Real-time Interactive Big Data Analysis Using In-Memory Computing

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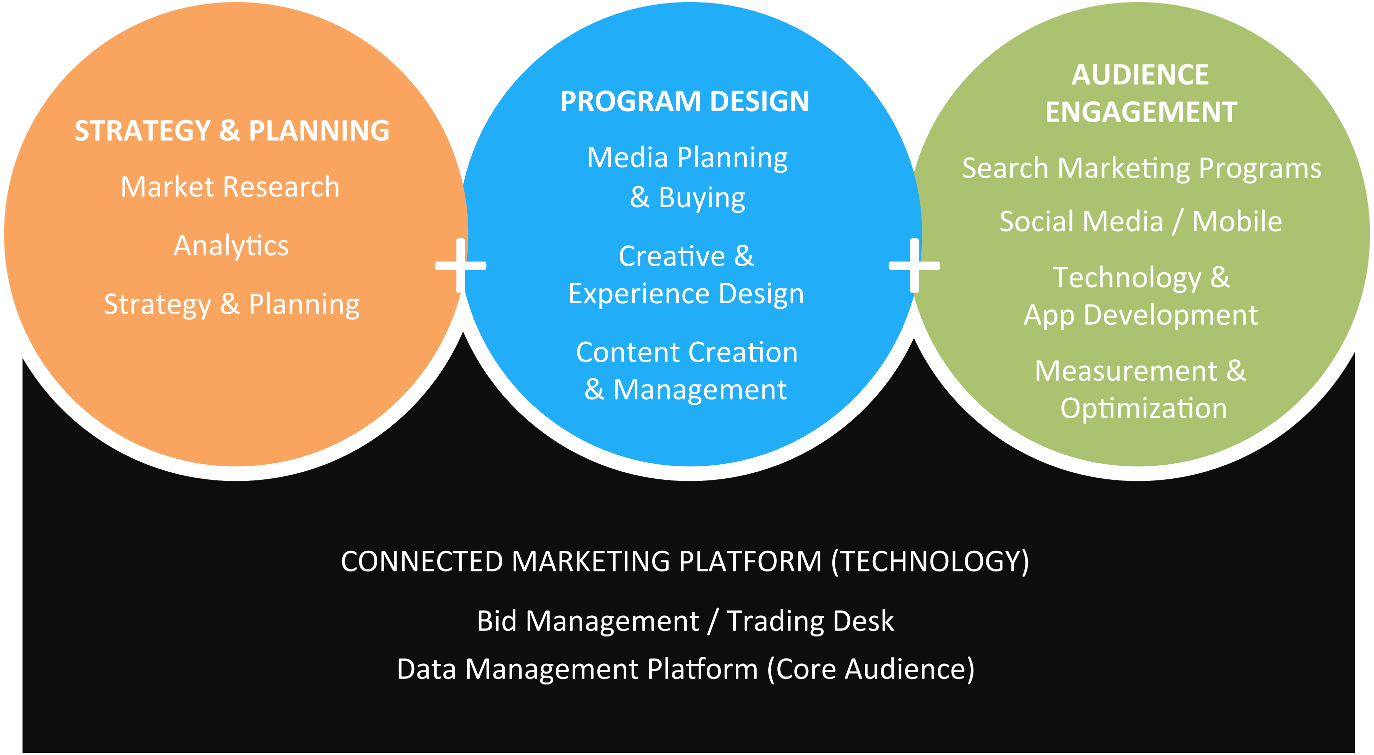
icrossing



STRATEGY & PLANNING

Market Research

Analytics

Strategy & Planning

+

PROGRAM DESIGN

Media Planning & Buying

Creative & Experience Design

Content Creation & Management

+

AUDIENCE ENGAGEMENT

Search Marketing Programs

Social Media / Mobile

Technology & App Development

Measurement & Optimization

CONNECTED MARKETING PLATFORM (TECHNOLOGY)

Bid Management / Trading Desk

Data Management Platform (Core Audience)

DIGITAL AGENCY INSIDE A

CONTENT EMPIRE

Leveraging audience insights:

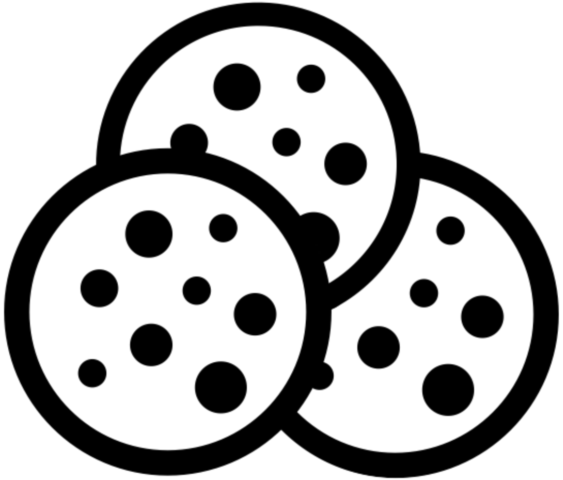
ELLE HouseBeautiful Esquire COSMOPOLITAN

- 20+ brands
- 30+ TV networks
- 50+ newspapers
- 300+ magazines

Big Data - Cookies!

