User Research on Permissions

Marian Harbach – Google Chrome
TPAC 2024

Agenda

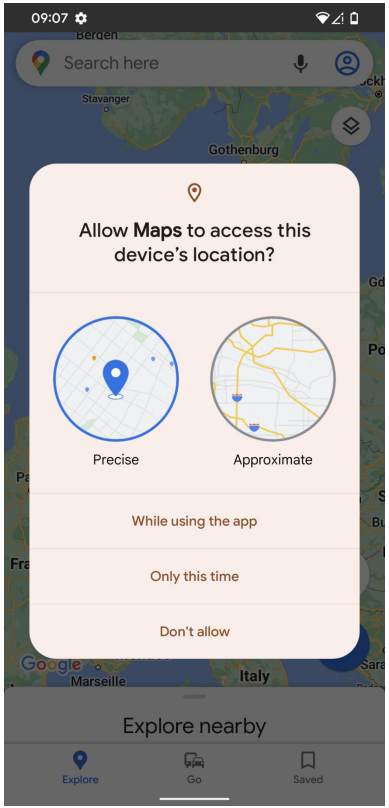
- Permissions Prompts on Desktop
- Permission Prompt Quieting on Desktop
- Q&A / Discussion

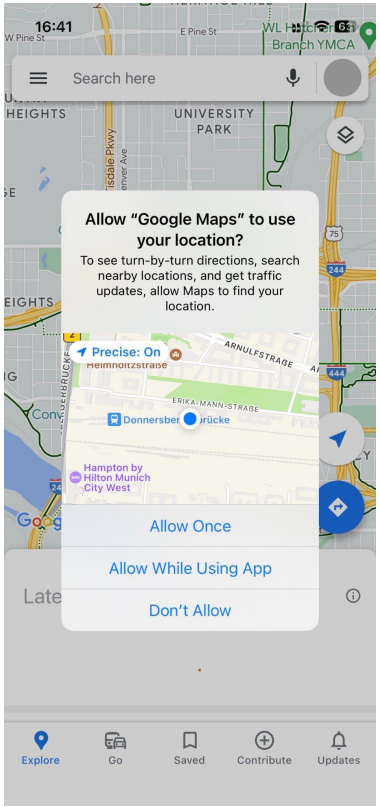
Websites Need Your Permission Too

User Sentiment and Decision-Making on Web Permission Prompts in Desktop Chrome

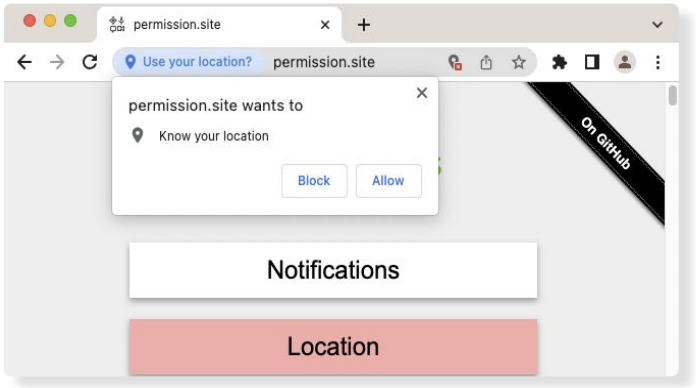
ACM CHI 2024

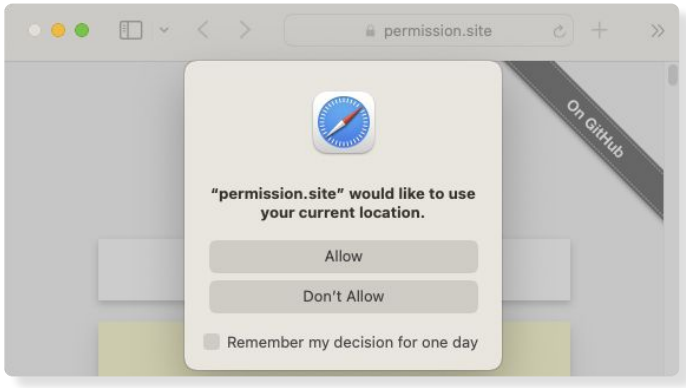
Permission prompts on mobile

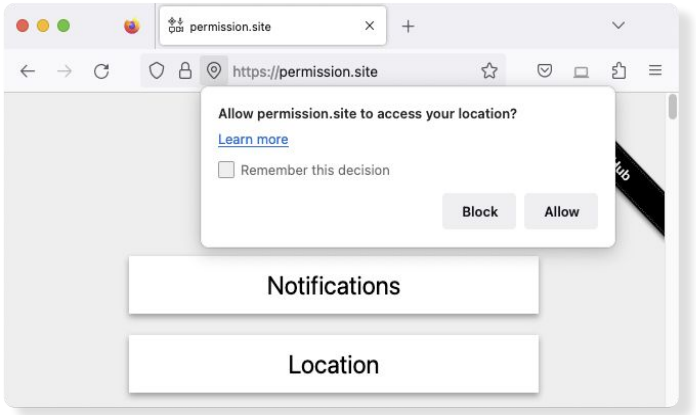


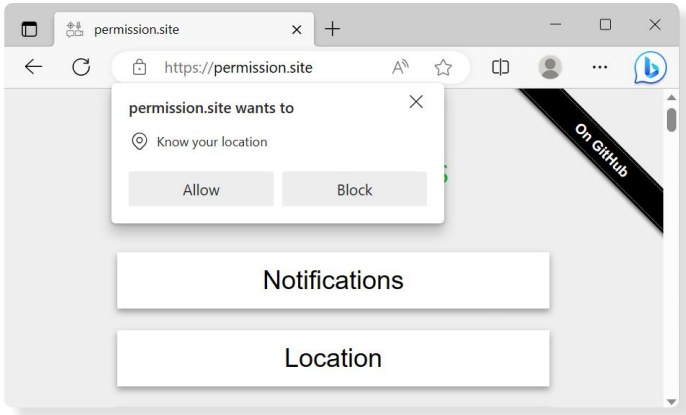


