Every Second Counts:

Quantifying the Negative Externalities of Cybercrime via Typosquatting

Mohammad Taha Khan*, Xiang Huo*, Zhou Li† & Chris Kanich*

University of Illinois at Chicago* & RSA Labs†

Cybersecurity In General…

- Generally focus on:
  - Detecting malicious programs
  - Finding and fixing bugs and flaws
  - Economic analyses

Why Is This Important?

- The ultimate goal:
  - Minimize the harm caused to users
  - Harm: Monetary, **wasted effort, loss of time**

Typosquatting

*[J. Szurdi, B. Kocso, G. Cseh, M. Felegyhazi, and C. Kanich, "The Long "Taile" of Typosquatting Domain Names, *USENIX*, 2014.]

An Example

Time

Typosquatting

- Evidence that typosquatting is **PERVASIVE**:
  - Large organizations invest into defensive registrations
  - Internet users continue to make typos

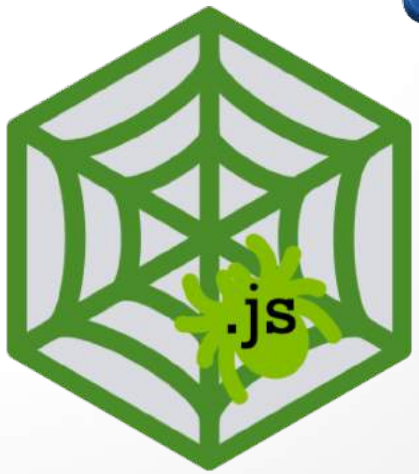
- What makes it **FEASIBLE** to study:
  - Observable from a network level
  - Can infer **User intent** from available data

Our Contributions

- Passive detection of typosquatting domains using a conditional probability model
- Present a harm metric in the form of loss of time and users
- Apply this metric to quantify the cybercrime of typosquatting
- Our work uses an **open methodology** with fine grained measurements

Data-Sets

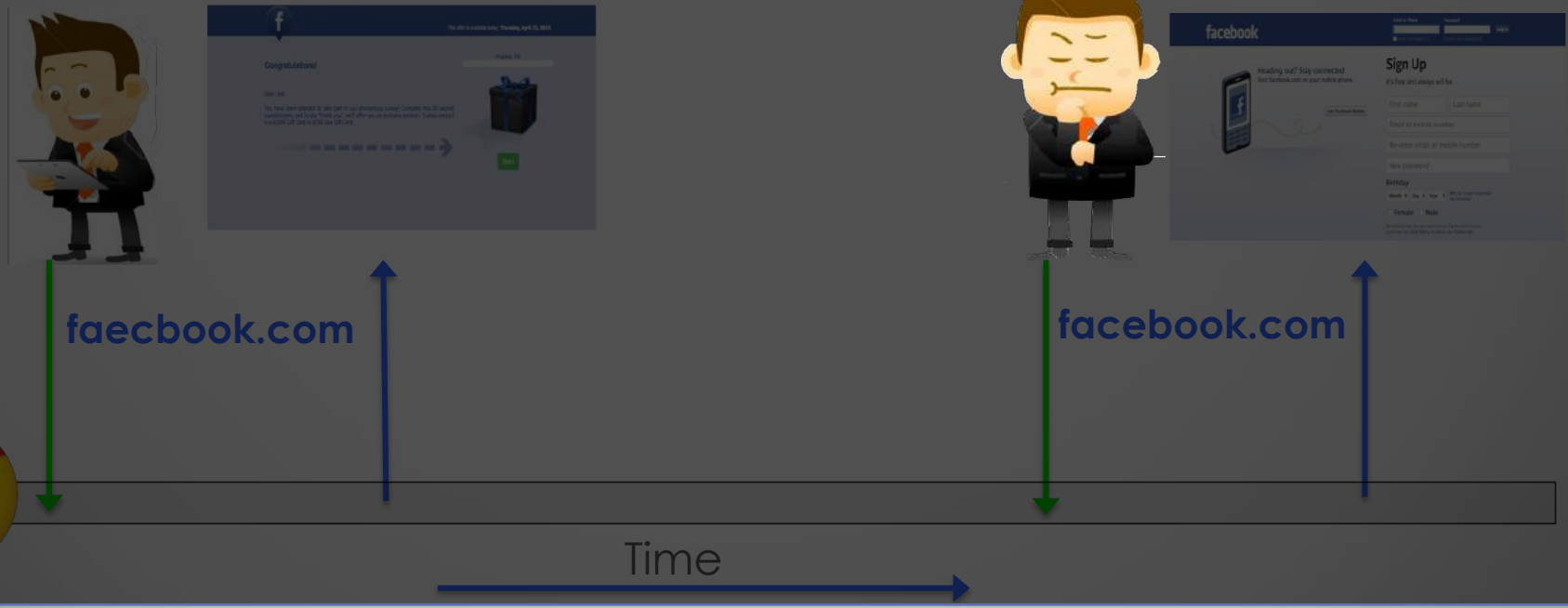
- Passive Sources
  - HTTP data logs
  - DNS logs from recursive resolver
  - Enterprise proxy data
- Active Sources
  - High Fidelity Crawler



