On the Security and Privacy Risks of Browser Extensions

Dr.-Ing. Aurore Fass

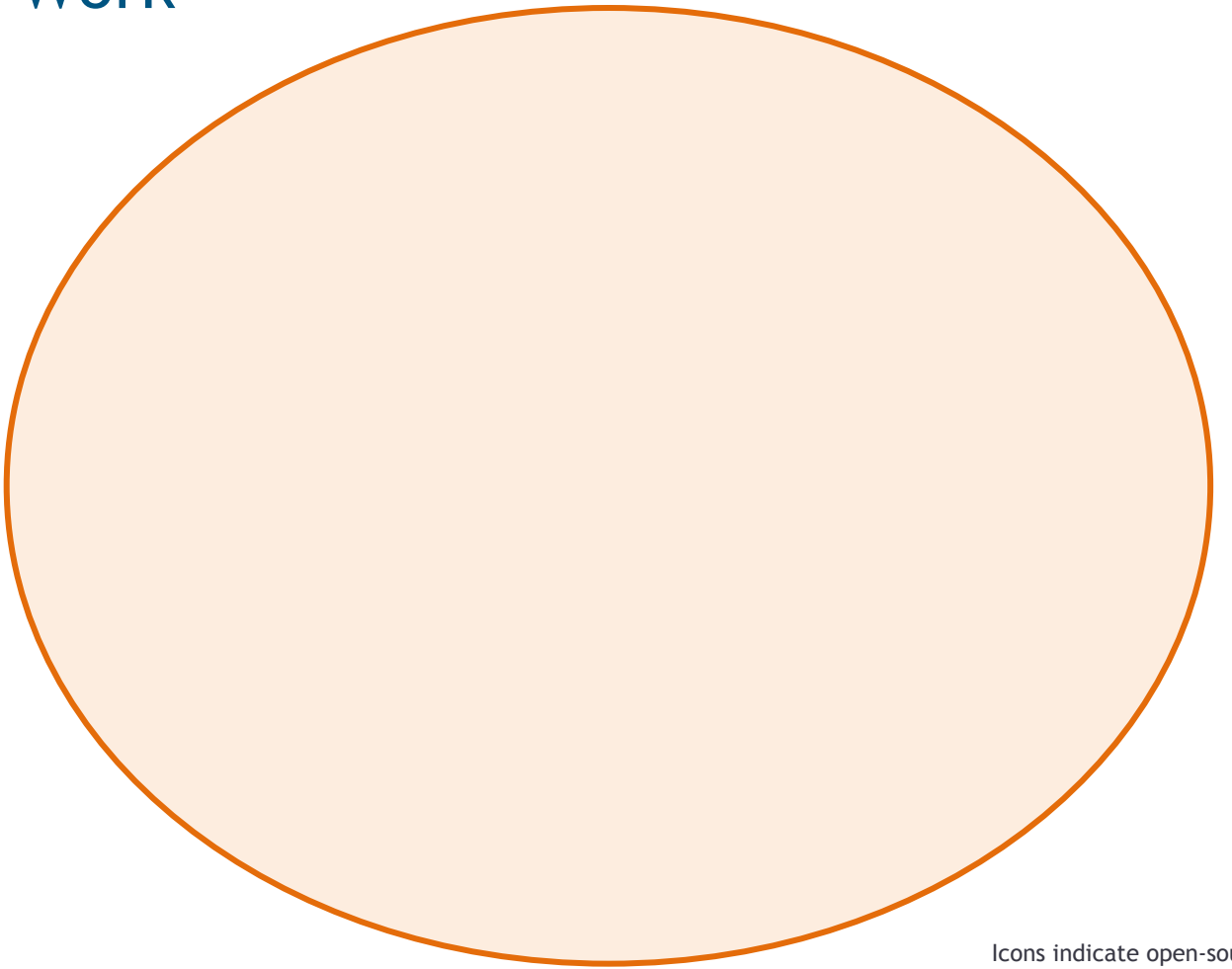
Tenured Researcher — Inria Centre at Université Côte d'Azur (since Dec 1, 2025)

Keynote, GDR RSD / ASF Winter School, January 8th 2026

Dr.-Ing. Aurore (/ɔʀɔʀ/) FASS

- 🇫🇷 2017: Graduated from TELECOM Nancy (**FR**)
- 🇩🇪 2017—21: PhD Student + Postdoc at CISPA (**DE**)
- 🇺🇸 2021—23: Visiting Assistant Professor at Stanford (**US**)
- 🇩🇪 2023—25: Tenure-Track Faculty W2 at CISPA (**DE**)
- 🇫🇷 2025—: Tenured Researcher at Inria (**FR**)

Research Work



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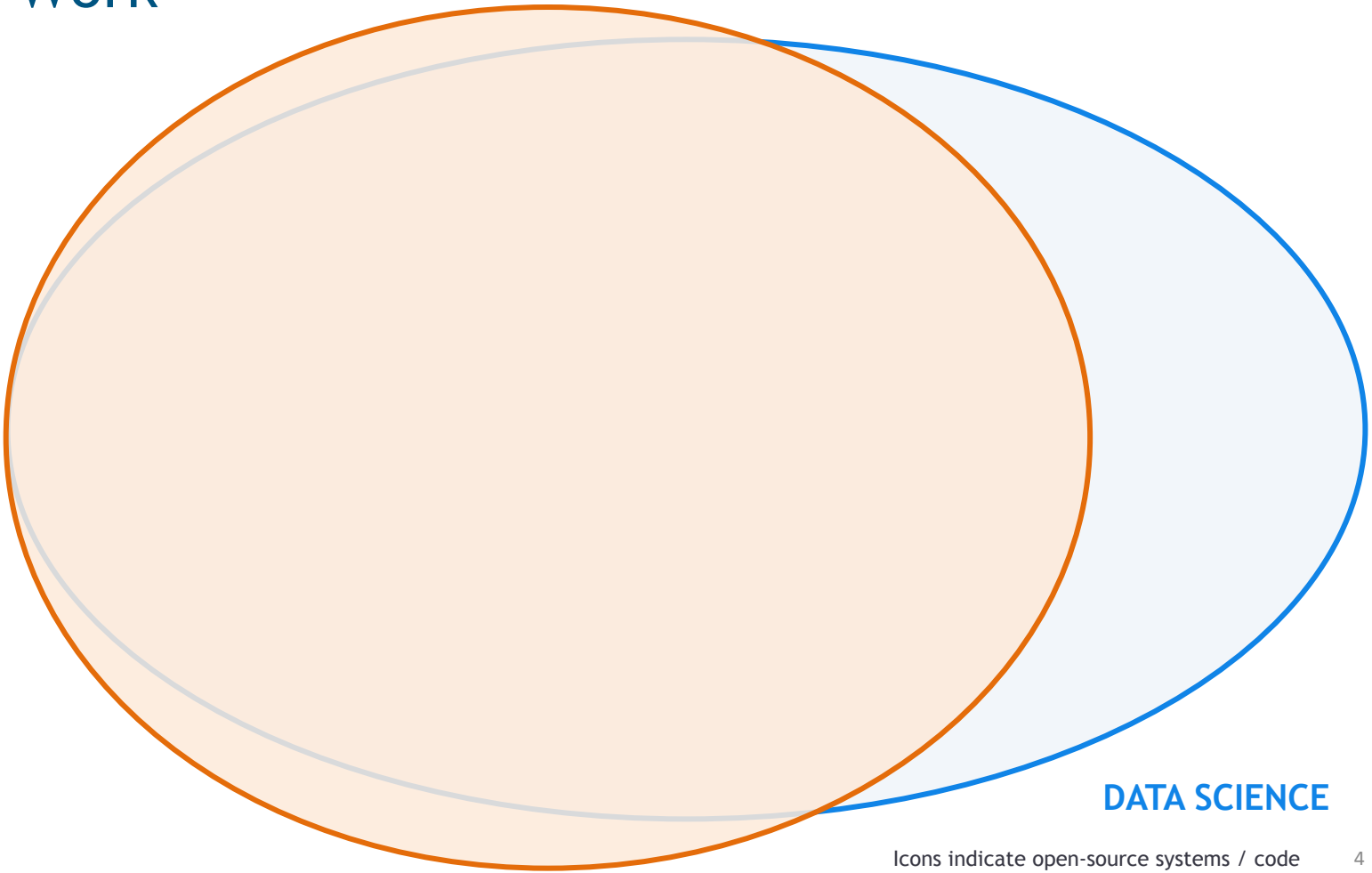
Research Work



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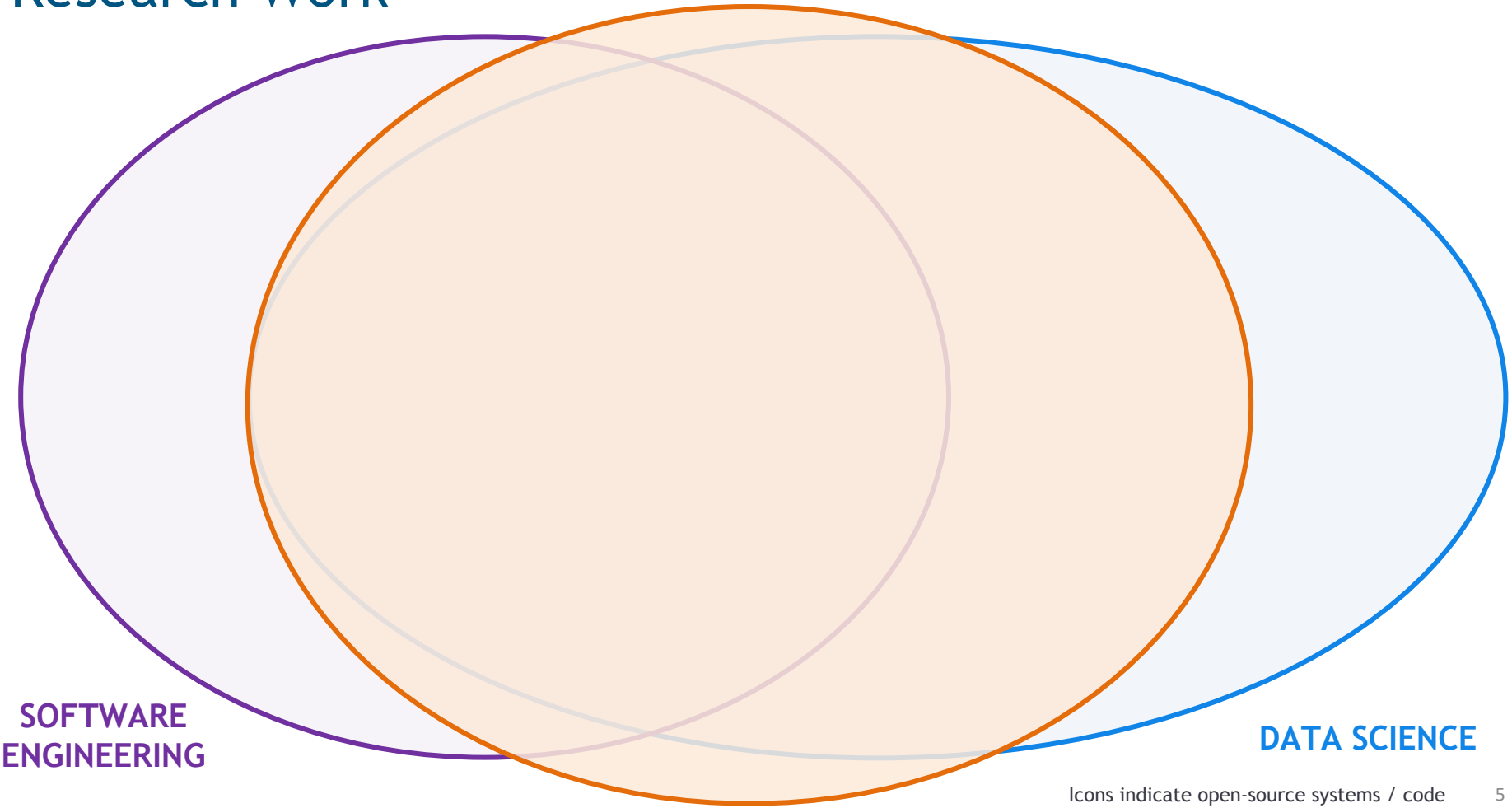

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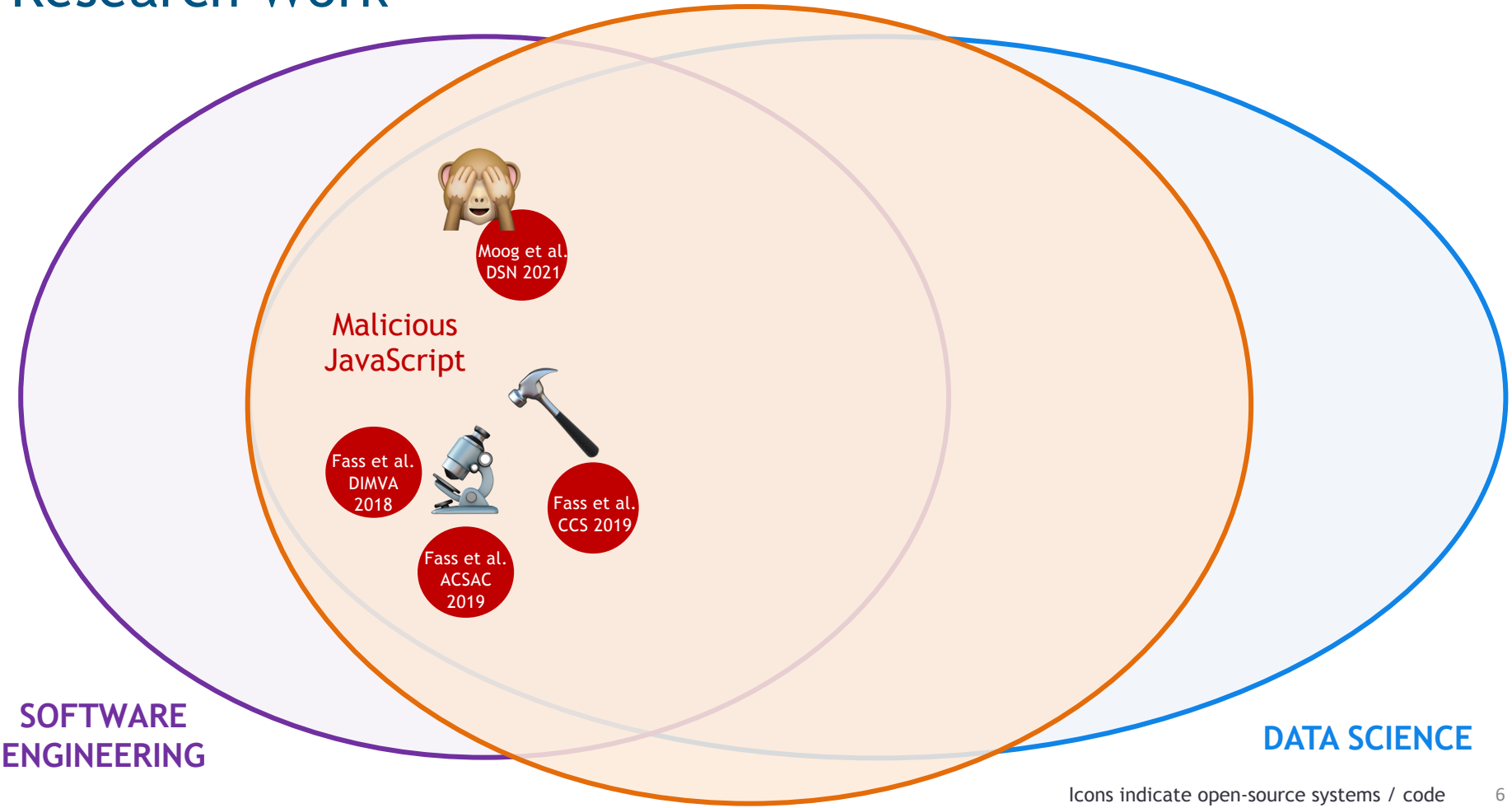

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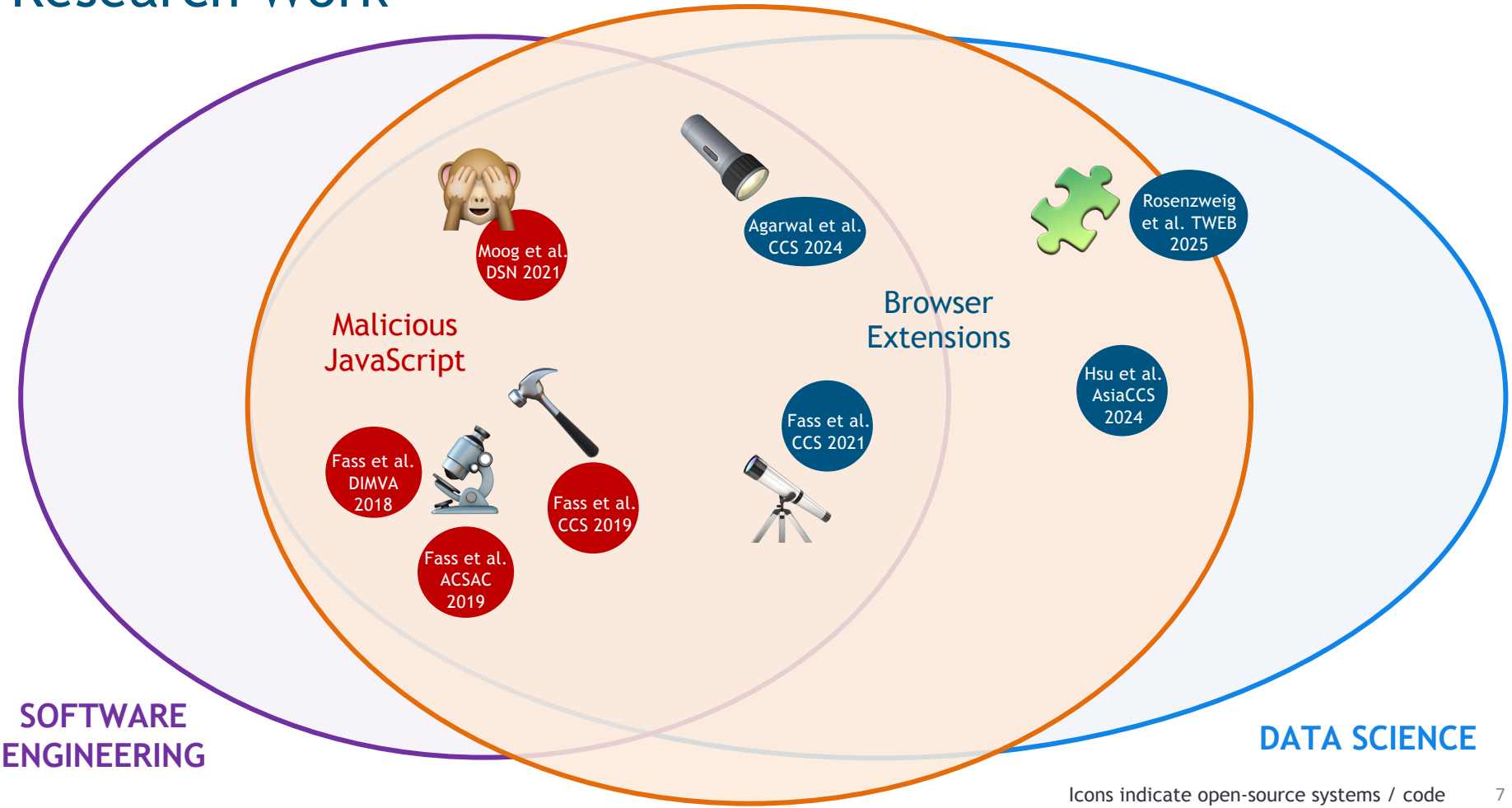

