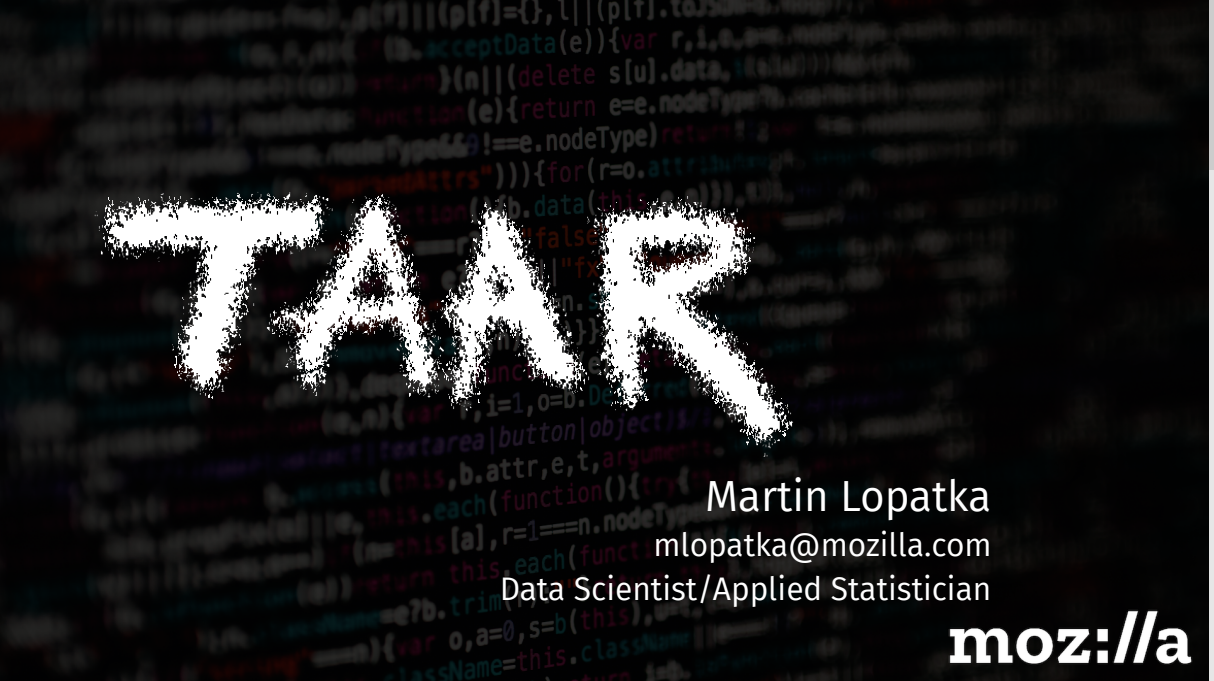
2019-06-11

- Personalised web browsing experience is hard
- Especially with a rigorous and respectful privacy policy
- Ultimately, many of the approaches in UMAP strive to find innovative ways to extract a meaningful signal from very noisy data.



TAAR
Martin Lopatka
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Data Scientist/Applied Statistician

- Martin Lopatka
- Time we have through… Mozilla's approach to recommending browser extensions
- T.A.A.R.
- Curiosity vs. builders
- given the time, focus on a very brief overview, and two specific design choices
- Privacy by design and CLLR

Telemetry

Firefox Telemetry (optionally) measures and collects non-personal, performance and usage information.[1]

[1] https://wiki.mozilla.org/Telemetry

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└Telemetry

Firefox Telemetry (optionally) measures and collects non-personal, performance and usage information.

- application localization identifier: (ch-de, br-pt)
- operating system
- subsession length
- bookmark count
- open tab count
- unique TLDs
- add-ons installed

Telemetry-Aware Add-on Recommender

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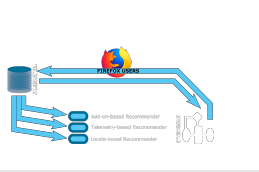

- Full system Spec
- Three modules each leveraging different subsets of client information based on availability.
- Individual recommendations combined via linear stacked ensemble
- These are domain specific and specific to our telemetry infra, so lets treat them like black boxes
- more interesting is the comparison of functions for determining individual weighting of the recommendations.