Permission prompts on the (desktop) web

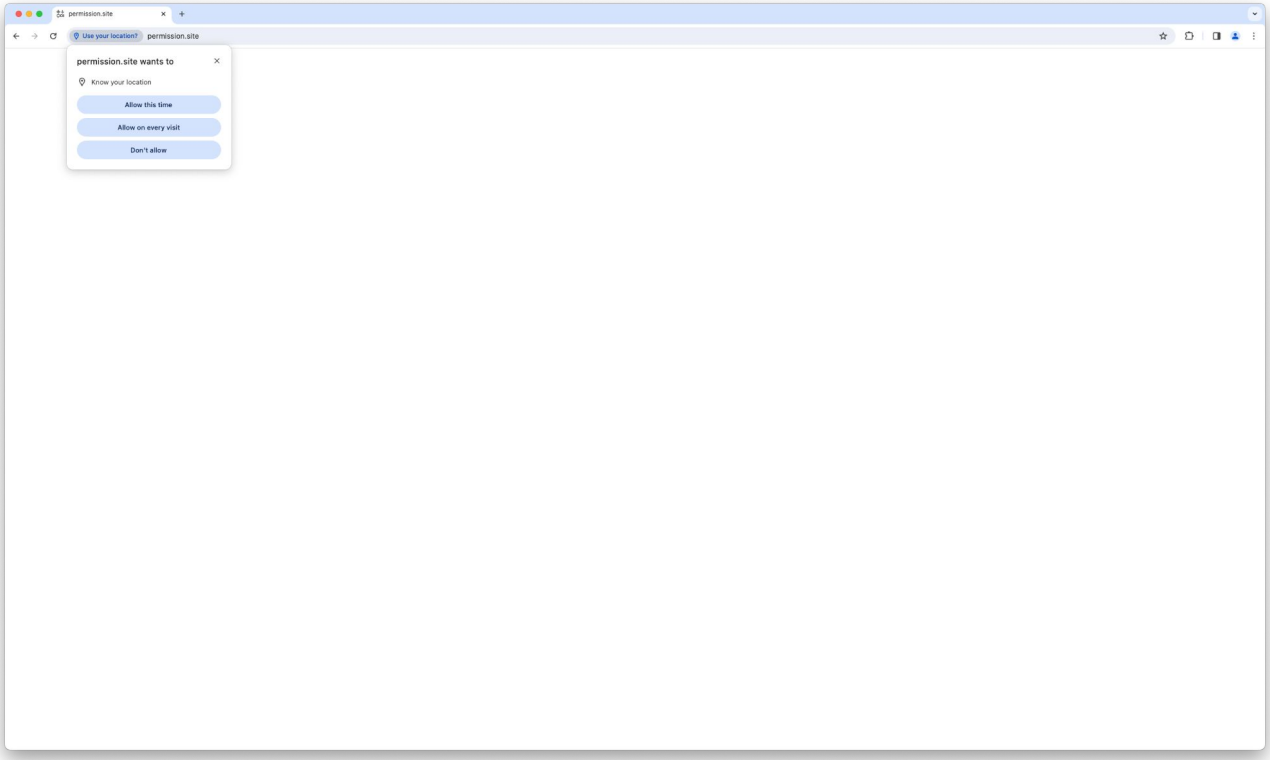




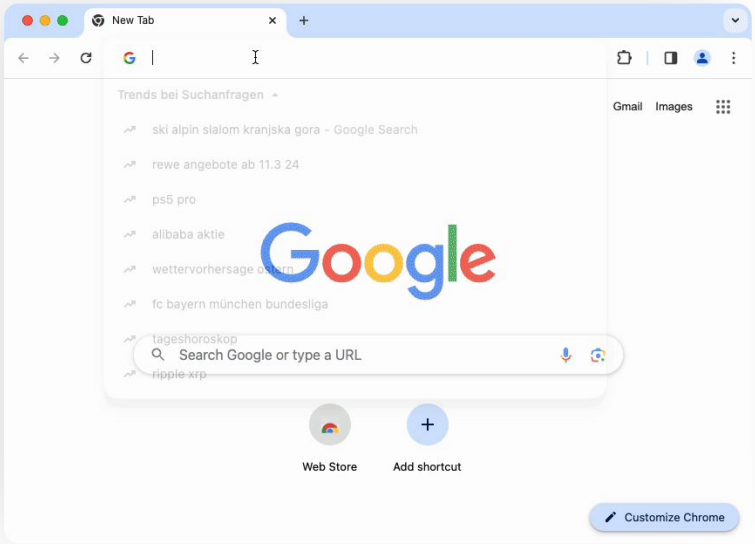


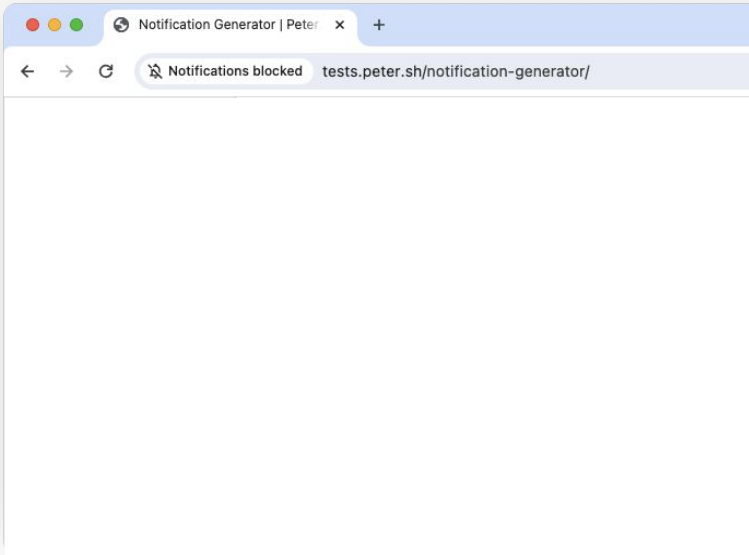


Permission prompts on the (desktop) web



Additional differences





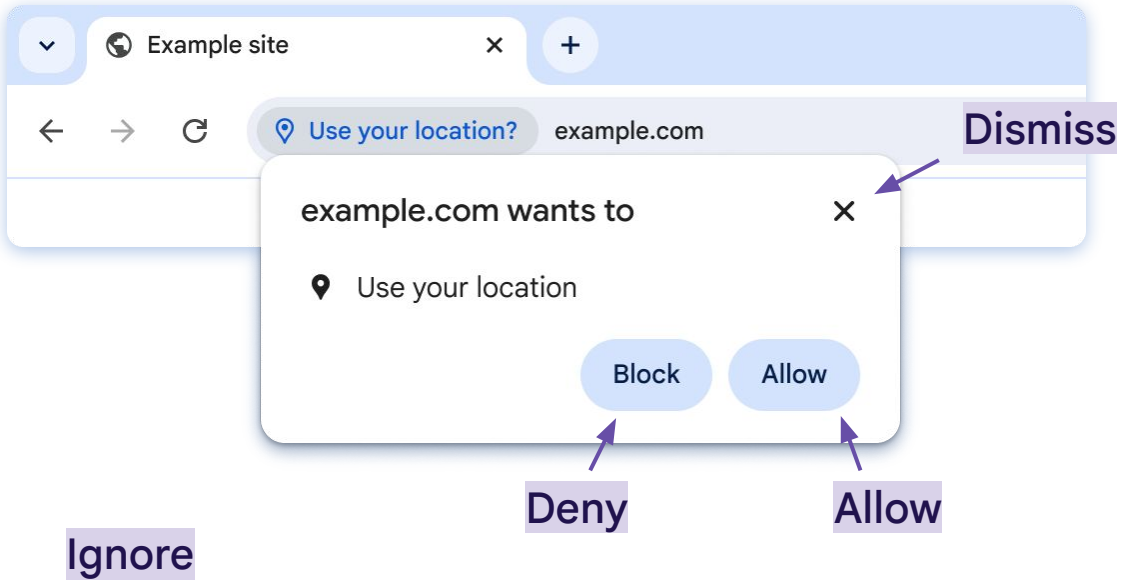
Goals of this work

- Describe user behavior

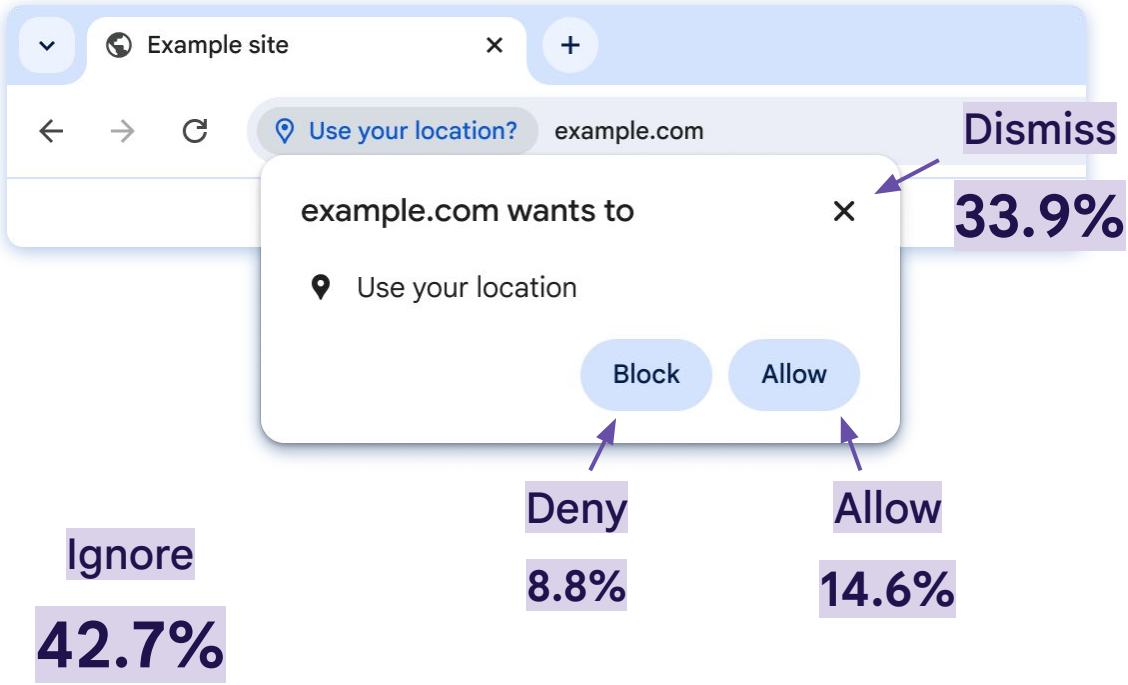
- Understand sentiment
  - annoyance and interruptions
  - reasons for decision making
  - availability of contextual information
  - perceived self-benefit
  - impact of prior user interaction