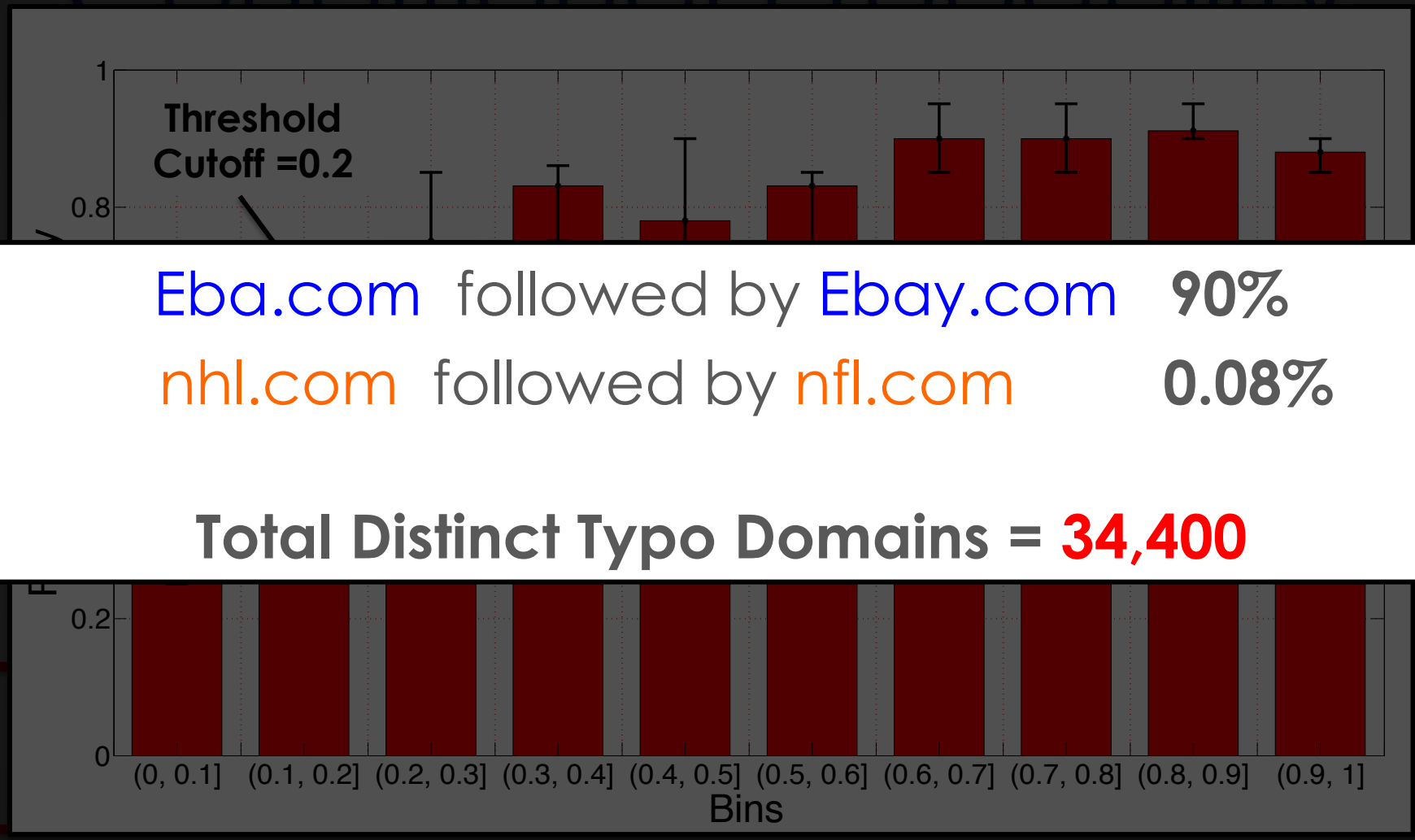
User Intent

- User Intent to visit the [illegible]e generates similar pairs of domains

- User intent is manifested in various discovery methods



Conditional Probability



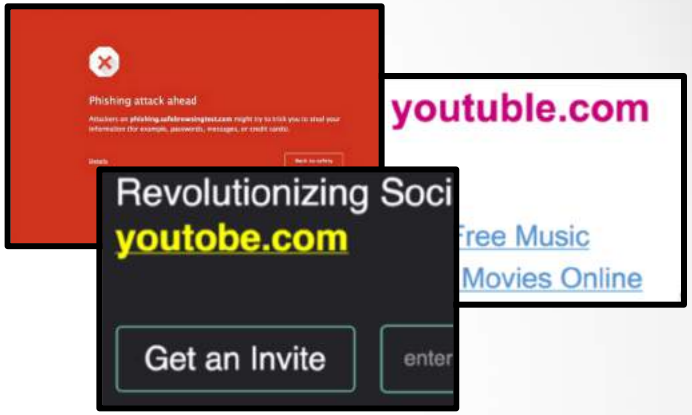
Eba.com followed by Ebay.com **90%**

nhl.com followed by nfl.com **0.08%**