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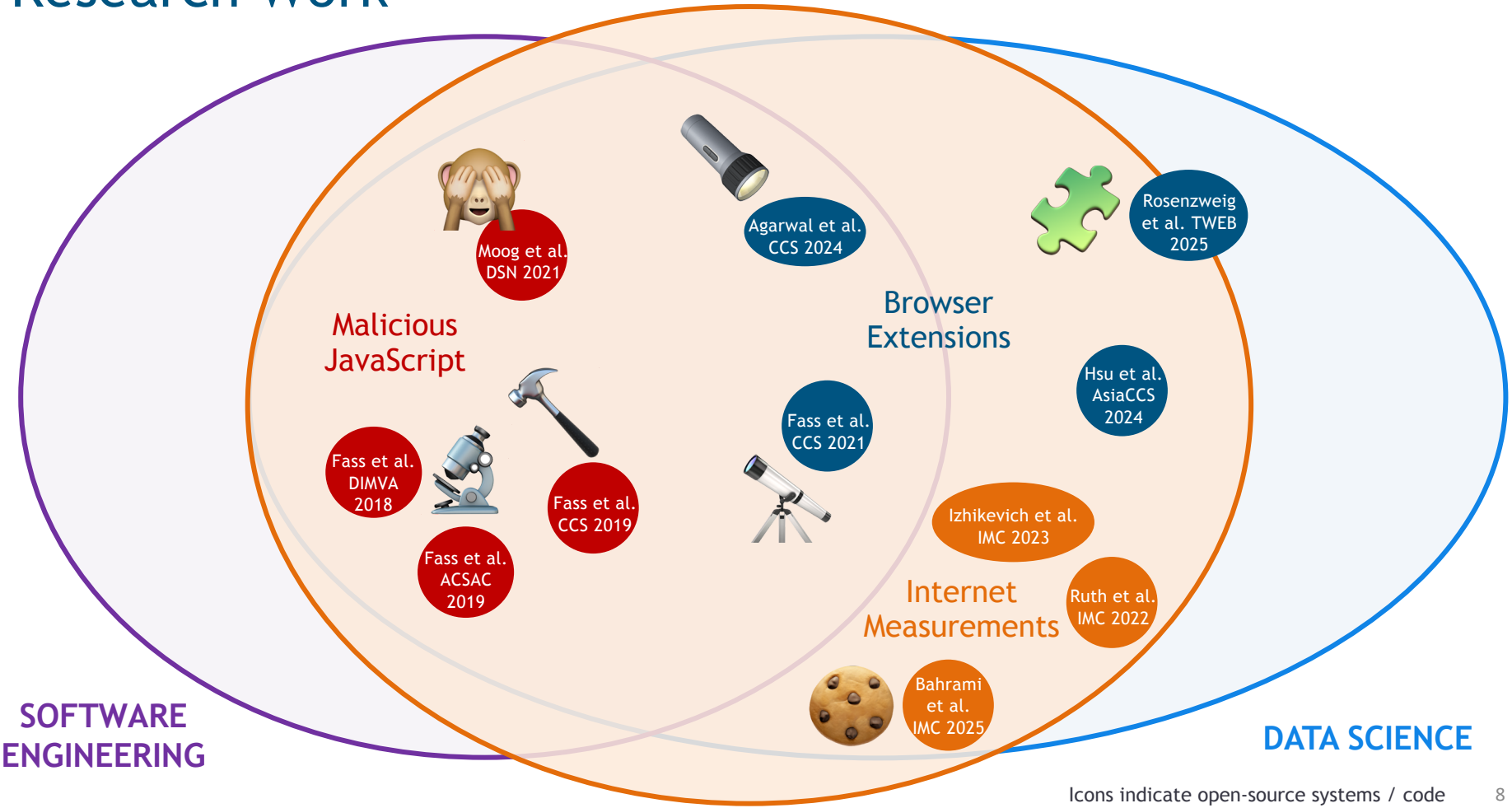

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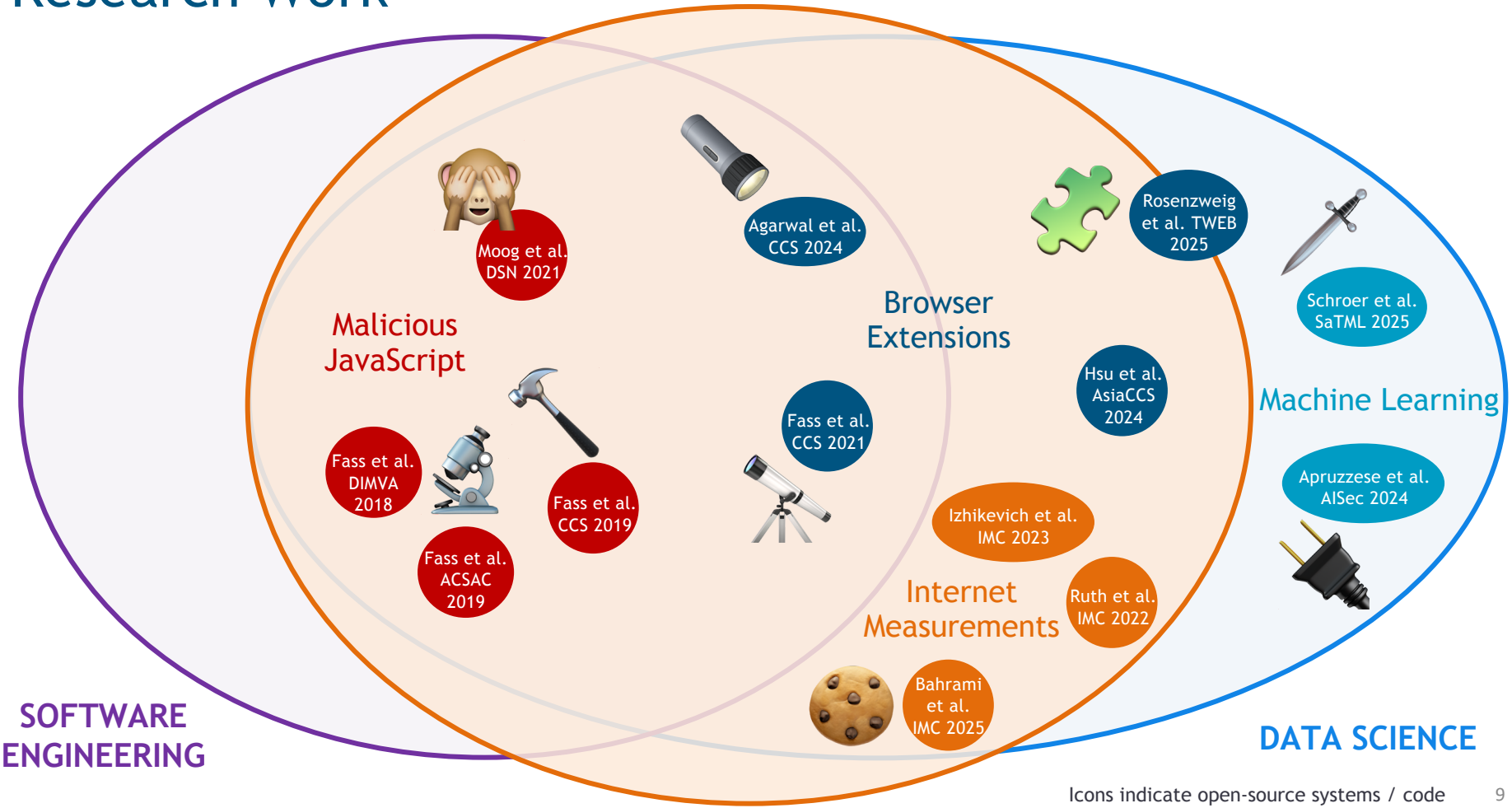

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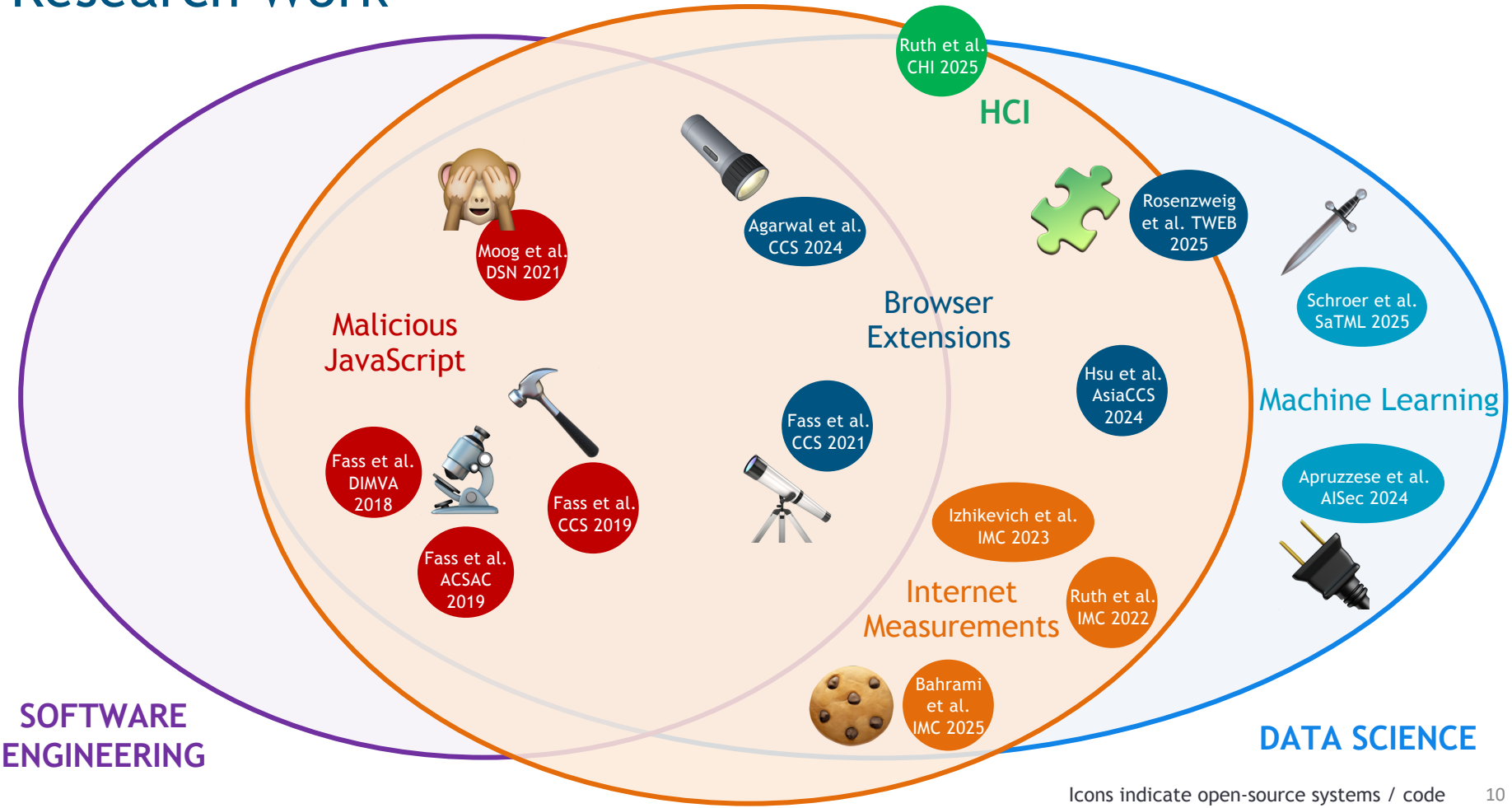

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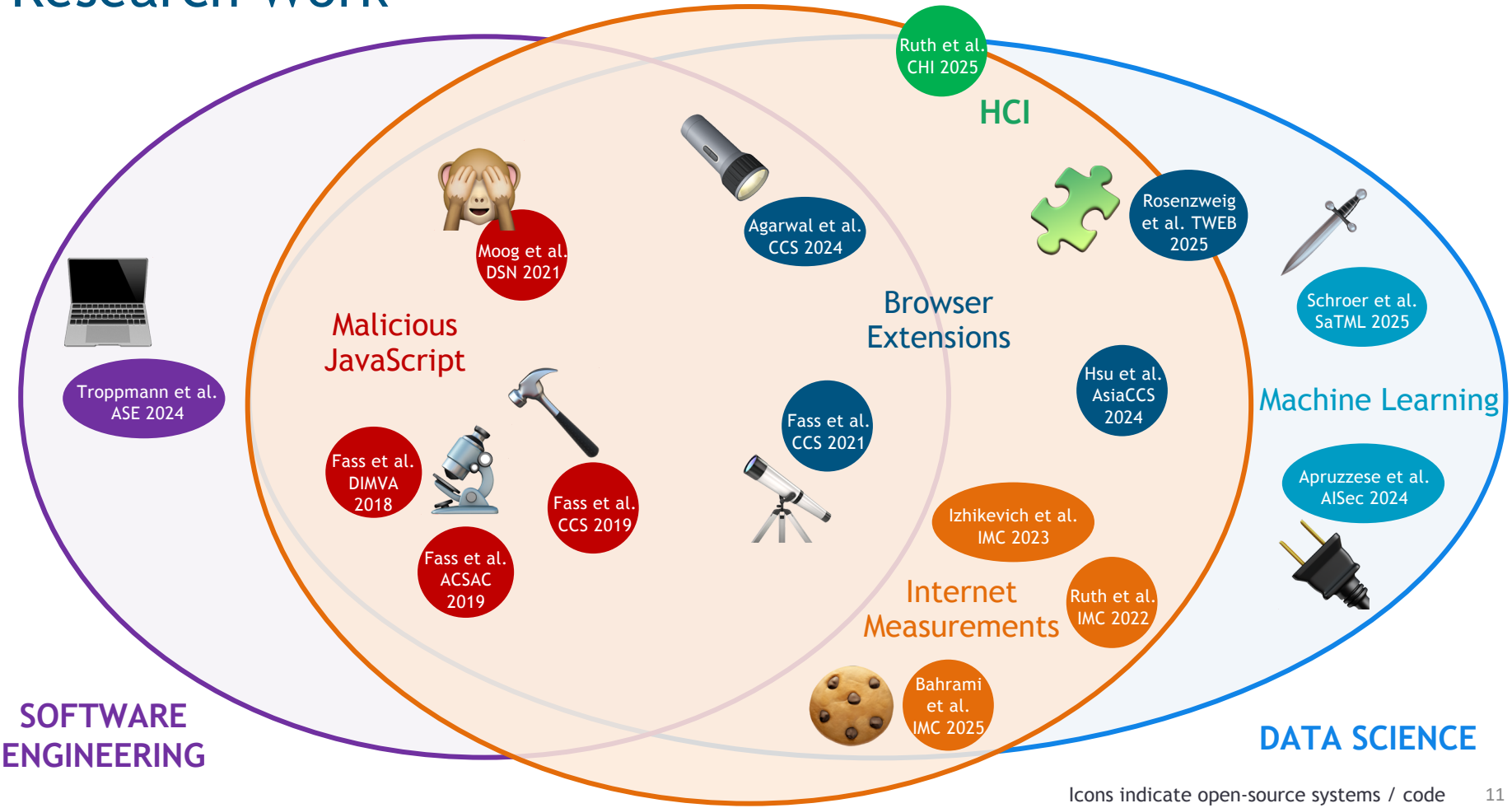

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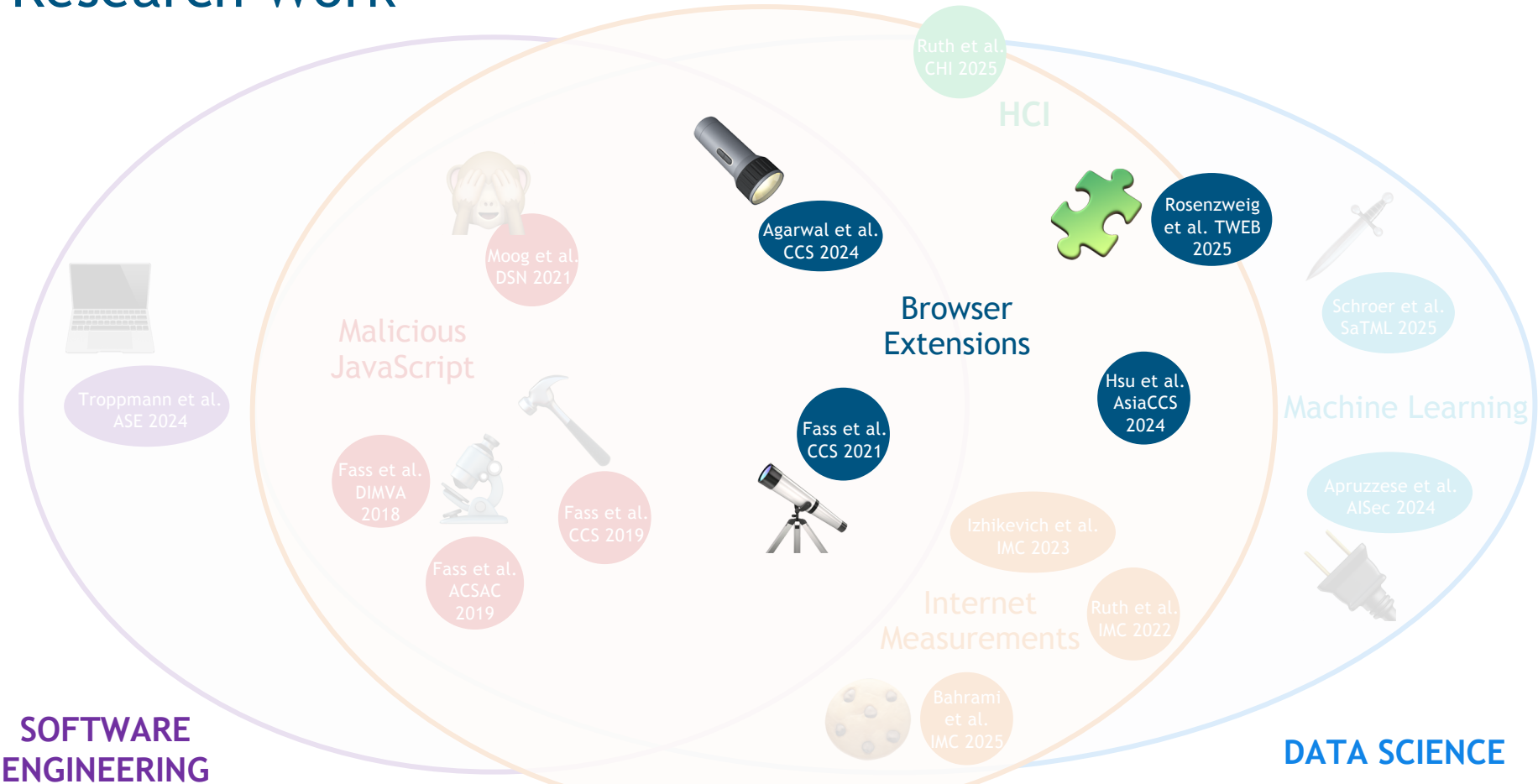

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Outline

- Background: Browser Extensions
- Investigating Security-Noteworthy Extensions (SNE)
- Detecting Vulnerable Extensions
  - Threat model and automated tool (DOUBLEX)
  - Case studies, results, and potential defense strategies
- Detecting Malicious Extensions
  - Lab setting vs. real world
- Detecting Fingerprintable Extensions
  - Presentation of 3 fingerprinting vectors, results, and potential mitigations

Hsu et al. AsiaCCS 2024

Fass et al. CCS 2021

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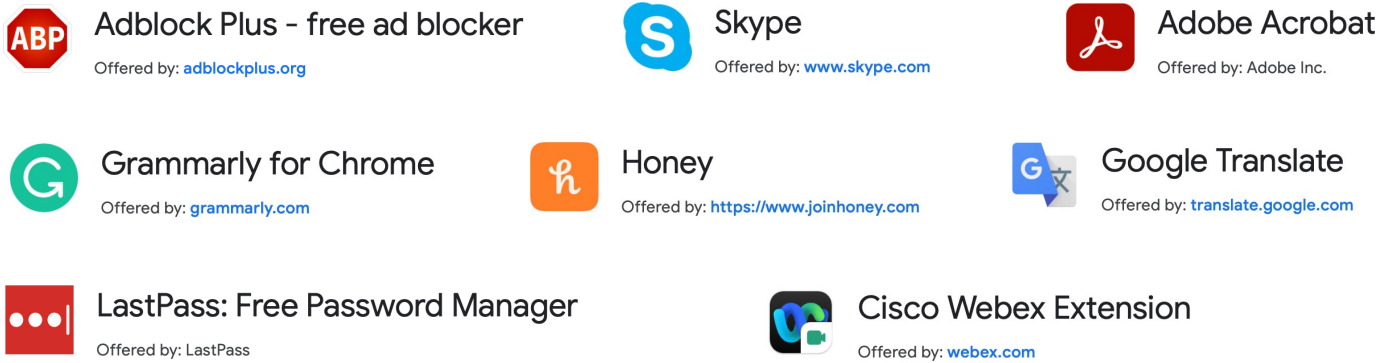
What are Browser Extensions?

