On the Privacy Concerns of URL Query Strings

Andrew G. West (Verisign Labs) and Adam J. Aviv (USNA)

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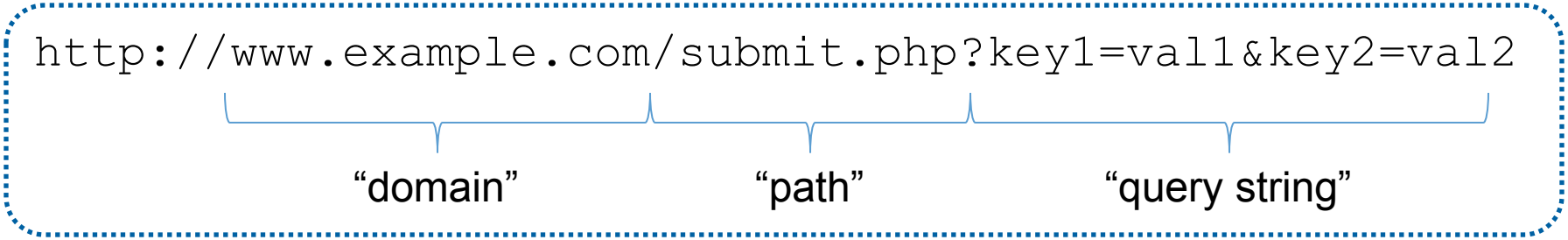
URL Query Strings



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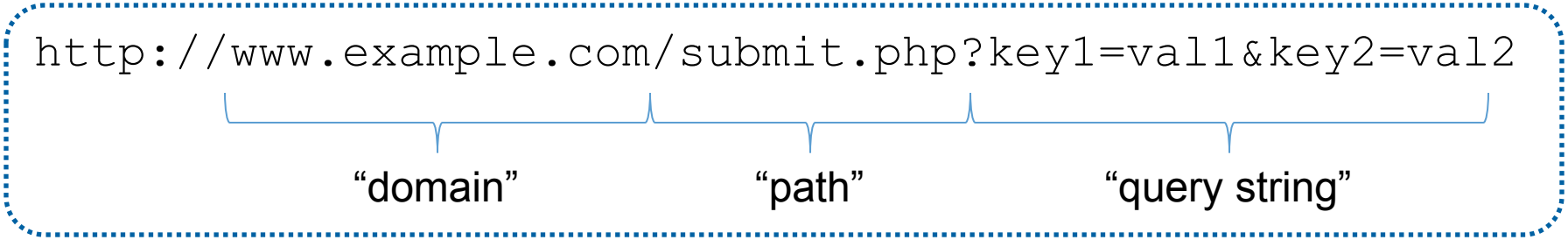

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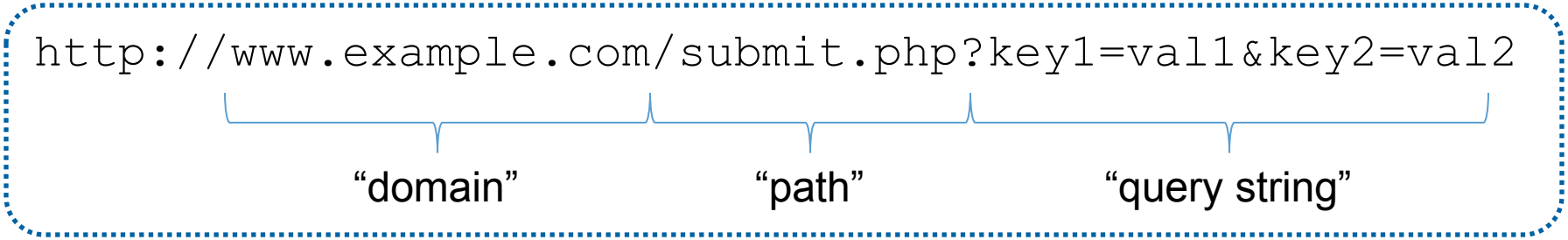

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"domain" "path" "query string"

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WEB 2.0 SERVICES IDEAL FOR PRIVACY LOGIC

- Web 2.0 is medium by which many links arrive on public web
- Strip params unnecessary for rendering; retroactively sanitize

How do we approach this?

