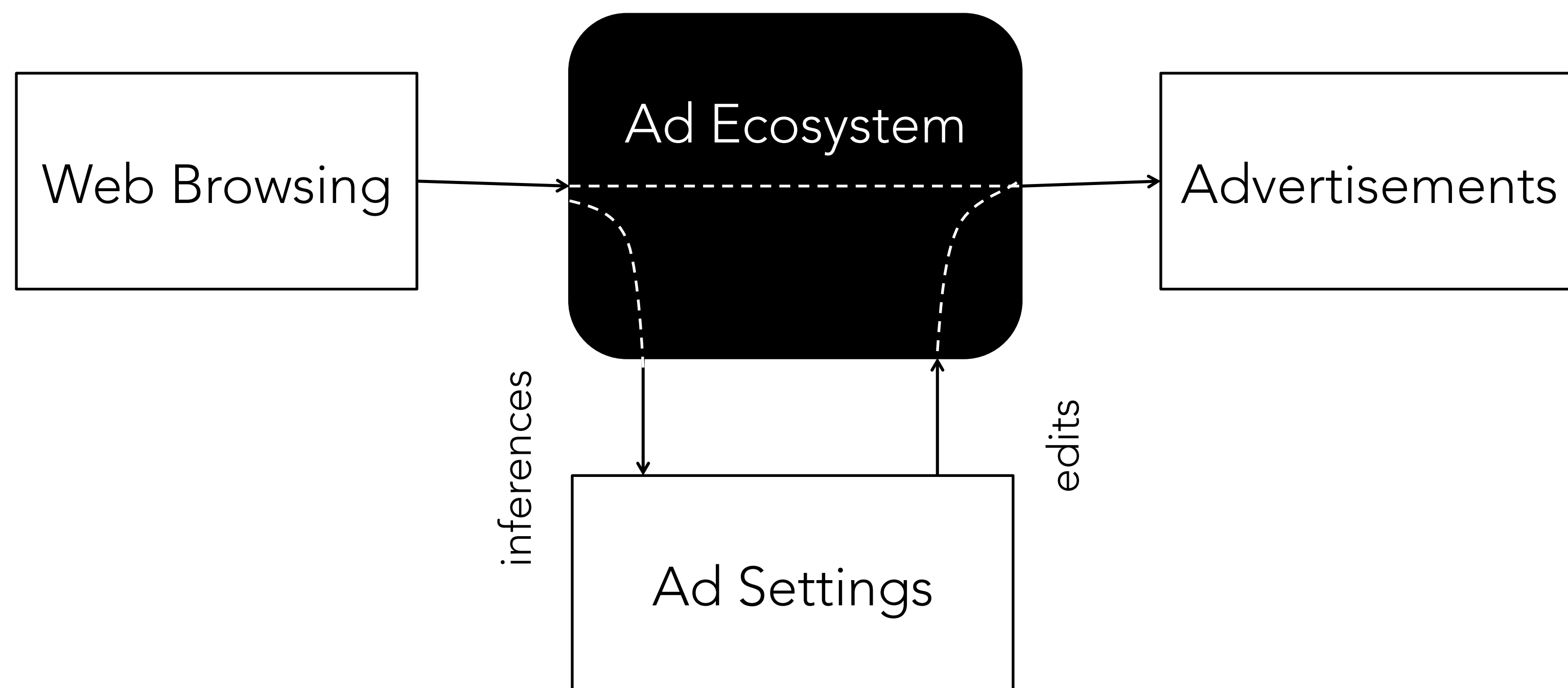


Opacity, Choice, and Discrimination in Personalized Ads

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Information Flow Experiments



Experimental Findings

Experiment 1: Opacity

p-value: 5.3×10^{-6}

Top ads for group visiting substance abuse webpages

The Watershed Rehab	www.thewatershed.com/Help
Watershed Rehab	www.thewatershed.com/Rehab
The Watershed Rehab	Ads by Google
Veteran Home Loans	www.vamortgagecenter.com
CAD Paper Rolls	paper-roll.net/Cad-Paper

Experiment 2: Choice

p-value: 5.3×10^{-6}

Top ads for group removing dating interest

Car Loans w/ Bad Credit	www.car.com/Bad-Credit-Car-Loan
Individual Health Plans	www.individualhealthquotes.com
Crazy New Obama Tax	www.endofamerica.com
Atrial Fibrillation Guide	www.johnshopkinshealthalerts.com
Free \$5 - \$25 Gift Cards	swagbucks.com

Top ads for group keeping dating interest

Are You Single?	www.zoosk.com/Dating
Top 5 Online Dating Sites	www.consumer-rankings.com/Dating
Why can't I find a date?	www.gk2gk.com
Latest Breaking News	www.onlineinsider.com
Gorgeous Russian Ladies	anastasiadate.com