User Behavior

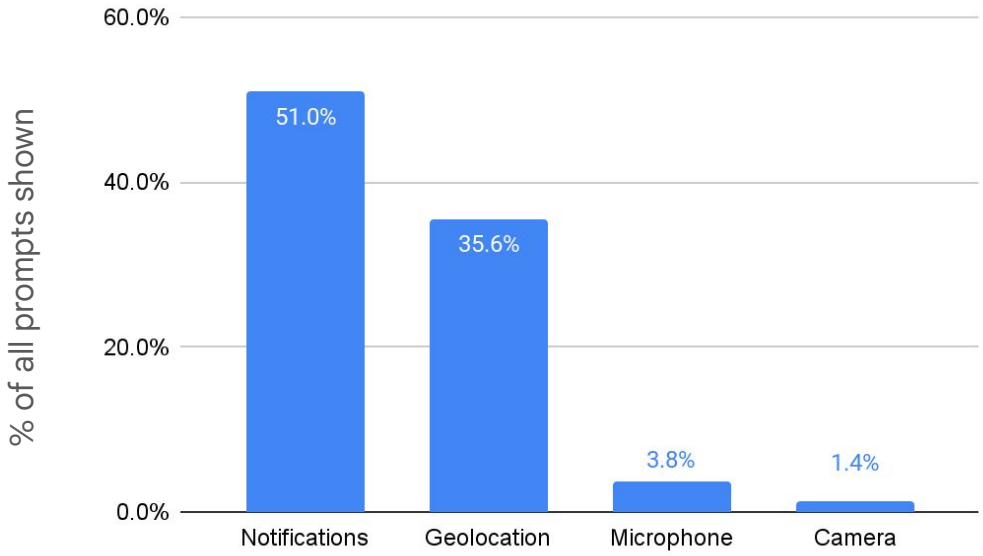
Actions on Chrome’s desktop permission prompt