Total Distinct Typo Domains = 34,400

Typo Characterization

- Adversarial registrations
  - Parked Domains
  - Malicious Websites
  - Other

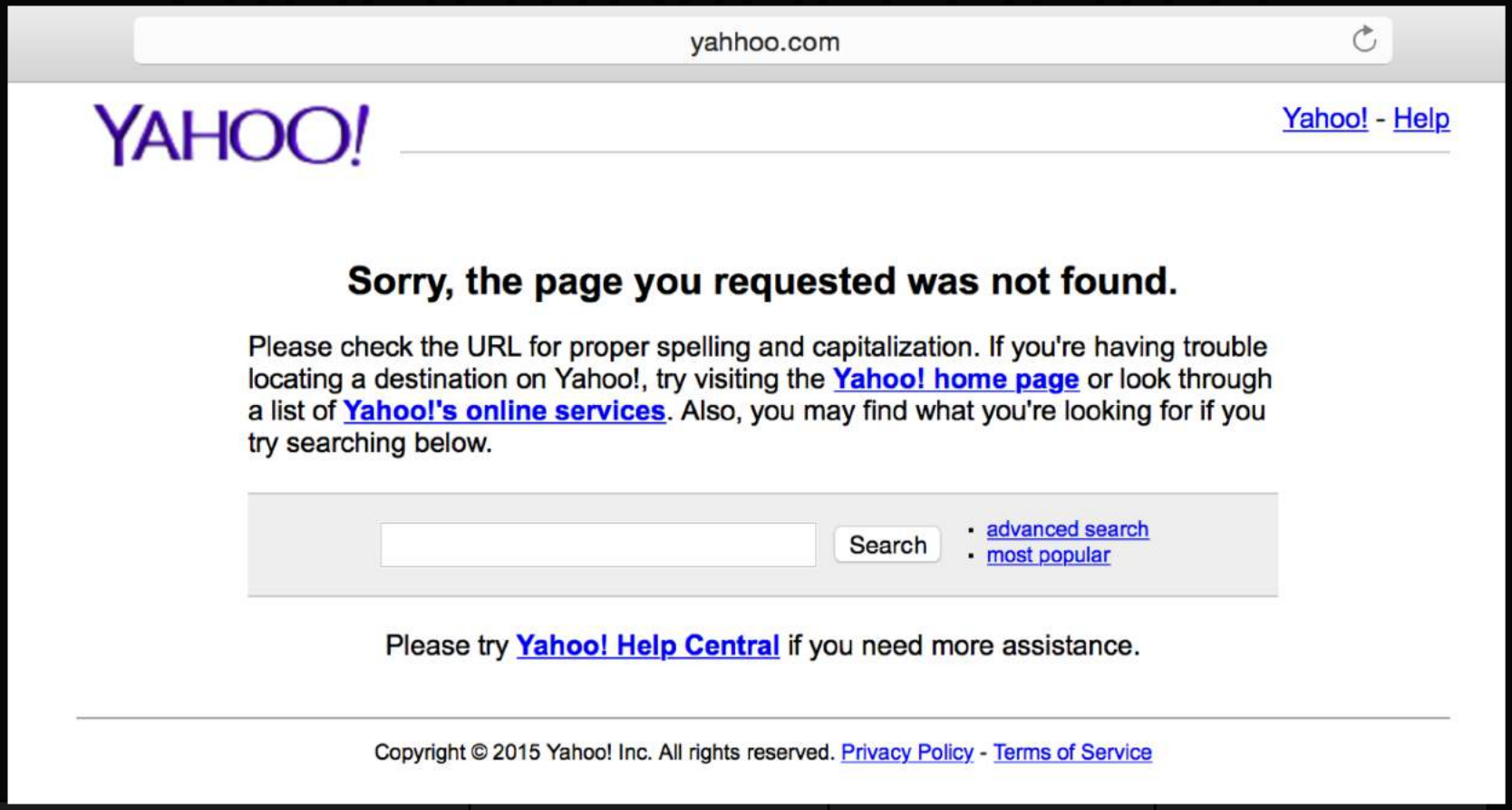


- Cooperative registrations
  - JavaScript and 3xx redirections
  - Defensive registrations

- Unregistered websites
  - NX Domains

What Next...??

