

Exploration of Social and Web Image Search Results Using Tensor Decomposition

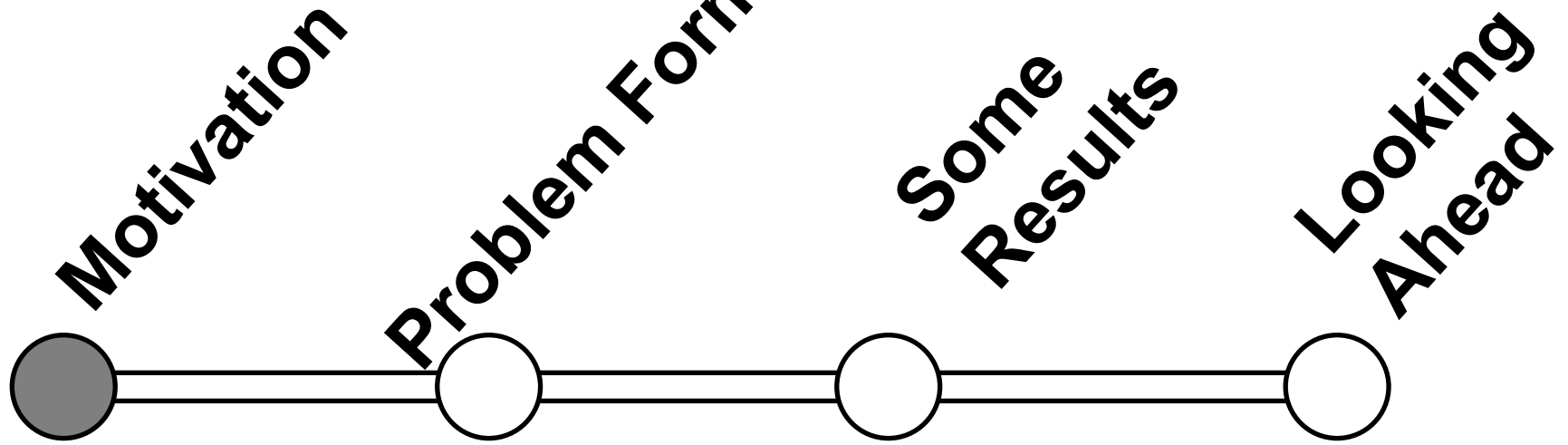
Liuqing Yang, Vagelis
Papalexakis,

Computer Science & Engineering

UC Riverside

**CVPR 2017 – Tensor Methods in Computer Vision Workshop
Honolulu, HI**