- Third-party programs to **improve user browsing experience**



- **~200k** Chrome extensions totaling almost **2B** active users
  - ➢ Necessitates a thorough **security and privacy assessment**

Background — `manifest.json`

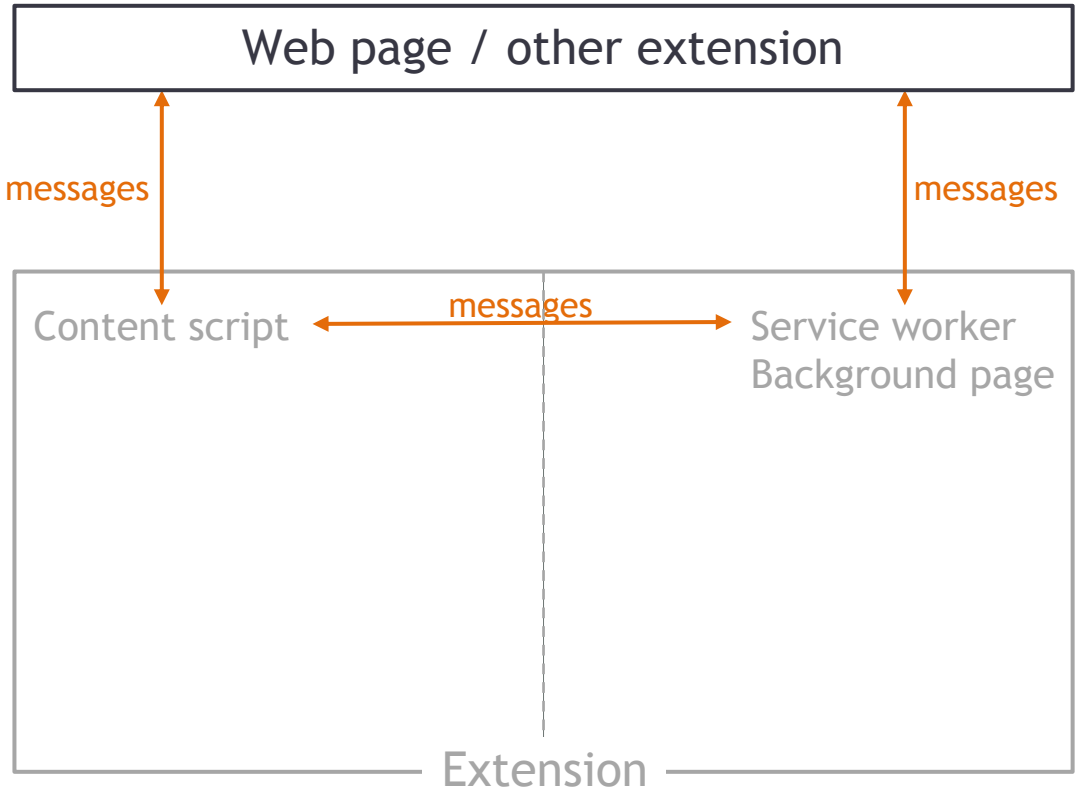
- Every extension needs a manifest written in JSON, called `manifest.json`, which gives essential information, e.g.,
  - Extension's name, version, and manifest's version
  - Main components of an extension (CS, BP/SW, …)
  - Permissions of an extension (`downloads`, `history`, …)
  - …

https://developer.chrome.com/docs/extensions/reference/manifest

Background — Extension Architecture

- Service worker (SW in MV3) / Background page (BP in old MV2):
  - Core logic of an extension
  - Executed independently of the lifetime of a tab / window
  - Privileged part of an extension
- Content scripts (CS):
  - Injected by an extension into (a) web page(s)
  - Can use standard DOM APIs to read / modify a web page
  - Similar to scripts directly loaded by a web page + some more privileges
  - Restricted access to extension APIs

Background — Extension Architecture & Messages



Background — Authorized APIs & Permissions

- Extensions only have access to:
  - APIs explicitly declared in the `manifest.json`, e.g.,
    - `storage` - store/access data from the *extension storage*
    - `downloads` - download files
    - `history` - access to a user's browsing history
    - `bookmarks`, `cookies`, `topSites`, …
  - `host` declared in the `manifest.json` = web pages an extension can access (read/write), e.g., to do some *cross-origin* requests

- https://developer.chrome.com/docs/extensions/mv3/declare_permissions/

- https://developer.mozilla.org/en-US/docs/Mozilla/Add-ons/WebExtensions/manifest.json/permissions

Background – manifest.json -- example

```
{
  "name": "My Extension",
  "version": "versionString",
  "description": "A plain text description",
  "manifest_version": 3
  "permissions": ["downloads", "history"],
  "host_permissions": ["https://example.com/*"],
  "background": {
    "service_worker": ["service_worker.js"],
  },
  "content_scripts": [{
    "matches": ["<all_urls>"],
    "js": ["content_script.js"]
  }],


}
```

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How Secure are Browser Extensions?

- Browser extensions provide additional functionality…
- … so browser extensions need additional & elevated privileges compared to web pages
  - e.g., ad-blockers need to modify web page content or intercept network requests
  - e.g., extensions can download arbitrary files and access cross-domain data; while web pages cannot (blocked by the Same-Origin Policy)

➢ Browser extensions are an attractive target for attackers 😈

Dangerous Browser Extensions

→ Extensions can put their users' security & privacy at risk:

- **Contain malware**: designed by malicious actors to harm victims
  - E.g., propagate malware, steal users' credentials, track users [1, 3]
- **Contain vulnerabilities**: designed by well-intentioned developers… but buggy
  - E.g., can lead to user-sensitive data exfiltration [1, 2]
- **Violate the Chrome Web Store policies**
  - E.g., deceive users, promote unlawful activities, lack a privacy policy [1]
- **Be fingerprintable**: can be recognized and uniquely identified
  - E.g., can lead to user tracking or inferring of user personal information [4]

[1] Hsu, Tran, and Fass; *AsiaCCS* 2024 | [2] Fass, Somé, Backes, and Stock; *CCS* 2021 | [3] Rosenzweig, Dalla Valle, Apruzzese, and Fass; *TWEB* 2025 | [4] Agarwal, Fass, and Stock; *CCS* 2024

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➢ **Security-Noteworthy Extensions (SNE)** [1]

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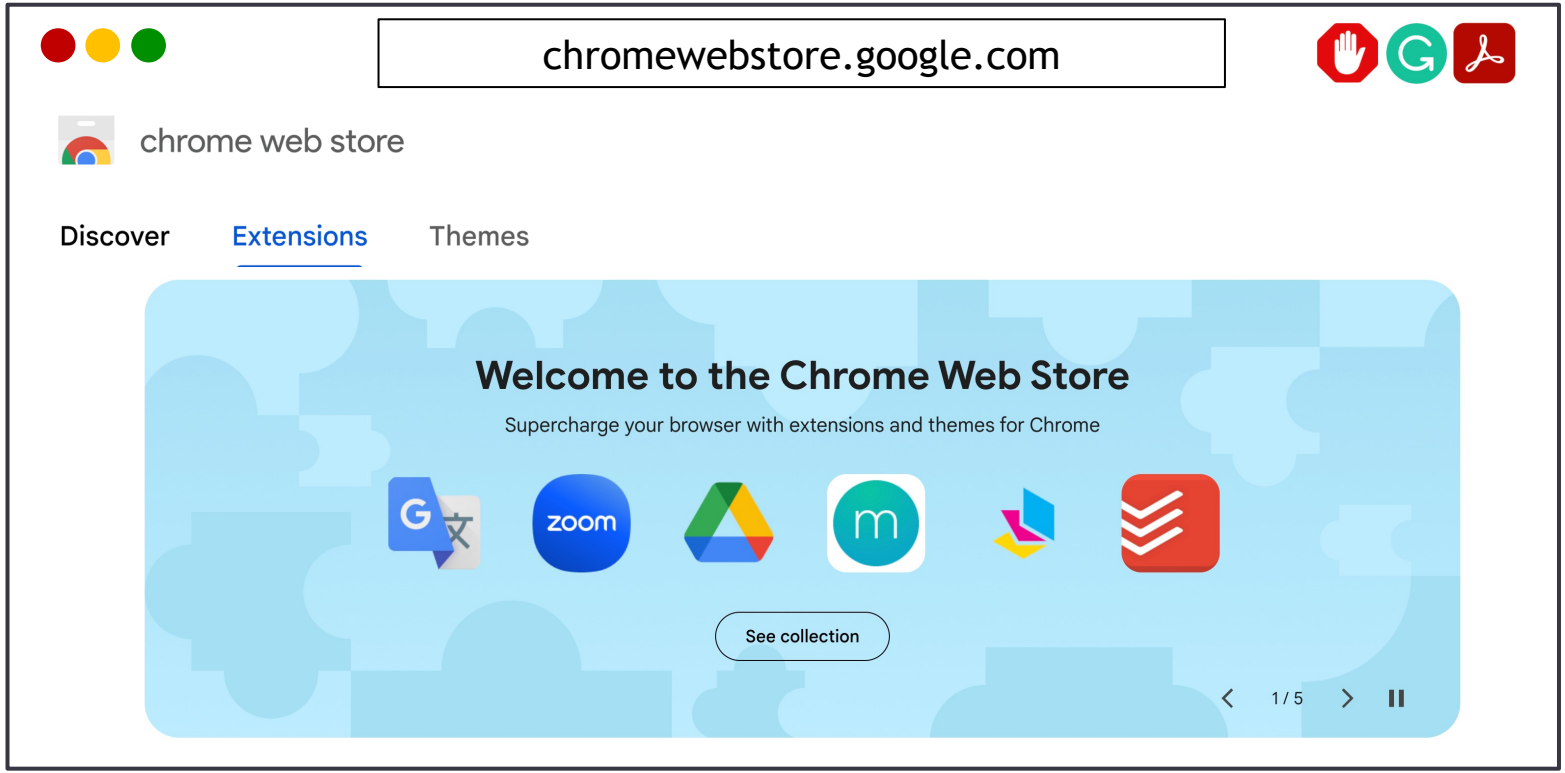
How are Security-Noteworthy Extensions (SNE) Installed?



[1] Hsu, Tran, and Fass; *AsiaCCS* 2024

How are Security-Noteworthy Extensions (SNE) Installed?

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Main Findings on the Chrome Web Store

- **350M users** installed **Security-Noteworthy Extensions** in just 3 years
- These **dangerous extensions** stay in the Chrome Web Store ***for years***
- **60%** of extensions have **never received a single update**


What is in the Chrome Web Store?

Sheryl Hsu
Stanford University

Manda Tran
Stanford University

Aurore Fass
Stanford University, CISPA Helmholtz Center for Information Security

> What is in the Chrome Web Store?

In *ACM AsiaCCS* 2024. Sheryl Hsu, Manda Tran, and Aurore Fass

Hsu et al. AsiaCCS 2024

[1] Hsu, Tran, and Fass; *AsiaCCS* 2024

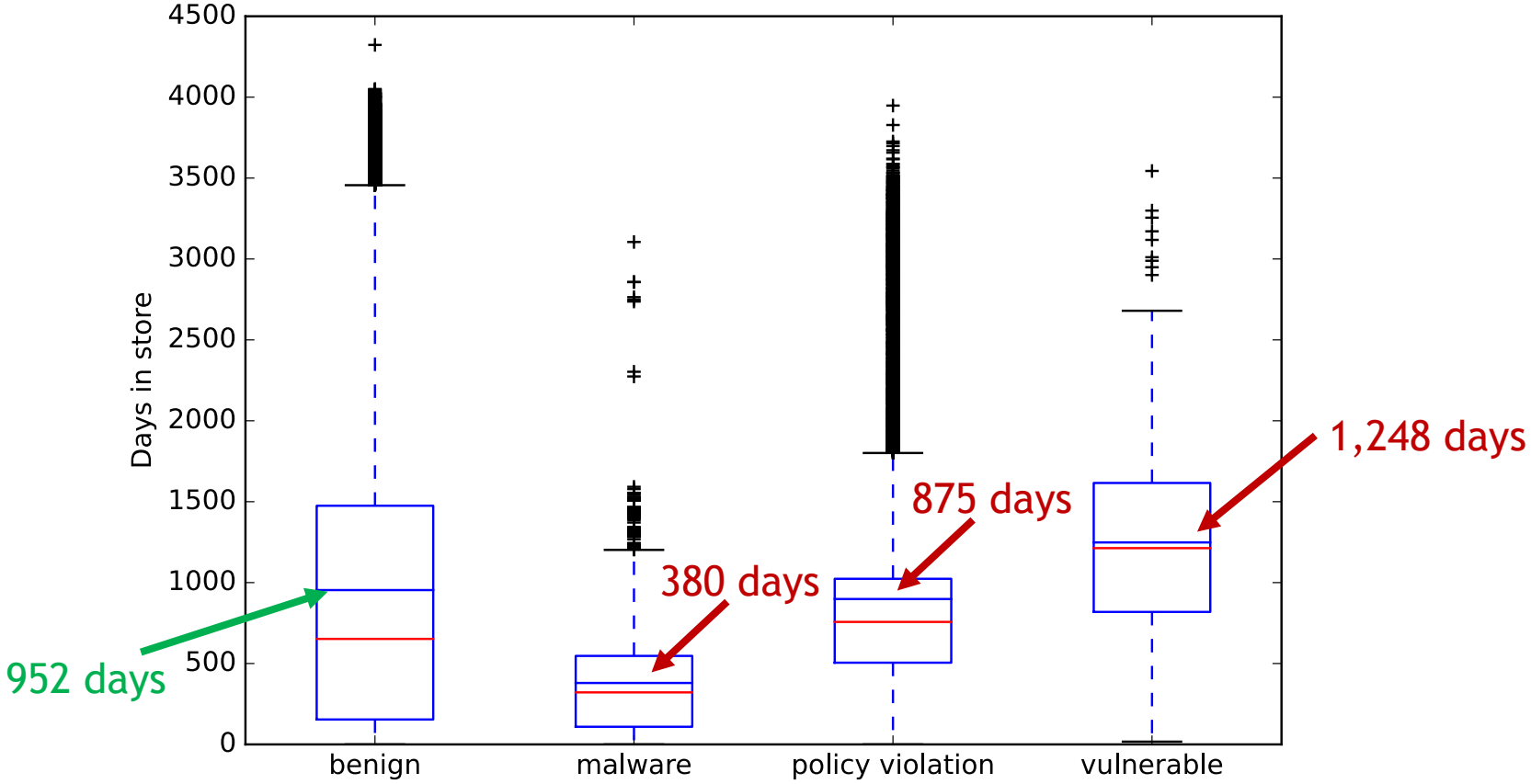
Browser Extension Collection: Chrome-Stats

Category	#Extensions Metadata collected	#Extensions Code collected	When collected
SNE	26,014	16,377	Before May 1, 2023
- Malware-containing	10,426	6,587	Before May 1, 2023
- Policy-violating	15,404	9,638	Before May 1, 2023
- Vulnerable [2]	184	152	March 16, 2021
Benign extensions	226,762	92,482	Before May 1, 2023

