

Informationsbedürfnisse mit KI ermitteln

Maximilian Matthe*, Daniel M. Ringel**, and **Bernd Skiera*****

Markendialog 2024

Markenführung mit KI – Wie wird aus Intelligenz auch Effektivität?

21.3.2024, Berlin

*Indiana University Bloomington, USA

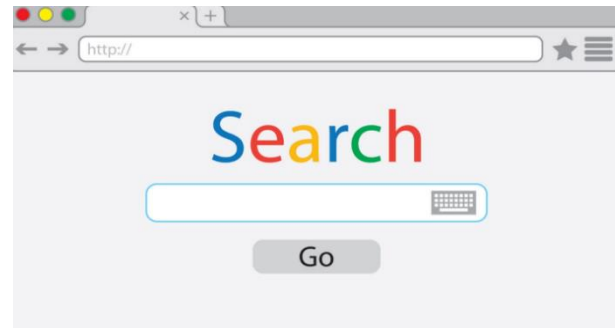
**University of North Carolina at Chapel Hill, USA

***Goethe University Frankfurt, Germany

How does my brand look like?

Motivation for this project

Consumers regularly Search Online to Find Information about Brands



Search Engines



E-Commerce Websites



Online Forums



Q&A Platforms



Digital Assistants



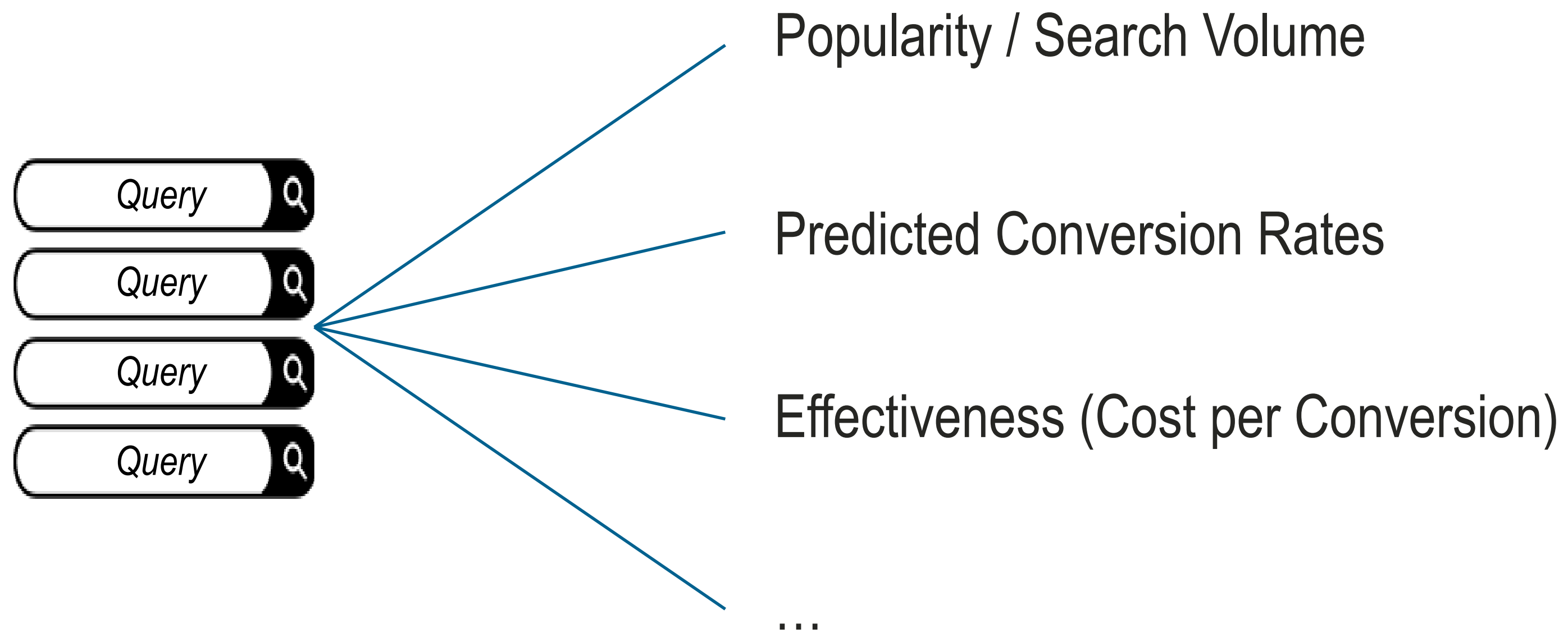
Generative A.I.



Millions of queries submitted each day, creating massive targeting opportunities.

Typical Approach for Targeting Consumers in Online Search

Targeting Queries based on Performance Metrics



Challenge: How to Target the Queries of Specific Audiences?

Consumer Characteristics

Financial experience

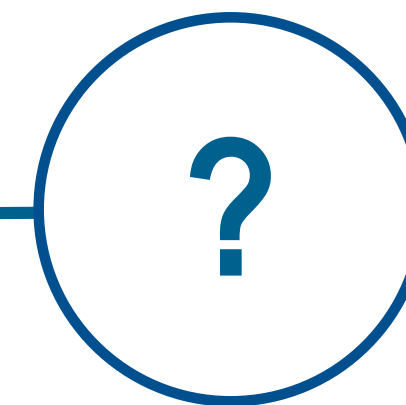
Socio-demographics

Risk attitudes

Usage intensions

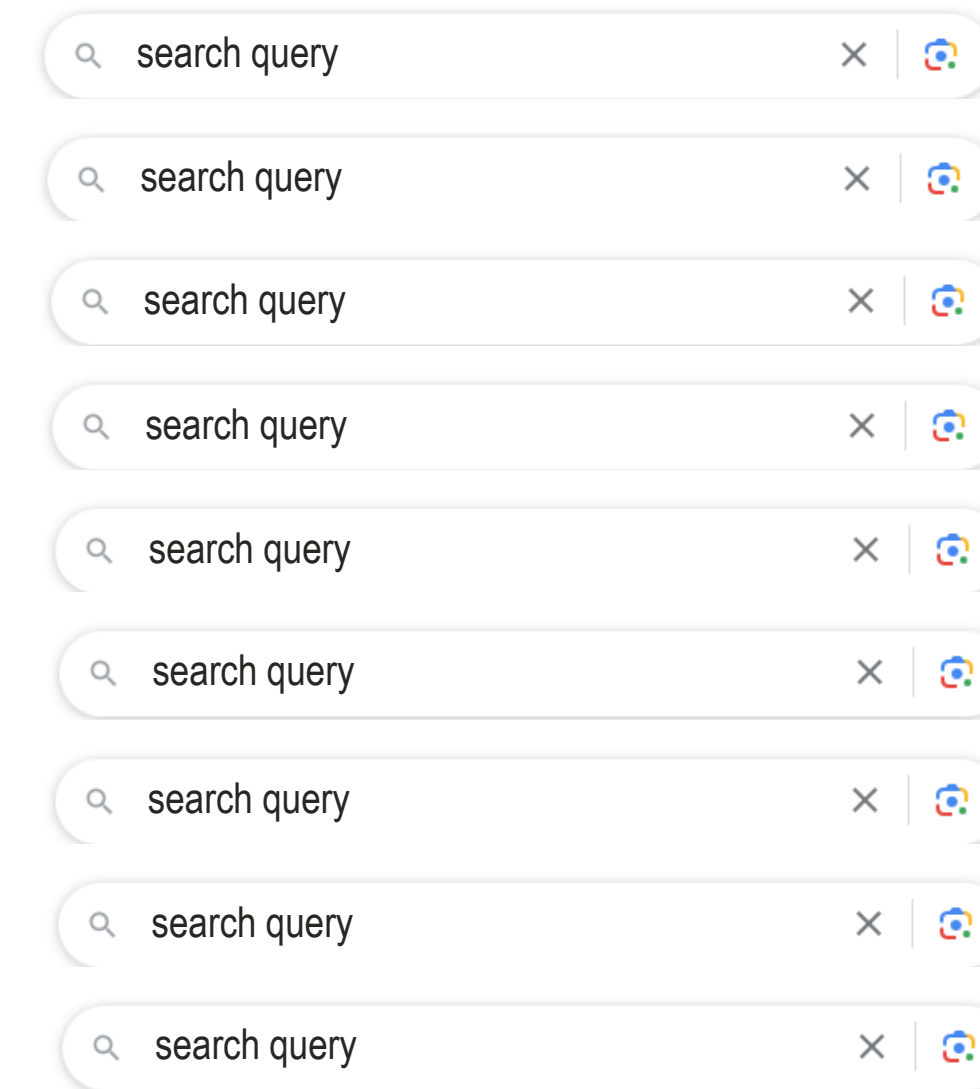
Mindset

...



Missing Link

Search Queries



Marketers

Often aim to reach a target audience of consumers with attractive characteristics (e.g., indicators of profitability).