1. Measurement study over 892M user-sourced URLs
2. “CleanURL” (a privacy-aware link transformation service)

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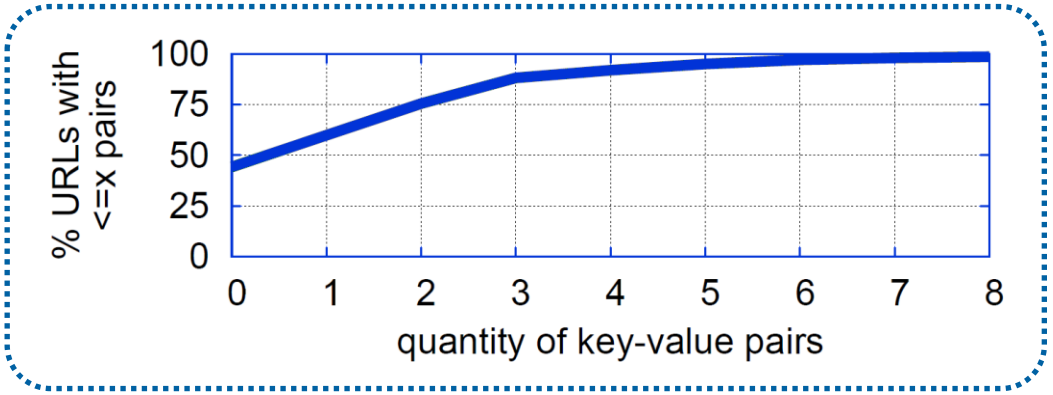

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  - 490M URLs (54.9%) w/1+ pair
  - 44.6M URLs (5%) w/5+ pairs
  - 23.4K URLS w/100+ pairs

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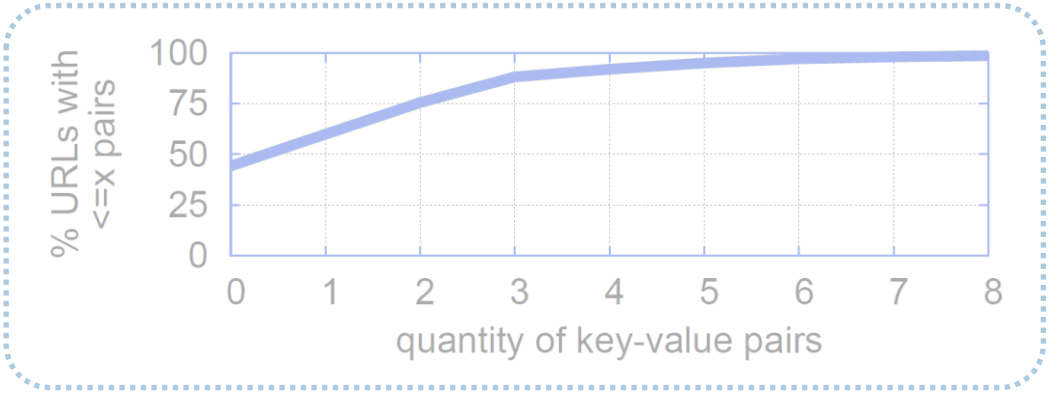