- Subscribers
- Visitors
- International
- Multiple devices

300+ million
unique cookies



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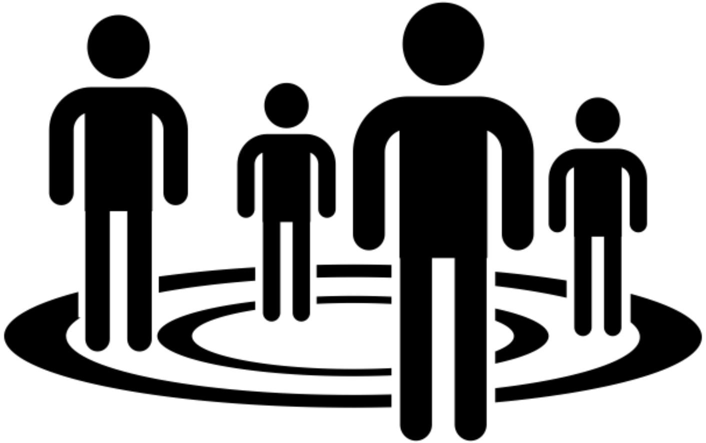
DMP Audience Data

Attributes

- Geographic
- Demographic
- Behavioral
- Psychographic

11,000+ Unique Attributes



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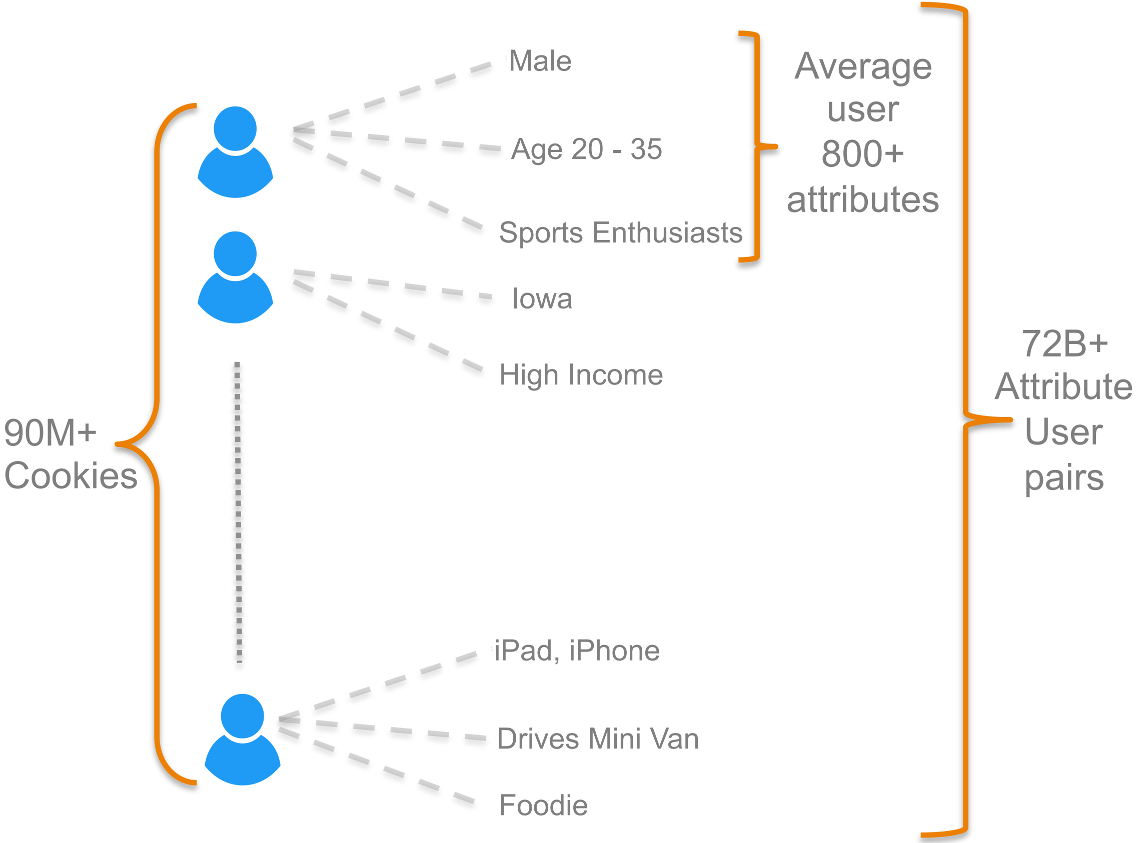
Cookies + Audience Attributes = Super Big Data!



