# Tracking Tracker Blockers: Privacy Software Review

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Problems/Motivation

- How are we all tracked?
  - Websites and trackers have evolved
  - Cookies and trackers are often active without user consent
- How pervasive are trackers on the internet?
  - How likely are specific trackers to be encountered?
  - How widespread are individual trackers?
- What can we do to stop them?
  - Comparison of public extensions and browsers
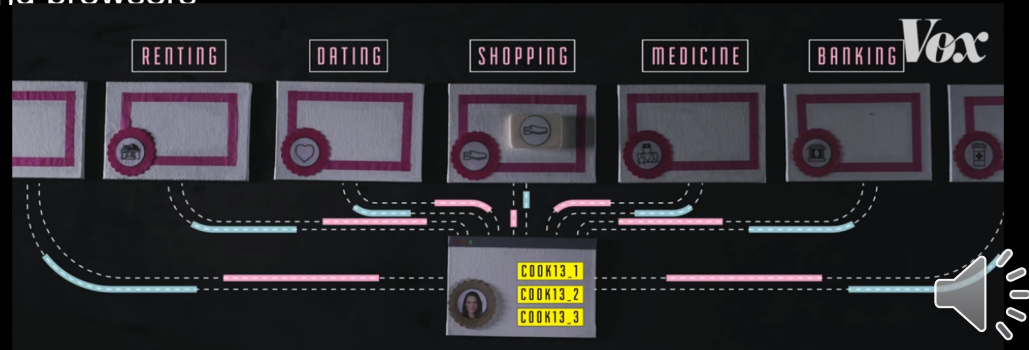
Goals

- Compare effectiveness of privacy extensions and browsers against trackers on popular sites on the internet
- Design and propose new metric for comparing blocking software
- Evaluate best blockers for particular users and browsing behavior
- Understand prevalence of trackers and their presence across websites

Metric

- Best blockers stop prevalent trackers encountered on prominent websites
- Score extensions by weighting frequency of blocked trackers with prominence of website (inverse of Alexa Top 50 rank) [1]
- Emphasis on blocking pervasive trackers that appear on popular sites

$$\text{Blocker score} = \sum_{\text{tracker}}^{\{\text{blocked}\}} \left(\frac{1}{\mathbf{rank}(\text{website})} \right)^2 \cdot \mathbf{freq}(\text{tracker})$$

Website Prominence

Tracker Prevalence

Results

- Ghostery performed very well (confirmed with earlier research) [1]
- PrivacyBadger blocks large volume of (obscure) trackers
  - Falls short by failing to block some of more prevalent trackers
- uBlock Origin best according to our new metric
  - Blocked same pervasive trackers as Ghostery and more obscure trackers like PrivacyBadger
- Firefox's built in privacy performed poorly
  - Captured small portion of total trackers regardless of prevalence

Blocker	Score
Ghostery	13.38
PrivacyBadger	12.74
uBlock Origin	17.52
Firefox	7.64