[1] Hsu, Tran, and Fass; *AsiaCCS* 2024

[2] Fass et al.; *CCS* 2021

Number of Days in the CWS



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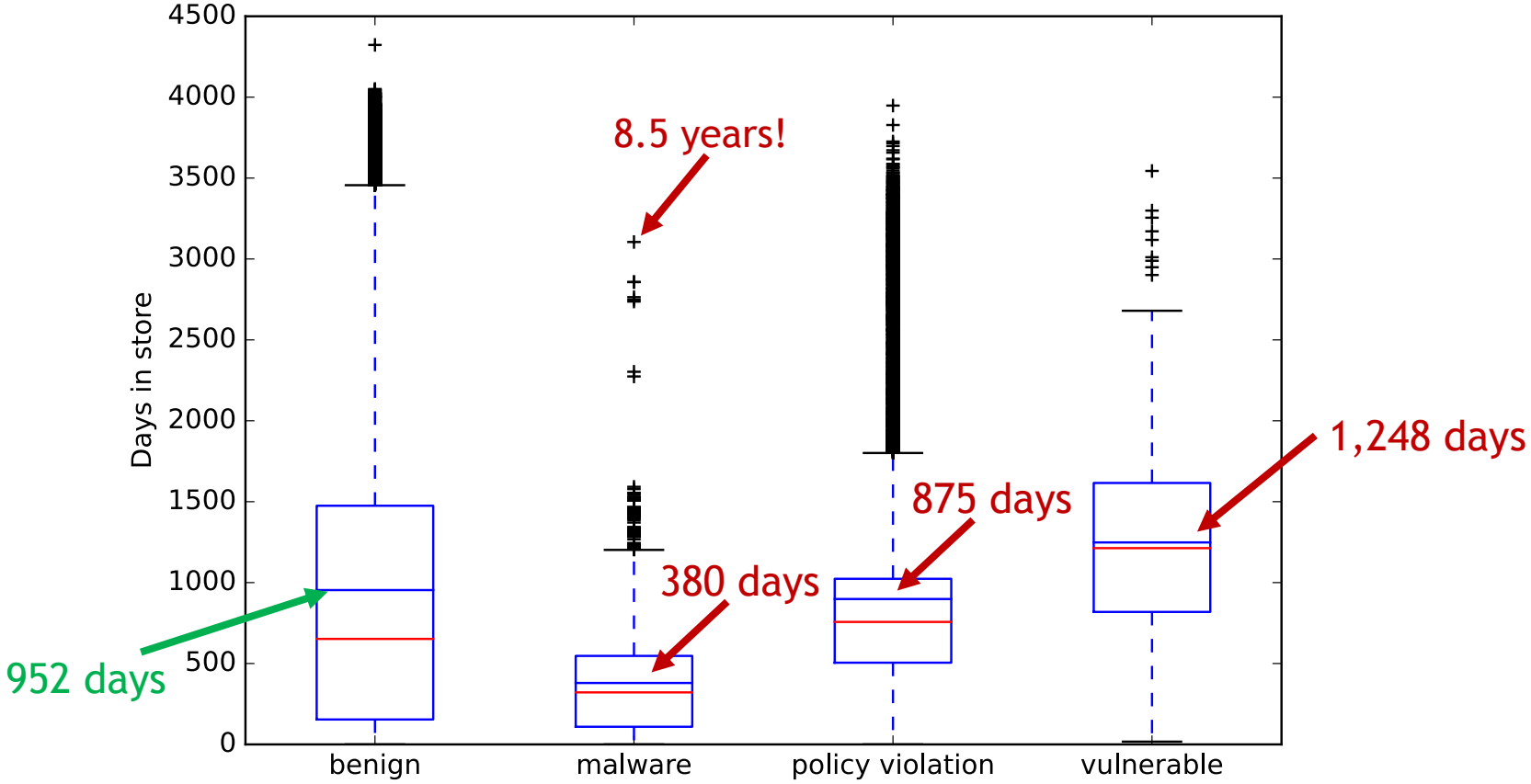

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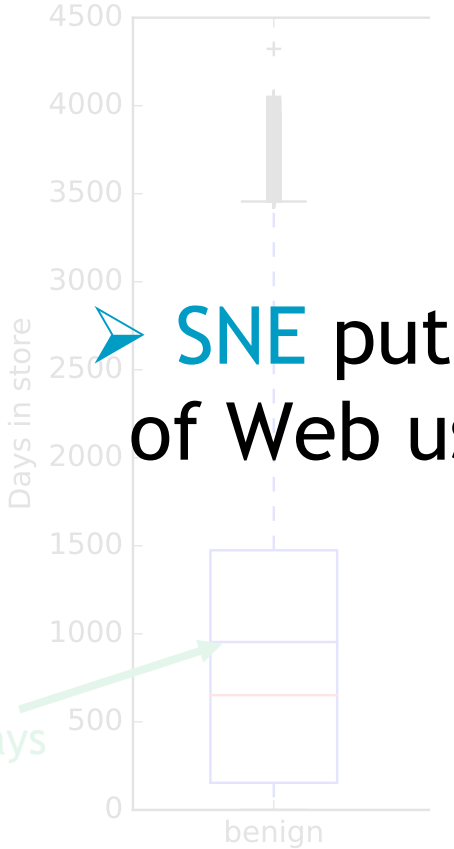
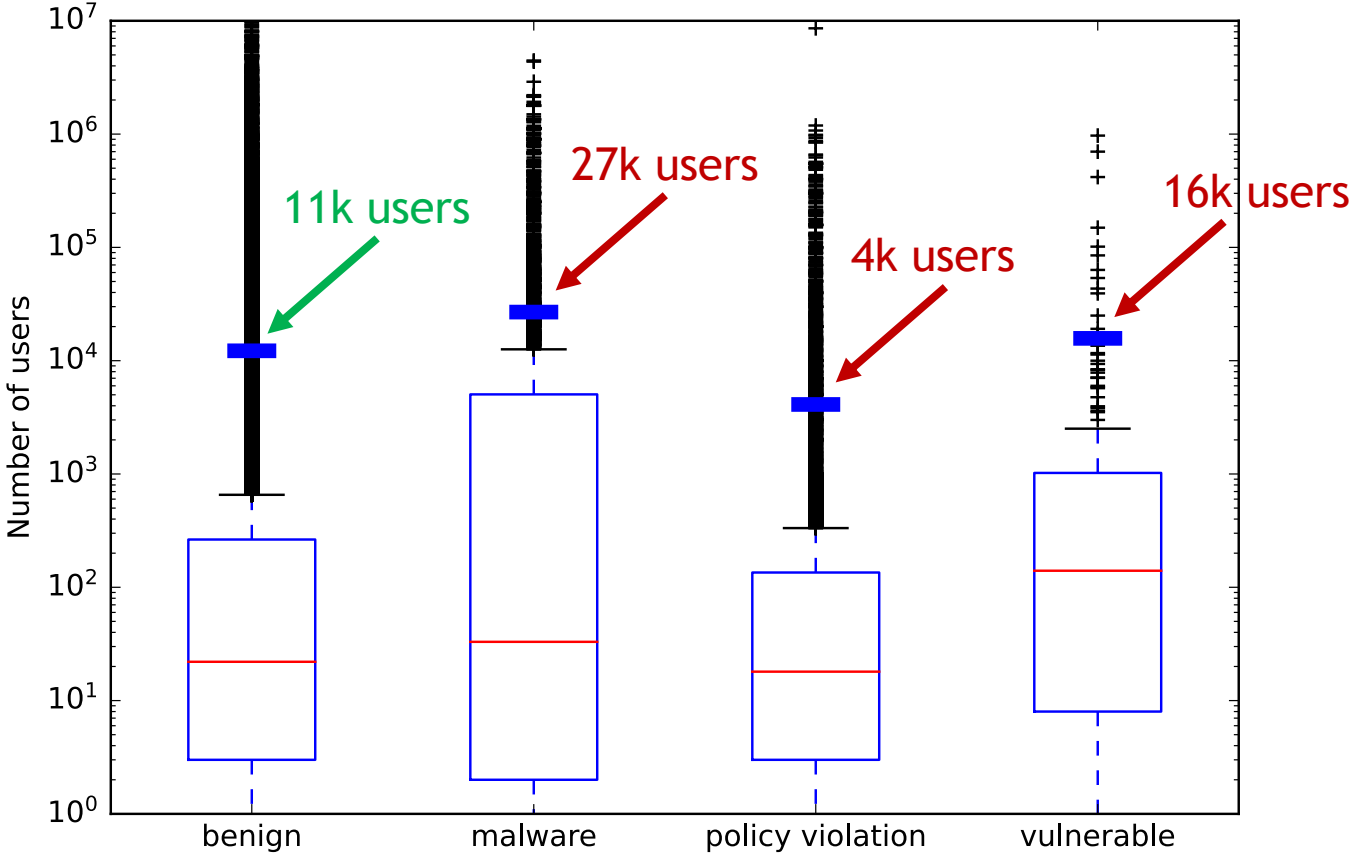


- SNE put the security & privacy of Web users **at risk *for years***

[1] Hsu, Tran, and Fass; *AsiaCCS* 2024

Number of Users



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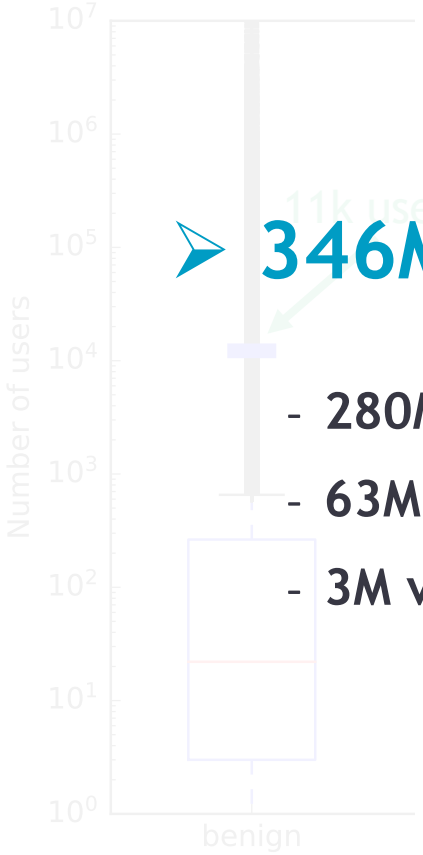

- **346M users installed SNE**
  (in the last 3 years):
  - **280M malware-containing**
  - **63M policy-violating**
  - **3M vulnerable extensions**

[1] Hsu, Tran, and Fass; *AsiaCCS* 2024

Media Coverage

Forbes

FORBES > INNOVATION > CYBERSECURITY

280 Million Google Chrome Users Installed Dangerous Extensions, Study Says

Davey Winder Senior Contributor

Davey Winder is a veteran cybersecurity writer, hacker and analyst.

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Jun 24, 2024, 06:57am EDT

How safe are Google Chrome extensions? SOPA IMAGES/LIGHTROCKET VIA GETTY IMAGES

The Register

Risk of installing dodgy extensions from Chrome store way worse than Google's letting on, study suggests

All depends on how you count it – Chocolate Factory claims 1% fail rate

Thomas Claburn

Sun 23 Jun 2024 // 10:36 UTC

ADGUARD

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Google is failing miserably at weeding out bad extensions, new research indicates

July 5, 2024 · 7 min read

TECHSPOT

TRENDING FEATURES REVIEWS THE BEST DOWNLOADS PRODUCT FINDER FORUMS

SECURITY THE WEB MALWARE CHROME

Researchers say 280 million people have installed malware-infected Chrome extensions in the last 3 years

Google claims less than 1% of all installs include malware

By Rob Thubron June 24, 2024 at 11:39 AM

[1] Hsu, Tran, and Fass; *AsiaCCS* 2024

Media Coverage

This review process weeds out the overwhelming majority of bad extensions before they even get published. In 2024, less than 1% of all installs from the Chrome Web Store were found to include malware. We're proud of this record and yet some bad extensions still get through, which is why we also monitor published extensions.

https://security.googleblog.com/2024/06/staying-safe-with-chrome-extensions.html

[1] Hsu, Tran, and Fass; *AsiaCCS* 2024

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Analysis of Vulnerable Extensions: Threat Model

Challenging to detect due to their inherently benign intent (*benign-but-buggy*)

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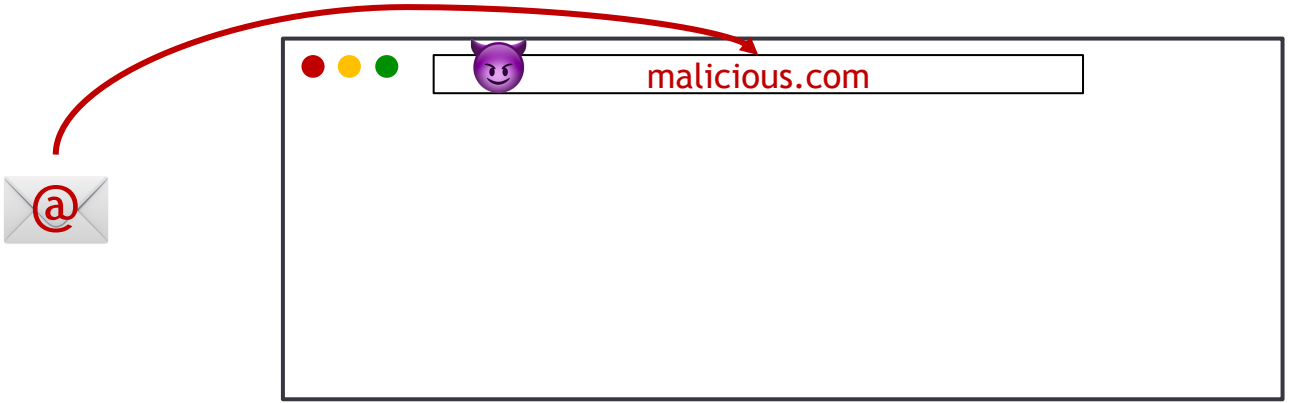

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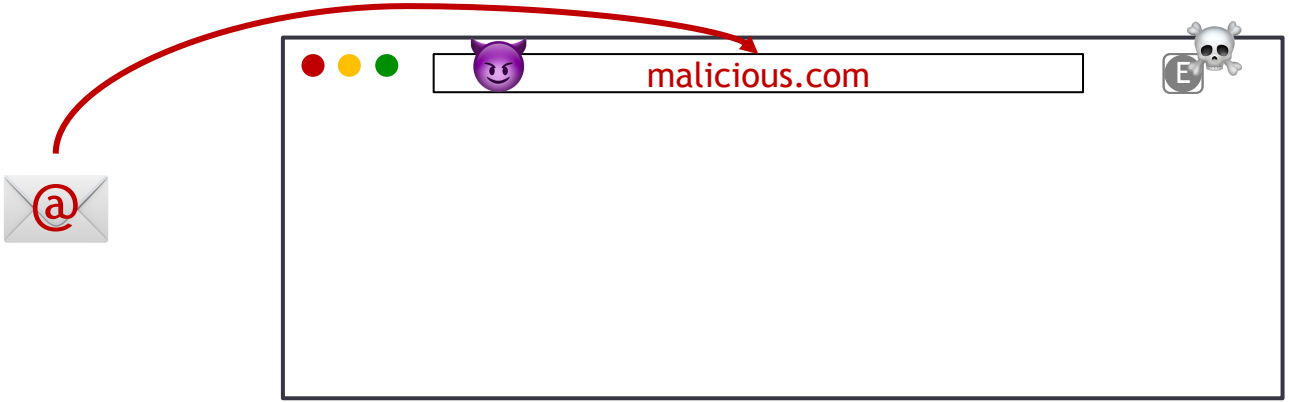

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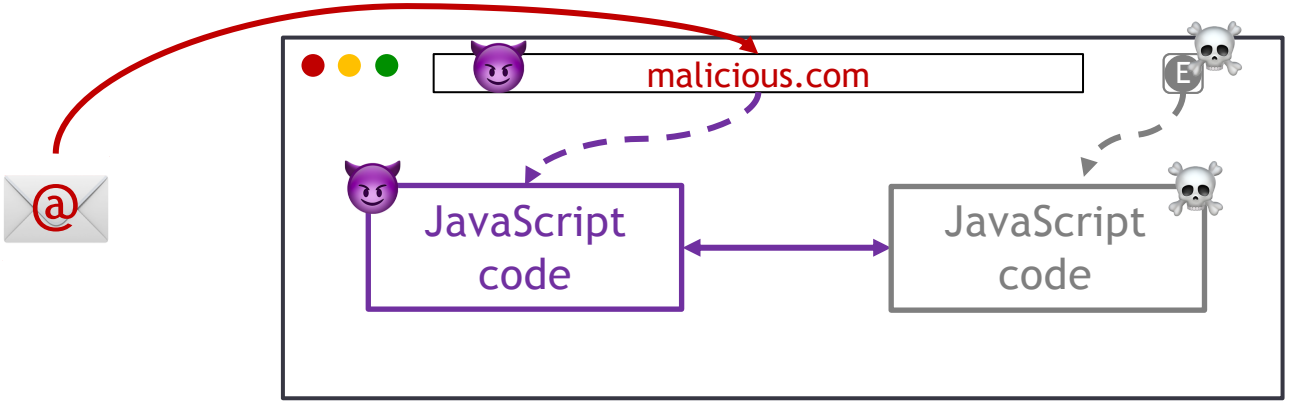

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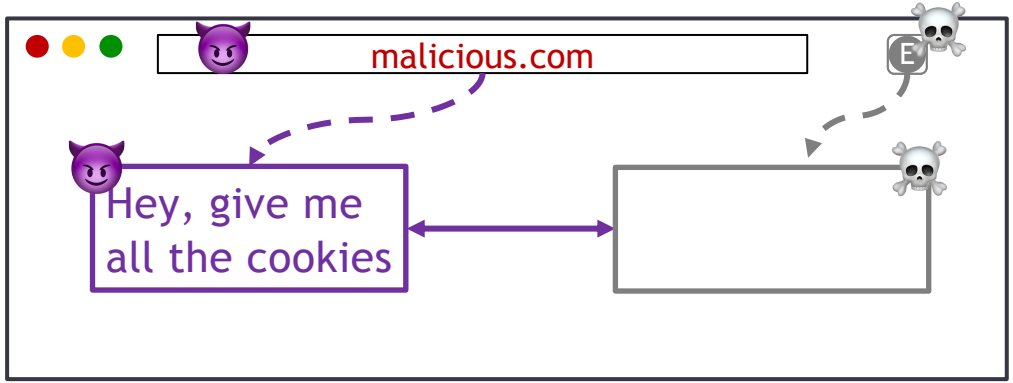

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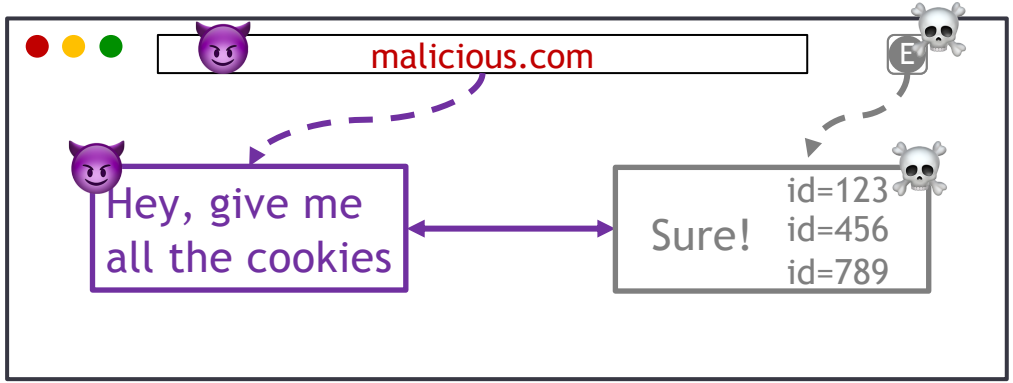