Male

Age 20 - 35

Sports Enthusiasts

Average user 800+ attributes

Iowa

High Income

90M+ Cookies

72B+ Attribute User pairs

iPad, iPhone

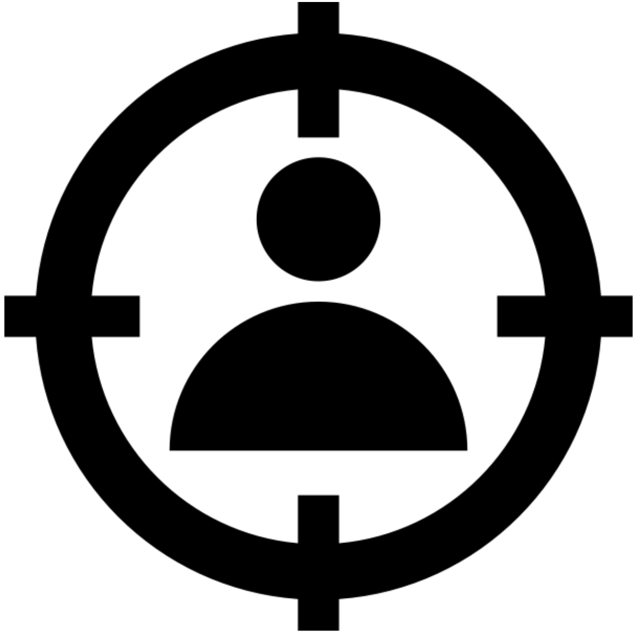
Drives Mini Van

Foodie

Audiences – Targeting vs Discovering

- Who you are targeting

- How do you connect with them?
- What describes them?



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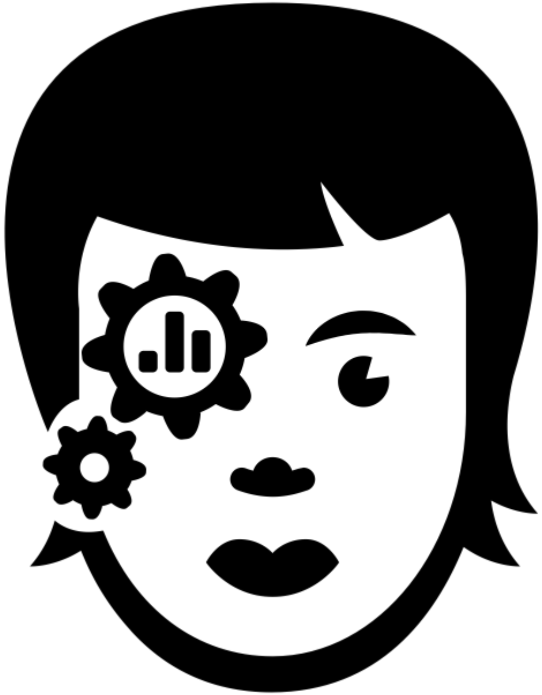
Data Scientists

<u>Discovering Audience Attributes</u>

1. Define an audience using attributes
2. Identify all attributes of cookies in audience
3. Calculate highly indexing attributes