Roadmap



Motivation

Google

twitter



Motivation

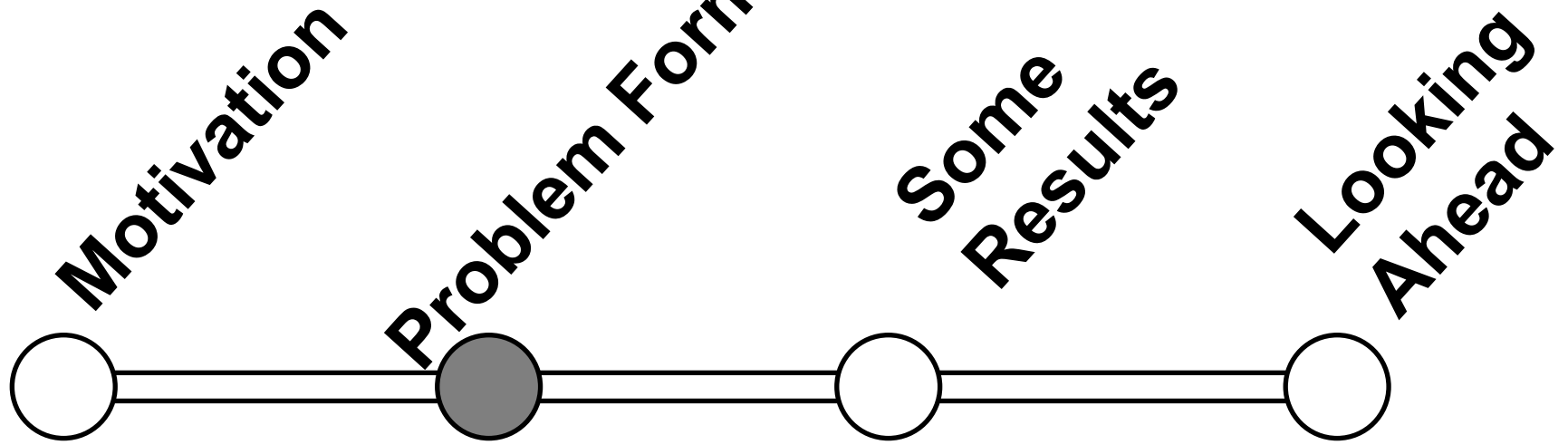
Google

twitter

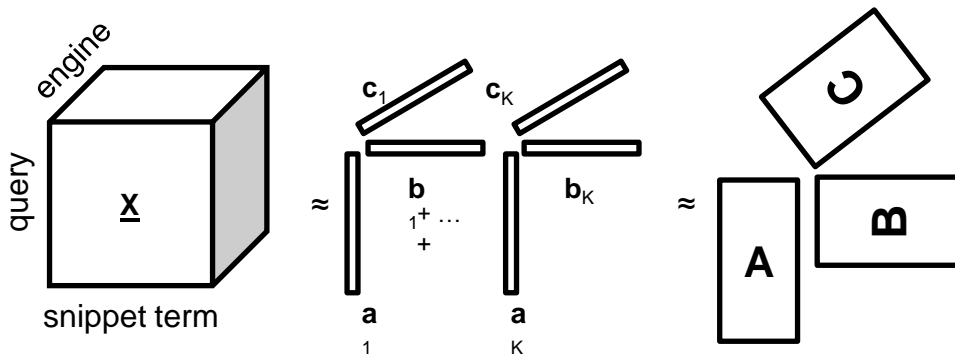
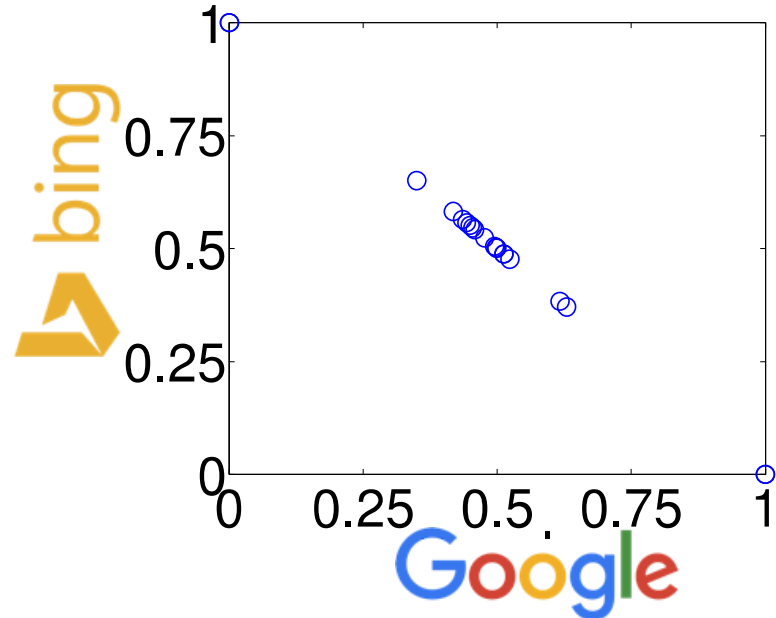
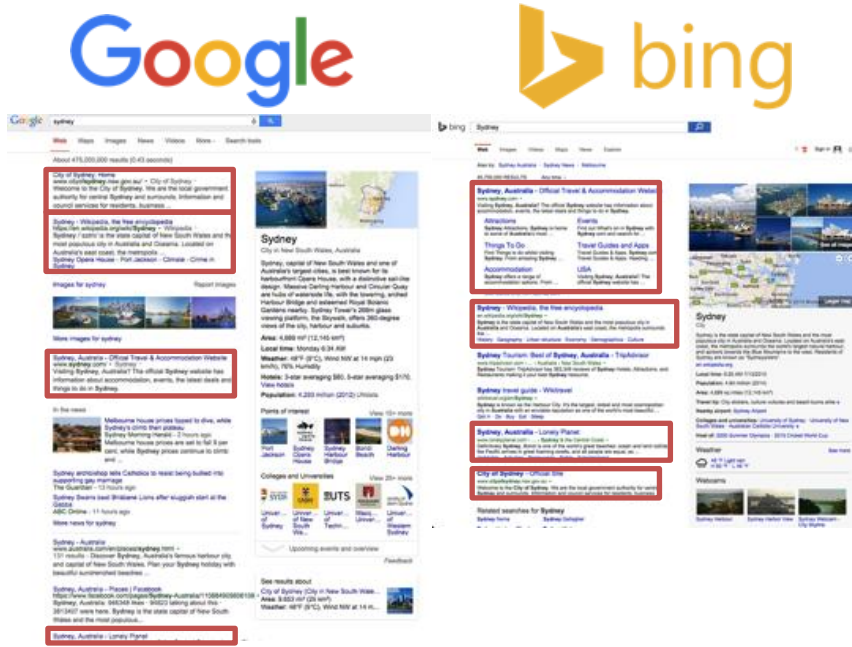