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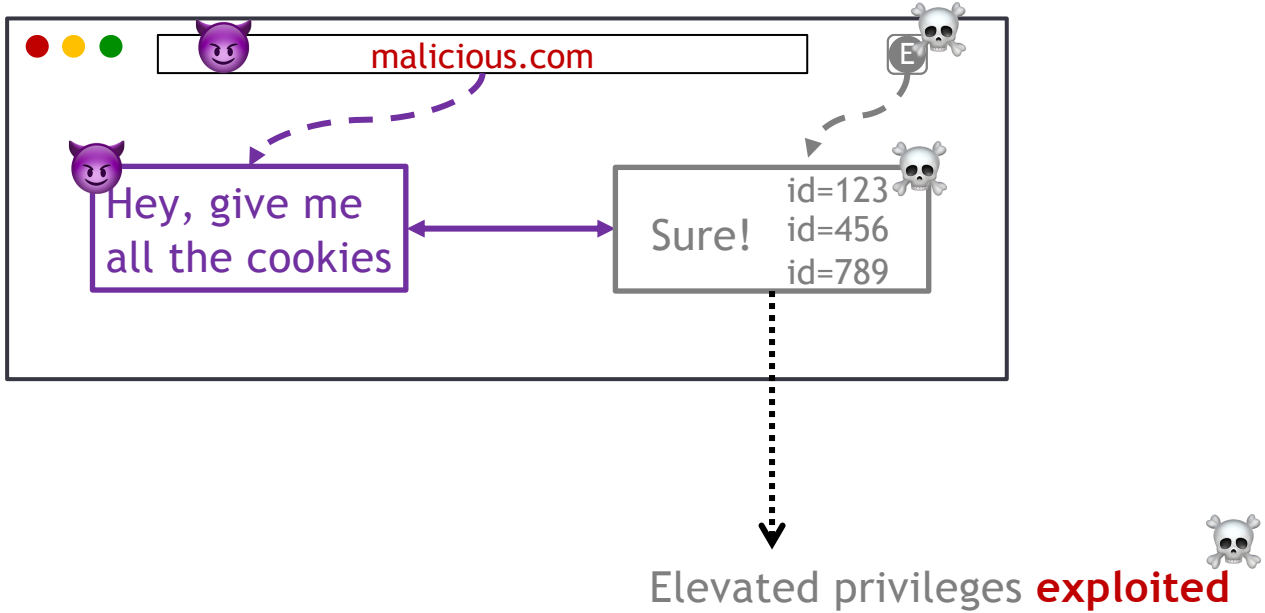

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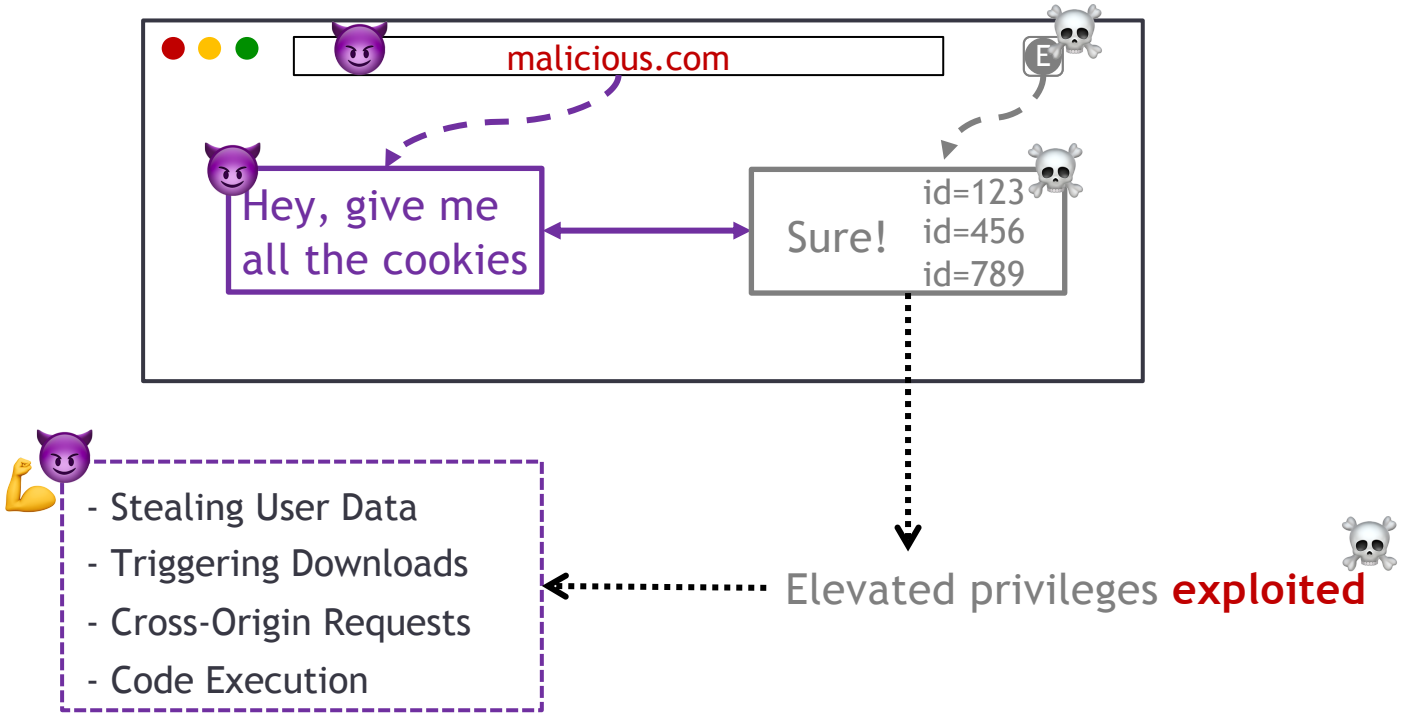

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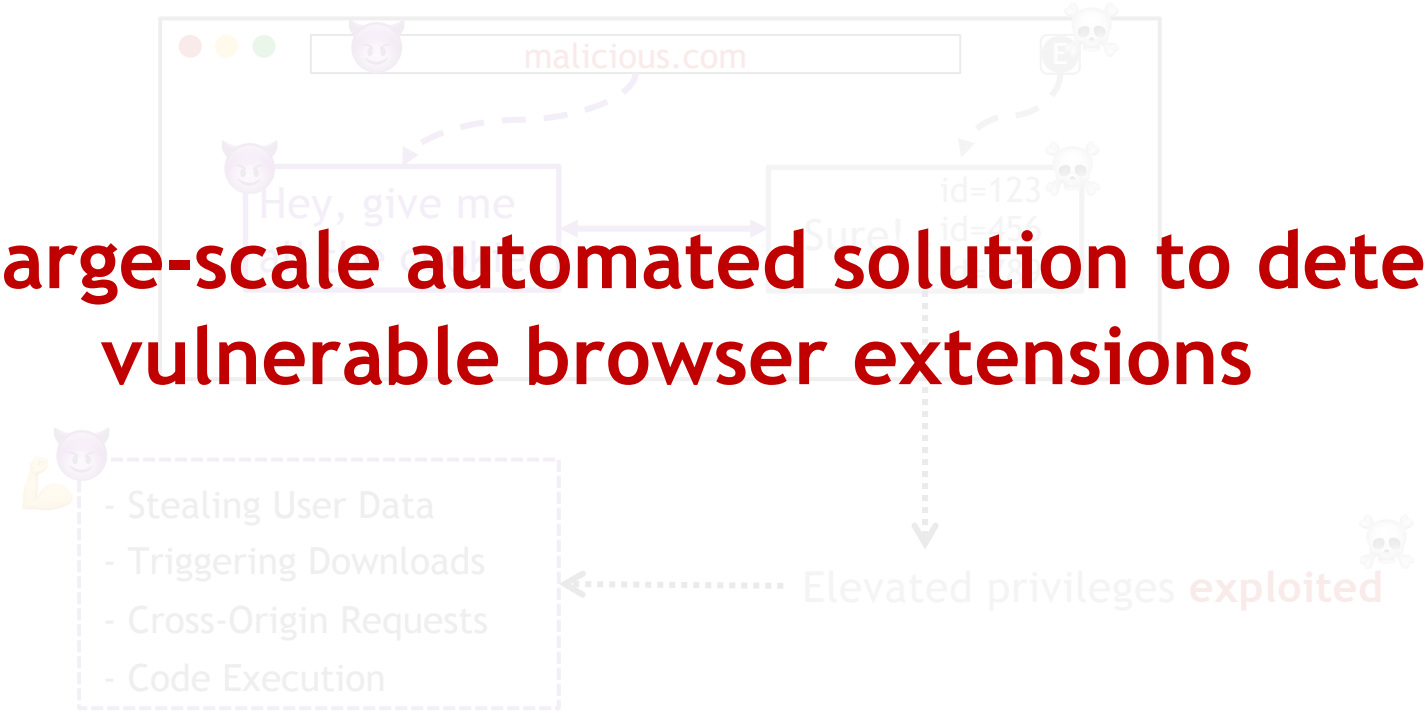

No large-scale automated solution to detect vulnerable browser extensions

[2] Fass et al.; *CCS* 2021

Detecting Vulnerable Extensions

Fass et al.
CCS 2021


DOUBLEX: Statically Detecting Vulnerable Data Flows
in Browser Extensions at Scale
Aurore Fass, Dolière Francis Somé, Michael Backes, and Ben Stock
CISPA Helmholtz Center for Information Security

> DOUBLEX: Statically Detecting Vulnerable Data Flows in Browser Extensions

In *ACM CCS* 2021. Aurore Fass, Dolière Francis Somé, Michael Backes, and Ben Stock

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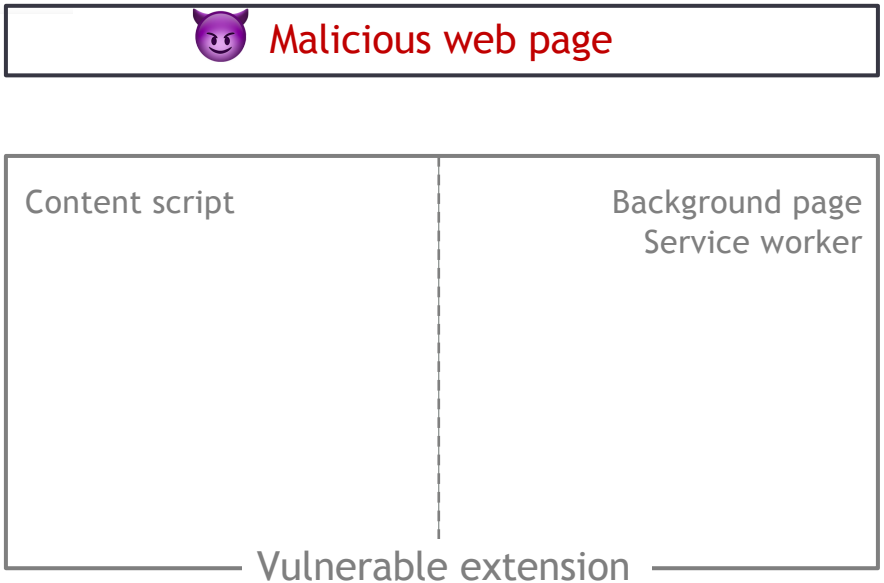

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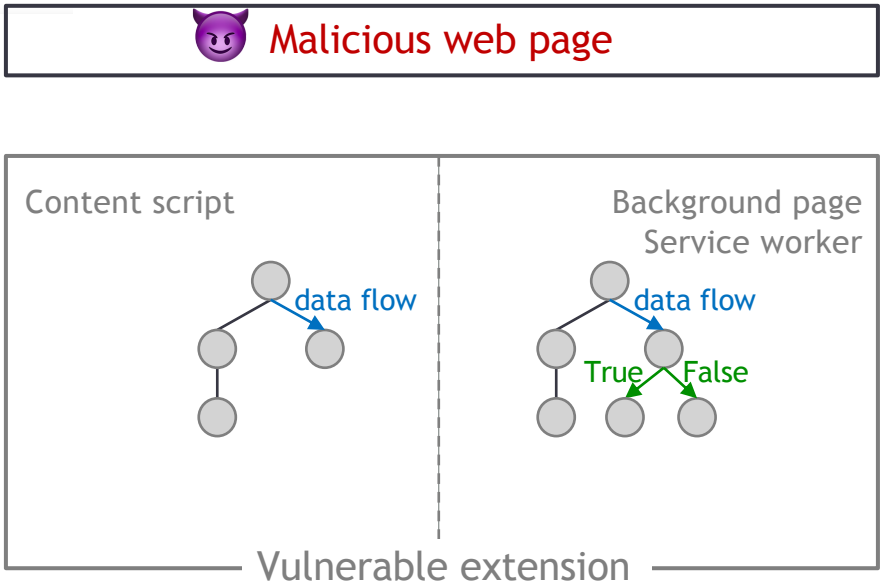

Per-component JavaScript code abstraction

- AST (Abstract Syntax Tree)
- Control flow
- Data flow
- Pointer analysis

[2] Fass et al.; *CCS* 2021

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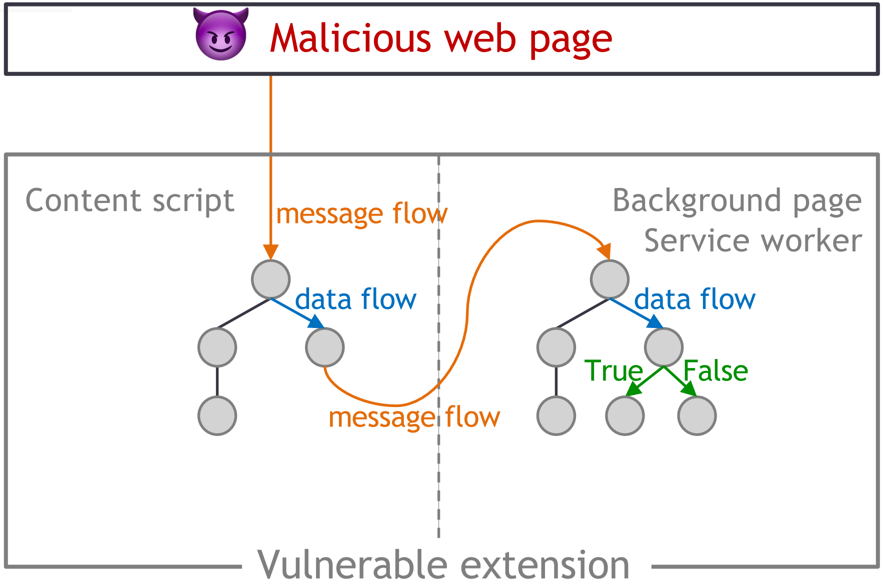

Per-component JavaScript code abstraction

- AST (Abstract Syntax Tree)
- Control flow
- Data flow
- Pointer analysis

Extension Dependence Graph (EDG)

➢ Message interactions

Detecting Vulnerable Extensions

Fass et al.
CCS 2021


DoubleX: Statically Detecting Vulnerable Data Flows in Browser Extensions at Scale
Aurore Fass, Dolière Francis Somé, Michael Backes, and Ben Stock
CISPA Helmholtz Center for Information Security

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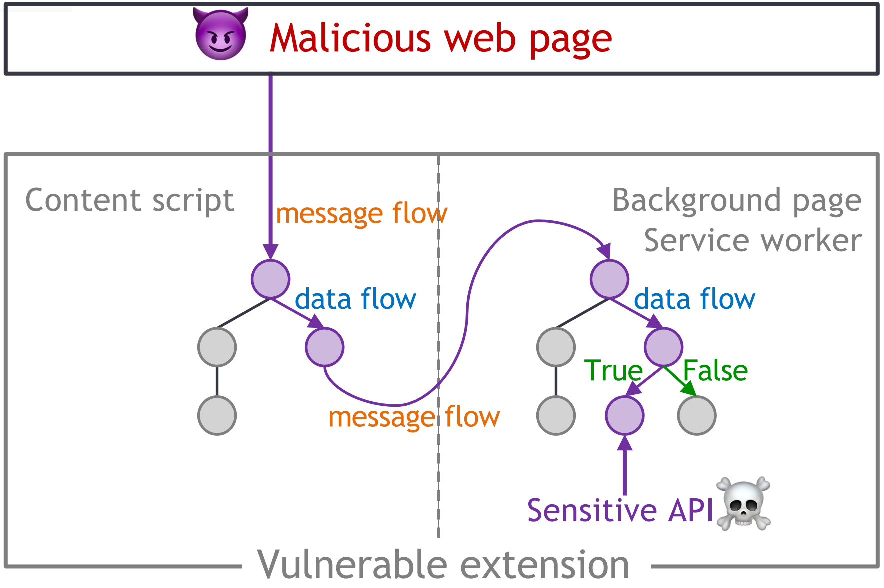

Per-component JavaScript code abstraction

- AST (Abstract Syntax Tree)
- Control flow
- Data flow
- Pointer analysis

Extension Dependence Graph (EDG)

➢ Message interactions

Suspicious data flow tracking

➢ Detects any path between an attacker & sensitive APIs

[2] Fass et al.; *CCS* 2021

Simplified Example of a Vulnerability

```
1 // Content script code = from the extension
2 window.addEventListener("message", function(event) {
3
4
5
6 })
```

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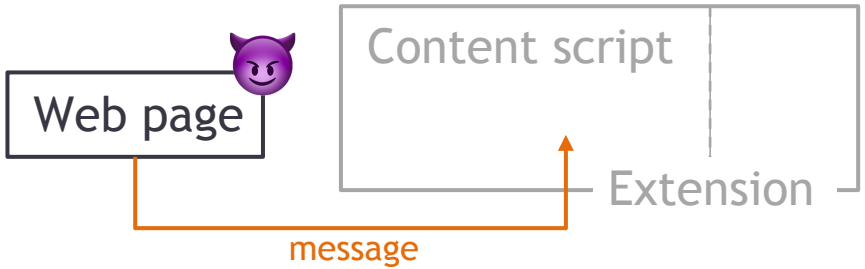

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Simplified Example of a Vulnerability

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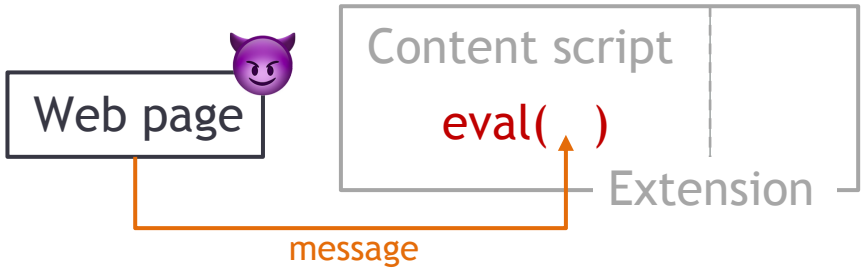
1 // Content script code = from the extension
2 window.addEventListener("message", function(event) {
3   if (1 === 1) {
4     window["e" + "val"](event.data);
5   }
6 })
```

eval



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```
// DOUBLEX report 🔭
{"direct-danger1": "eval",
"value": "eval(event.data)",
"line": "4 - 4",
"dataflow": true, ✅
"param1": {
  "received": "event",
  "line": "2 - 2"}}
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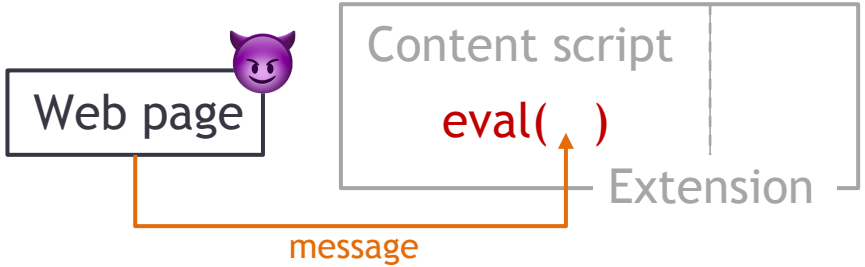
Not detected by prior work ❌

eval

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6
7      event = {"data": 42};
8      eval(event.data);
9    }
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eval

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7      event = {"data": 42};
8      eval(event.data);
9    }
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False positive for prior work ❌

```
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"value": "eval(event.data)",
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"param1": {
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  "line": "2 - 2"}},