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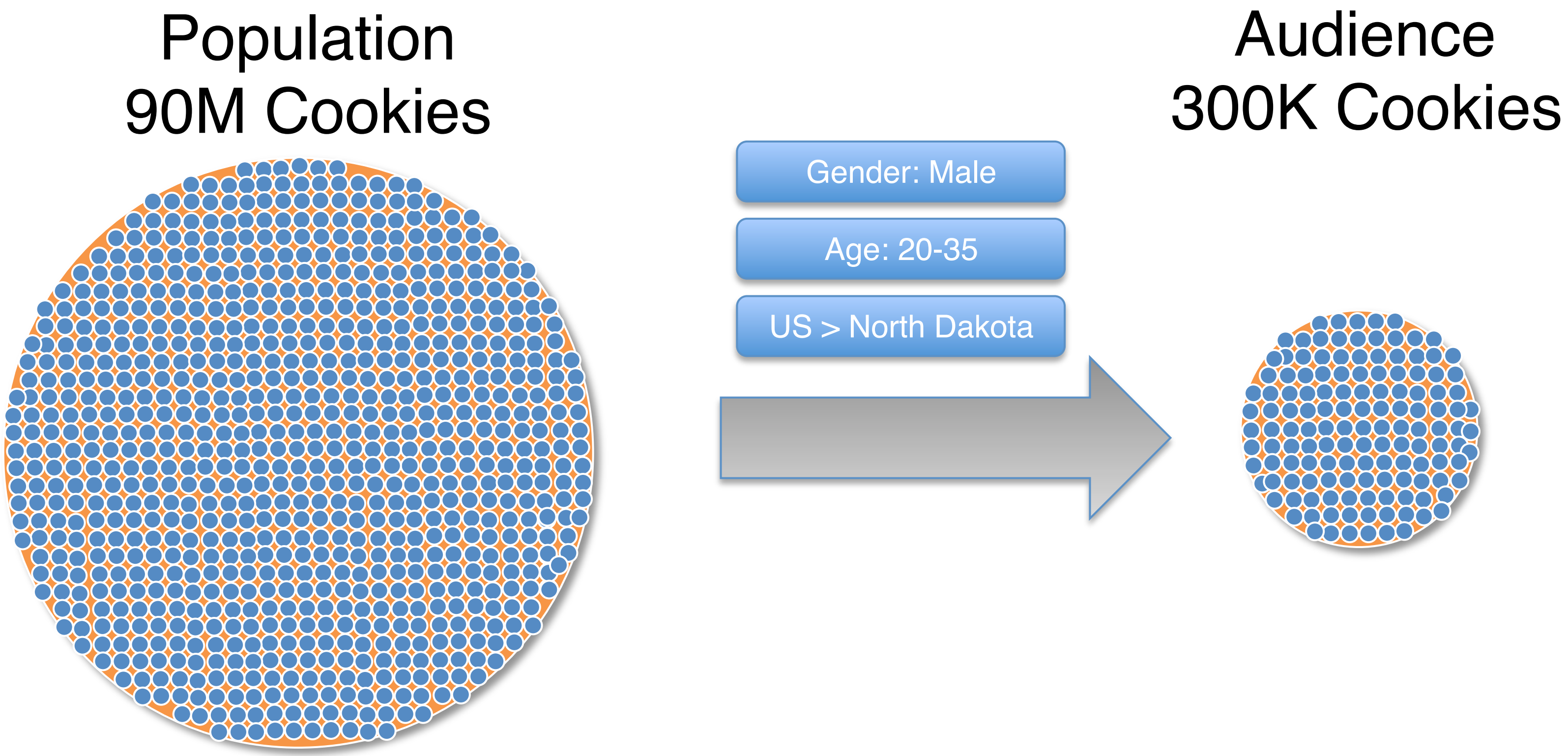
1) Define the Audience