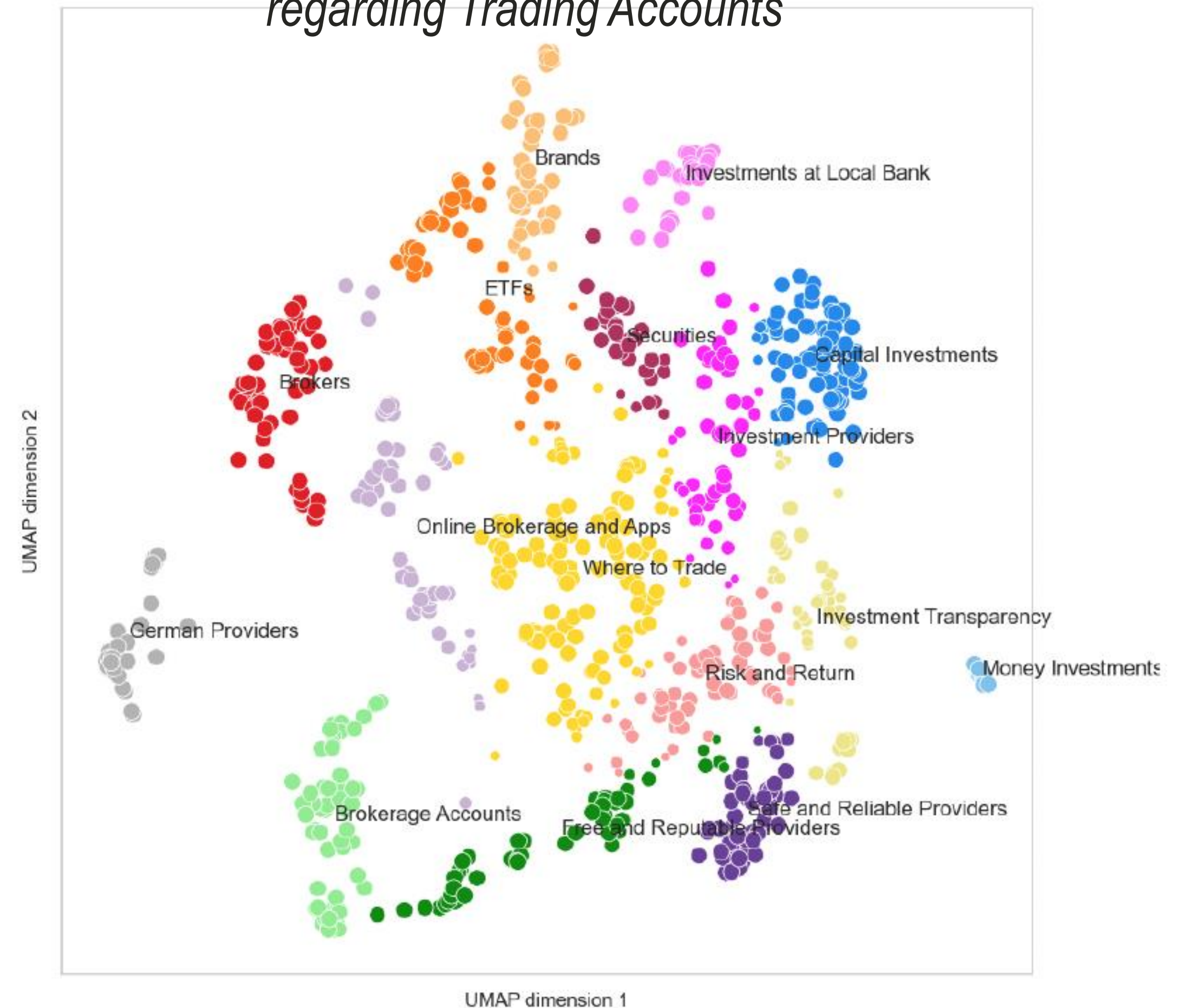
In online search, need to **direct** their content/ads towards **specific queries or keywords**.

Introducing Information Exigencies

Imminent demand for specific information, that manifests in the queries consumers submit to information sources.

- Arise from consumers' individual knowledge gaps
- Manifest in the queries consumers submit
- Provide signals of the searching consumers' characteristics

Landscape of Consumers' Information Exigencies regarding Trading Accounts



UMAP = Uniform Manifold Approximation and Projection

Excurs:
**How do maps fit to the talk of
Elena González-Blanco Garcia?**

AI Derives Similarities between Unstructured Data

How does AI work?

The slide illustrates AI concepts through three diagrams:

- Male-Female:** A 3D vector space diagram showing the relationship between 'king' and 'man' (blue vector) and 'queen' and 'woman' (purple vector). A dashed line connects 'king' to 'queen', and another connects 'man' to 'woman', showing they are parallel vectors.
- RED NEURONAL:** A diagram of a neural network with three layers: ENTRADAS (Inputs x_1, x_2, \dots, x_n), Capa oculta (Hidden layer), and Capa de salida (Output layer). Weights $W^{(1)}$ and $W^{(2)}$ connect the layers. A bias node $+1$ is shown in the input and hidden layers. The output is labeled Y with values y_1, y_2, \dots, y_m .
- Transformer Architecture:** A detailed diagram of a Transformer block. It shows the flow from Inputs through Input Embedding and Positional Encoding, followed by a stack of $N \times$ layers. Each layer contains Multi-Head Attention, Masked Multi-Head Attention, Feed Forward, and Add & Norm blocks. The final output goes through another Add & Norm block, a Linear layer, and a Softmax layer to produce Output Probabilities.

EvoMap: Basic Idea

Competitive Relationships
(here: pairwise distances)

t

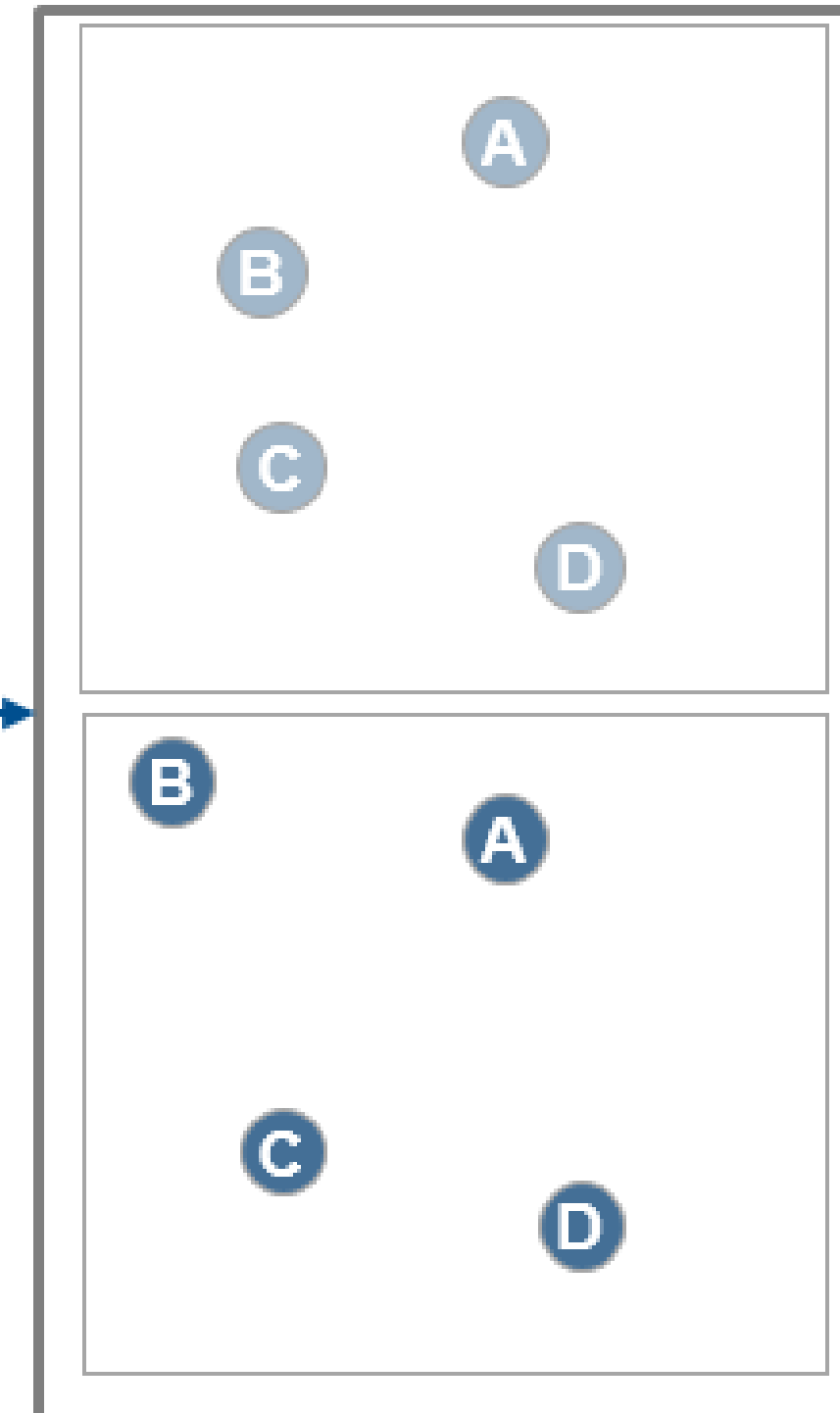
	A	B	C	D
A		.6	.8	.8
B	.6		.4	.8
C	.8	.4		.6
D	.8	.8	.6	