Quantifying Harm

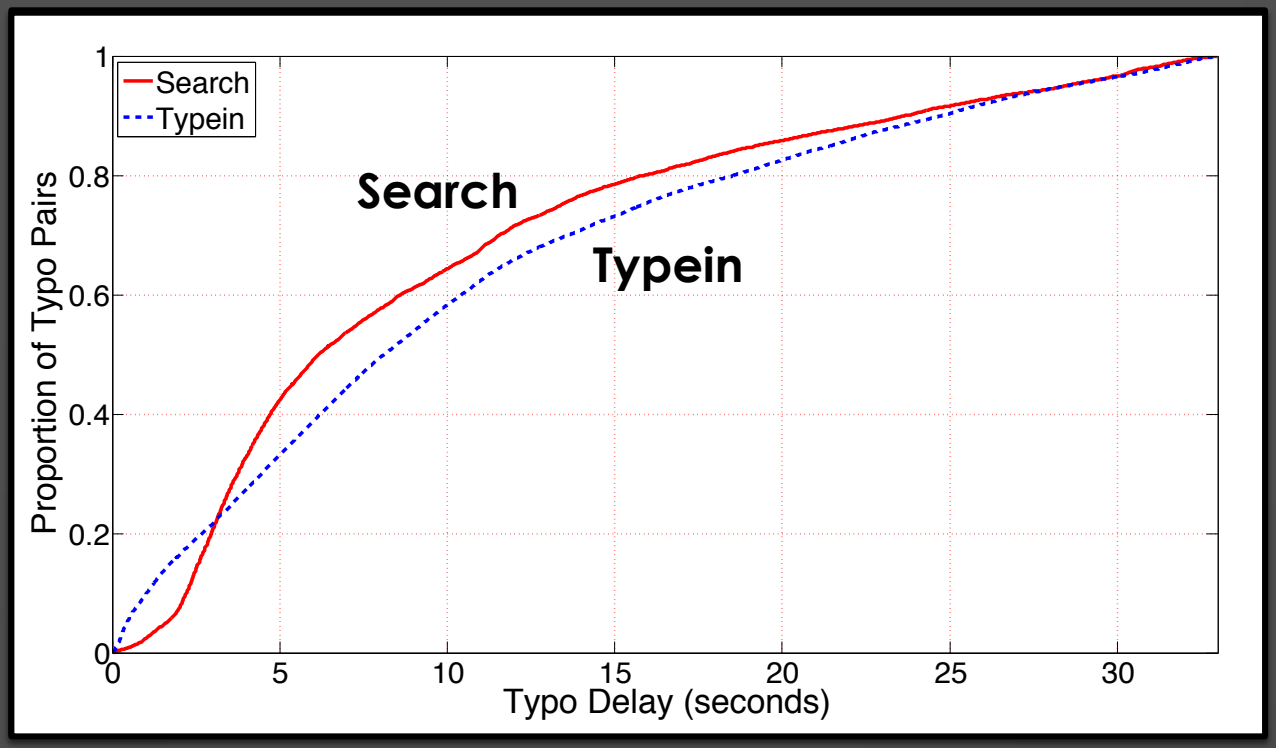


	Cooperative	Adversarial	Unregistered
Average Delay (s)	2.87	9.58	10.38
Average User Loss (%)	3.30	16.81	11.53