Population
90M Cookies

Gender: Male

Age: 20-35

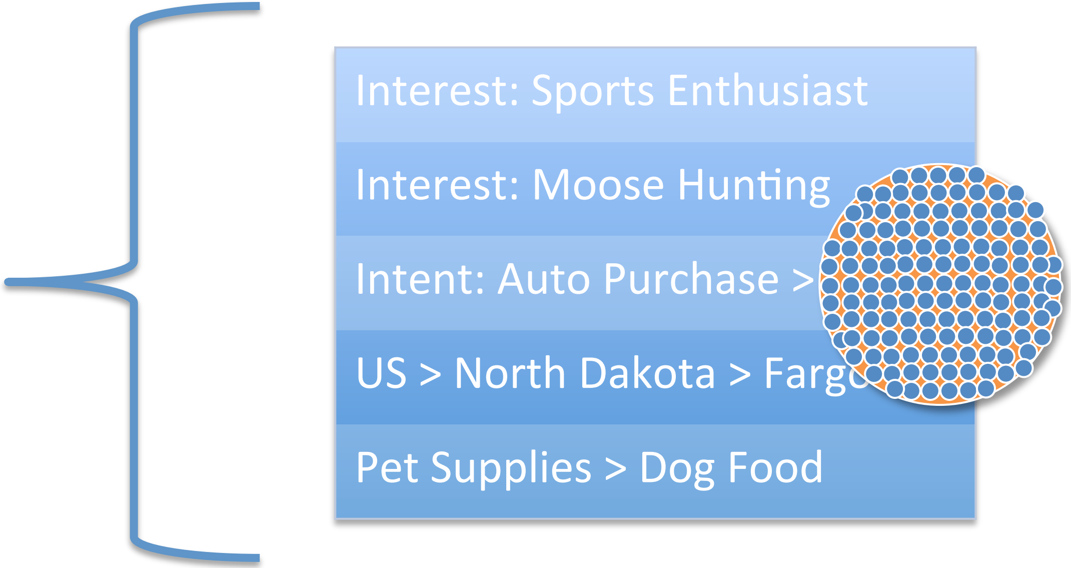
US > North Dakota

Audience
300K Cookies

2) Audience Attributes

Attributes of Cookies in Audience

Audience 300K Cookies



Interest: Sports Enthusiast

Interest: Moose Hunting

Intent: Auto Purchase >

US > North Dakota > Fargo

Pet Supplies > Dog Food

3) Index the Attributes

Attributes of
Cookies in Audience

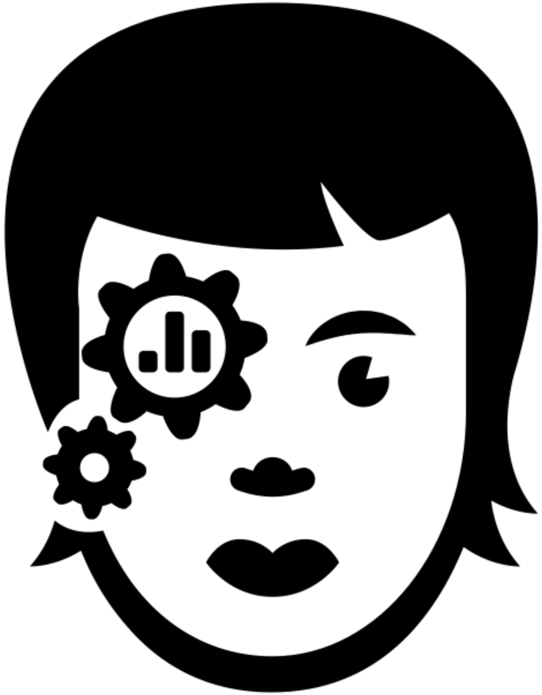
- Interest: Sports Enthusiast
- Interest: Moose Hunting
- Intent: Auto Purchase > Truck
- US > North Dakota > Fargo
- Pet Supplies > Dog Food

Attribute	Audience	Population
Interest: Sports Enthusia		
Interest: Moose Hunting		
Intent: Auto Purchase >		
US > North Dakota > Far		
Pet Supplies > Dog Food	6%	9%

Data Scientists

Development Ask

1. Make it accessible to "normals"
2. Exportable visualizations & calculations
3. Reduce query time from 1 hr to 1 sec



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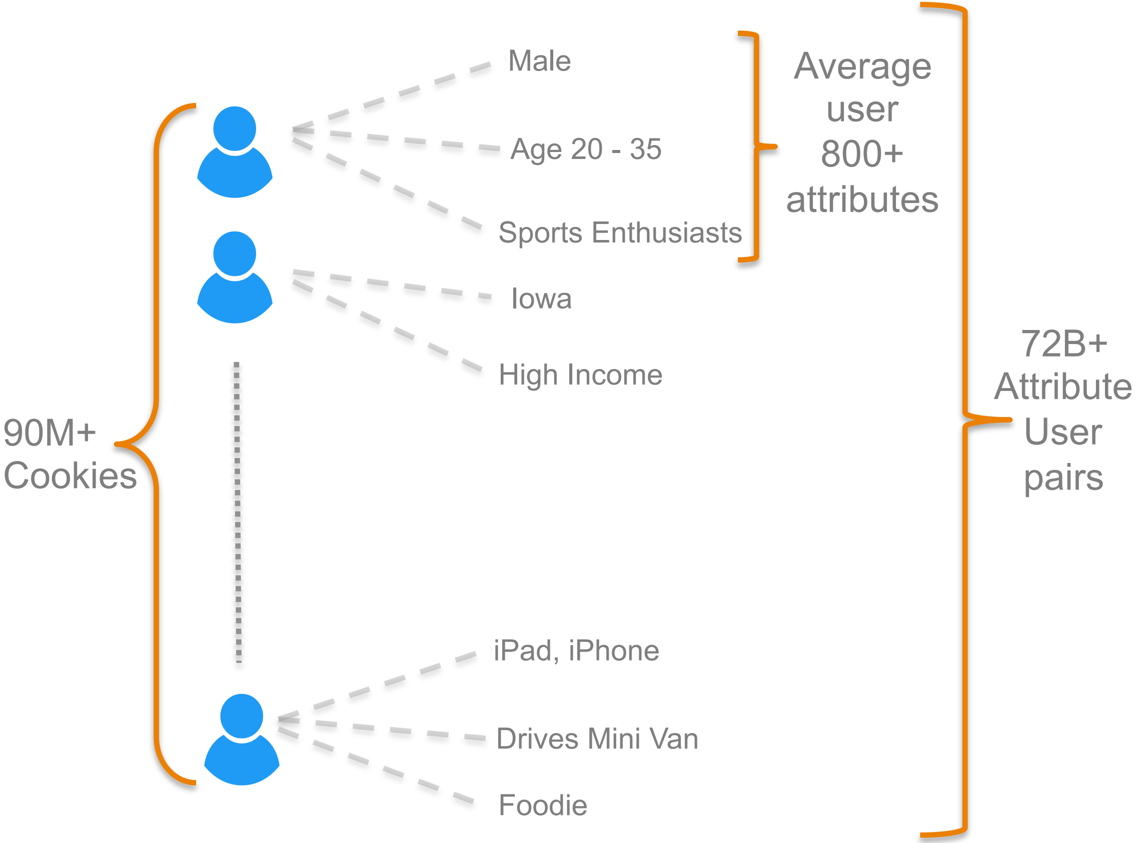
Why is this Hard?