$t + 1$

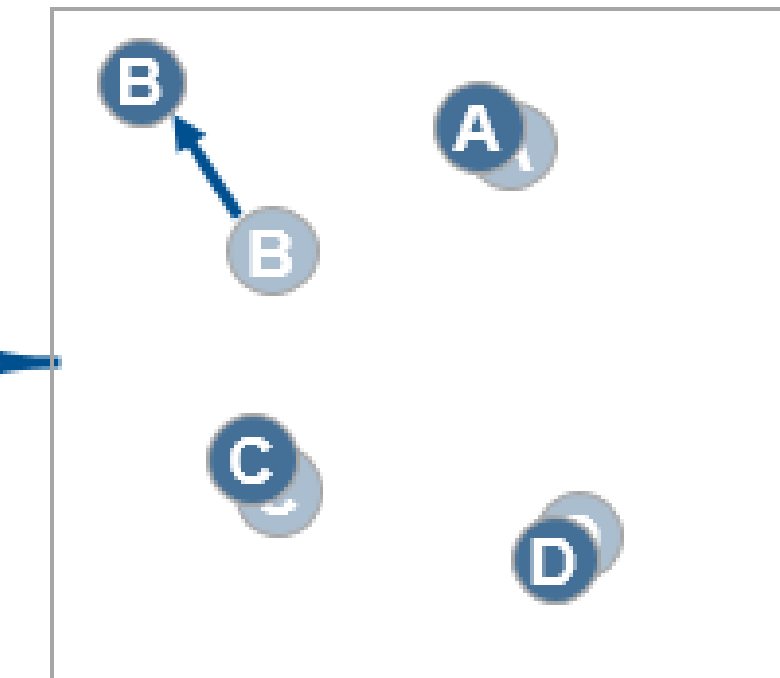
	A	B	C	D
A		.8	.8	.8
B	.8		.6	.9
C	.8	.6		.6
D	.8	.9	.6	

EvoMap

Estimated Positions

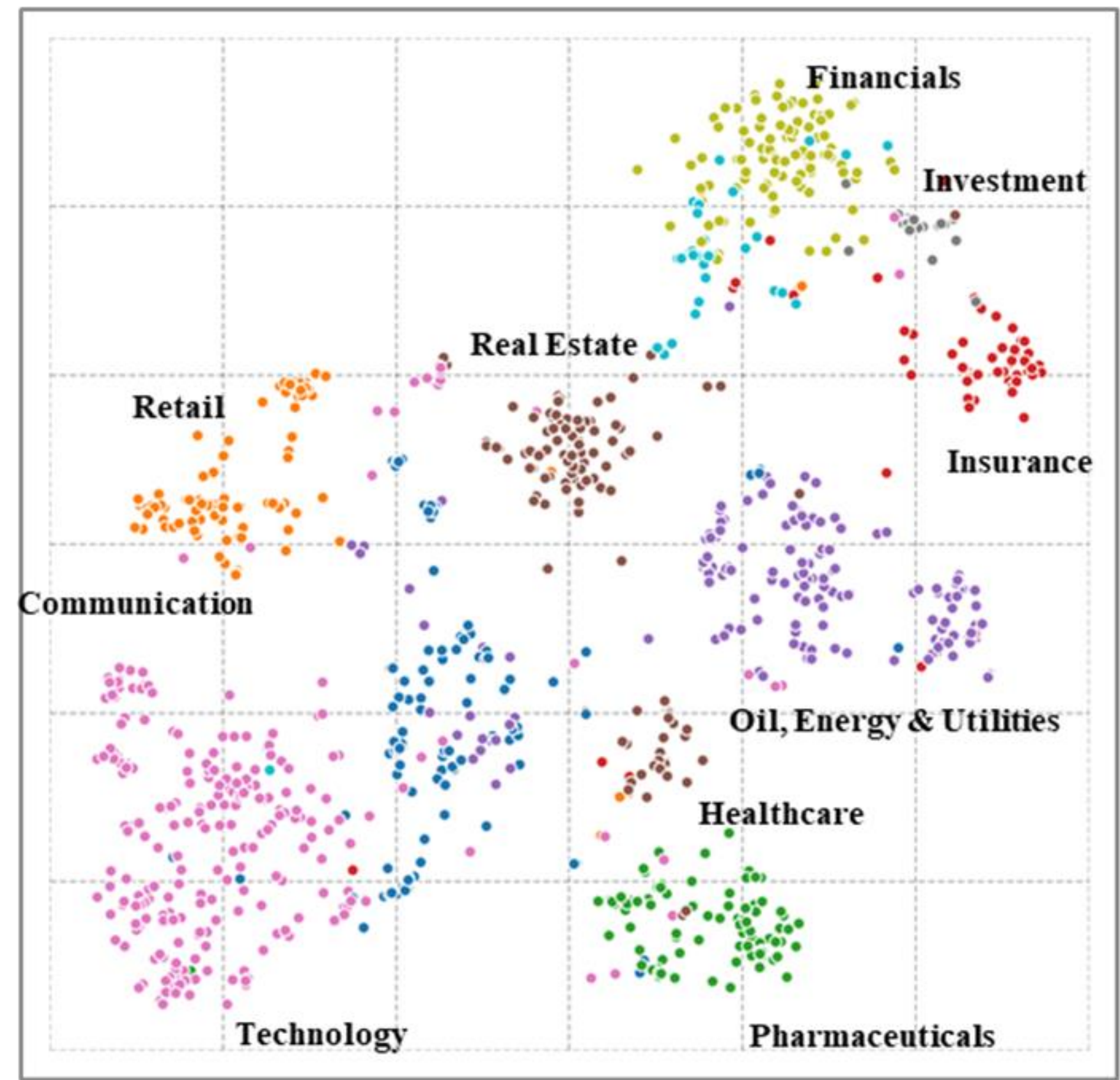


Trajectories of Positions

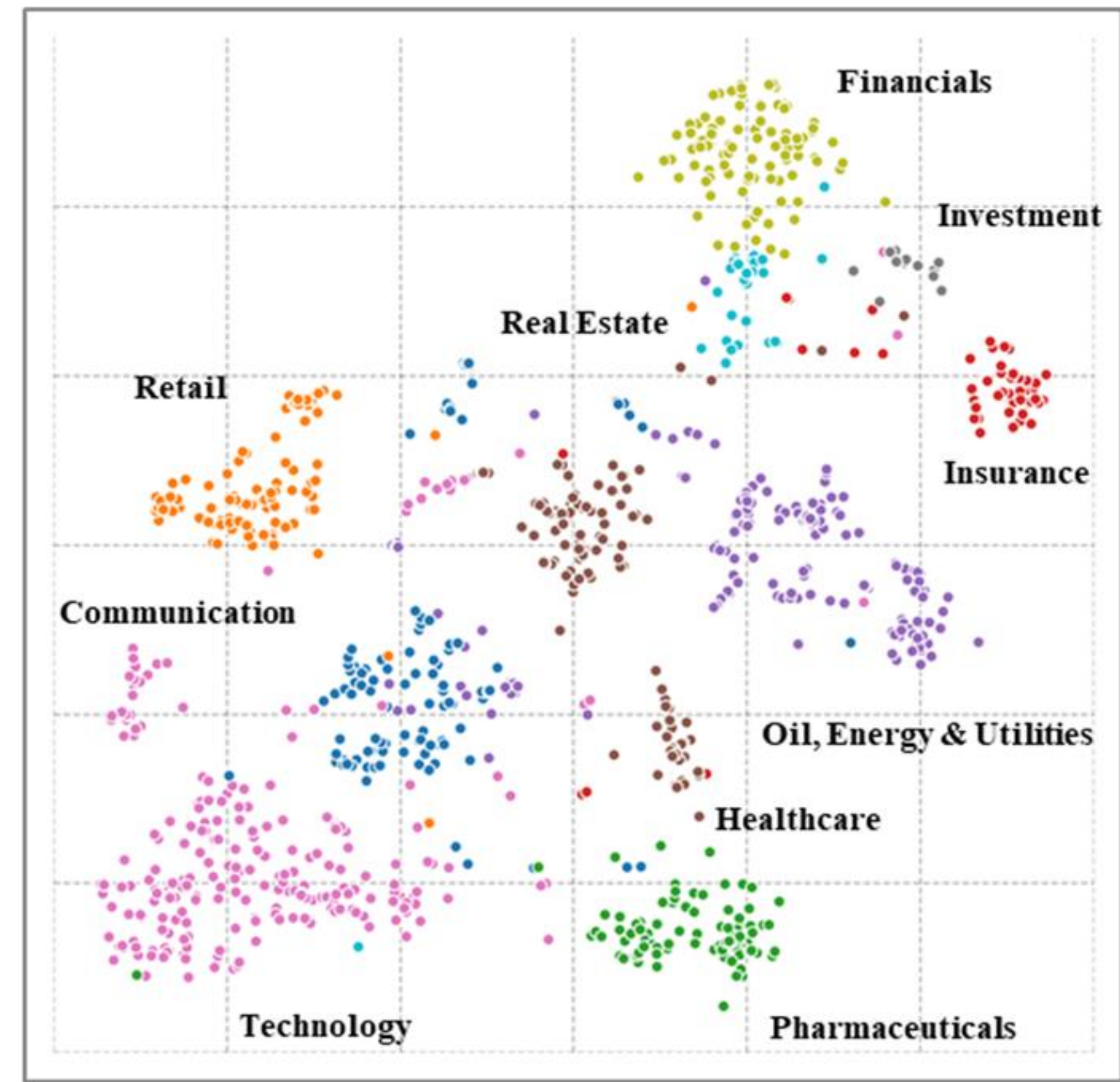


EvoMap jointly estimates a sequence of positions from a sequence of competitive relationship matrices (→ **One-Step Approach**)