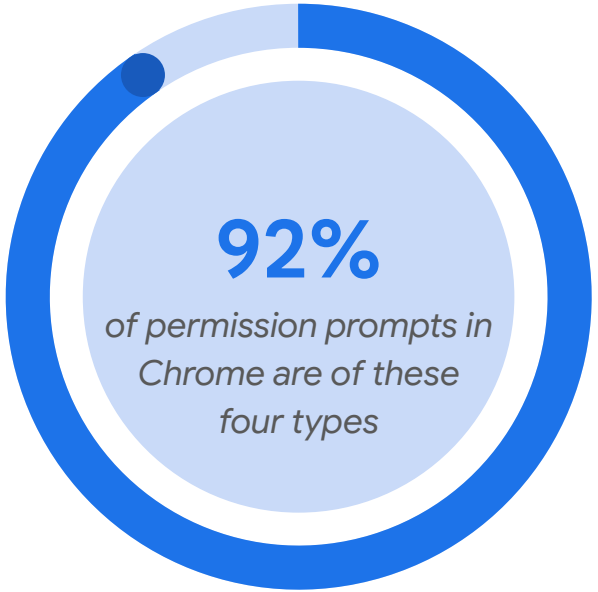


Prevalence of outcomes

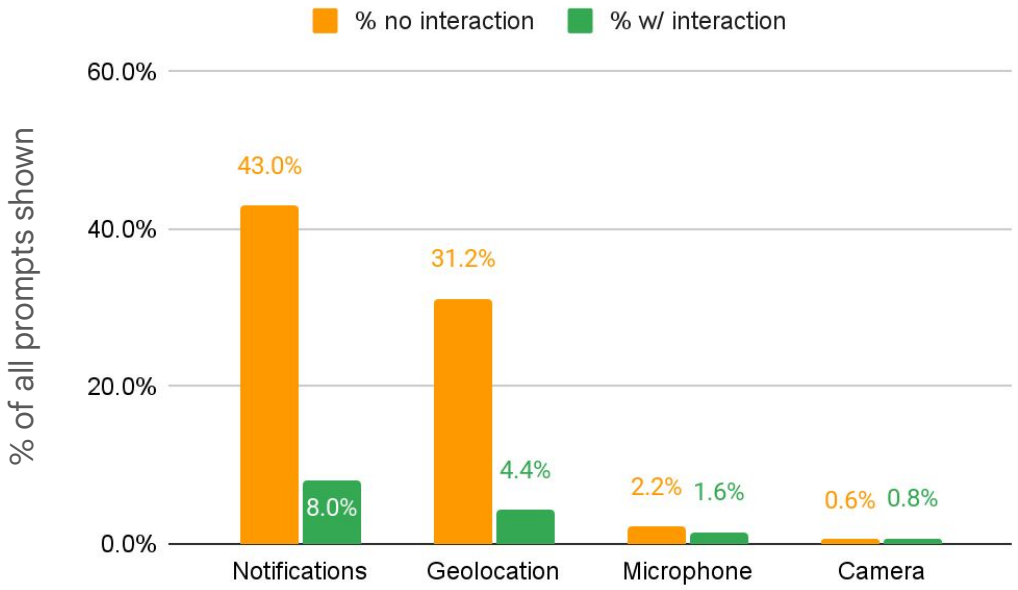


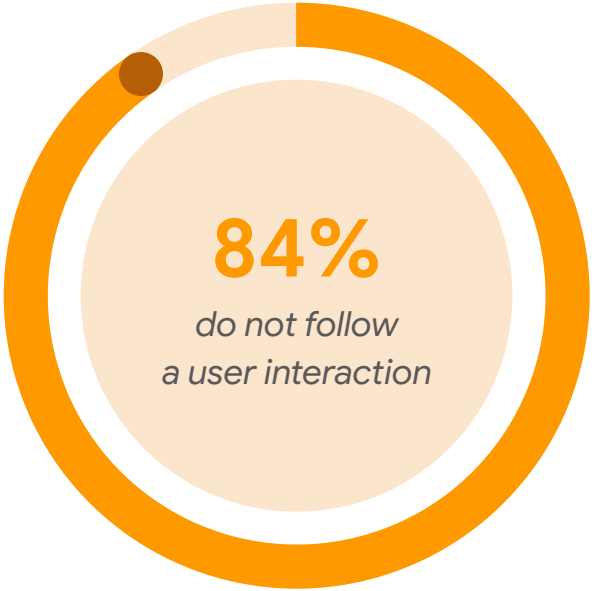
Four major prompt types



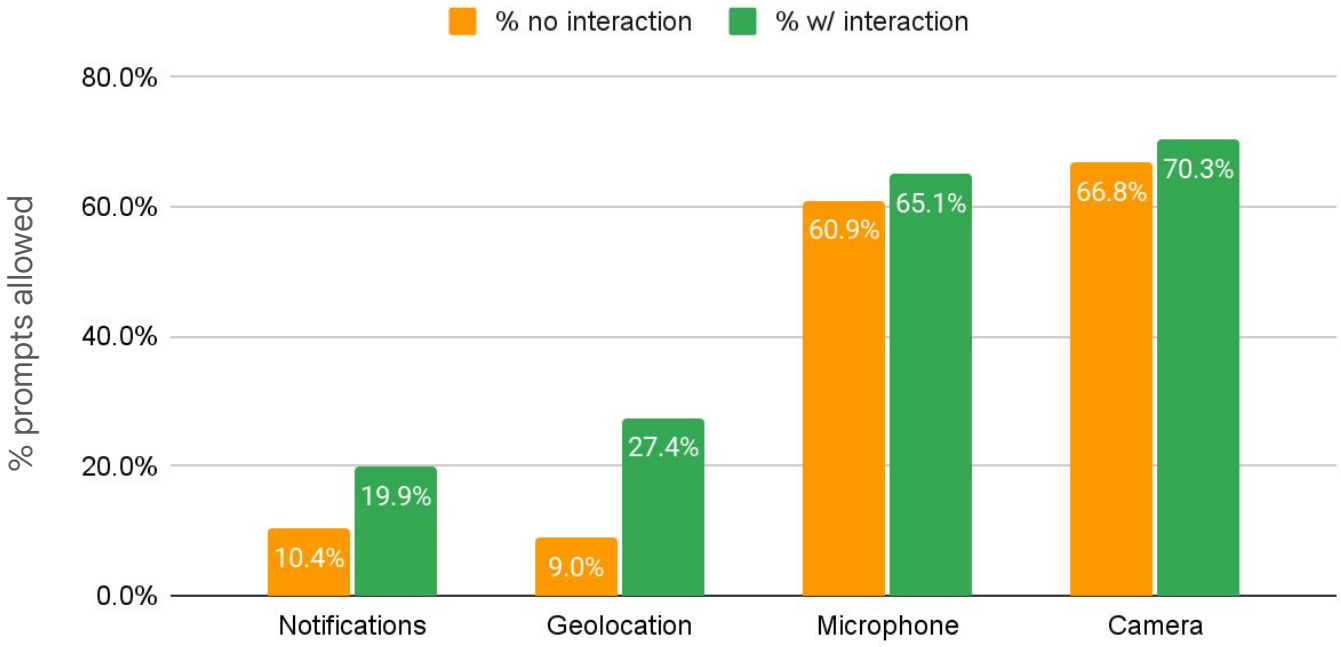


Prior user interaction



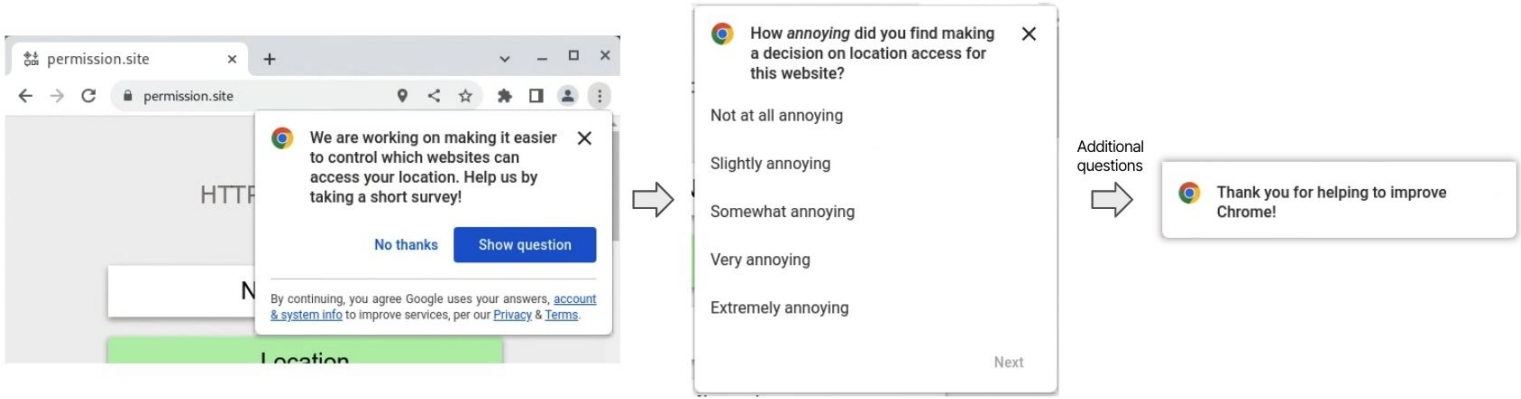


Higher allow rates after user interaction



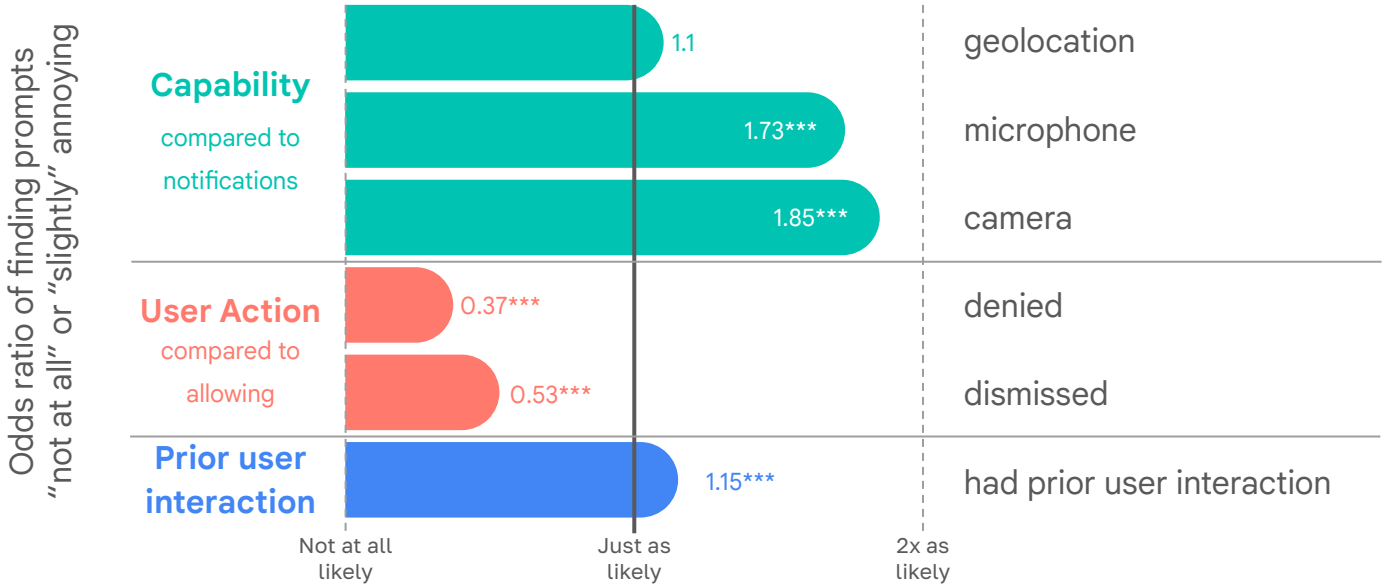
User Sentiment

Method

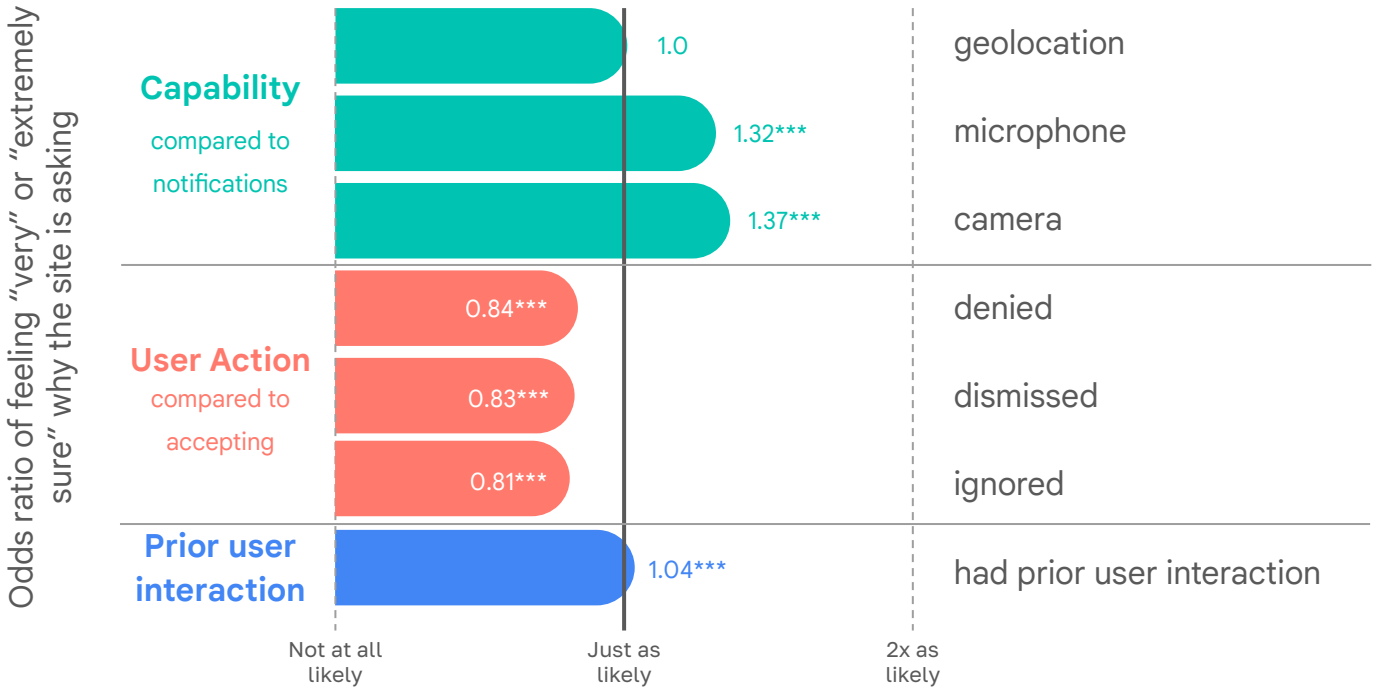


- **2.6M** survey invitations shown
- **9.2k + 16.5k** complete responses
  - 40s / 55s median response time
  - Caveat: self-selection bias

Allowed prompts are less annoying



Feeling sure why the site is asking



Summary

Summary

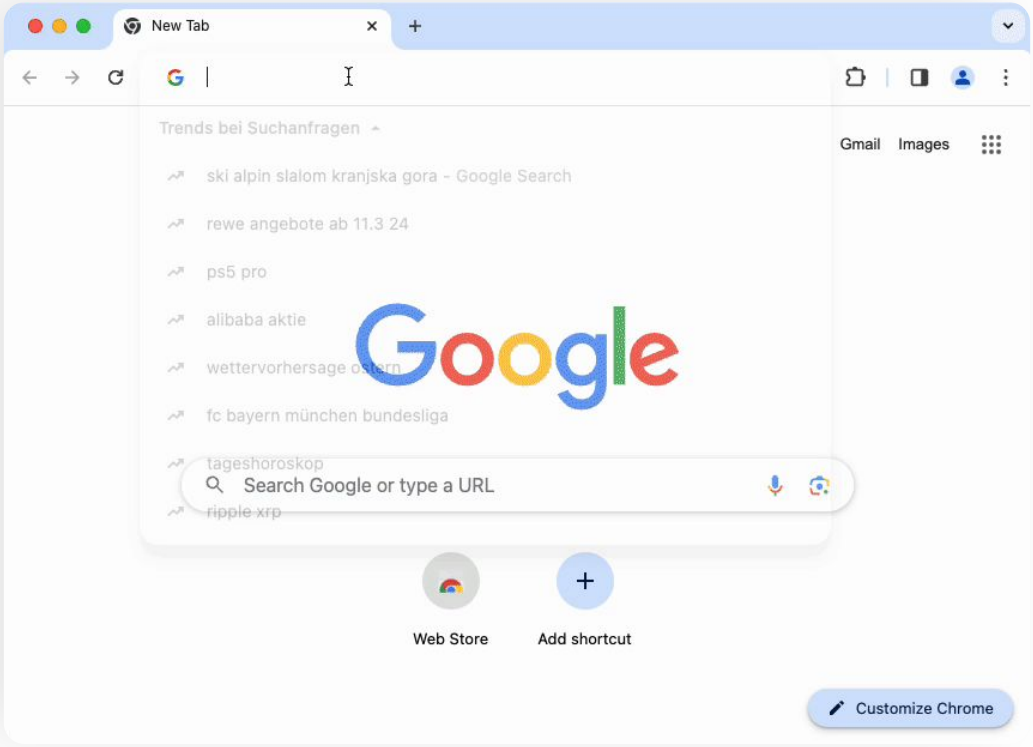
- 87% of prompts on desktop Chrome are for notifications and geolocation
- Allowed permission prompts are less annoying
- Prior user interaction
  - Only 15% of permission prompts follow a user interaction
  - More likely to allow access
- Availability of contextual information