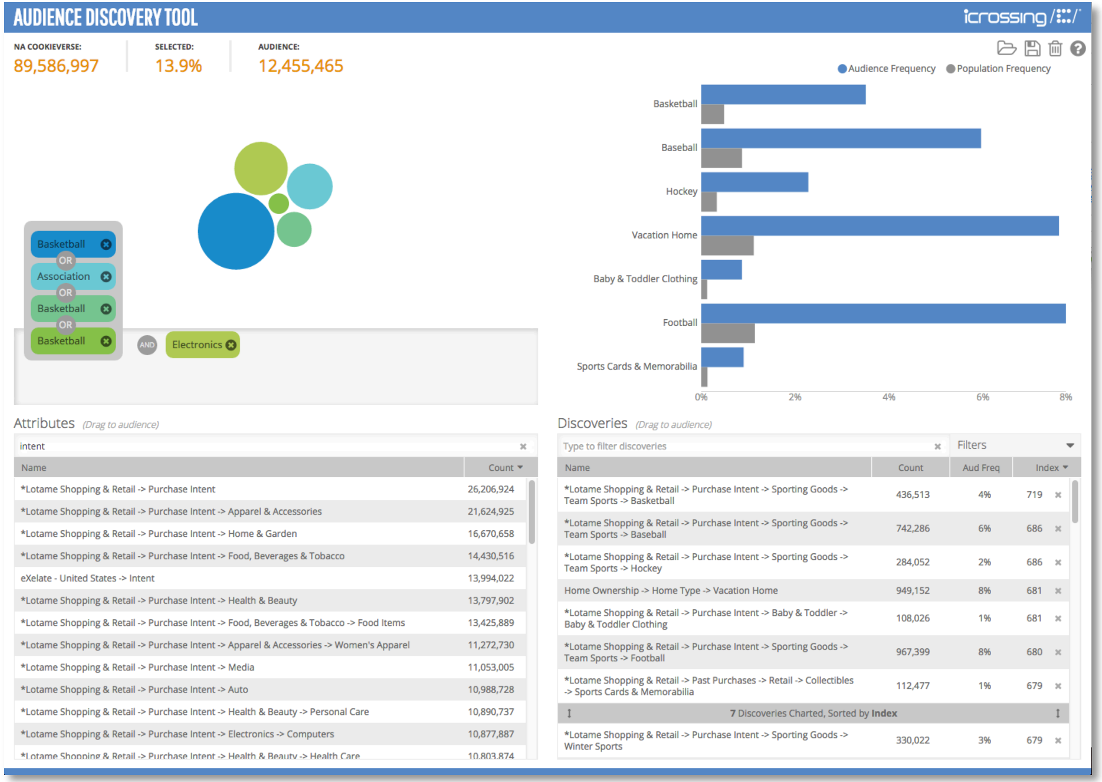


<u>Algorithm</u>

1. Check every cookie if it satisfies audience criteria
2. Collect all attributes for every audience cookie
3. Calculate percentages & index

Within 1 sec !!!!!!

The Answer – Audience Discovery Tool



NA COOKIEVERSE: 89,586,997

SELECTED: 13.9%

AUDIENCE: 12,455,465

Attributes *(Drag to audience)*

intent

Name	Count
*Lotame Shopping & Retail -> Purchase Intent	26,206,924
*Lotame Shopping & Retail -> Purchase Intent -> Apparel & Accessories	21,624,925
*Lotame Shopping & Retail -> Purchase Intent -> Home & Garden	16,670,658
*Lotame Shopping & Retail -> Purchase Intent -> Food, Beverages & Tobacco	14,430,516
eXelate - United States -> Intent	13,994,022
*Lotame Shopping & Retail -> Purchase Intent -> Health & Beauty	13,797,902
*Lotame Shopping & Retail -> Purchase Intent -> Food, Beverages & Tobacco -> Food Items	13,425,889
*Lotame Shopping & Retail -> Purchase Intent -> Apparel & Accessories -> Women's Apparel	11,272,730
*Lotame Shopping & Retail -> Purchase Intent -> Media	11,053,005
*Lotame Shopping & Retail -> Purchase Intent -> Auto	10,988,728
*Lotame Shopping & Retail -> Purchase Intent -> Health & Beauty -> Personal Care	10,890,737
*Lotame Shopping & Retail -> Purchase Intent -> Electronics -> Computers	10,877,887
*Lotame Shopping & Retail -> Purchase Intent -> Health & Beauty -> Health Care	10,803,874

