% Among Us Hack free skins unlocked pets and hats remove ads Mod apk. This Among Us Hack Android will allow you to access unlimited amounts of both skins and pets Dead Among Us Hack latest version. Among Us mod among us mod menu among us mod menu pc among us mod pc among us mod menu 2021 9.1 among us mod apk all unlocked 2021 among us mod always impostor among us mod apk 9.1 among us mod apk ios among us mod apk happened among us mod apk pc among us mod apk 2021 6.9 among us mod apk map among us mod become impostor among us mod be impostor among us mod by platinmods among us mod costume among us mod can see impostor among us mod cheat always impostor Among Us Hack among us hacks among us hacks android among us hacks ios among us hacks pc among us hacks 2021 among us hackers among us hack always impostor among us hacks mobile among us hack android among us hack always impostor among us hack all skins among us hack ios among us hack apk pc among us hack always impostor pc among us hack apkgame among us hack bluesacks among us hack ban among us hack buy among us hack by rev among us hack by mr luke among us hack be impostor among us hack best among us hack become impostor among us hack client among us hack covid 19 among us hack cheat engine among us hack client pc among us hack covid among us hack cydia among us hack clothes among us hack cheat

**[[CT7-O3]] [[Garena Free Fire Hack]] | FREE DIAMONDS 2021**

UPDATED: June 23, 2021 (Online Users: 10,063)

3 seconds ago. Your Garena Free Fire Hack is now complete and the Diamond will be available in your account. About Free Fire Free Fire - Battlegrounds is a survival, third-person shooter game in the form of battle royale. 50 players parachute onto a remote island, where there is only one winner - the last man standing. Garena Free Fire Hack Cheats - Generate unlimited Diamonds. Welcome to official Garena Free Fire Hack tool lets you Hack unlimited number of Diamonds - All you have to do is connect to your game account and then choose the amount of Diamonds and click on "Hack"

**Click here**

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Garena Free Fire Hack Diamonds Generator

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This is an updated release of free fire hack and it includes the following items:

**\*TVjswoy \* -! Free Homescapes Coins Generator [2021] HOMESCAPES HACK FULL GENERATOR EKB #TVjswoy**

UPDATED: April 7, 2021

HomesCapes Hack, Cheat HomesCapes, Cheat HomesCape, HomesCape Cheat, HomesCape Cheats, HomesCapes Cheats, Cheating HomesCapes, Cheats for HomesCapes, HomesCapes Cheat, Hack HomesCapes

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This is the greatest working Homescapes Hack App that you can use right now to generate unlimited amounts of coins. This is the only way to win this amazing game. The hack has been developed to ensure that you remain at the top of the leader board. No one will ever be as good as you.

This is the only hack that has been updated and is currently the only one that actually works.

**GET INSTANT ACCESS!**

not download anything, the code will appear on our web site, and you will be writing it on a piece of paper, not having any chance fitting viruses, or similar malware and trojans. !150FA



# Cluster Example