  - More likely to allow access
  - Higher for mic and camera

“Don’t Interrupt Me”

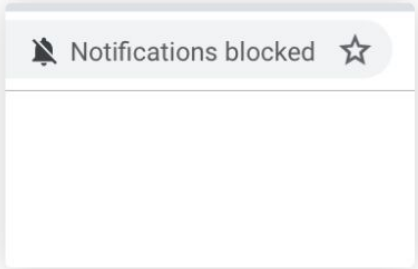
A Large-Scale Study of On-Device Permission Prompt Quieting in Chrome

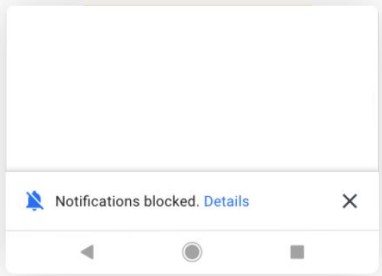
NDSS 2024

Motivation


New Tab
Trends bei Suchanfragen
ski alpin slalom kranjska gora - Google Search
rewe angebote ab 11.3 24
ps5 pro
alibaba aktie
wettervorhersage ostern
fc bayern münchen bundesliga
tageshoroskop
ripple xrp
Gmail
Images
Google
Search Google or type a URL
Web Store
Add shortcut
Customize Chrome

Prior Work





Triggered if any of the below is true:

- Site in bottom 5% by grant rate
- User denied 3 consecutive prompts in 28d
- Settings opt-in

-30% 🎉
avg. **deny** rate

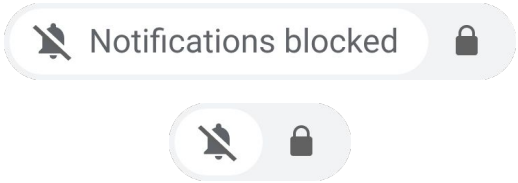
-5% 👍
avg. **grant** rate

3% ⚠️
Notification **prompts quietable**

14% 😕
Users eligible for quieting

Bilogrevic et al., "Shhh…be quiet!" – Reducing the Unwanted Interruptions of Notification Permission Prompts on Chrome, Usenix Security 2021