Discoveries *(Drag to audience)*

Type to filter discoveries

Filters

Name	Count	Aud Freq	Index
*Lotame Shopping & Retail -> Purchase Intent -> Sporting Goods -> Team Sports -> Basketball	436,513	4%	719
*Lotame Shopping & Retail -> Purchase Intent -> Sporting Goods -> Team Sports -> Baseball	742,286	6%	686
*Lotame Shopping & Retail -> Purchase Intent -> Sporting Goods -> Team Sports -> Hockey	284,052	2%	686
Home Ownership -> Home Type -> Vacation Home	949,152	8%	681
*Lotame Shopping & Retail -> Purchase Intent -> Baby & Toddler -> Baby & Toddler Clothing	108,026	1%	681
*Lotame Shopping & Retail -> Purchase Intent -> Sporting Goods -> Team Sports -> Football	967,399	8%	680
*Lotame Shopping & Retail -> Past Purchases -> Retail -> Collectibles -> Sports Cards & Memorabilia	112,477	1%	679
7 Discoveries Charted, Sorted by **Index**			
*Lotame Shopping & Retail -> Purchase Intent -> Sporting Goods -> Winter Sports	330,022	3%	679

- Audience discovery
  - Cookie Attributes
  - Frequency vs Population
- Built for non-technical users
  - Strategy
  - Sales / Account
  - Anyone
- Flexible
  - Research tool
  - In-meeting, iterative discovery
- Approachable
  - Real-time
  - Results in seconds
  - Simple, elegant interface
  - Multiple export formats

“Making science accessible”

Data Processing R& D

Traditional Relational Databases

- Long load time
- Complex queries resulting in long query times
- Rigid data model

Non Traditional Databases

- Lack of complex query feature
- Large memory footprint requirement
- Aggregation query exceeded by many 10x of seconds

Neo4j
the graph database

cassandra

mongoDB
{ name: mongo, type: DB }

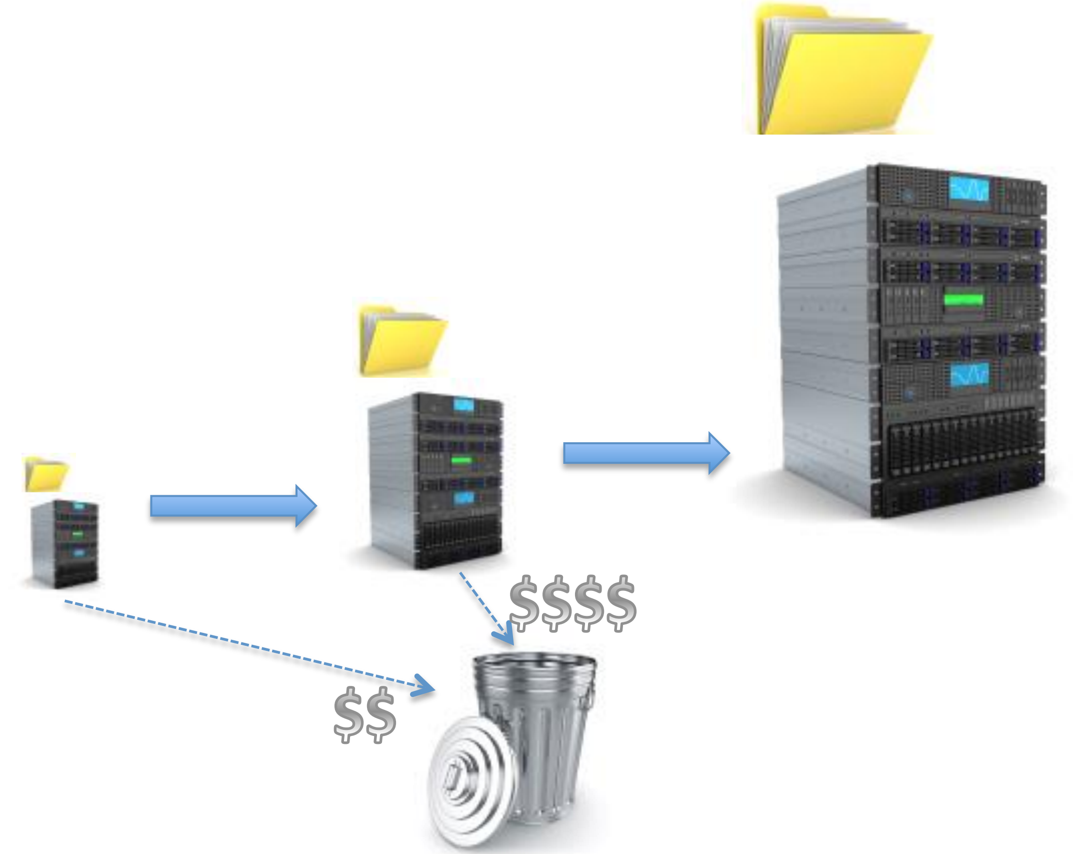
redis

The Low Hanging Fruit

- In memory cache
- Customizable query using Java code
- Relatively low data loading time

