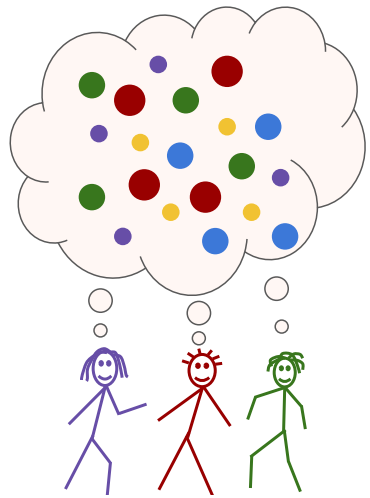
On Valuing and Procuring Personal Data



Bo Waggoner
Microsoft Research, NYC
→ U. Colorado, Boulder

Berkeley, CA
May 2019

This talk

Part 1: Background (manifesto)

- What does it mean to **own** personal data?
- How might *people* and *firms* **value** personal data?

Part 2: Research on valuing and procuring data **efficiently**

- Active-learning based (with Jake Abernethy, Yiling Chen, C.J. Ho)
- Prediction-market based (with Raf Frongillo; Jake Abernethy; Justin Harris)

Part 3: Discussion (screed)

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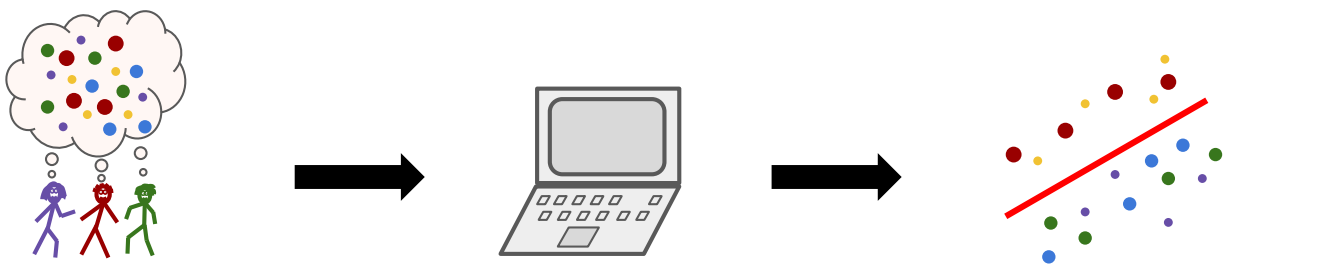
proxy: loss function measures performance, data improves loss

Research #1: An Active-Learning Approach

Low-Cost Learning via Active Data Procurement.
Abernethy, Chen, Ho, **Waggoner**. EC 2015.

Problem: How to model and achieve procurement of personal data?



agents with private data and costs

algorithm with budget B

hypothesis h

Related approaches: Purchase data to estimate population statistics, especially

- Roth, Schoenebeck. EC 2012.
- Chen, Immorlica, Lucier, Syrgkanis, Ziani. EC 2018. *extends RS12*
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Drawbacks: specialized to statistics; not **data efficient**

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For $t = 1, \ldots, T$:

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Key idea: base prices on **value of data** to the learning algorithm

Results: regret bounds $T\sqrt{\frac{\gamma}{B}}$ (online setting)
and generalization bounds $\sqrt{\frac{\gamma}{B}}$ (i.i.d. data)

Research #2: A Markets-Based Approach

A Market Framework for Eliciting Private Data.
Waggoner, Frongillo, Abernethy. NeurIPS 2015.

Goal: use a "market" to procure data **privately** and with **good incentives**!

See also:

- A Collaborative Mechanism for Crowdsourcing Prediction Problems (NeurIPS 2011). Abernethy, Frongillo.
- The Possibilities and Limitations of Private Prediction Markets (EC 2016). Cummings, Pennock, Wortman Vaughan.
- An Axiomatic Study of Scoring Rule Markets (ITCS 2018). Frongillo, **Waggoner**.
- Bounded-Loss Private Prediction Markets (NeurIPS 2018). Frongillo, **Waggoner**.

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Key ideas:

- Aligned incentives, bounded budget
- Opt-in for users
- Pay only for **useful** data
- Can add **differential privacy**

Part 3: Discussion

(Apologies in advance)

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  in particular: control over what information is revealed about you

Summary

- "Ownership:" data rights
- Value for data: "willingness to sell", loss function proxy
- Research: active-learning style, prediction-markets style
- Why markets? economic role of data
- Technical solutions? libre software

Thank you!