1. What (visual) features differentiate stock & social images?
2. What (visual) features are common?

Roadmap



A Detour



[Agrawal, Golshan, Papalexakis WWW '15, KDD '15]

Arranging the Data



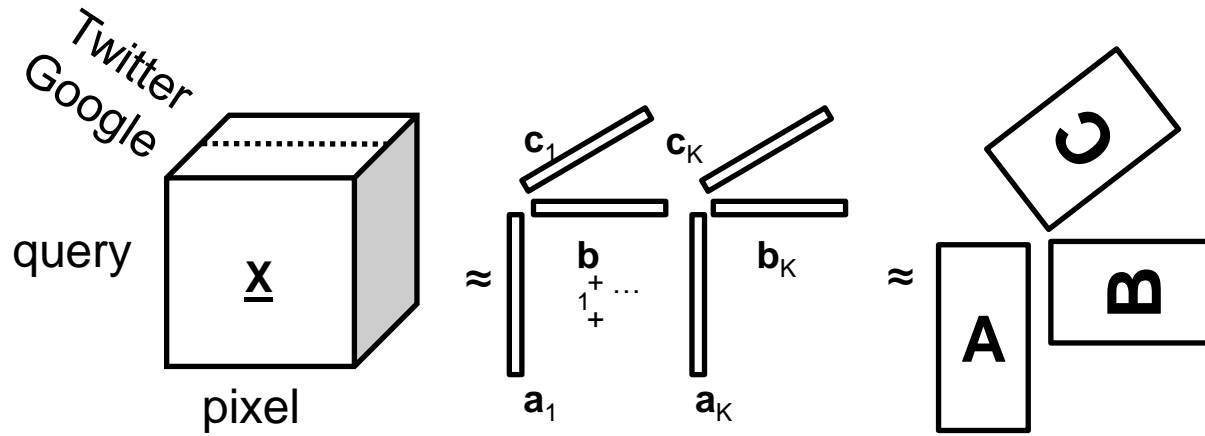
Golden Gate Br.