{"direct-danger2": "eval",
"value": "eval(42)",
"line": "8 - 8",
"dataflow": false} ✅
```

[2] Fass et al.; *CCS* 2021

Simplified Example of a Vulnerability

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```
// Attacker code = from the targeted web page
postMessage("alert(1)", "*")
```

(very) malicious payload

[2] Fass et al.; *CCS* 2021

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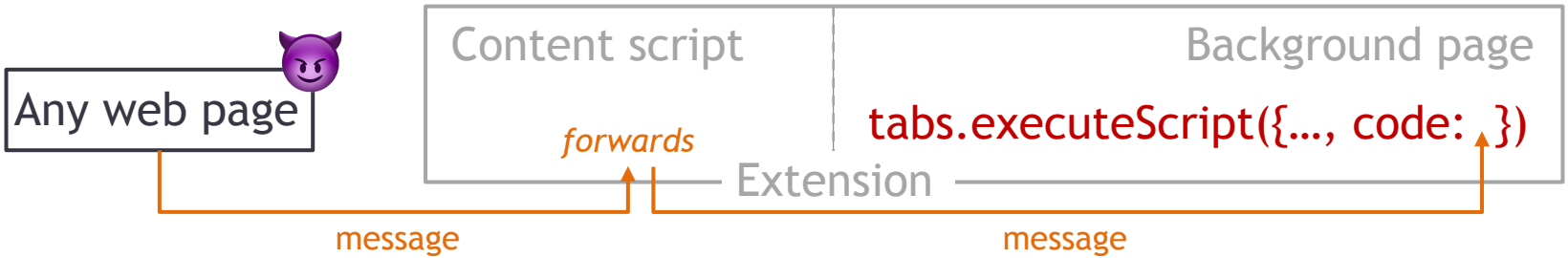
Case Studies of Vulnerable Chrome Extensions

- Arbitrary code execution (*cdi…*, 4k+ users)



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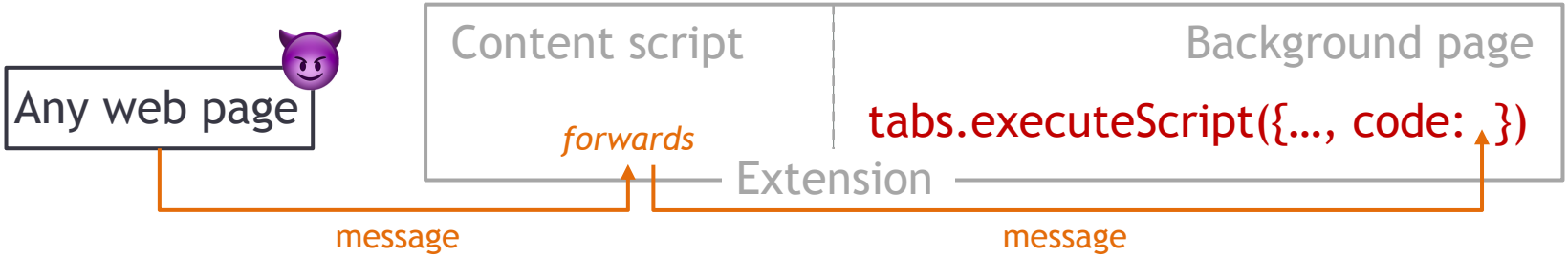
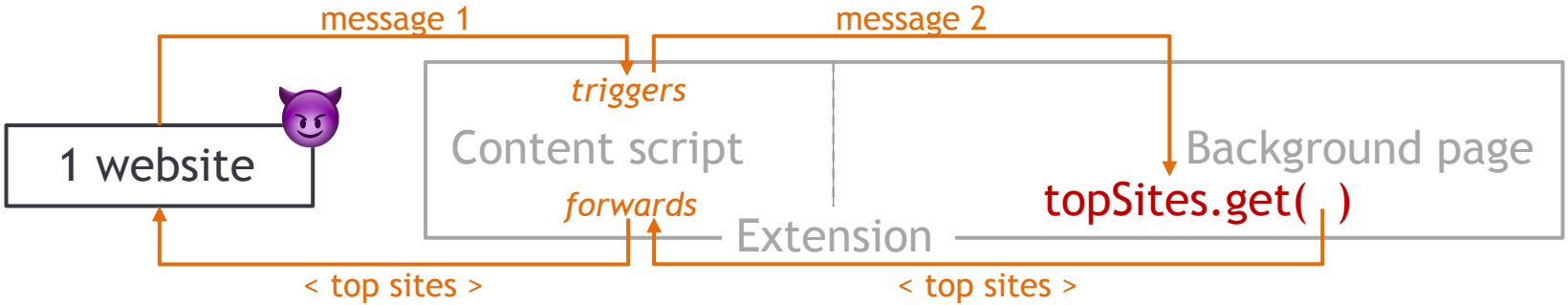


- Most visited website exfiltration (*lkl…*, 700k+ users)



Detecting Vulnerable Extensions with DOUBLEX

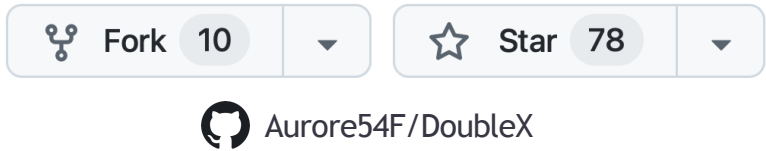
Analyzed 155k Chrome extensions from 2021 with DOUBLEX (takes 2—3s per extension)

- **184 vulnerable Chrome extensions**
- Impacting **3M users*** (* based on Google's definition)

- **Precision: 89%** of the flagged extensions are vulnerable
- **Recall: 93%** of known vulnerabilities [Somé, S&P 2019] are detected

- **Open source**, for developers and Web users

  (even in other fields, e.g., mini apps [Wang et al., ICSE 2023])



[2] Fass et al.; *CCS* 2021

Defenses & Perspectives

- (Migrate an extension to Manifest V3)
- Know that communication with external actors may be dangerous
- Only allow communication with specified extensions or web pages
- Limit code execution by sanitizing messages
- DOUBLEX could provide a feedback channel for developers

[2] Fass et al.; *CCS* 2021

Outline

- Background: Browser Extensions
- Investigating Security-Noteworthy Extensions (SNE)
- Detecting Vulnerable Extensions
  - Threat model and automated tool (DOUBLEX)
  - Case studies, results, and potential defense strategies
- **Detecting Malicious Extensions**
  - Lab setting vs. real world
- Detecting Fingerprintable Extensions
  - Presentation of 3 fingerprinting vectors, results, and potential mitigations

Hsu et al. AsiaCCS 2024

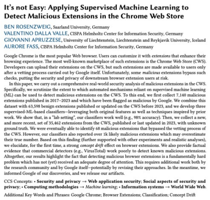
Fass et al. CCS 2021

Rosenzweig et al. TWEB 2025

Agarwal et al. CCS 2024

Detecting Malicious Extensions — Lab Setting

Rosenzweig et al. TWEB 2025



It's not Easy: Applying Supervised Machine Learning to Detect Malicious Extensions in the Chrome Web Store

BEN ROSENZWEIG, Saarland University, Germany
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In this paper, we carry out a comprehensive real-world security analysis of malicious extensions in the CWS. Specifically, we scrutinize the extent to which automated mechanisms reliant on supervised machine learning (ML) can be used to detect malicious extensions on the CWS. To this end, we first collect 7,140 malicious extensions published in 2017–2023 and which have been flagged as malicious by Google. We combine this dataset with 63,598 benign extensions published or updated on the CWS before 2023, and we develop three supervised-ML-based classifiers—leveraging both original features as well as techniques inspired by prior work. We show that, in a "lab setting", our classifiers work well (e.g., 98% accuracy). Then, we collect a new, and more recent, set of 35,462 extensions from the CWS, published or last updated in 2023, with unknown ground truth. We were eventually able to identify 68 malicious extensions that bypassed the vetting process of the CWS. However, our classifiers also reported over 1k likely malicious extensions which may overestimate their true number. Based on this finding (further supported with other experiments and realistic analyses), we elucidate, for the first time, a strong *concept drift* effect on browser extensions. We also provide factual evidence that commercial detectors (e.g., VirusTotal) work poorly to detect known malicious extensions. Altogether, our results highlight the fact that detecting malicious browser extensions is a fundamentally hard problem which has not (yet) received an adequate degree of attention. This requires additional work both by the research community and by Google itself—potentially by revising their approaches. In the meantime, we informed Google of our discoveries, and we release our artifacts.

CCS Concepts: • **Security and privacy → Web application security**; **Social aspects of security and privacy**; • **Computing methodologies →** *Machine learning*; • **Information systems → World Wide Web**.

Additional Key Words and Phrases: Google Chrome; Browser Extensions; Classification; Concept Drift

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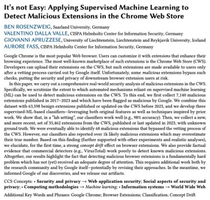
[3] Rosenzweig et al.; *TWEB* 2025

Detecting Malicious Extensions — Lab Setting

Rosenzweig et al. TWEB 2025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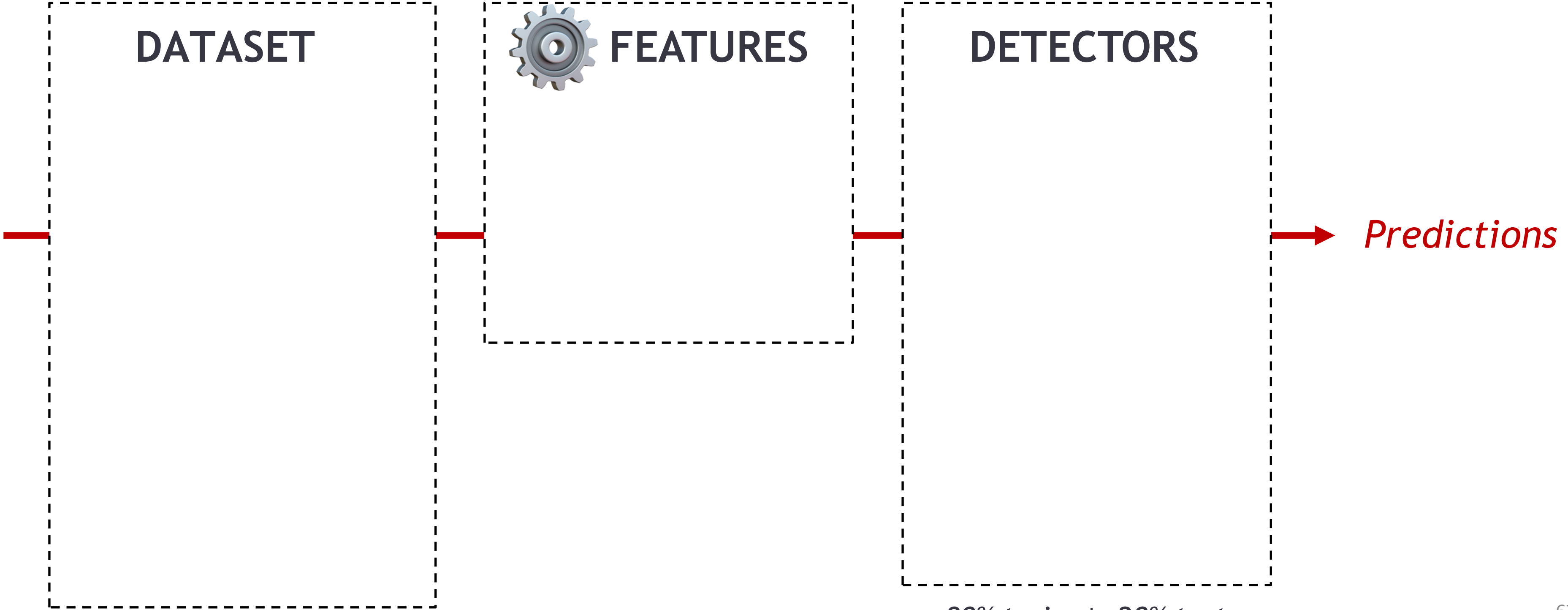
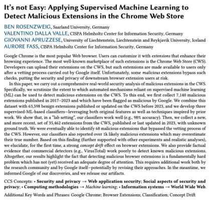


80% train | 20% test

Detecting Malicious Extensions — Lab Setting

Rosenzweig et al. TWEB 2025



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DATASET

7,140 malicious extensions

Last update 2017—22

63,598 benign extensions

Last update 2012—22

FEATURES

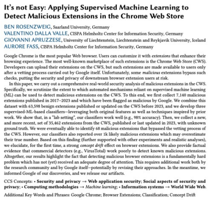
DETECTORS

80% train | 20% test

Predictions

Detecting Malicious Extensions — Lab Setting

Rosenzweig et al. TWEB 2025



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FEATURES

- Source code [A]
- Metadata

[A] Fass et al.; *ACSAC* 2018

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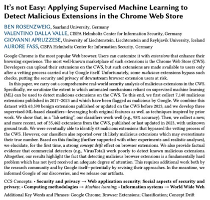
→ *Predictions*

Detecting Malicious Extensions — Lab Setting



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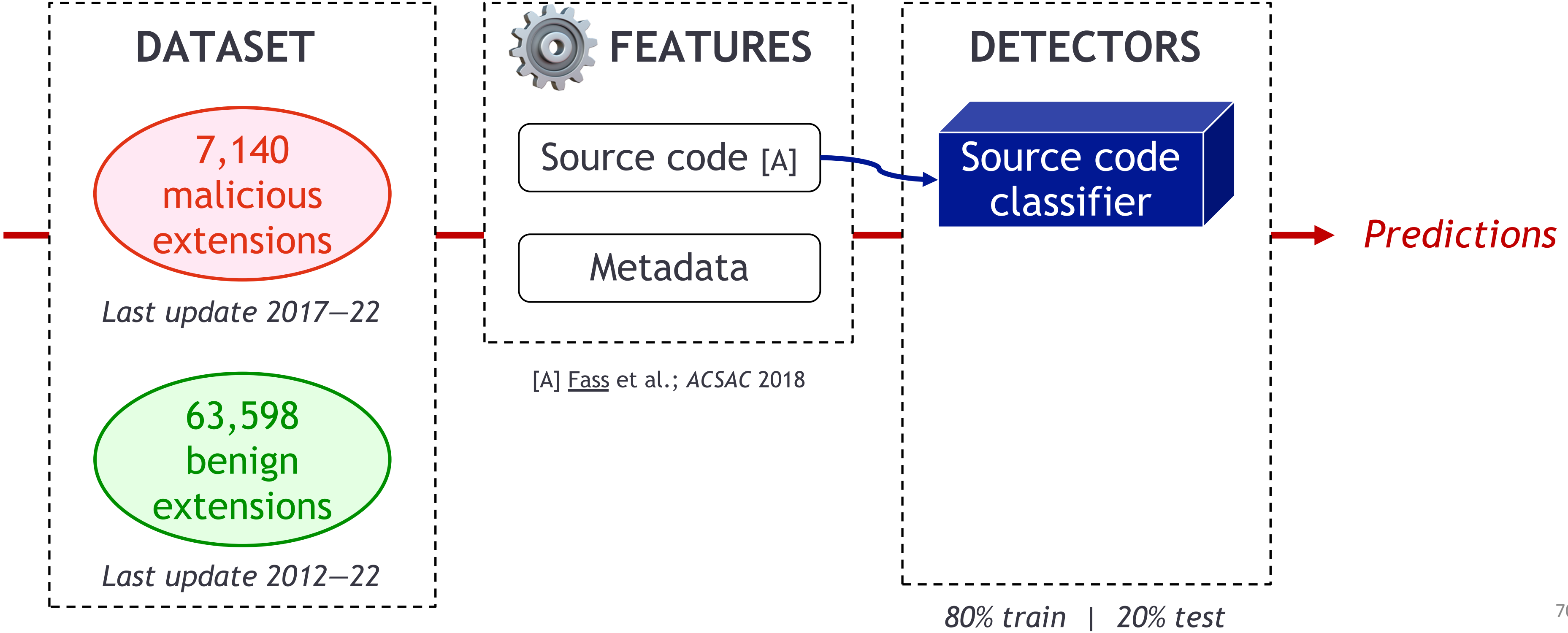

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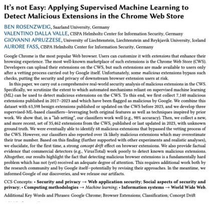
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FEATURES

Source code [A]

Metadata

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DETECTORS

Source code classifier

Metadata classifier

80% train | 20% test

Predictions

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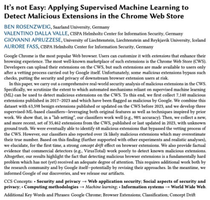
Rosenzweig et al. TWEB 2025



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Google Chrome is the most popular Web browser. Users can customize it with *extensions* that enhance their browsing experience. The most well-known marketplace of such extensions is the Chrome Web Store (CWS). Developers can upload their extensions on the CWS, but such extensions are made available to users only after a vetting process carried out by Google itself. Unfortunately, some *malicious* extensions bypass such checks, putting the security and privacy of downstream browser extension users at risk.

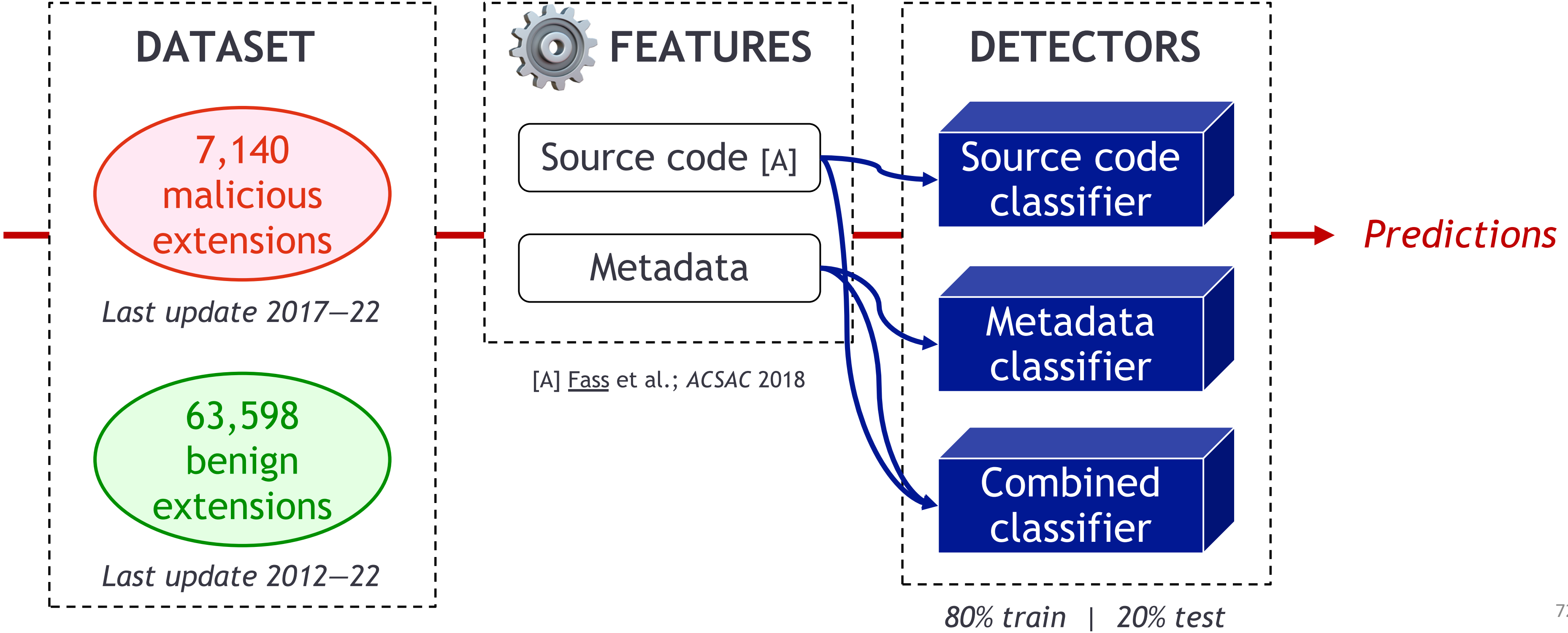
In this paper, we carry out a comprehensive real-world security analysis of malicious extensions in the CWS. Specifically, we scrutinize the extent to which automated mechanisms reliant on supervised machine learning (ML) can be used to detect malicious extensions on the CWS. To this end, we first collect 7,140 malicious extensions published in 2017–2023 and which have been flagged as malicious by Google. We combine this dataset with 63,598 benign extensions published or updated on the CWS before 2023, and we develop three supervised-ML-based classifiers—leveraging both original features as well as techniques inspired by prior work. We show that, in a "lab setting", our classifiers work well (e.g., 98% accuracy). Then, we collect a new, and more recent, set of 35,462 extensions from the CWS, published or last updated in 2023, with unknown ground truth. We were eventually able to identify 68 malicious extensions that bypassed the vetting process of the CWS. However, our classifiers also reported over 1k likely malicious extensions which may overestimate their true number. Based on this finding (further supported with other experiments and realistic analyses), we elucidate, for the first time, a strong *concept drift* effect on browser extensions. We also provide factual evidence that commercial detectors (e.g., VirusTotal) work poorly to detect known malicious extensions. Altogether, our results highlight the fact that detecting malicious browser extensions is a fundamentally hard problem which has not (yet) received an adequate degree of attention. This requires additional work both by the research community and by Google itself—potentially by revising their approaches. In the meantime, we informed Google of our discoveries, and we release our artifacts.