This Work



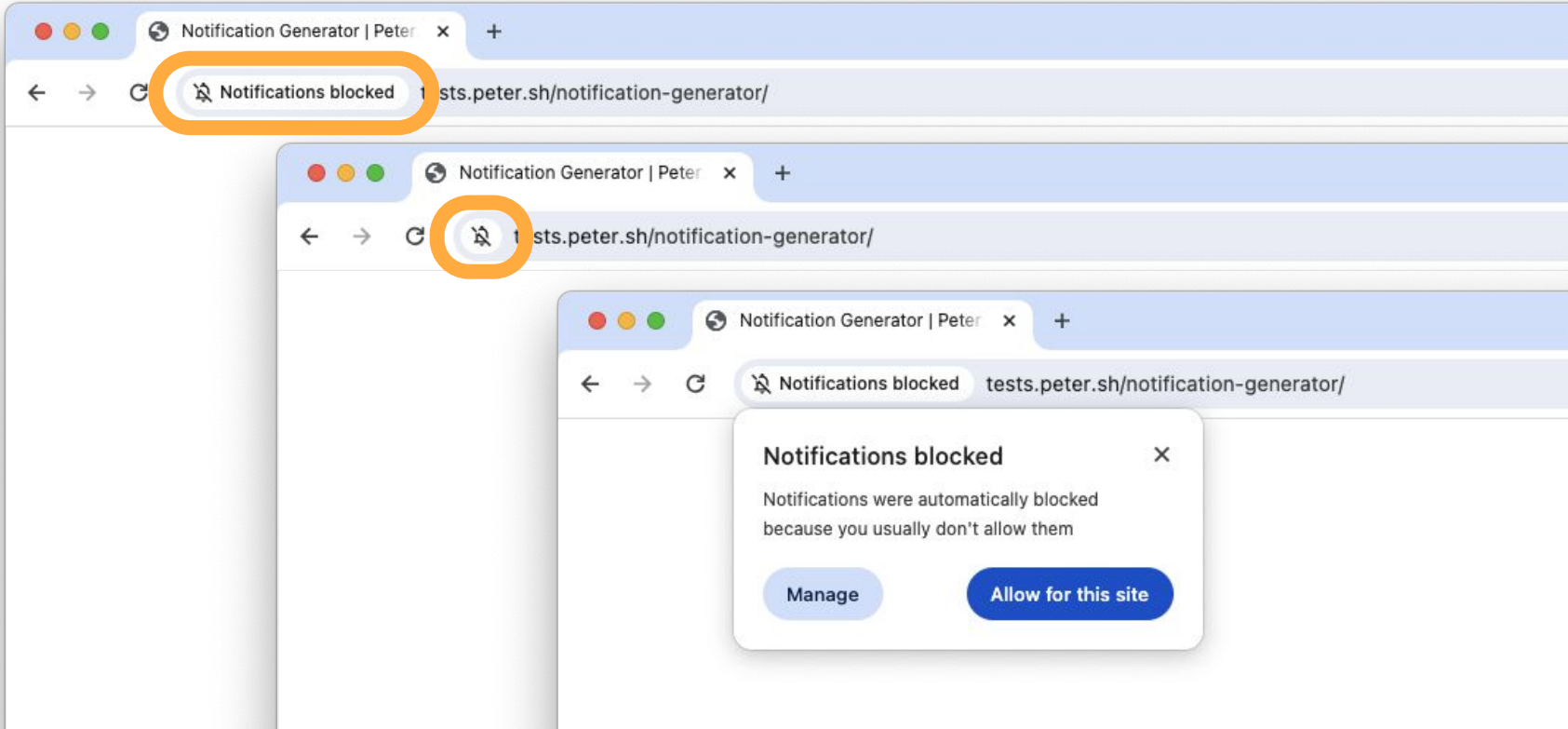
Current
quiet prompt UI

ML-based activation

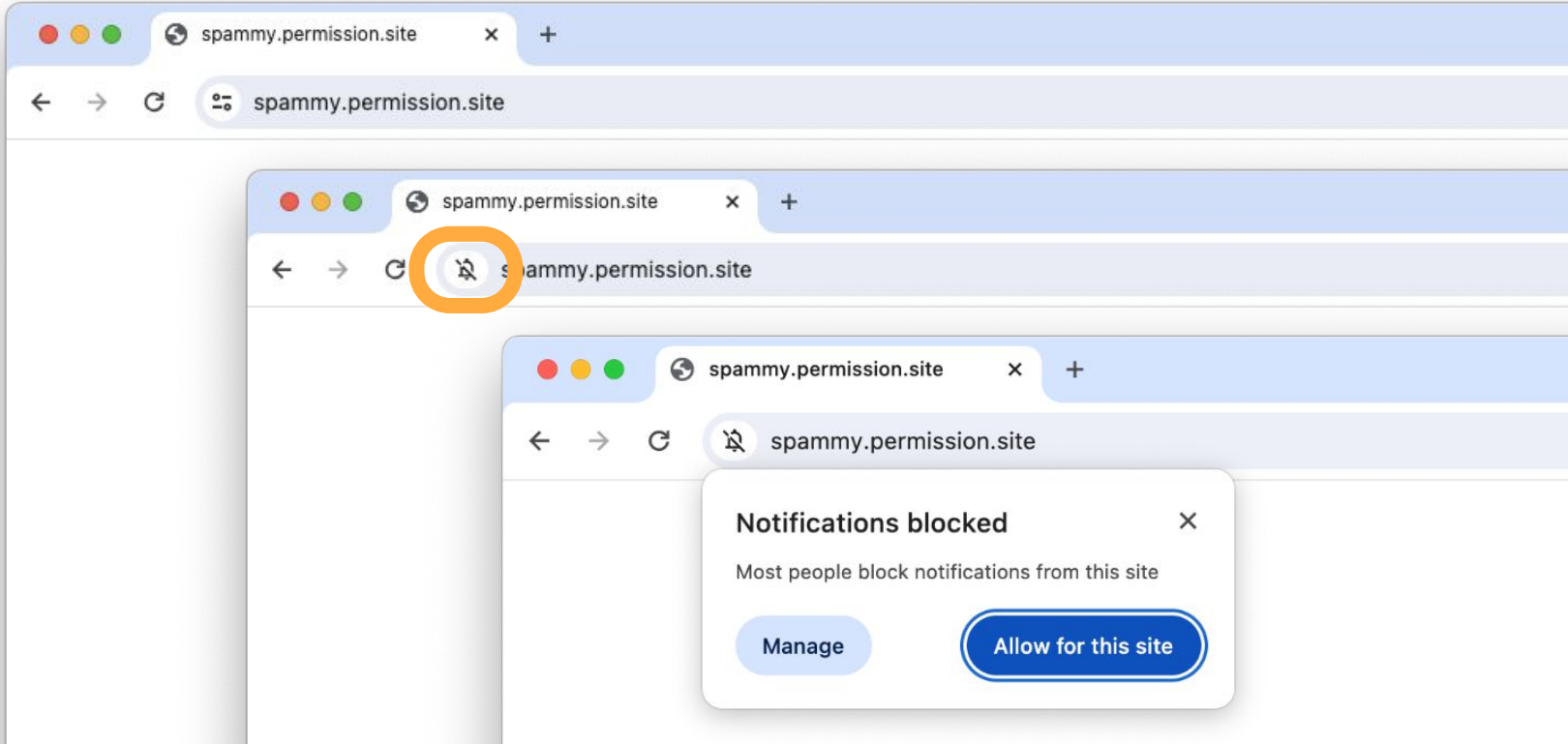
User experience

Current Quiet Prompt UI

Quiet Chip

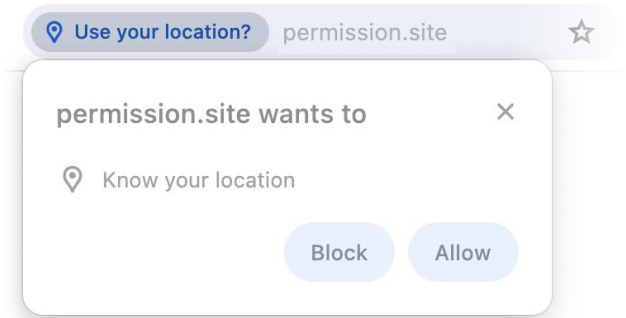

Notification Generator | Peter
Notifications blocked
sts.peter.sh/notification-generator/
Notification Generator | Peter
sts.peter.sh/notification-generator/
Notification Generator | Peter
Notifications blocked
tests.peter.sh/notification-generator/
Notifications blocked
Notifications were automatically blocked because you usually don't allow them
Manage
Allow for this site