Queries

Pixels



Decomposing the Tensor using CP

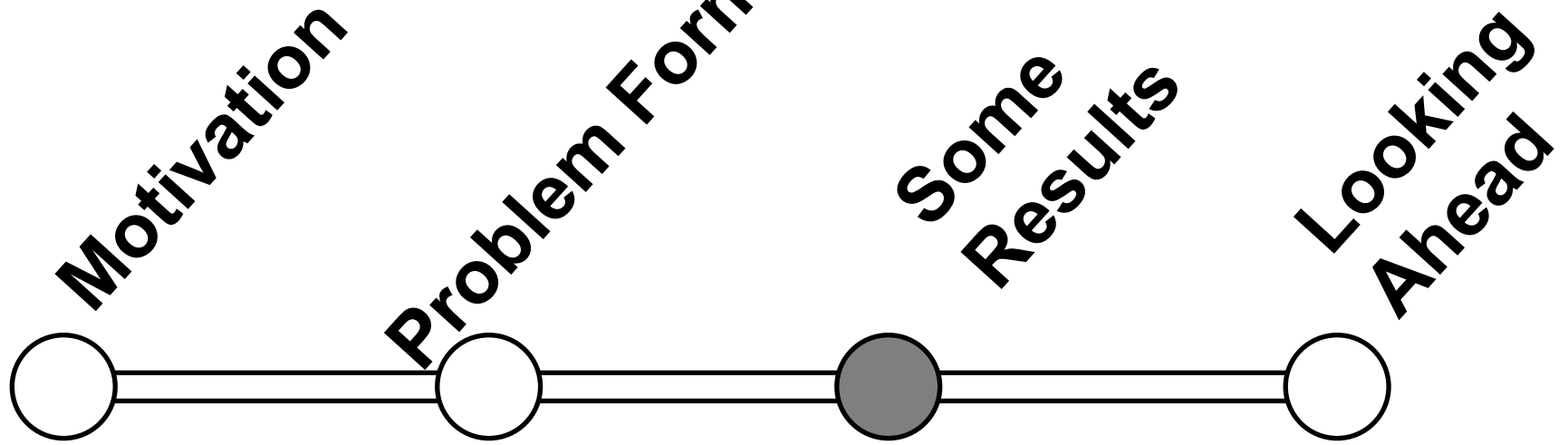


A Query embedding
Query-by-"cluster"

B Pixel embedding
Latent representative
image of cluster

C Image source embedding
Source-by-"cluster"

Roadmap

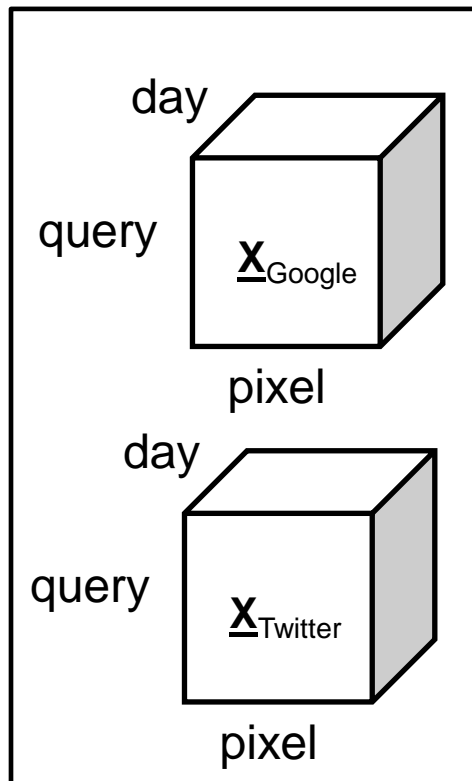


Data Collection

- Use Google and Twitter APIs to collect a small dataset
- Duration: Oct. 8 – Nov.11, 2016
- Queries:

Election	Gun control	Refugee	Artificial Intelligence
Hurricane	Donald Trump	Mark Zuckerberg	Bruno Mars
Lakers	Ford	Jimmy Kimmel	Los Angeles

Tensor Formulation



- 4-mode tensor:
 - *query x pixel x day x source*
- We select top-1 image per query
- We have a 4th embedding matrix:
 - *Temporal evolution of pattern*
- For rank selection:
 - Hard case (size of 4th mode is 2, Core Consistency cannot apply)
 - Trial-and-error