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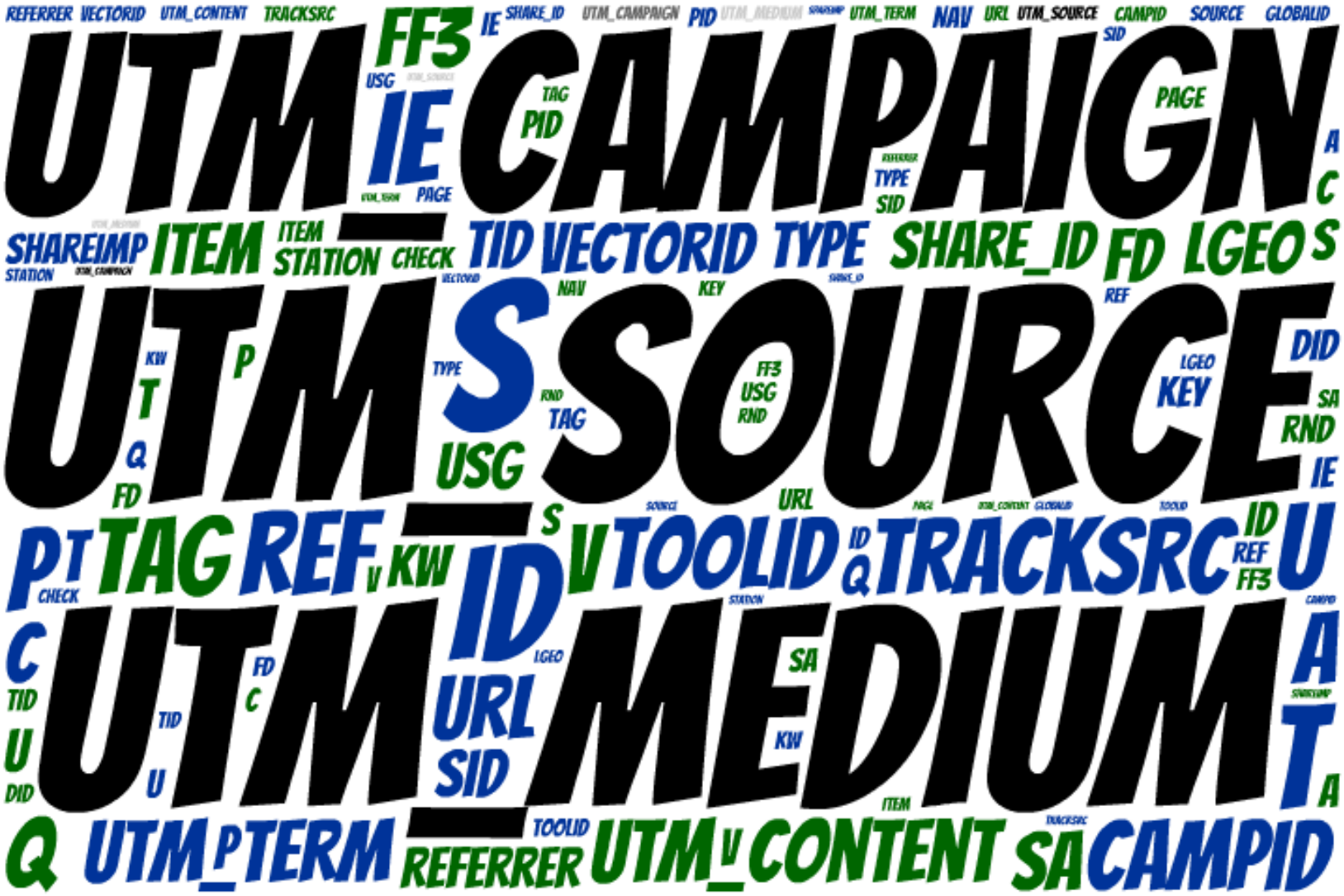
- Broader perspective:
  - 1.3 billion key-value pairs total
  - 909k unique key names

Common Query String Keys



Privacy-sensitive Key-value Pairs

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Prevalence may be *under-reported*

- Naming conventions are non-standardized:
  - 103K instances of key "`email`"
  - 637K (6.2×) keys pattern match "`*email*`"
  - 1.7M (16.5×) instances where value is an email address
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Must be *cautious* of such claims

- Not all values are sensitive (just a majority per Monte Carlo)
- No idea which of these values are "personal"
  - Ex: do geo-coordinates locate user? Or a monument?