CCS Concepts: • **Security and privacy → Web application security**; **Social aspects of security and privacy**; • **Computing methodologies →** *Machine learning*; • **Information systems → World Wide Web**.

Additional Key Words and Phrases: Google Chrome; Browser Extensions; Classification; Concept Drift

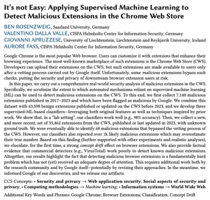
> It's not Easy: Applying Supervised ML to Detect Malicious Extensions in the CWS

In *ACM TWEB* 2025. Ben Rosenzweig, Valentino Dalla Valle, Giovanni Apruzzese, and Aurore Fass



Detecting Malicious Extensions — Lab Setting

Rosenzweig et al. TWEB 2025


It's not Easy: Applying Supervised Machine Learning to Detect Malicious Extensions in the Chrome Web Store

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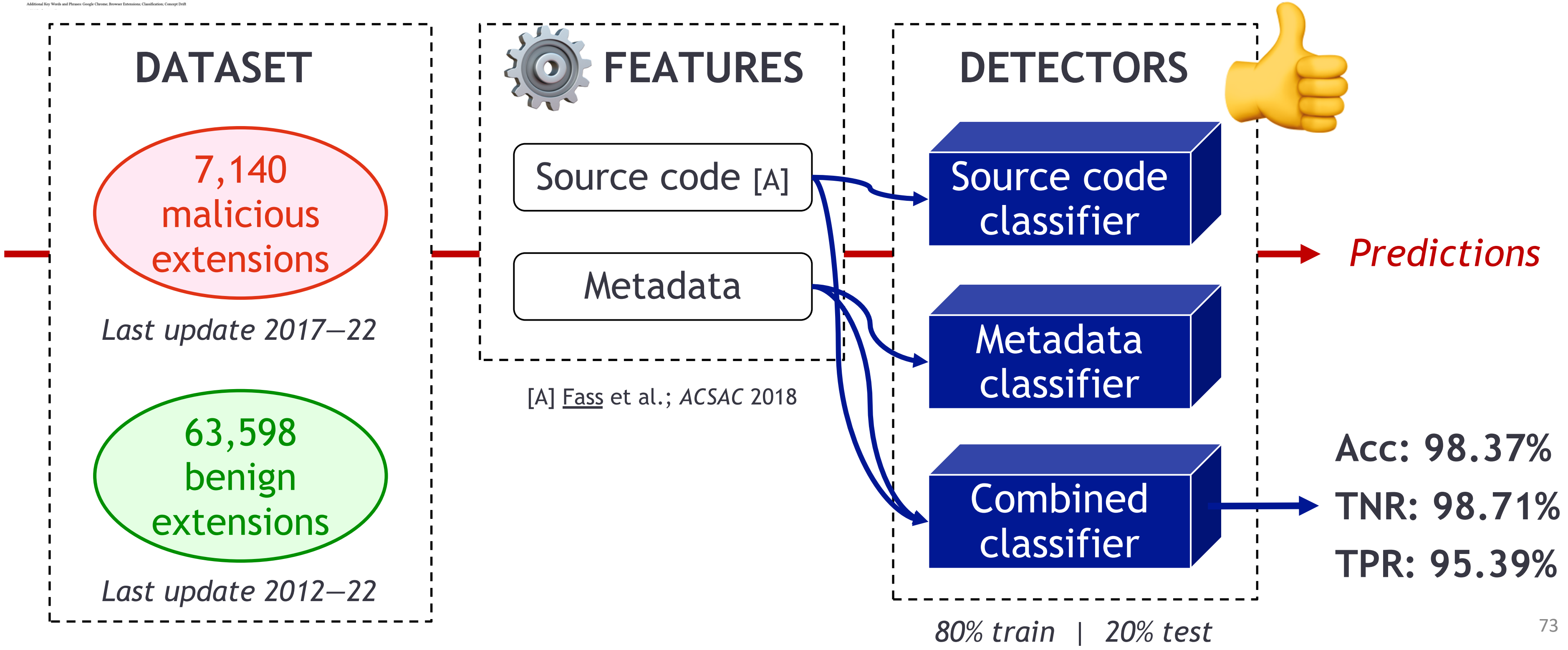


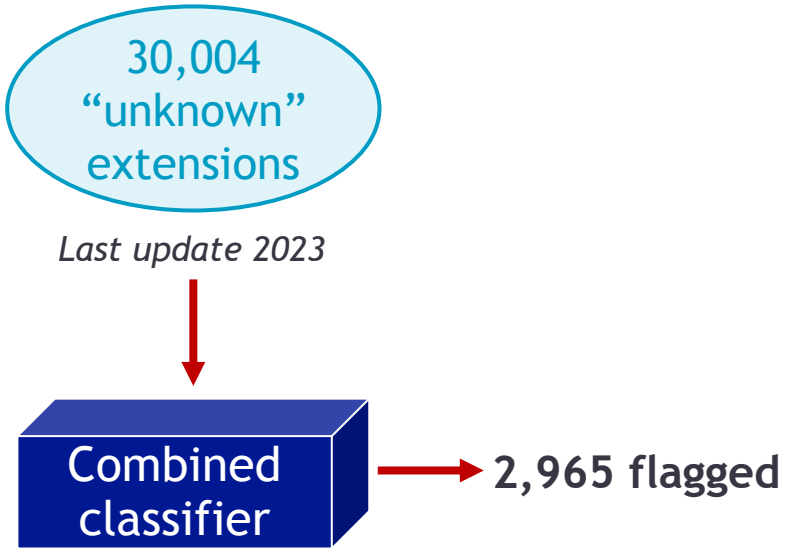
Detecting Malicious Extensions — Real World

30,004 “unknown” extensions

Last update 2023

[3] Rosenzweig et al.; *TWEB* 2025

Detecting Malicious Extensions — Real World



[3] Rosenzweig et al.; *TWEB* 2025

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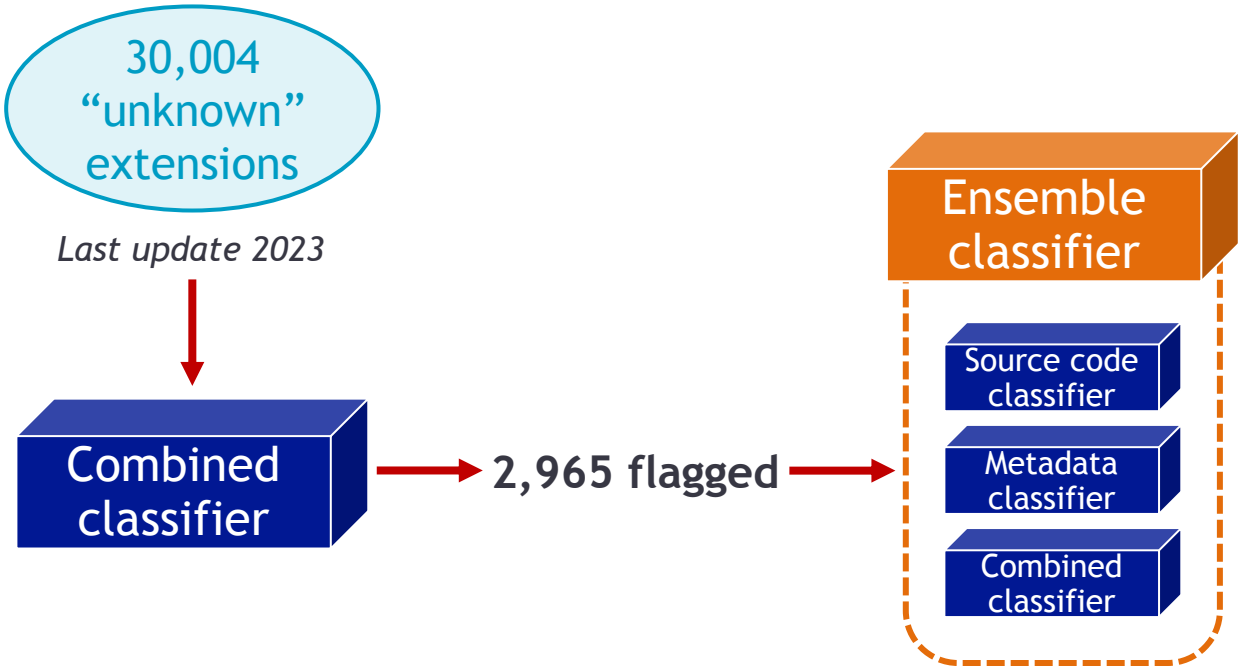

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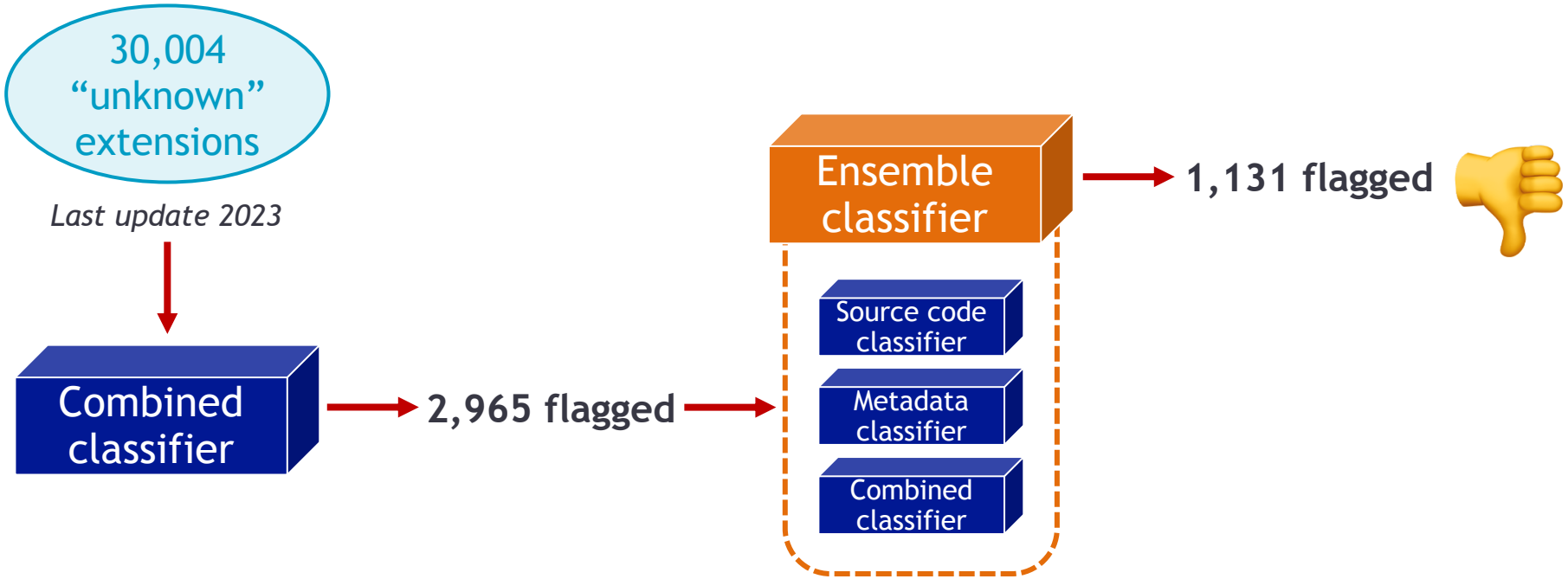

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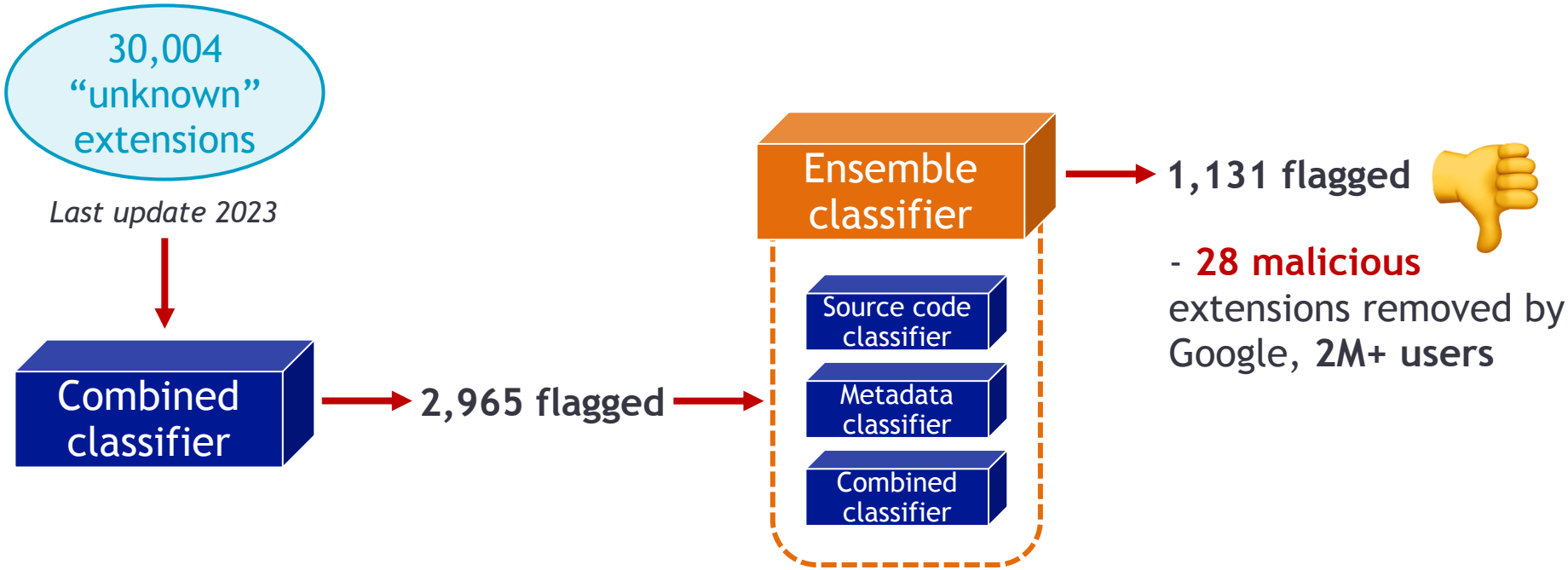

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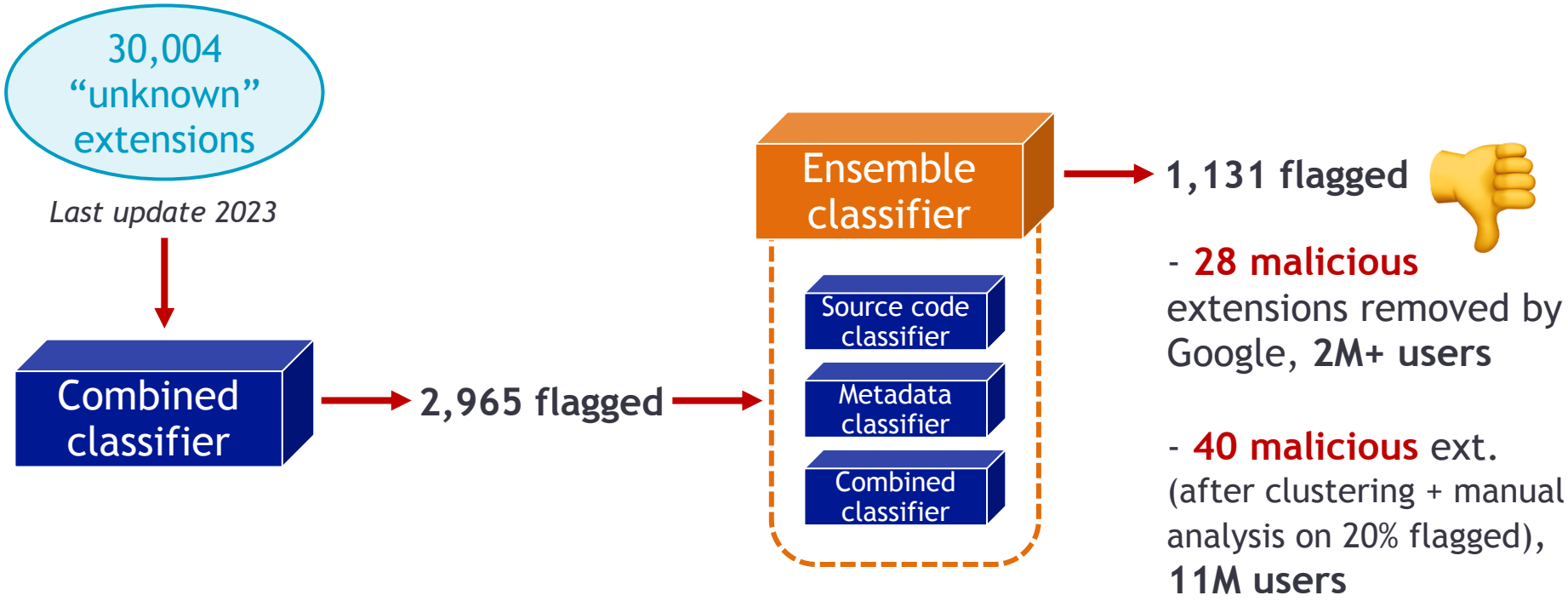