Dynamic Mapping of TNIC Data Using EvoMap: First and Last Map (<https://evomap.io>)



Time: 1998



Time: 2017

Legend: Each bubble represents a firm. Proximity indicates strength of competitive relationship. Clusters derived by clustering the competitive relationship matrices prior to mapping (Louvain community detection). Clusters labeled manually.

Back to my main talk

Research Overview

Research Aim Propose new targeting approach: **Target** consumers with **via Information Exigencies (TAVIX)**

Challenges

Data Search queries and consumer characteristics not jointly observable to firms.

Analysis Vast combinatorial space between queries and characteristics.

Solution

1. **QueryCatcher** Record queries and characteristics
2. **Machine learning** Discover Information Exigencies
3. **TAVIX App** Define target audience → Build targeted search campaign.

Overview of Our Approach

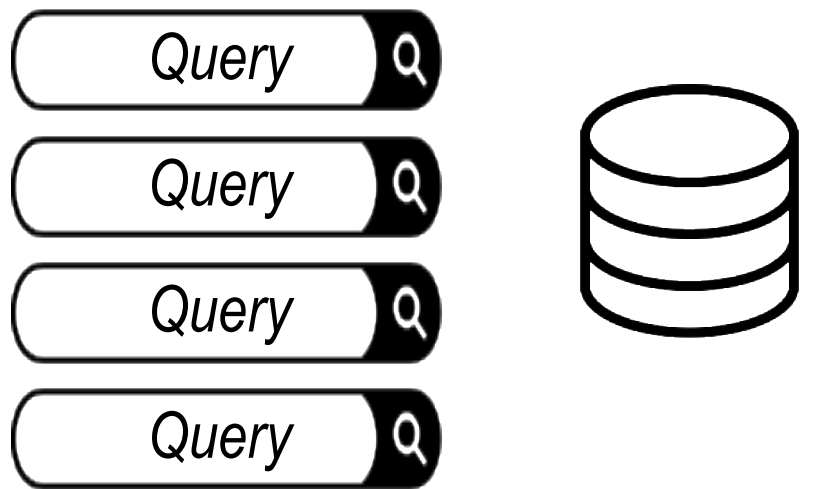
Phase 1: Data Collection & Analysis

1.1 Give Panelists a Search Task



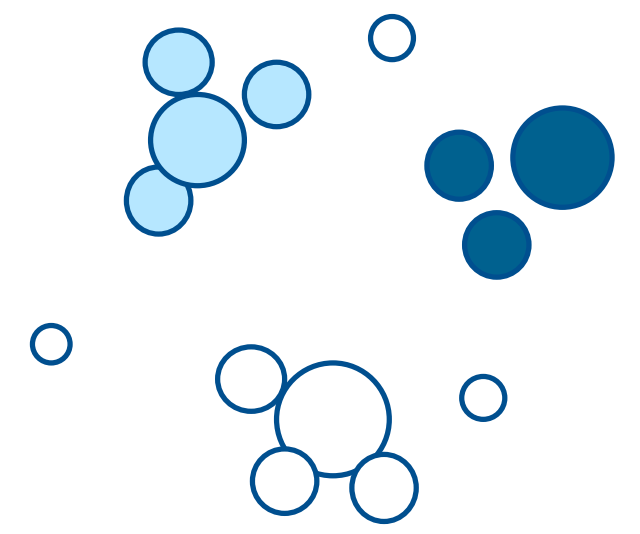
Participants from market research panel

1.2 Record Panelists' Search Queries



API-based search interface

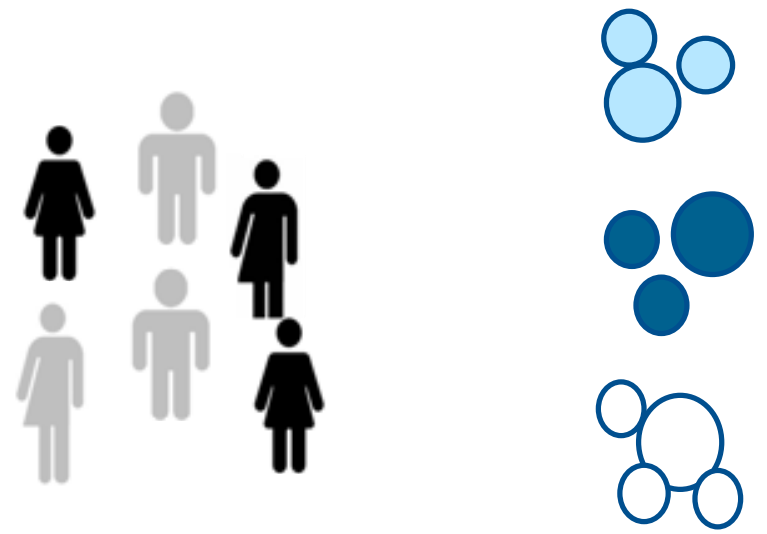
1.3 Discover Information Exigencies (IXs)



Unsupervised machine-learning of search query records

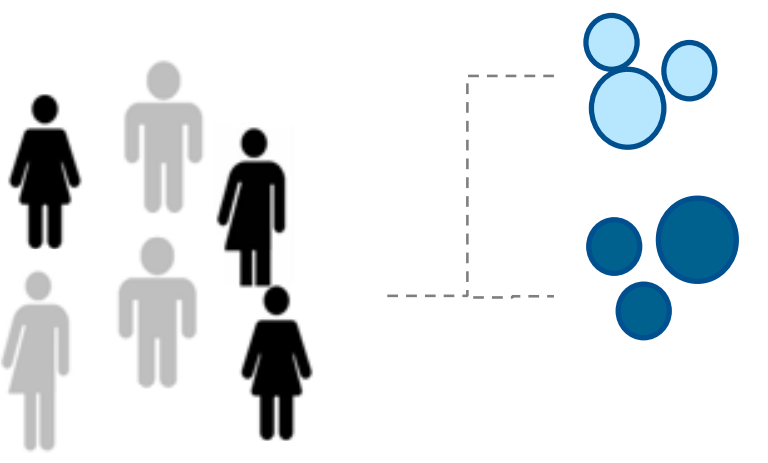
Phase 2: App-enabled Campaign Generation