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“Grand slam” examples, redacted:

```
[media]/xmlrpc.php?cmd=getVideos&username=admin&password=[redacted]

[medical]/index.aspx?accountname=[redacted]health&username=[redacted]&password=[redacted]

[healthcare]/?do=patient&directAccess=yes&username=[redacted]&password=[redacted]
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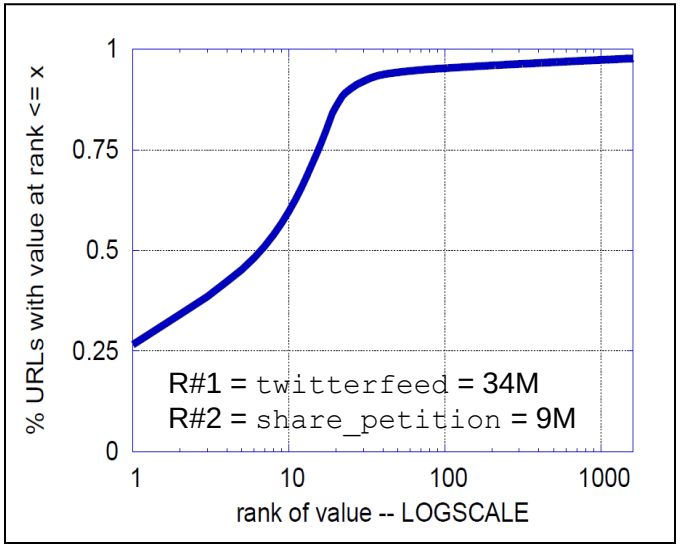

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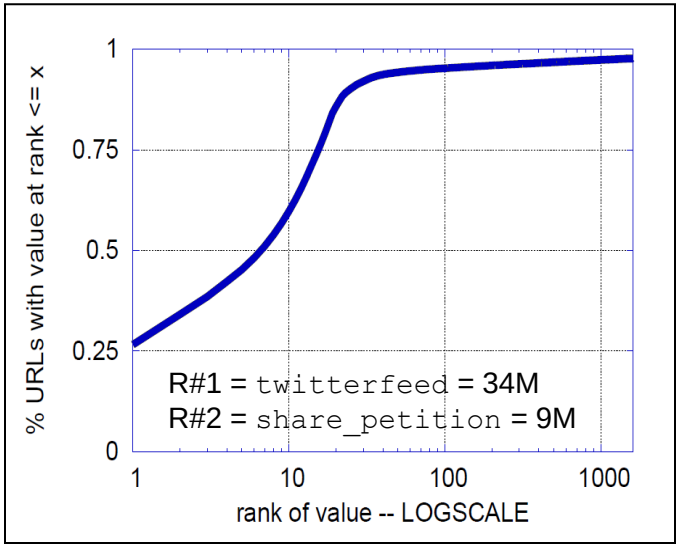
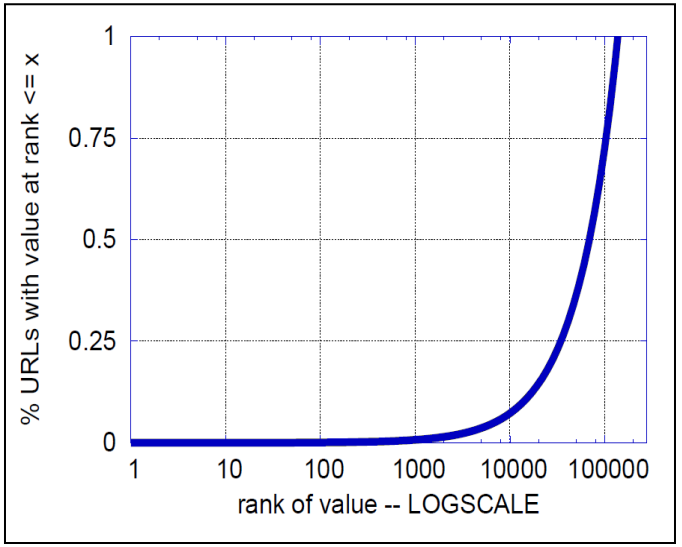


key = `secureCode` (275k instances)



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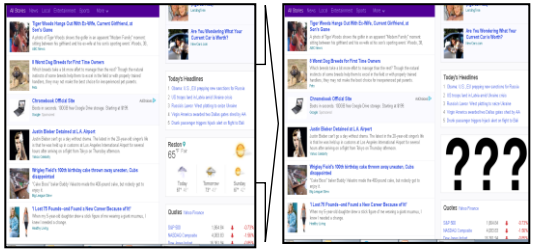

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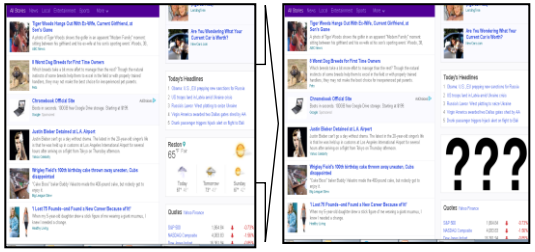

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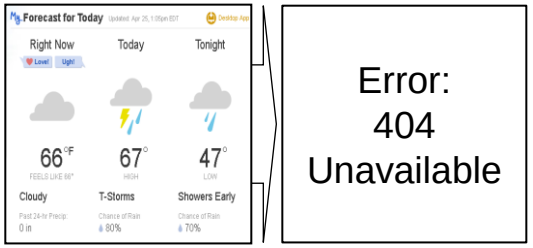

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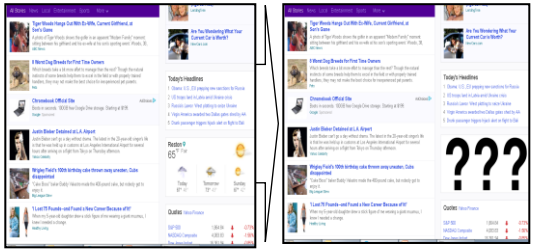

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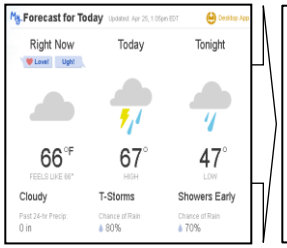

Error:
404
Unavailable

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- Programmatically difficult
  - Regexes gleaned from manual work
  - Mining corpora w/metrics such as entropy
  - Human feedback loops once online

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Your cleaned URL: [[base_url]]/R09XVIUh

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- Can domain sensitivity be learned from human feedback?
- Best practices involve HTTPS/TLS/SSL

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