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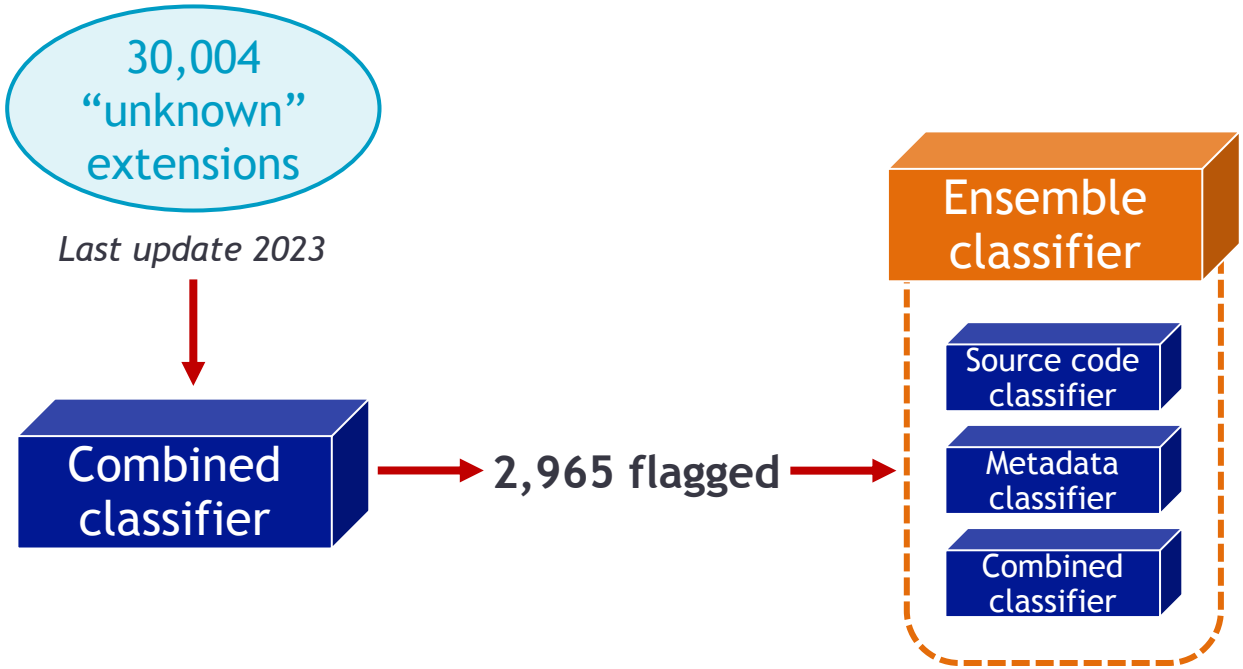


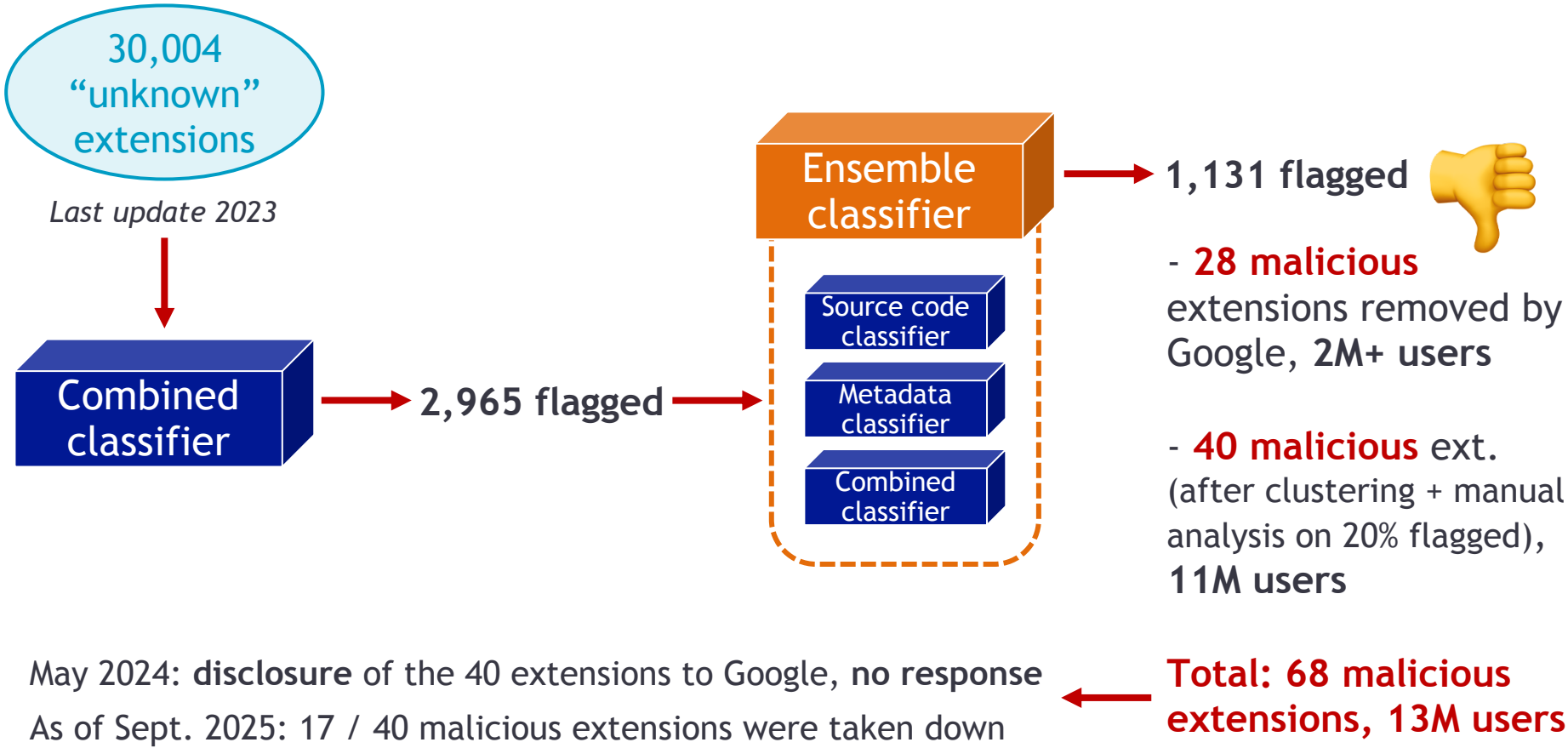
- **28 malicious** extensions removed by Google, **2M+ users**

- **40 malicious** ext. (after clustering + manual analysis on 20% flagged), **11M users**

Total: 68 malicious extensions, 13M users

[3] Rosenzweig et al.; *TWEB* 2025

Detecting Malicious Extensions — Real World



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- **Lab setting**: 98.37% accuracy
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- **Concept drift**
  - **Intrinsic evolution** of extensions, hard for supervised ML tools to keep a (high) accuracy over time
  - **How** to validate concept drift? → see experiments in the paper
  - **Why** are extensions affected? → see paper (study feature importance)

[3] Rosenzweig et al.; *TWEB* 2025

Detecting Malicious Extensions — Takeaways

- ML evaluations can be **misleading**: detectors performing well in a lab setting are **no guarantee of practical applicability** in the real world
- Detectors need to be **retrained regularly**
- Investigate **active learning** as a **mitigation to concept drift**
  - E.g., *uncertainty sampling*: monthly retraining of the detector on X labeled extensions where the detector is the most uncertain

[3] Rosenzweig et al.; *TWEB* 2025

Outline

- Background: Browser Extensions
- Investigating Security-Noteworthy Extensions (SNE)
- Detecting Vulnerable Extensions
  - Threat model and automated tool (DOUBLEX)
  - Case studies, results, and potential defense strategies
- Detecting Malicious Extensions
  - Lab setting vs. real world
- **Detecting Fingerprintable Extensions**
  - Presentation of 3 fingerprinting vectors, results, and potential mitigations

Hsu et al. AsiaCCS 2024

Fass et al. CCS 2021

Rosenzweig et al. TWEB 2025

Agarwal et al. CCS 2024

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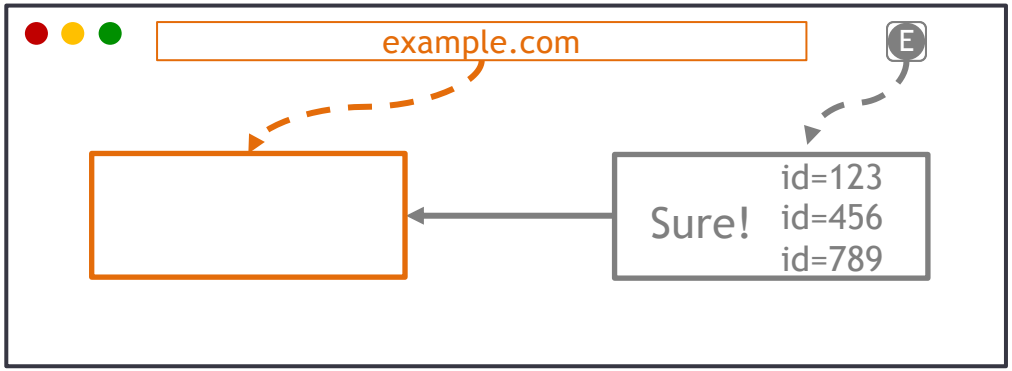

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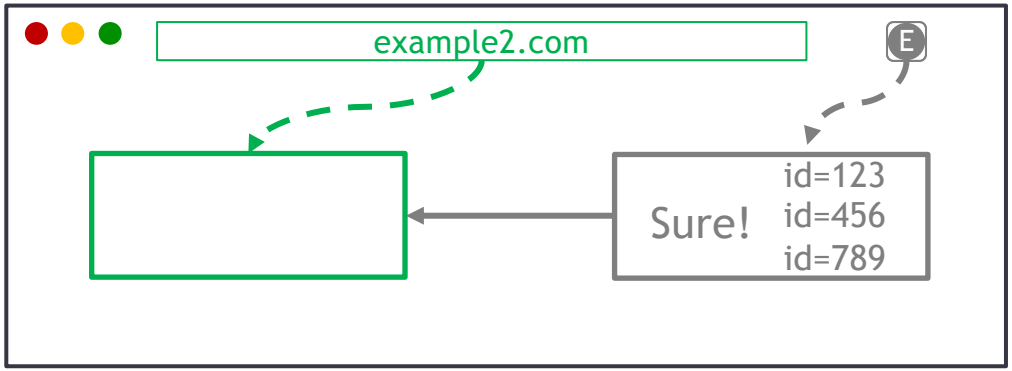

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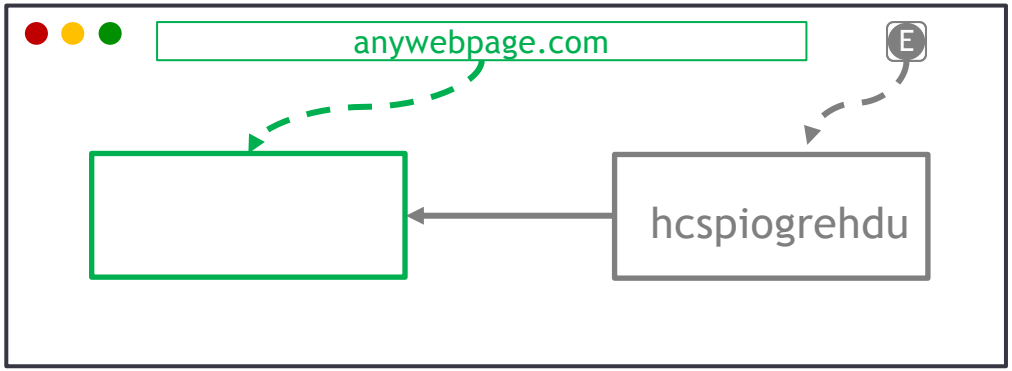

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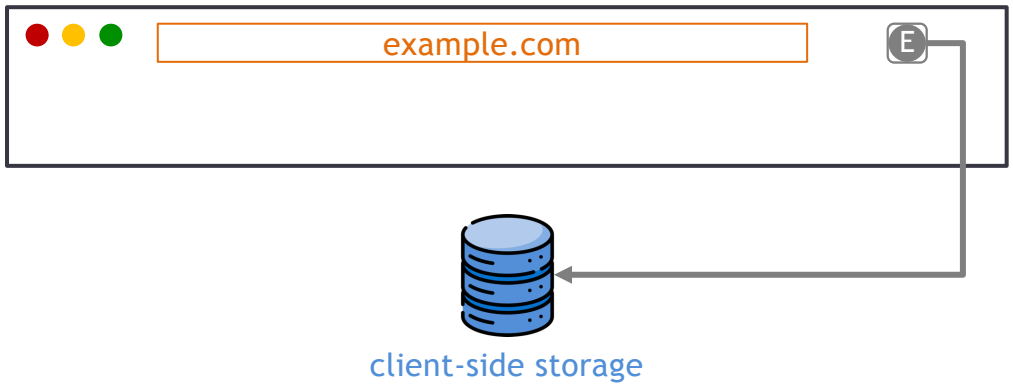

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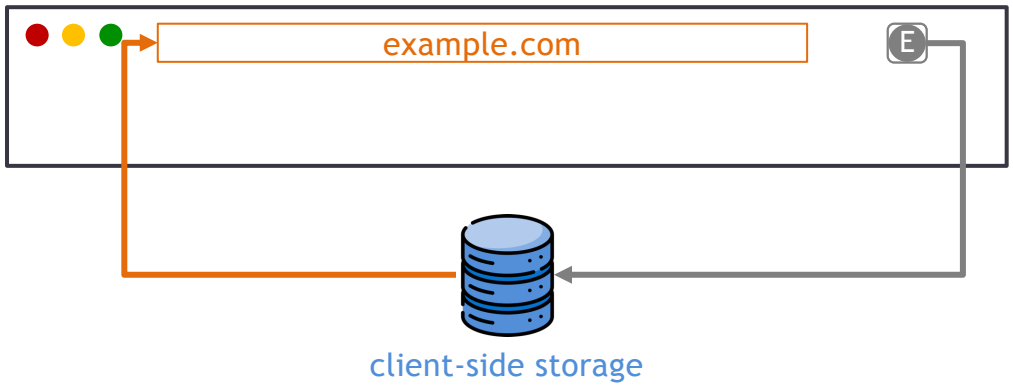

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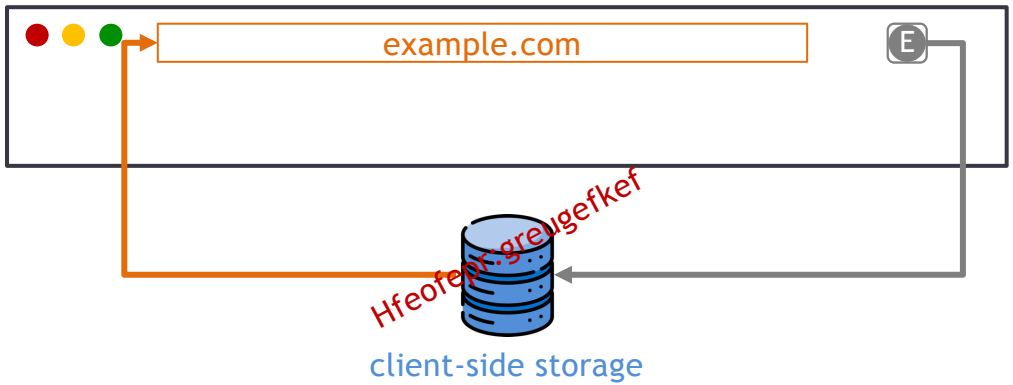

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Why is this bad?

- "Malicious" websites can **track users** by fingerprinting their extensions
- Extensions can **reveal personal user information**, e.g., geolocation, ethnicity, social/personal interests, medical issues, religion, etc. [Karami; NDSS'19]

[4] Agarwal, Fass, and Stock; *CCS* 2024

Detecting Fingerprintable Extensions

*How many extensions can be **uniquely fingerprinted** through these observable side effects?*

Detecting Fingerprintable Extensions

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Peeking through the window: Fingerprinting Browser Extensions through Page-Visible Execution Traces and Interactions

Shubham Agarwal
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Ben Stock
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ABSTRACT

1 INTRODUCTION

CCS CONCEPTS

KEYWORDS

> Peeking through the `window`: Fingerprinting Browser Extensions through Page-Visible Execution Traces and Interactions

In *ACM CCS* 2024. Shubham Agarwal, Aurore Fass, and Ben Stock

Detecting Fingerprintable Extensions with Raider

Analyzed 38k Chrome extensions from 2024 with Raider

- **2,747 fingerprintable Chrome extensions** (lower bound)
- Impacting **169M users**

- **Notified 1,967 developers** about their fingerprintable extension(s)
  - Only 30 (!) replied
  - Of those, only 16 positively acknowledged the issues
    - But: they heavily rely on our fingerprinting vectors (e.g., script injection or data storage) for their extensions' functionality

- Raider PoC is **available online** Raider-ext/raider

[4] Agarwal, Fass, and Stock; *CCS* 2024

Mitigations

- Global APIs:
  - ensure that browser extension code runs before the attacker code (inject at document_start)
  - ensure that APIs cannot be overwritten (freeze their native definition)
- Global variables: scope appropriately
- Storage: use the chrome.storage API instead

[4] Agarwal, Fass, and Stock; *CCS* 2024

Summary

Dangerous Browser Extensions

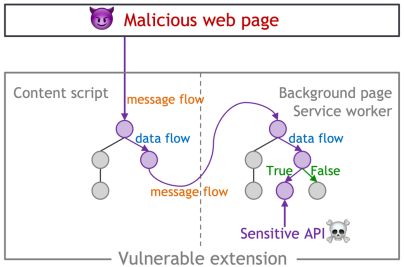
Hsu et al. AsiaCCS 2024

→ **Extensions can put their users' security & privacy at risk:**

- **Contain malware:** designed by malicious actors to harm victims
  - E.g., propagate malware, steal users' credentials, track users
- **Contain vulnerabilities:** designed by well-intentioned developers… but buggy
  - E.g., can lead to user-sensitive data exfiltration
- **Violate the Chrome Web Store policies**
  - E.g., deceive users, promote unlawful activities, lack a privacy policy
- **Be fingerprintable:** can be recognized and uniquely identified
  - E.g., can lead to user tracking or inferring of user personal information

Detecting Vulnerable Extensions with DOUBLEX

Fass et al. CCS 2021



Aurore54F/DoubleX

➢ DOUBLEX detects suspicious data flows in browser extensions

184 vulnerable extensions | **Precision: 89%** | **Recall: 93%**

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Rosenzweig et al. TWEB 2025

its-not-easy/tweb25

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Corresponding Publications

- What is in the Chrome Web Store?

Sheryl Hsu, Manda Tran, and Aurore Fass. In *ACM AsiaCCS* 2024

- DoubleX: Statically Detecting Vulnerable Data Flows in Browser Extensions at Scale

Aurore Fass, Dolière Francis Somé, Michael Backes, and Ben Stock. In *ACM CCS* 2021

- It's not Easy: Applying Supervised Machine Learning to Detect Malicious Extensions in the Chrome Web Store

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