2.1 Define Target Audience



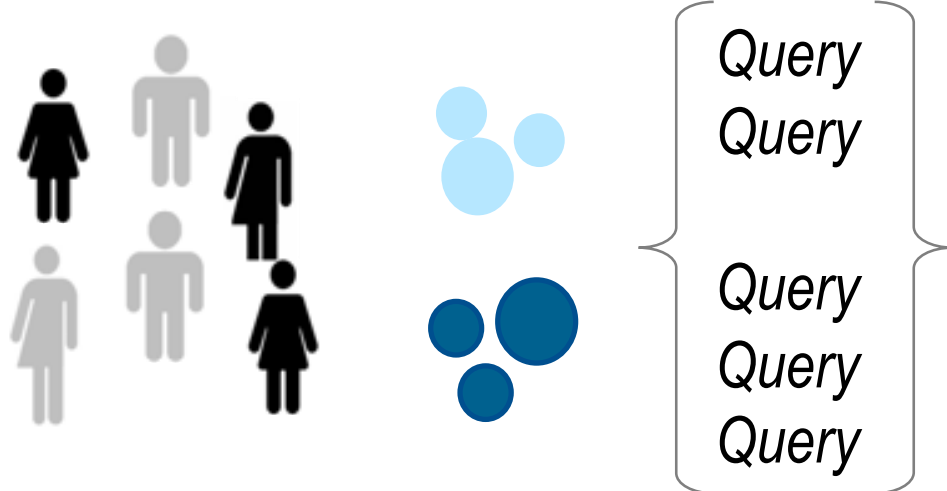
TAVIX App

2.2 Identify Target Audience Specific IXs



TAVIX App

2.3 Build Targeted Search Campaign



TAVIX App

Details on Phase 1: Data Collection and Analysis

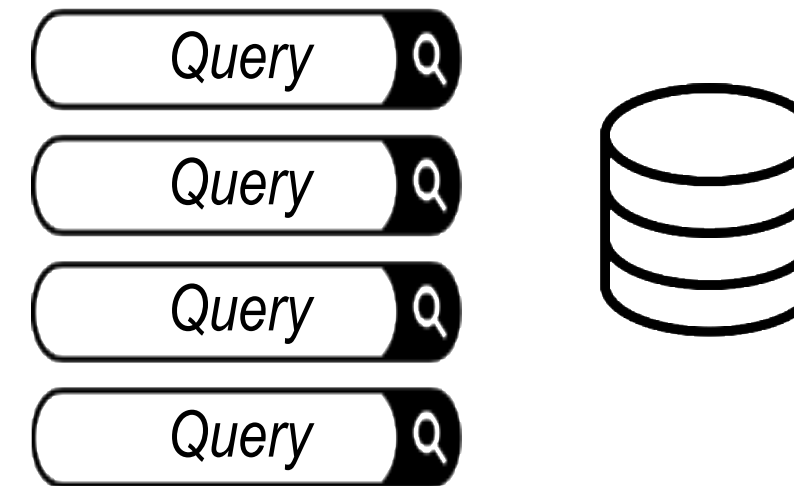
Phase 1: Data Collection & Analysis

1.1 Give Panelists a Search Task



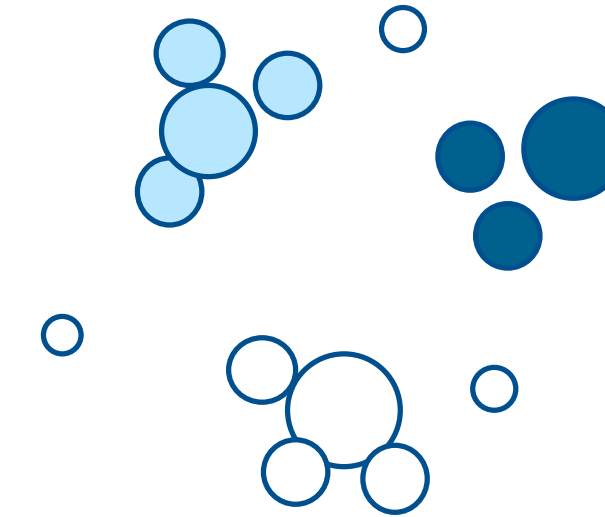
Participants from market research panel

1.2 Record Panelists' Search Queries



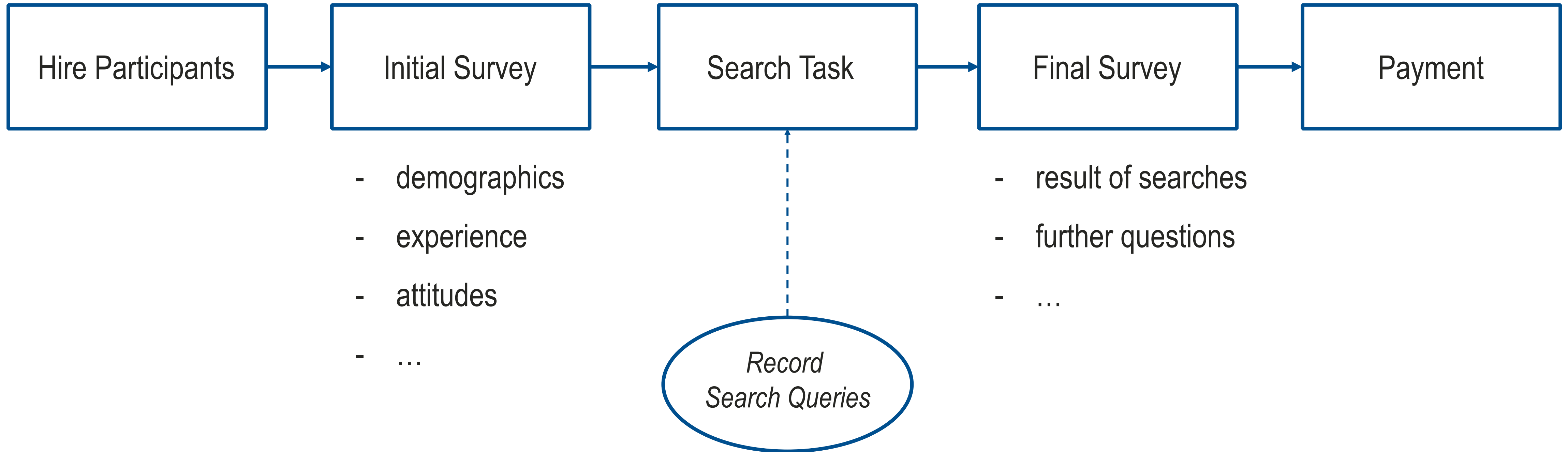
API-based search interface

1.3 Discover Information Exigencies (IXs)



Unsupervised machine-learning of search query records

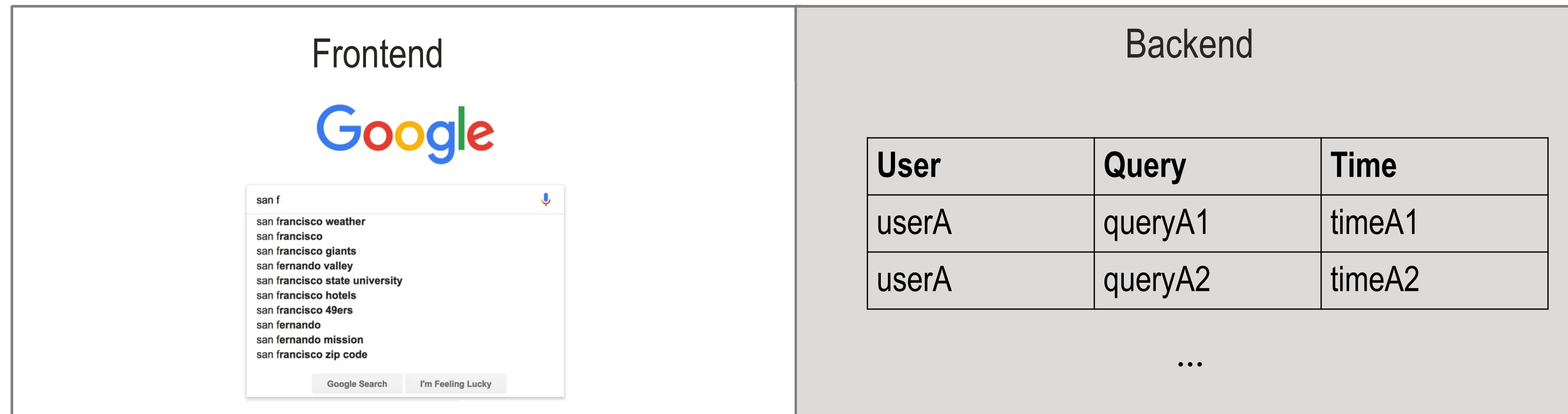
Data Collection Process



Including incentive alignment