Experiment 3: Discrimination

p-value: 5.3×10^{-6}

Top ads for male group

\$200k+ Jobs - Execs Only	careerchange.com
Find Next \$200k+ Job	careerchange.com
Become a Youth Counselor	www.youthcounseling.degreeleap.com
CDL-A OTR Trucking Jobs	www.tadriver.com/OTRJobs
Free Resume Templates	resume-templates.resume-now.com

Top ads for female group

Jobs (Hiring Now)	www.jobsinyourarea.co
4Runner Parts Service	www.westernpatoyotaservice.com
Criminal Justice Program	www3.mc3.edu/Criminal+Justice
Goodwill - Hiring	goodwill.careerboutique.com
UMUC Cyber Training	www.umuc.edu/cybersecuritytraining

Research Questions

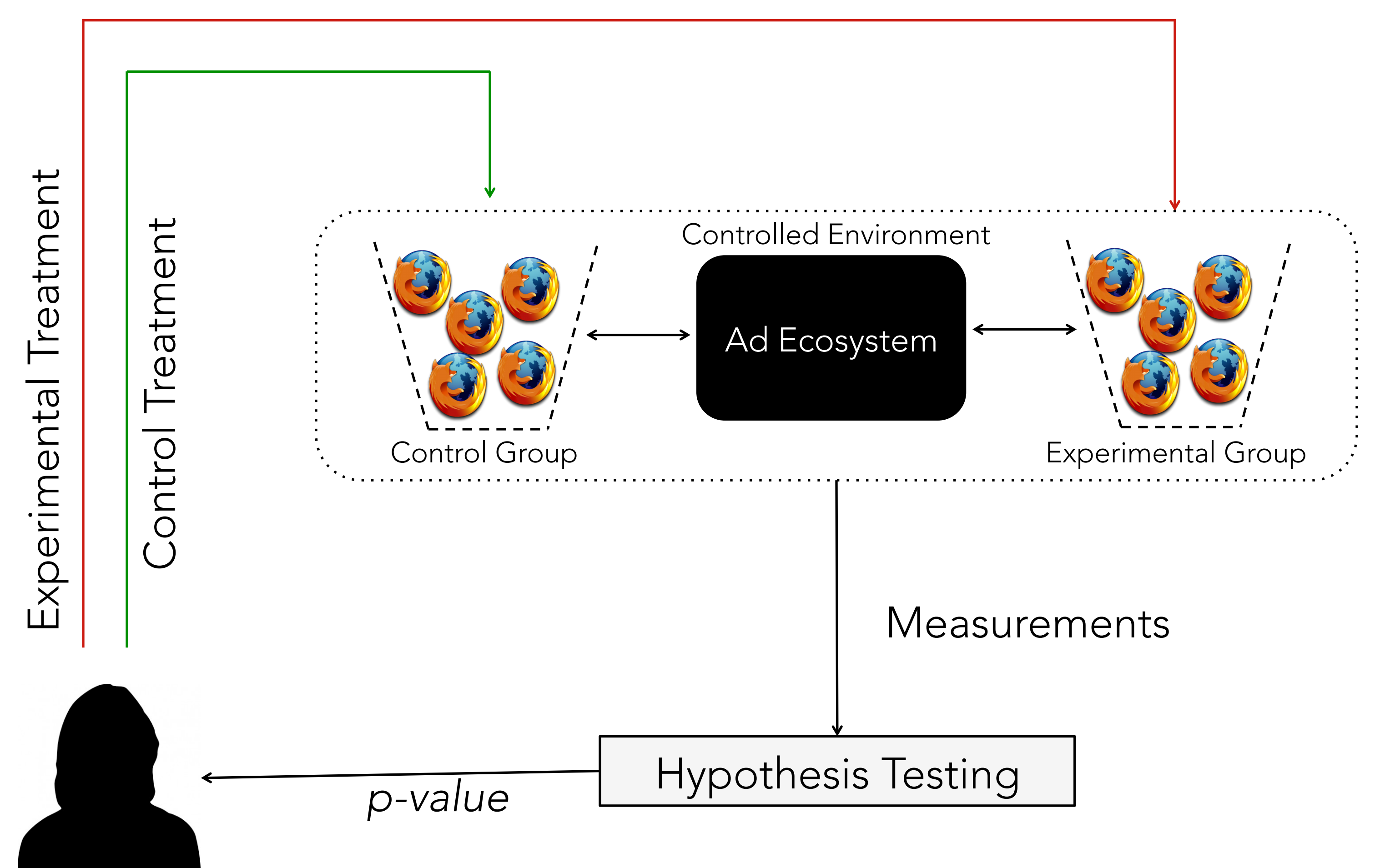
- Are Ad Settings **transparent**?
- Do Ad Settings provide users with **choice**?
- Are personalized ads served in a **fair** manner?