Quietest Chip

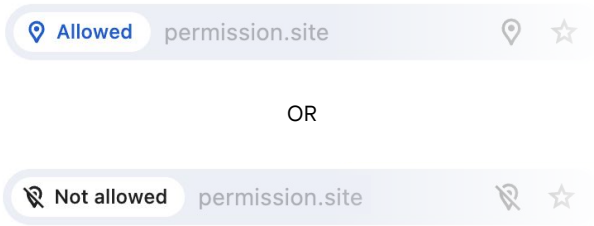


Chip Pattern

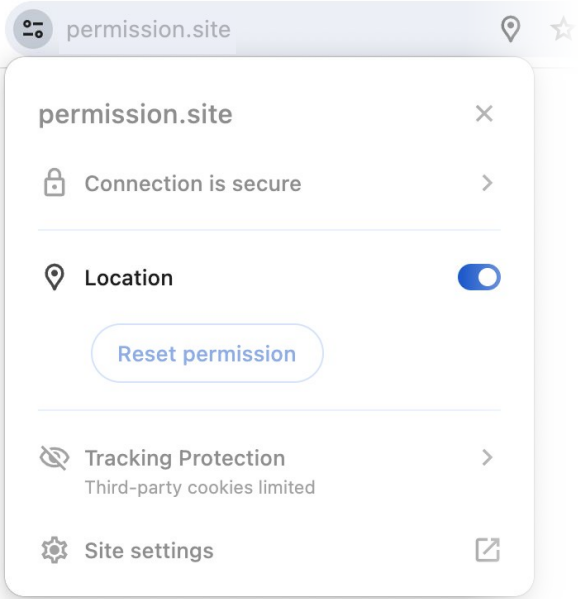
Request Chip



Confirmation Chip

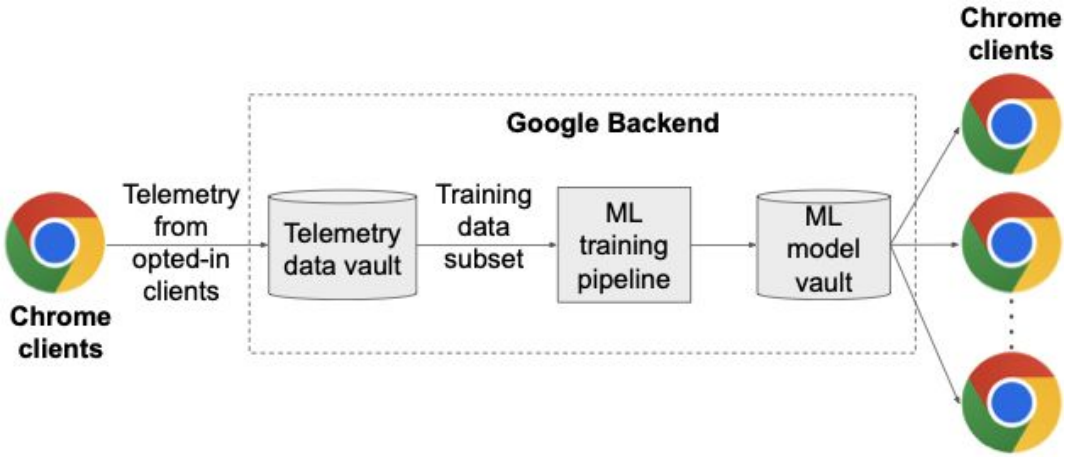


Site Controls



ML-based Activation

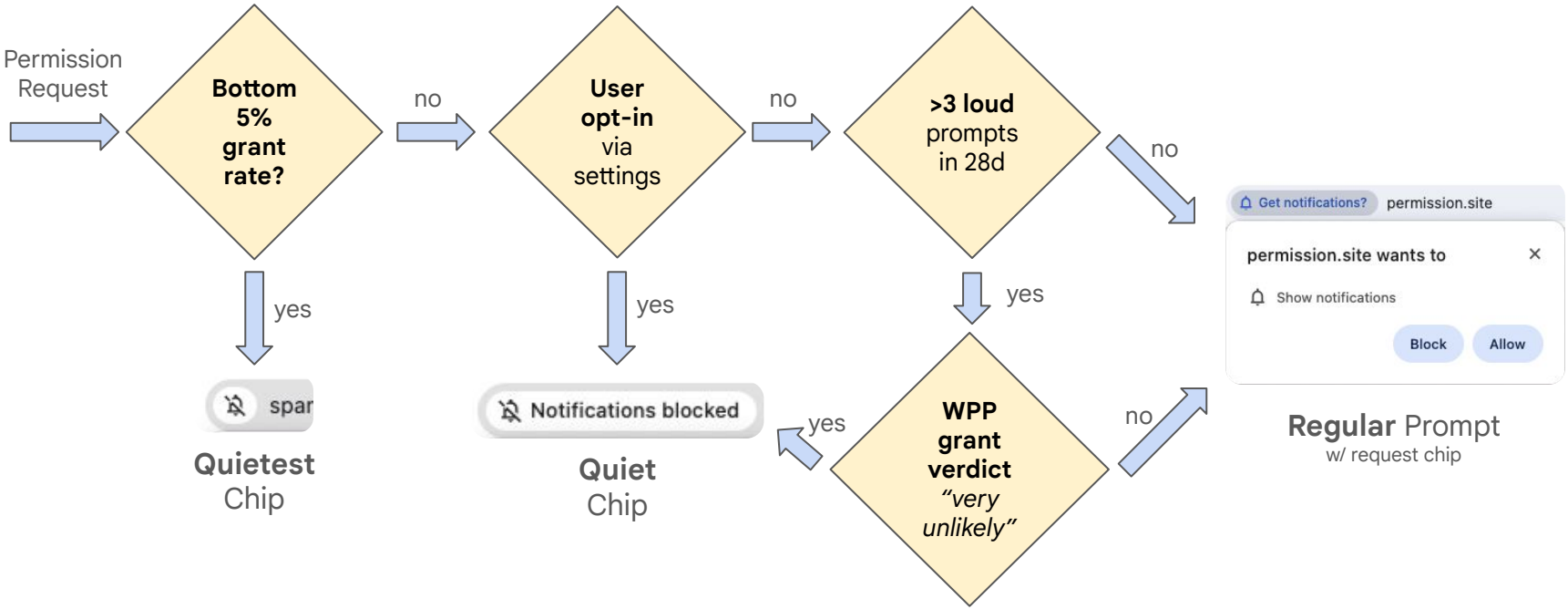
Web Permissions Predictions (WPP)



Features used for training:

- Permission type
- 28d average action rates across all permissions
- 28d average per-permission action rates
- 28d number of loud permission prompts
- User gesture prior to prompt?
- Desktop vs. mobile

Decision Logic

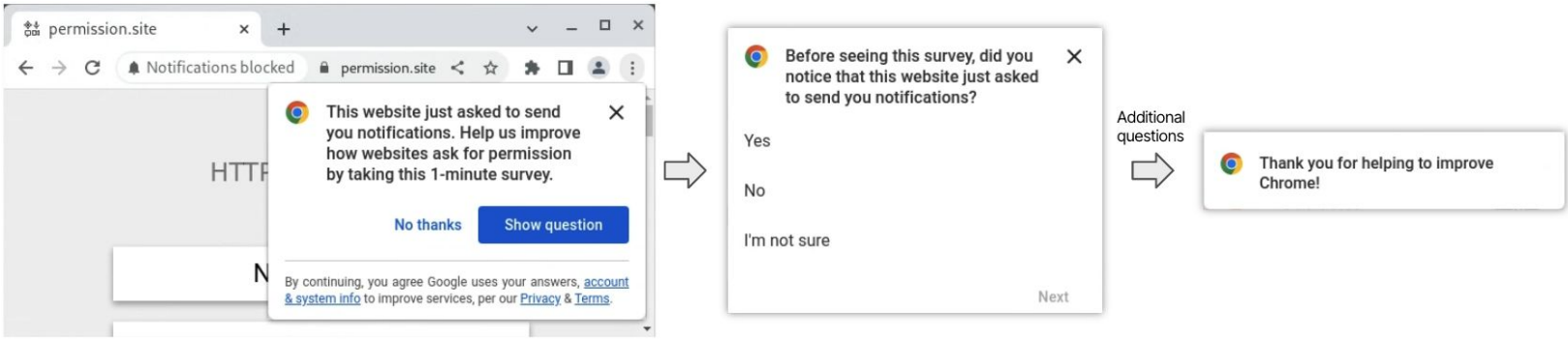


Improved quieting efficacy

Metric	Notifications Permission	Geolocation Permission
# of prompts	> 10 million	> 10 million
% of prompts for which WPP was the UI selector	43%	24%
% of quieted prompts (over all prompts for which WPP was the UI selector)	96%	81%
Post-hoc precision	99%	99%
Post-hoc recall	96%	83%