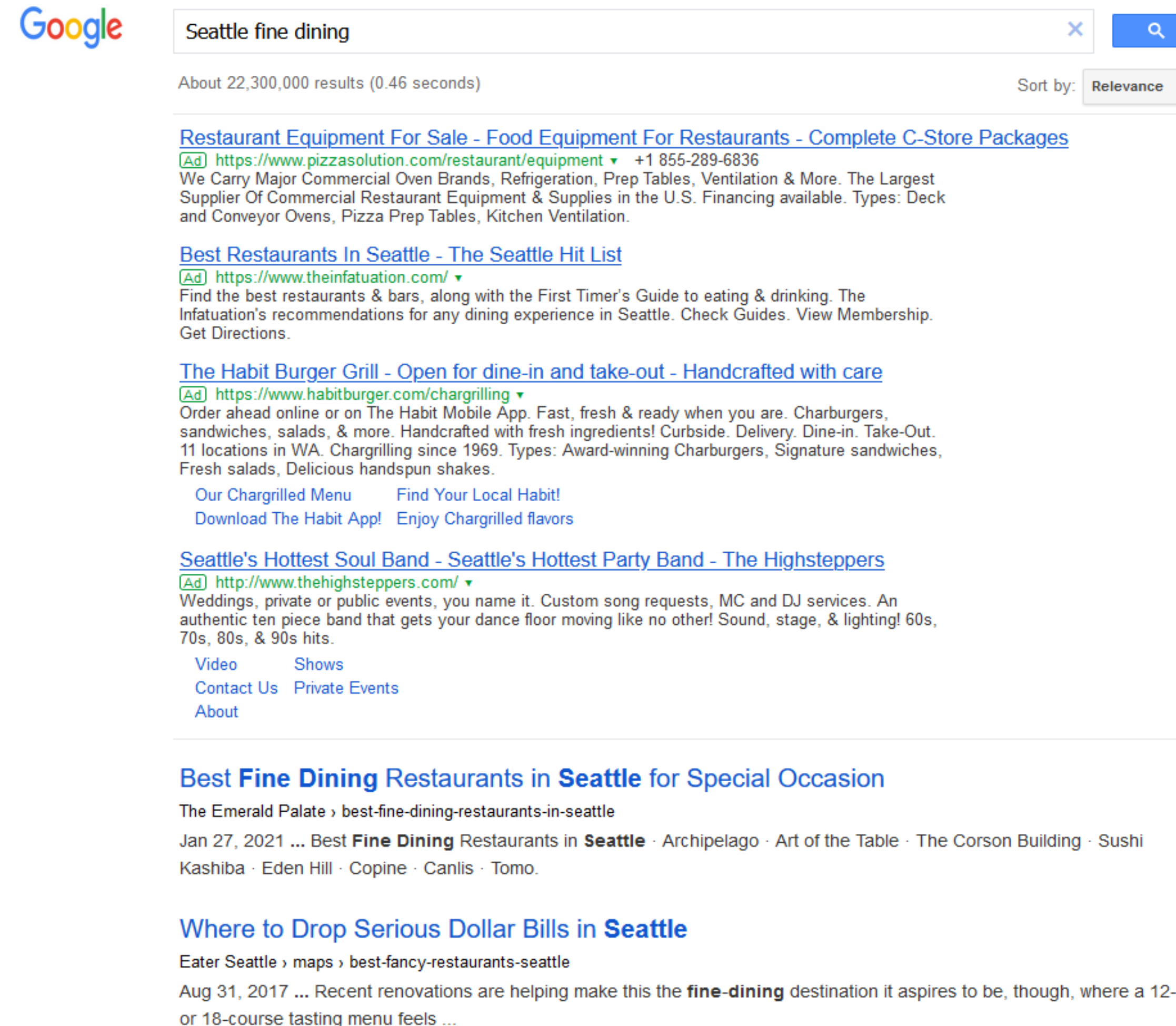
QueryCatcher

The "QueryCatcher"



- Built upon programmatic access to Google via its API
 - Embedded into custom website, allowing to monitor and record user activity
- Allow market researchers to mirror consumer information search in *a fully observable environment*

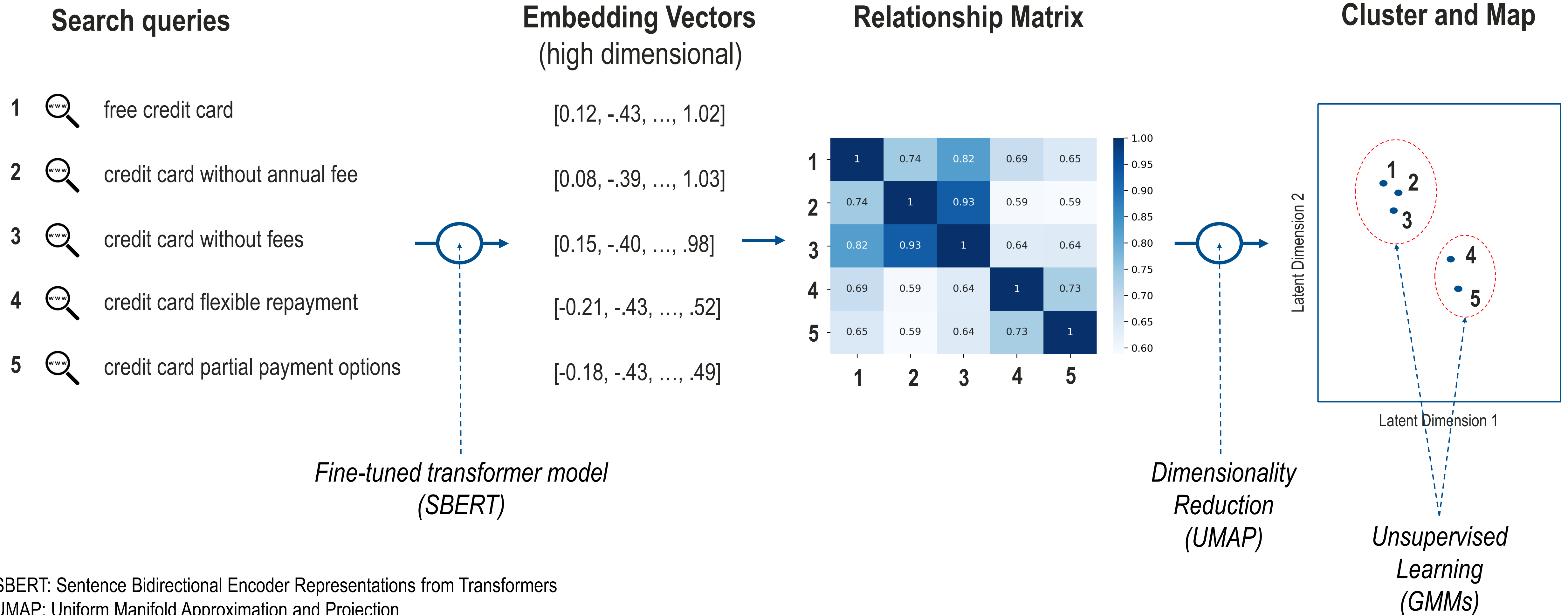
QueryCatcher Participant Interface



- ✓ direct interface to Google
- ✓ real search results in real-time
- ✓ records all activities
- ✓ fully anonymized
- ✓ desktop / mobile

Screenshot of user interface after loading results

Discovering Information Exigencies



Fine-tuned transformer model (SBERT)

Dimensionality Reduction (UMAP)

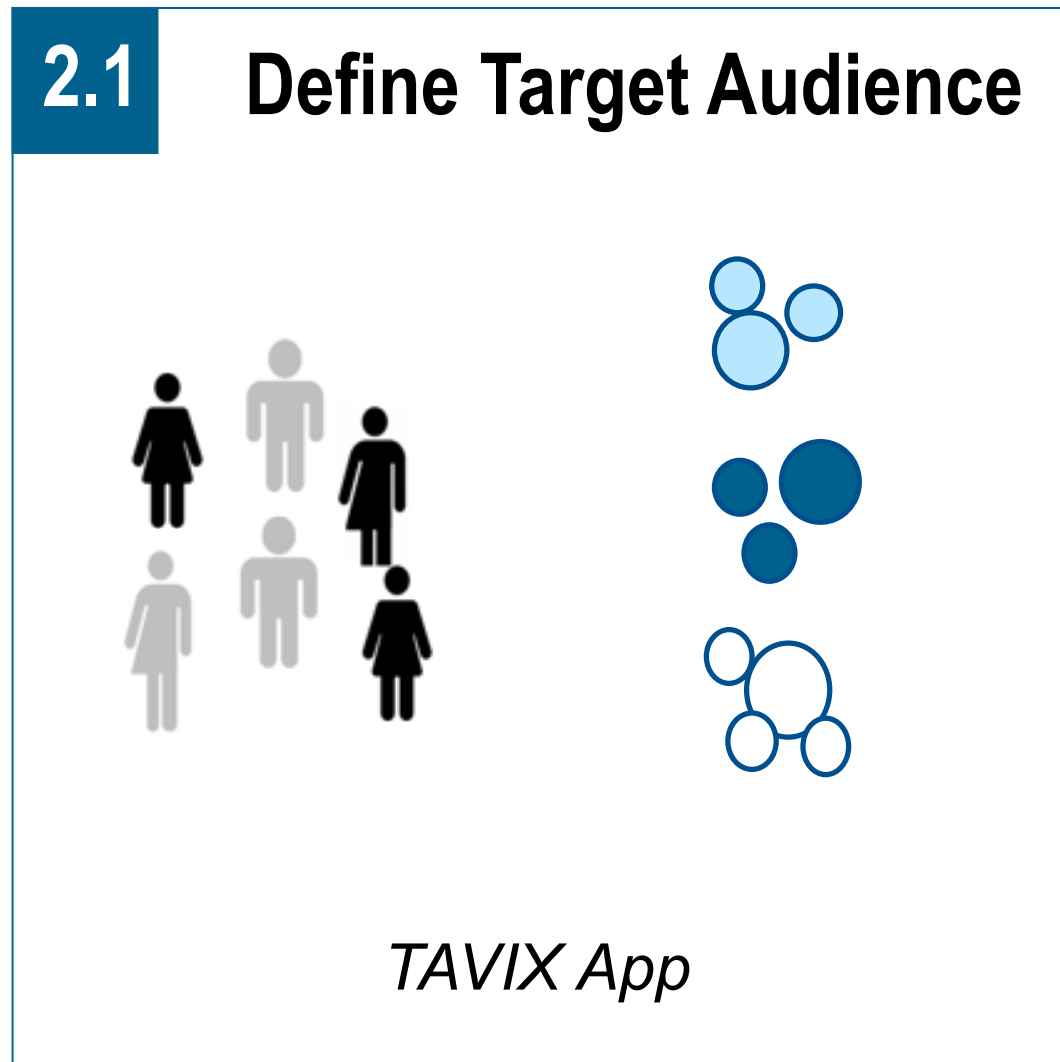
Unsupervised Learning (GMMs)