Search VS Typein Delays

- Different discovery methods show varying delay trends

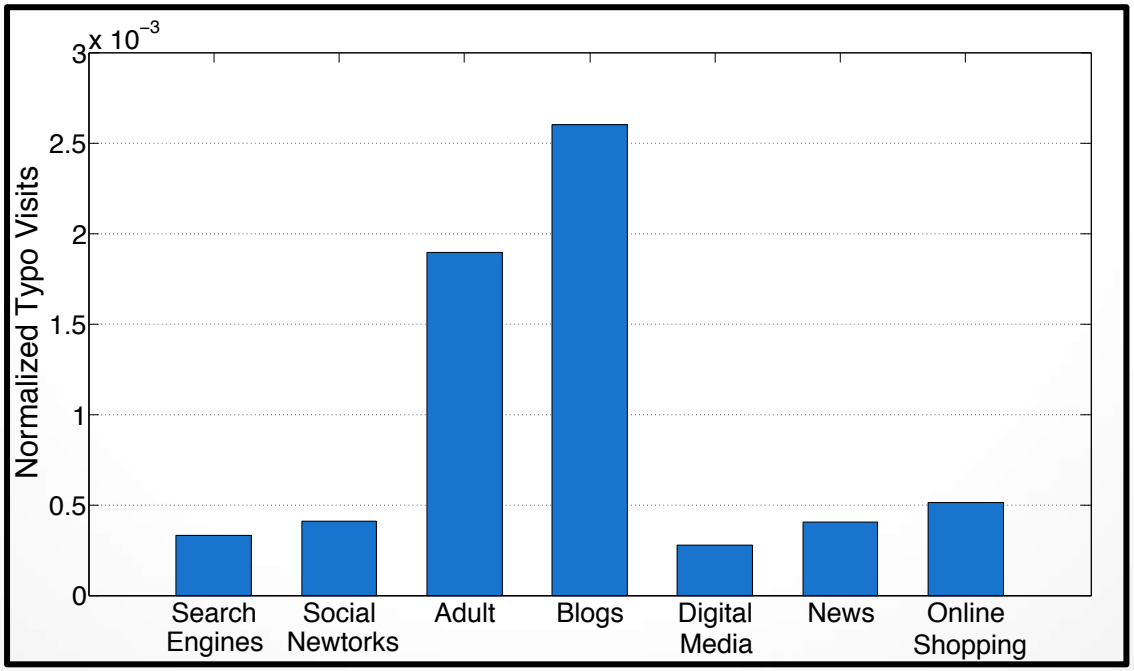
Unregistered Domains



Target Domain Category

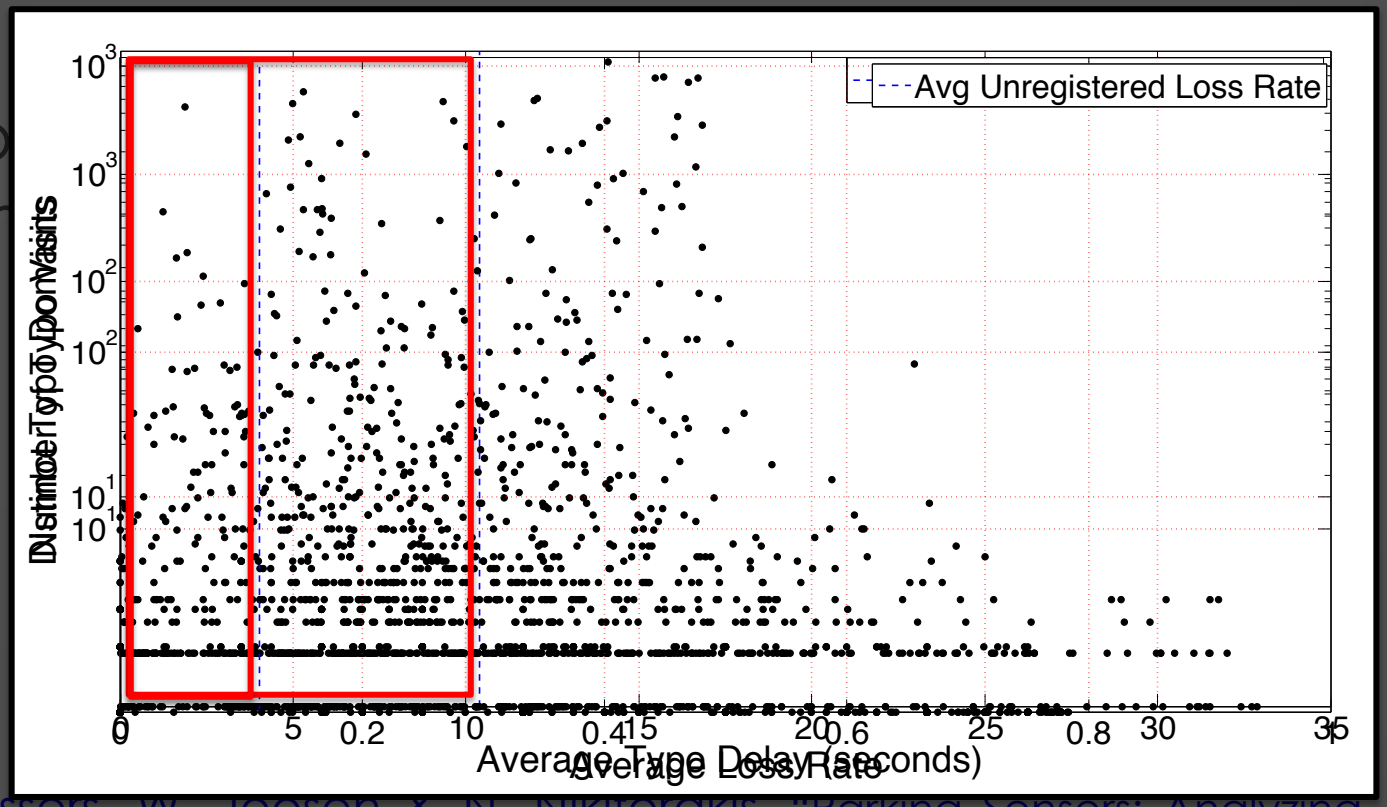
- Most Typos exist in the long tail of popularity

- Most distinct typos belonged to Adult and Blogs



Delay & Success Clustering

- Some typo domains help users to get faster to their destination websites
- Top
  dor



*[T. Vissers, W. Joosen & N. Nikiforakis, "Parking Sensors: Analyzing and Detecting Parked Domains". *NDSS 2015*]

Loss of Revenue

- Convert time and user loss into dollars.
- Intended site owner has a negative externality ratio of **18:1** against the typosquatter
- Using per capita income an average user loses **$0.29** to typosquatting per year
- For defenders, the effort ratio is **4.62:1**, far lower than non-violent crime*

*[J. M. Rao and D. H. Reiley, "The Economics of Spam," *The Journal of Economic Perspectives*, pp. 87–110, 2012.]

Conclusions

- Typosquatting is much less societally damaging than other non-violent crimes
- Defensive registrations do help against mistyping but not much against typosquatting
- Special technical or policy interventions are not necessarily required to deal with it

Thank You!

Qeustions?