Differential Privacy

- Differentially private release mechanism for frequencies reports an approximate answer to an ***item:count*** distribution.
- Noise must be chosen to preserve the usefulness of the provided answer while protecting the privacy of the more rare counts

Introduction to DP: https://robertovitillo.com/2016/07/29/differential-privacy-for-dummies/

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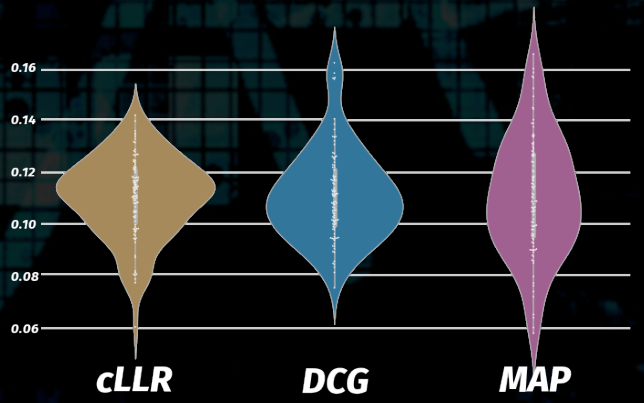
- Formalizes the idea that released data set can not be used to infer whether any one person is present
- Typically generated on the basis of a known distribution and some known noise distribution.
- We adapt this technique to generate add-on installation frequency tables for each locale according to the following procedure
- Guards against Overfitting

Log Likelihood Ratio Cost (cLLR)

```
'zh-CN': [('guid_01', 0.75),...,('guid_02', 0.05)],
'fr-FR': [('guid_03', 0.24),...,('guid_04', 0.01)],
...,
'en-US': [('guid_04', 0.18),...,(guid_05', 0.02)]
```



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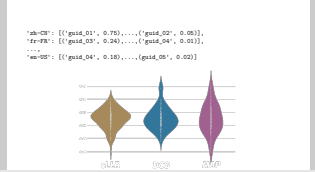

- better usage of full signal if component modules a probabilistic (flavoured) ignores rank!
- reference keynote, choosing the *correct* metric
- Symmetry accounts for incorrect recommendations (instead of just relative rank fo correct recommendations and the relevance score)
- Versus Discounted Cumulative Gain (DCG), and versus Mean Average Precision (MAP) for including in the recommendation list at all

Experimental design

Experiment ran: 27-Aug-2018 to 29-Oct-2018
Served recommendations to 348 900 unique clients

- **control** — Manually curated list of add-ons based on a user's locale
- **ensemble** — Weighted combination of all eligible models from the TAAR service
- **hybrid** — Identical to the ensemble with some curated add-ons interleaved

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Experiment ran: 27-Aug-2018 to 29-Oct-2018
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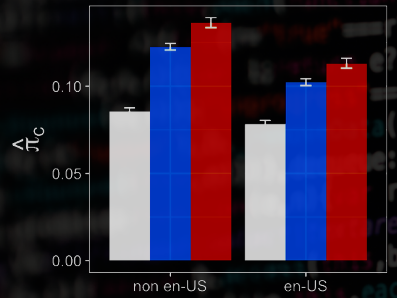
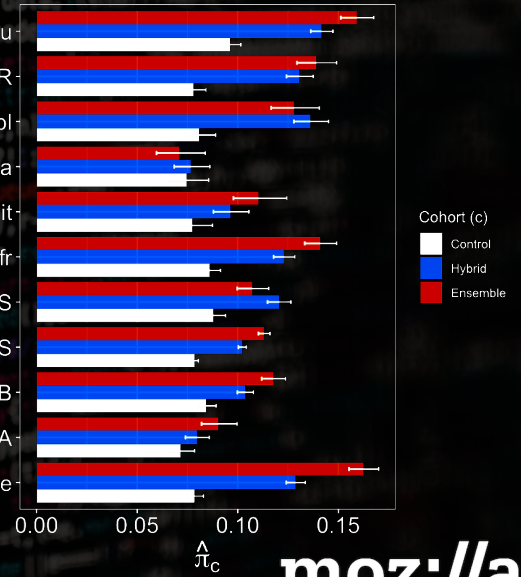
Performance





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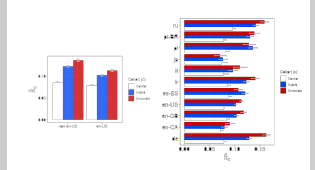

- variable availability of our data, not only in terms of quantity but in terms of fields
- handles peculiar data sparsity problems well
- Performs well and scales with data availability
- And 100% open source
- TAAR Serves about 240K recommendations per day in under 100ms

Acknowledgements

Victor Ng
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Laura Thomson

Fredrik Wollsén
Jason Thomas
Stuart Colville
Shell Escalante
Scott DeVaney
Kev Needham

AMO team
Localisation team
InfoSec
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- Thank you all for choosing to come engage with me here
- I'll be happy... questions
- but first... acknowledgements