SBERT: Sentence Bidirectional Encoder Representations from Transformers
 UMAP: Uniform Manifold Approximation and Projection
 GMMs: Gaussian Mixture Models

Details on Phase 2

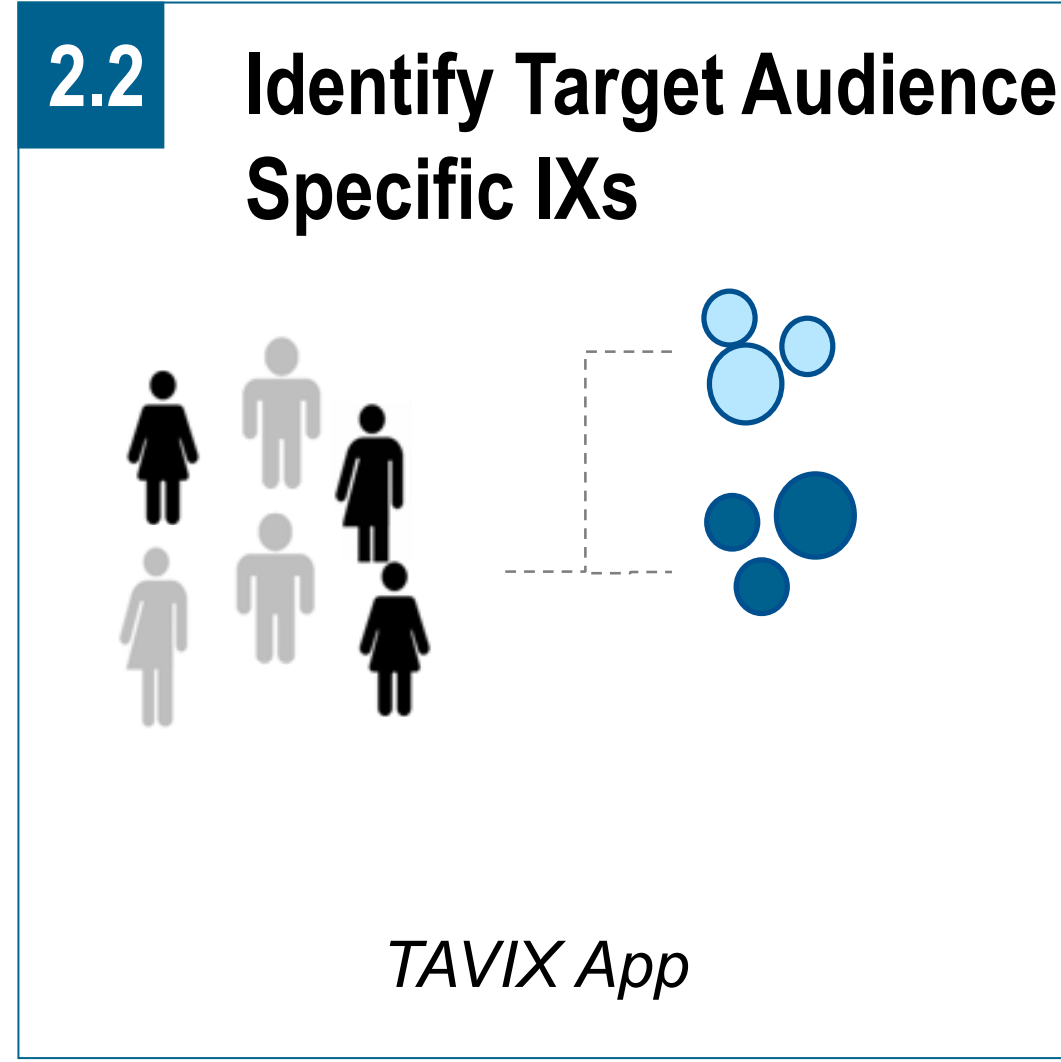
Phase 2: App-enabled Campaign Generation

2.1 Define Target Audience



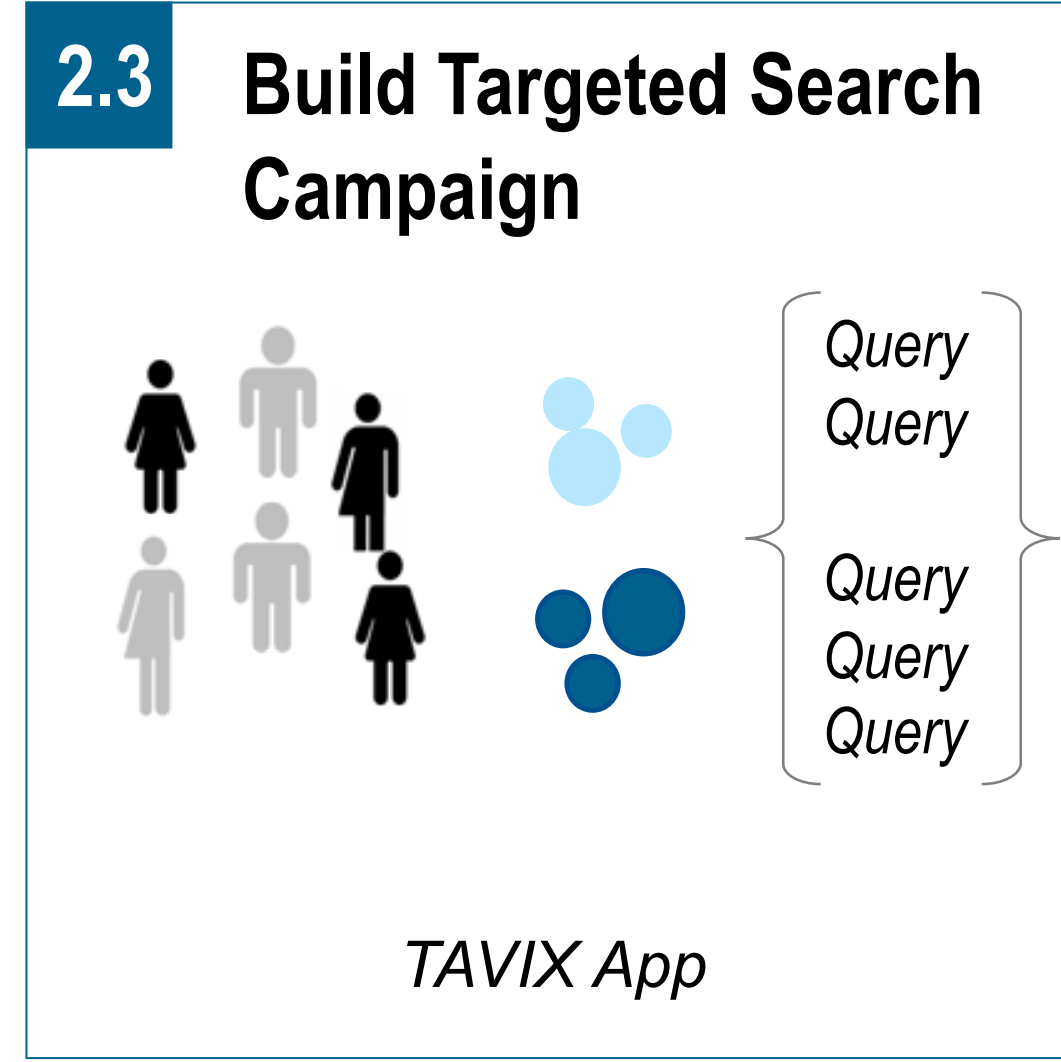
TAVIX App

2.2 Identify Target Audience Specific IXs



TAVIX App

2.3 Build Targeted Search Campaign



TAVIX App

Demo of TAVIX (“TARget consumers with Via Information Exigencies”)

Explore Data >

Define Target Audience >

Identify Specific IXs >

Build Set



TAVIX

Targeting via Information Exigencies

A research-driven app to interactively create targeted search campaigns

To get started:

Get a sample file, by clicking the link below

[Download sample file](#)

Drag & drop your own data here, or click to select a file

(Only .json files not exceeding 40Mb are accepted)

UPLOAD FILE

Or test the app in demo mode

START DEMO MODE


<https://tavix.run>

The TAVIX App makes Information Exigencies Accessible and Actionable

Define Target Audience

Respondent Attributes
Select available respondent attributes to identify your target audience

Age
18 70



Gender
 Male Female

Education Level
 High school diploma Vocational training Master degree Bachelor degree Higher secondary school
 Lower secondary school PhD

Job Type
 Self-employed Employee Other Living off savings Civil servant Student Attending school
 Retired