Contributions

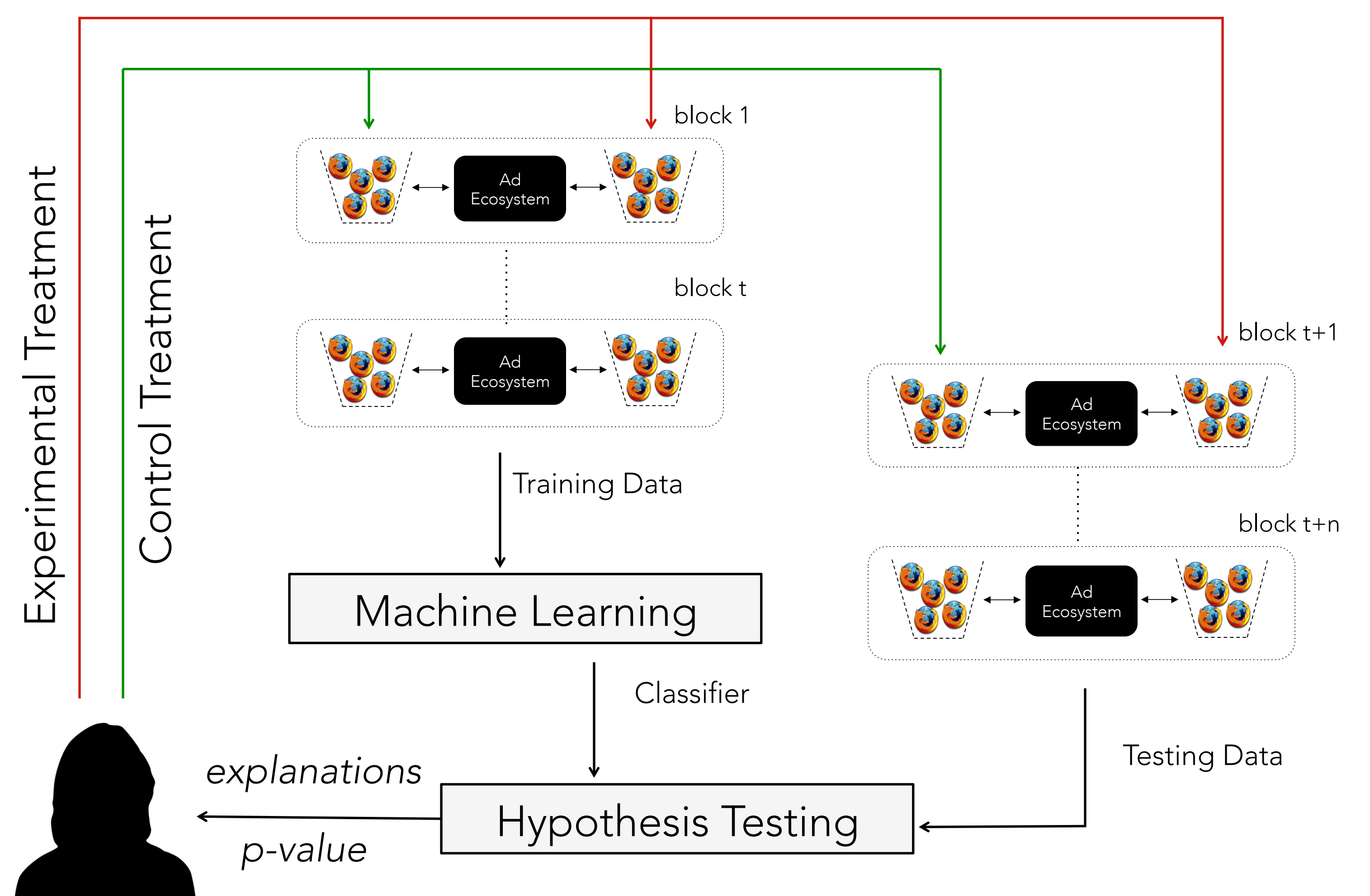
- We developed AdFisher, a tool for running Information Flow Experiments. It is freely available at github.com/tadatitam/info-flow-experiments
- We find statistical significance without making unreasonable assumptions about ad distributions.
- We demonstrate causal effects in personalization.

Methodology

Randomized Controlled Trials



Blocked Randomized Controlled Trials



Amit Datta, Micheal Tschantz, Anupam Datta. Automated Experiments on Ad Privacy Settings: A Tale of Opacity, Choice, and Discrimination. (to appear in PETS 2015)

Micheal Tschantz, Amit Datta, Anupam Datta, Jeannette Wing. A Methodology for Information Flow Experiments. ArXiv, Tech. Rep. arXiv:1405.2376, 2014.