Neo4j
the graph database

The Vertical Problem



Distributed Computing Ecosystem

- Not production ready
- Data import fails without explanation
- Aggregation fails to impress

cloudera IMPALA

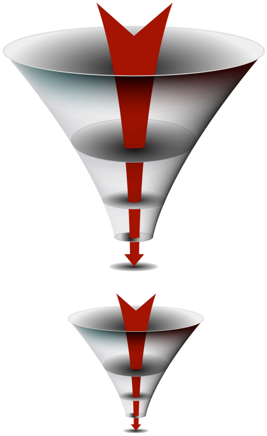
SHARK

Spark
Lightning-Fast Cluster Computing

Back to Basics

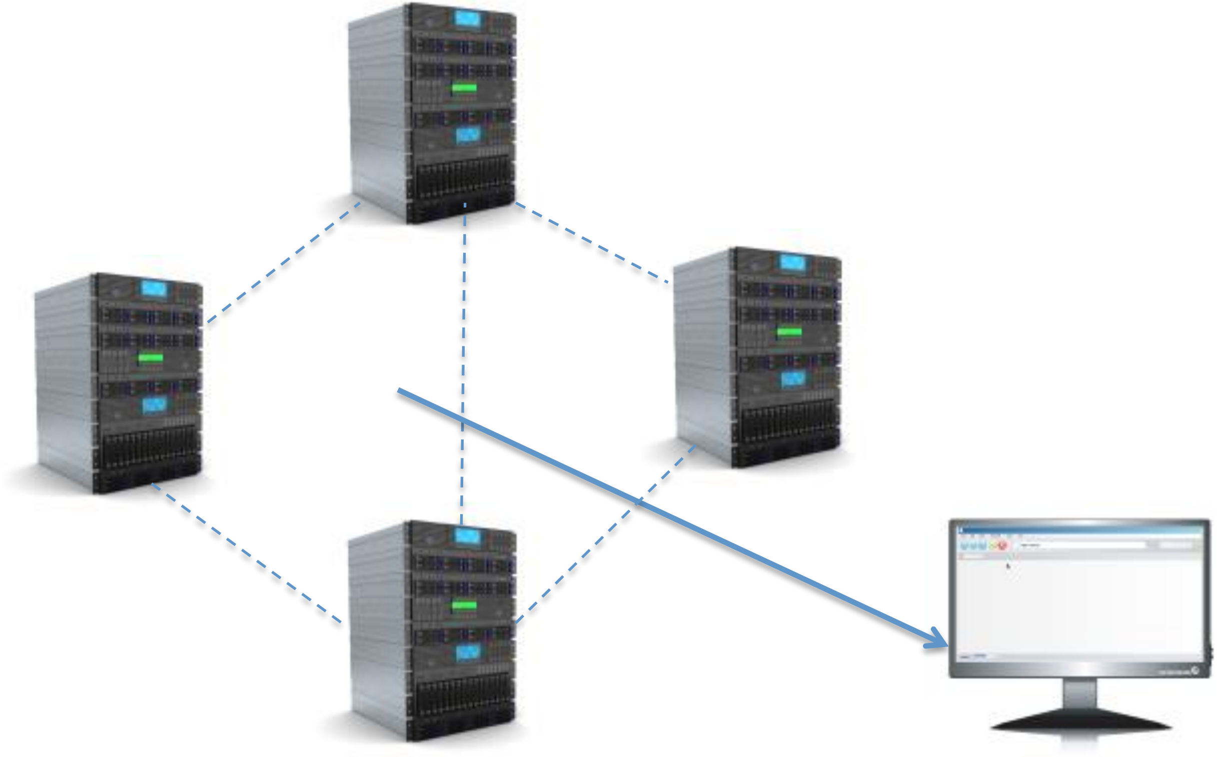
- Pure Java code solution
- Data and logic must exists in same memory space
- Capable of advanced filtering

GridGain



- Distributed computing, low overhead
- Data locality
- Minimal code migration

The Distributed Solution



The Challenges

- Tedious manual data distribution
- Gar building and deployment issues
- Development challenges

What We Learned

- Indexed data requiring minor calculations -- databases (relational & noSQL) great

- Large non-indexed data -- the data & processing need to live in the same (memory) space