Income
 4001€ - 6000€ 2001€ - 2500€ 3001€ - 4000€ 1501€ - 2000€ 2501€ - 3000€ 1001€ - 1500€
 >9000€ 501€ - 1000€ 6001€ - 9000€

Boolean fields
 Previous Experience Intent Onetime Invest Intent Savingsplan Intent Active Trading
 Interested In Shares Interested In Funds Interested In Etfs Interested In Bonds Interested In Levers
 Interested In Certificates Interested In Levers Or Certificates Plans Larger Invest Consider Ing
 Consider Comdirect Consider Spk Consider Etoro Consider Traderep

Selected respondent attributes

Selected range attributes
Age:
18 - 70

Selected categorical attributes
Gender:
No selected attributes
Education Level:
No selected attributes
Job Type:
No selected attributes
Income:
No selected attributes

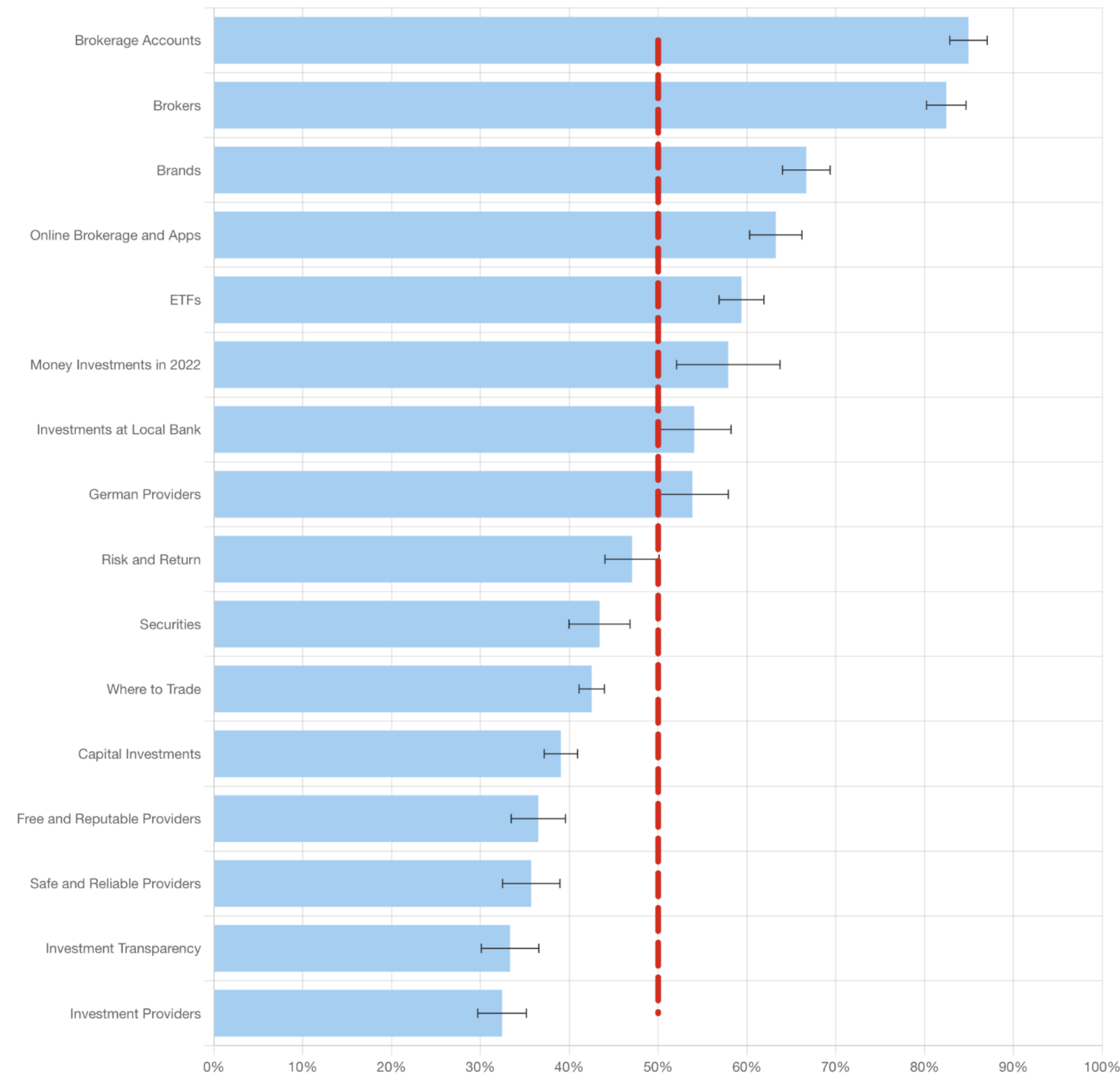
Selected boolean attributes
Previous Experience

The **T**argeting **V**ia **I**nformation **E**Xigencies (TAVIX) App allows users to

...define a target audience, based on a combination of consumer characteristics

The TAVIX App makes Information Exigencies Accessible and Actionable

Identify Target Audience's Information Exigencies



Red line marks average across entire sample of participants.

The **T**Argeting **V**ia **I**nformation **E**Xigencies (TAVIX) App allows users to

...define a target audience, based on a combination of consumer characteristics

...identify the information exigencies most specific to this target audience

The TAVIX App makes Information Exigencies Accessible and Actionable

Build Search Campaign

Selected respondent attributes

Selected range attributes
Age:
18 - 70

Selected categorical attributes
Gender:
No selected attributes
Education Level:
No selected attributes
Job Type:
No selected attributes
Income:
No selected attributes

Selected boolean attributes
Previous Experience

Build your own set of search terms

Select min - max probability 0 100

Top N search terms by probability

Enter the search term

0 selected search term REMOVE FROM THE SET EXPORT SEARCH TERM SET

<input type="checkbox"/> Search Term	Information Need	Need Probability
<input type="checkbox"/> aktien anbieter im broker depot	Brokers	1
<input type="checkbox"/> aktien depot bei banken	Brokerage Accounts	1
<input type="checkbox"/> aktien depot eröffnen	Brokerage Accounts	1
<input type="checkbox"/> aktien depot finanztip	Brokerage Accounts	1
<input type="checkbox"/> aktien depot preiswert günstig	Brokerage Accounts	1
<input type="checkbox"/> aktien depot vergleich	Brokerage Accounts	1
<input type="checkbox"/> aktien online depot vergleich	Brokerage Accounts	1
<input type="checkbox"/> aktienkauf kosten depot	Brokerage Accounts	1
<input type="checkbox"/> anbieter aktien depot	Brokerage Accounts	1
<input type="checkbox"/> anbieter wertpapiere depot	Brokerage Accounts	1

1-10 of 100 < >

The **T**argeting **V**ia **I**nformation **E**Xigencies (TAVIX) App allows users to

...define a target audience, based on a combination of consumer characteristics

...identify the information exigencies most specific to this target audience

...extract the most relevant queries for targeting the audience to build SEA campaign

Field Study

Empirical Setting

Industry Partner: Major European Retail Bank

Aim: **Acquire** a specific audience **for** their **online trading account**

Target audience

- **New customers** (considering their direct competitor)
- **Active traders** (rather than invest passively)
- Planning to invest **larger amounts**

Process

- Hire participants (*N participants = 813*)
- Search Task: “**Find a suitable provider to invest money in securities**”
- Record searches via **QueryCatcher** (*N unique queries = 871*) and identify underlying information exigencies (*N = 16*)
- Partner builds campaign using the **TAVIX App**
- Partner **runs campaign concurrently** with extant campaign by SEA experts

Evaluation

SEA Expert Campaign

- Benchmark campaign
- Professionally designed and managed by SEA team
- N queries = 134

TAVIX Campaign

- Built via the TAVIX App
 - *intend active trading OR*
 - *intend larger investments OR*
 - *considers direct competitor*
- N queries = 150

Query overlap: 0

Acquisition period: 4 months (concurrent) – Evaluation period: 3 months

Evaluation criteria

- Share of new customers
- Mean trading volume
- Cost per conversion

Findings

Comparison: TAVIX Campaign vs. Expert Campaign

- New Customer Share: **+21%**
- Mean Trading Volume: **+98%**
- Cost per Conversion: **+53%**

TAVIX Impact at Industry Partner

- New campaign integrated into main campaign
- TAVIX presented to management board and other units
- Use of TAVIX App to launch for SEO (with new, dedicated landing content)

Summing Up

Contribution

Main Contribution

New approach, enabling marketers to target consumers

based on their specific demand for information, i.e., their *information exigencies*

Interactive App (*The TAVIX App*)

Enabling marketers to translate our approach's findings into targeting decisions

Areas of application

- targeted search engine advertising
- strategic (segment-specific) content creation
- informational advertising
- *beyond...*

Informational / educational campaigns



Political campaigns



Marketing new technologies



Thanks for your Attention



Maximilian Matthe
mpmatthe@iu.edu



Daniel M. Ringel
dmr@unc.edu



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL



Bernd Skiera
skiera@wiwi.uni-frankfurt.de