Comparison

Effectiveness of Different Tracker Protections on Different Websites
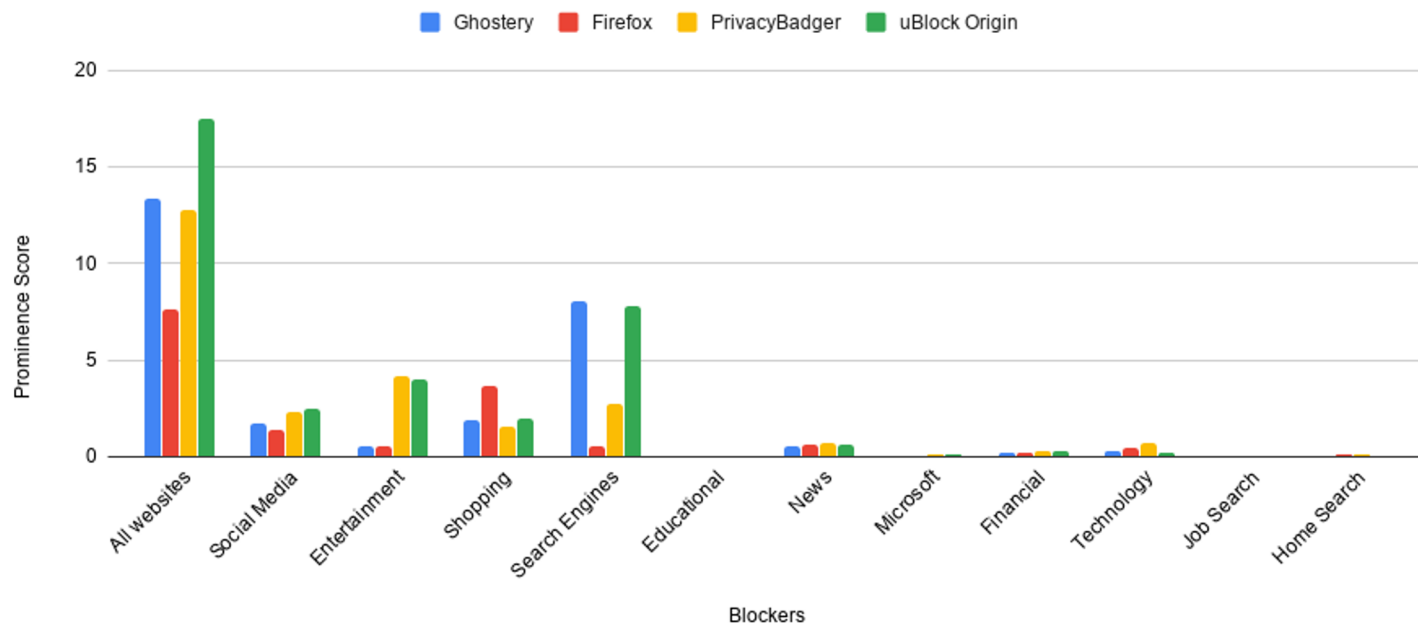
Domain Analysis

- Analyzed domains and companies of blocked sites [3]
- Google is most prevalent
- Blocked domains might not just be for tracking

Run experiments faster

Launch tests faster with no need to commit to a timeline or sample size, increasing your experiment velocity.

Client Reputation

Stop malicious clients before they can attack, based on Akamai's visibility into prior behavior of individual IP addresses

Connectivity Analysis

- Tracker Sharing Connectivity Analysis: website A and B use the same tracker
  - Prevalence of sharing of user information
- Domain Connectivity Analysis: website A uses a tracker that belongs to B
  - Big Tech most pervasive in collecting user information

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- With any privacy protection software, the leak of user information between websites can be largely reduced

Conclusion

- Metric provides high-level understanding of blocker effectiveness on prominent websites
    - Extensions that score higher block most pervasive trackers consistently across popular sites
    - More fine-grained analysis performed using metric on subset of domains (i.e. news sites)
    - uBlock Origin > Ghostery > Privacy Badgger >> Firefox
- Trackers might not be more nuanced than initially expected
- Top websites collect and share user information pervasively, but privacy software is here to help
- Github Repo: https://github.com/liangw6/XYZ

Future Work

- Further development of tracker metrics could help analyze extensions
- More types of cooperation with tracking companies could be interesting
- Expand investigated websites beyond Alexa Top 50 (i.e. top 1 million)
- Use connectivity as a new metric or analyze connectivity between types of websites (i.e., News, Shopping)

References

[1] S. Englehardt, A. Narayanan. 2016. Online Tracking: A 1-million-site Measurement and Analysis. In Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security (CCS '16). Association for Computing Machinery, New York, NY, USA, 1388–1401.

[2] S. Traverso, M. Trevisan, L. Giannantoni, M. Mellia and H. Metwalley, "Benchmark and comparison of tracker-blockers: Should you trust them?," *2017 Network Traffic Measurement and Analysis Conference (TMA)*, Dublin, 2017, pp. 1-9.

[3] WhoTracks.Me