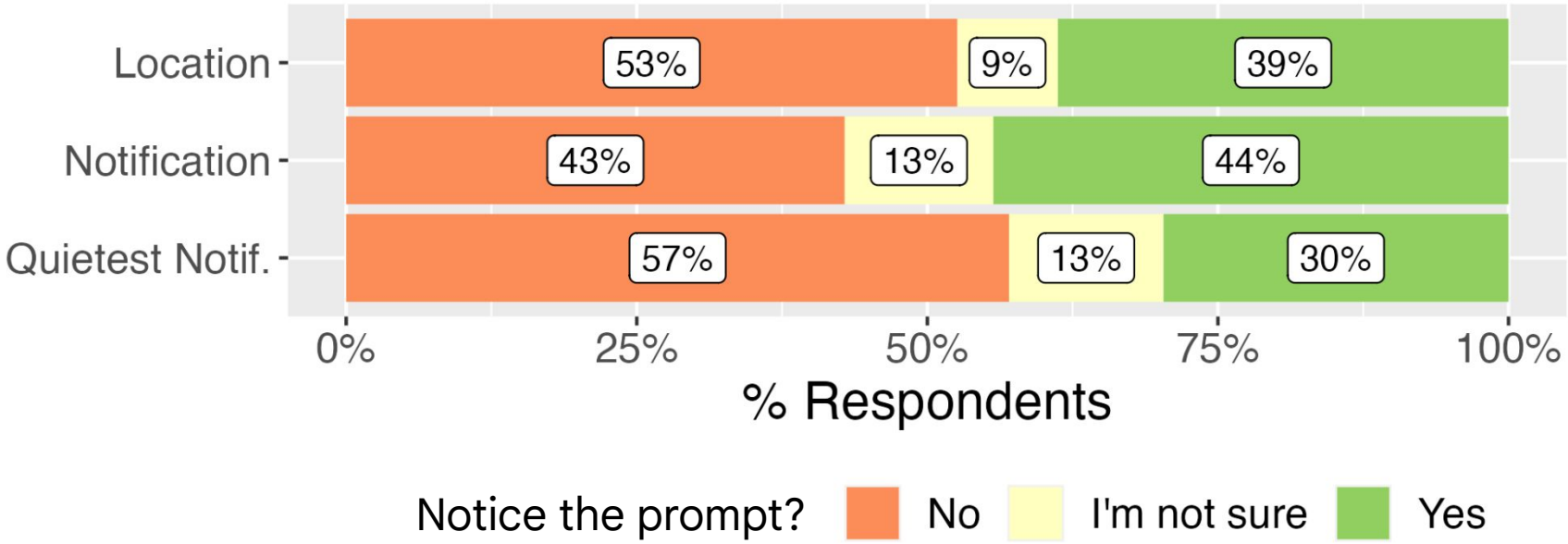
User Experience

Method



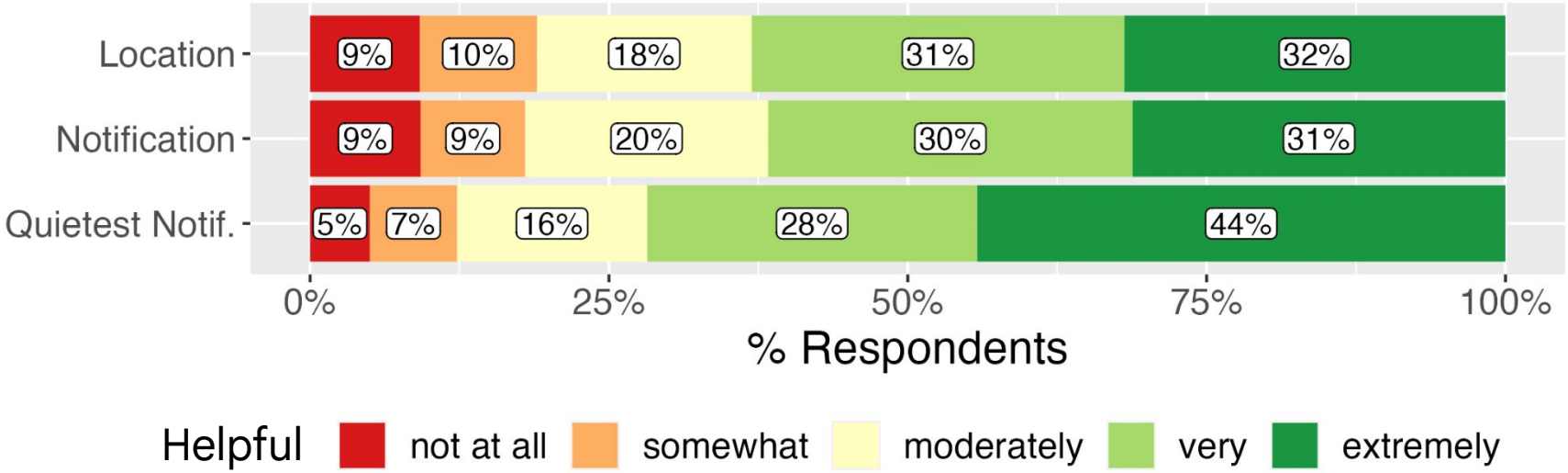
- **2.9M** survey invitations shown
- **13,109** complete responses
  - 7 languages, 156 countries, 66s median response time
  - Caveat: self-selection bias

How noticeable is the chip?



Q: Before seeing this survey, **did you notice** that this website asked to [send you notifications / see your location]?

How helpful is prompt quieting?



Q: Chrome automatically blocked this website's request, [based on your past choices / because most people block it or notifications from this site may be disruptive].
How helpful do you find Chrome's action?

Why do respondents feel uneasy about quieting?

Reason Category	Example	Geolocation	Notification	Quietest Notif.	Total
Want more control	*should ask first, make recommendation instead, feels like censorship*	51 (29%)	47 (19%)	41 (24%)	139 (23%)
Unsure what is happening	*general confusion / want to know more*	20 (11%)	28 (11%)	15 (9%)	63 (11%)
Inappropriate blocking in this case	*doesn't make sense on the this site, can't be perfect*	11 (6%)	33 (13%)	14 (8%)	58 (10%)
Fear of missing out	*afraid to miss something, may change their mind*	10 (6%)	25 (10%)	12 (7%)	47 (8%)
Privacy	*Chrome knows too much*	10 (6%)	18 (7%)	9 (5%)	37 (6%)
Concerned about malware/hackers	*site is not safe*	6 (3%)	16 (7%)	1 (1%)	23 (4%)
Unclear or off topic		29 (17%)	40 (16%)	34 (20%)	103 (17%)
No concern/probably OK		13 (7%)	18 (7%)	26 (15%)	57 (10%)
Answered unease question in reverse		8 (5%)	6 (2%)	4 (2%)	18 (3%)
Total		175	246	173	594

Q: Please briefly describe what makes you feel uneasy about Chrome blocking requests [based on your past choices / that most people block or because notifications from the site may be disruptive].

Quieting mental model

Reason	Geolocation	Notif.	Quietest Notif.	Total
Chrome thinks that this website is dangerous	15.1%	13.4%	14.9%	14.4%
Chrome thinks that I'm not interested in this website	4.2%	8.0%	9.7%	7.3%
I don't know	50.0%	46.3%	40.1%	45.5%
Previously denied request	16.2%	17.9%	19.0%	17.7%
Told Chrome to block website	9.4%	10.4%	12.6%	10.8%
Other	3.6%	2.1%	2.4%	2.7%
This website has a technical issue	1.6%	2.0%	1.3%	1.6%

Q: This website was blocked from $request_type. Why do you think that is?

Further improvements

- Reduced false positive rate by adding per-site signals to the WPP model

Summary

- ML-based activation **increases the reach and efficacy** of prompt quieting.
  This will reduce interruptions and prompt blindness.
- Most respondents **found quieting helpful** but struggle with understanding why Chrome is doing it.

Additional findings in the paper

- Subjective false positive rates
- Override efficacy

TL;DR

- Allowed permission prompts are **less annoying**.
- Only 15% of permission prompts **follow a user interaction**.
  - More likely to allow access
  - But not more contextual information
- More likely to allow when users **understand why they are being asked**.
- **Chrome intervenes** to reduce interruptions and prompt blindness using ML-based prompt quieting.
- Most respondents **found quieting helpful**.

Harbach (2024): Websites Need Your Permission Too – User Sentiment and Decision-Making on Web Permission Prompts in Desktop Chrome. ACM CHI 2024.

Harbach et al.: Don't Interrupt Me – A Large-Scale Study of On-Device Permission Prompt Quieting in Chrome. NDSS 2024.