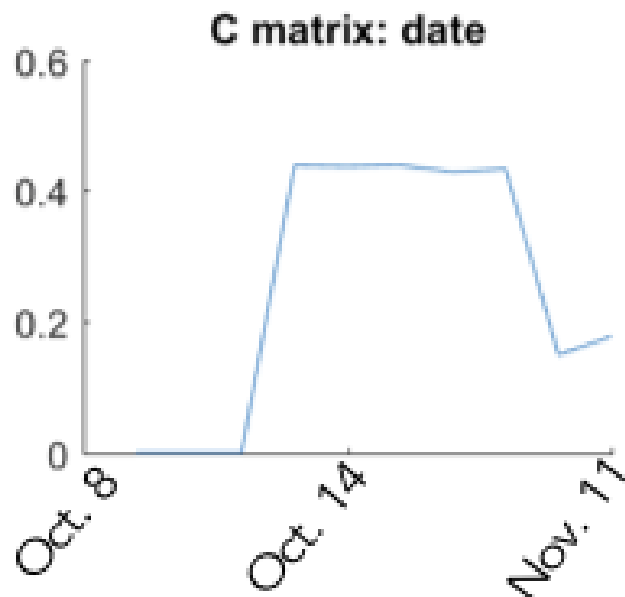


Top queries

top1: election,0.99

top2: Los Angeles,0.02

top3: Lakers,0.01



B matrix



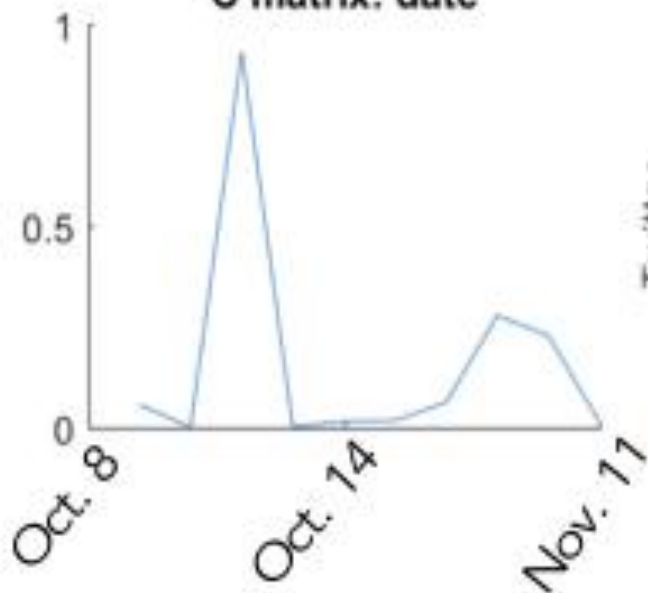
Top queries

top1: election,0.95

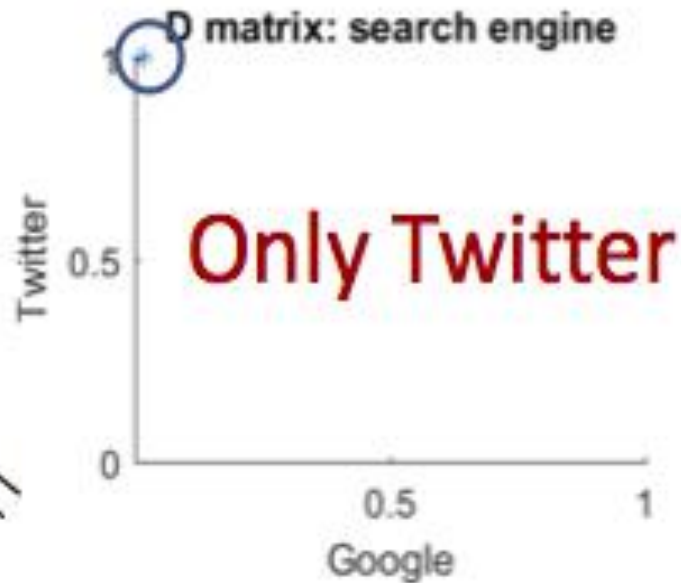
top2: refugee,0.18

top3: donald trump,0.17

C matrix: date



D matrix: search engine

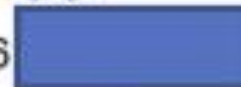


B matrix



Top queries

top1: refugee, 0.86



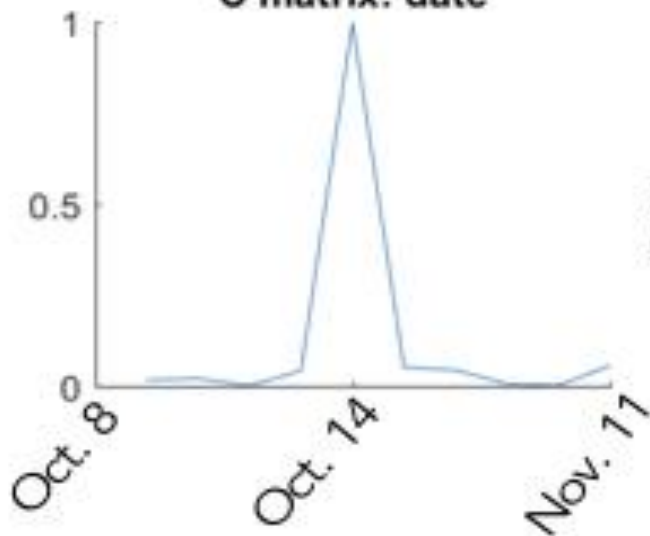
top2: election, 0.37



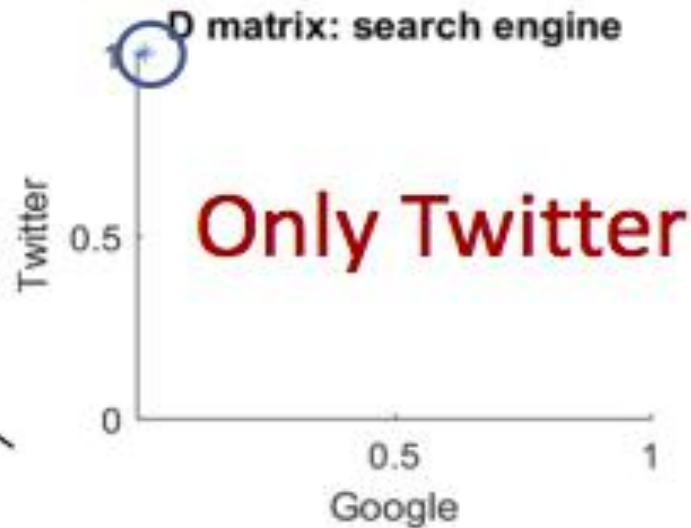
top3: artificial intelligence, 0.30



C matrix: date



D matrix: search engine



B matrix



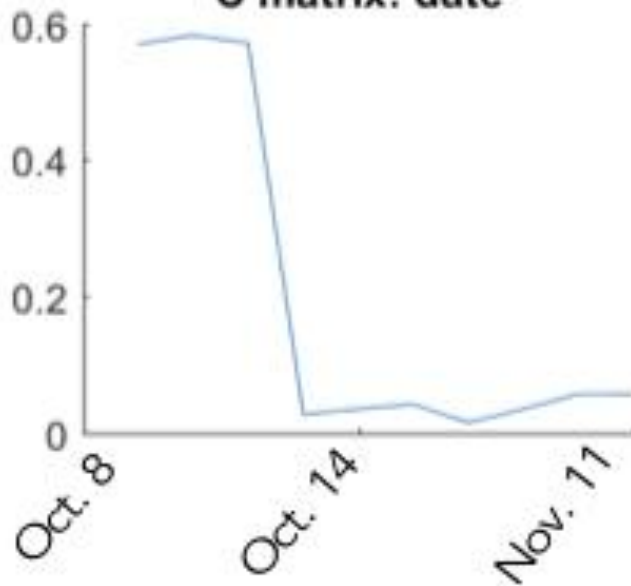
Top queries

top1: election,0.99

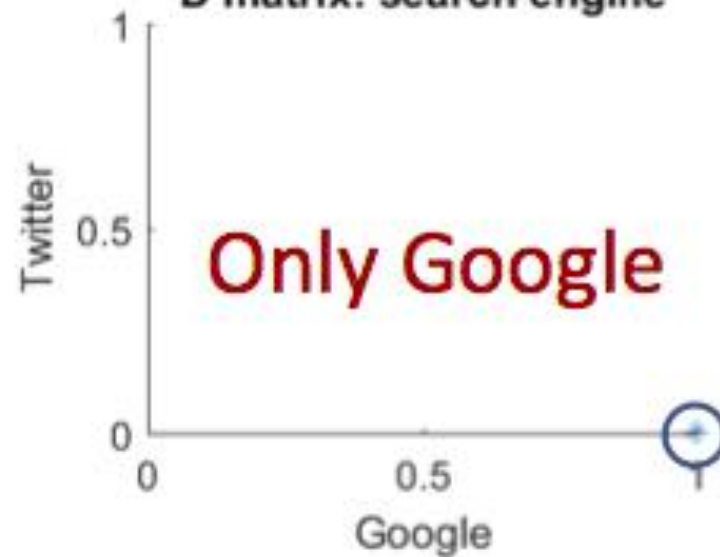
top2: mark zuckerberg,0.02

top3: Ford,0.01

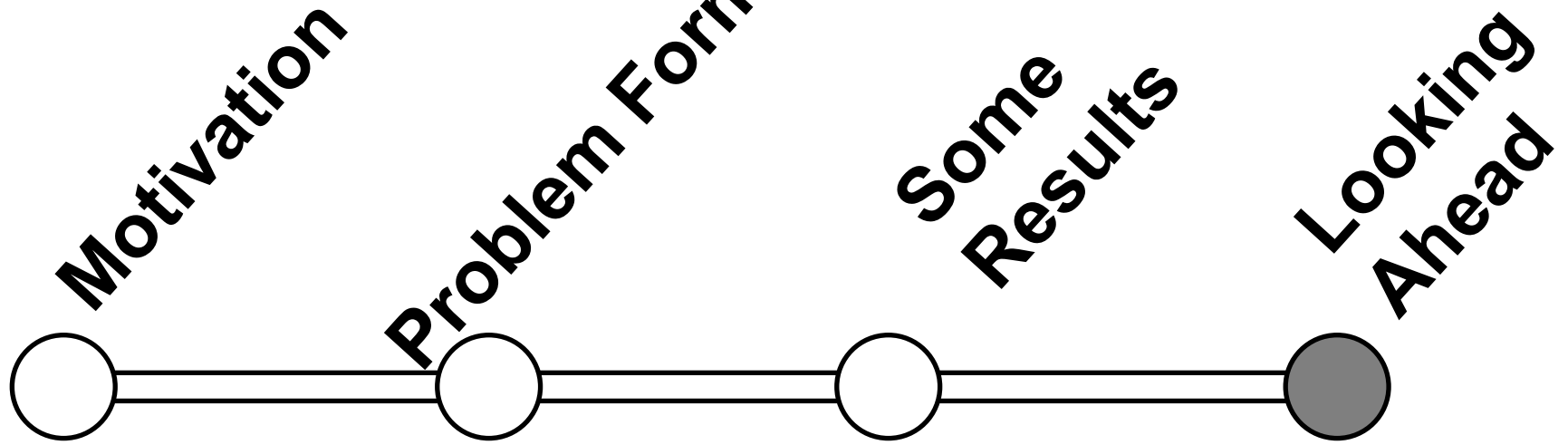
C matrix: date



D matrix: search engine



Roadmap



Future

- **Incorporate top-k results:**
 - ✧ Add a “result position” mode?
- **Investigate different tensor models**
 - ✧ Tucker (TensorFaces), others??
- **Eliminate semi-supervision:**
 - ✧ Ignore “source” mode and let structure alone identify social vs. stock images
- **Use side-information:**
 - ✧ Social information
 - ✧ Web search results

Mahalo!

Questions?

How to reach me: <http://www.cs.ucr.edu/~epapalex/>

Funding by