Visualizing LSA

Demo

- Create a fake TFIDF matrix with a strong concept
- Plot the matrix on a two term axis
- Perform SVD decomposition
- Plot the new axes
- Reduce the dimensionality of SVD
- Plot the new axes

Using MATLAB For LSA

Demo

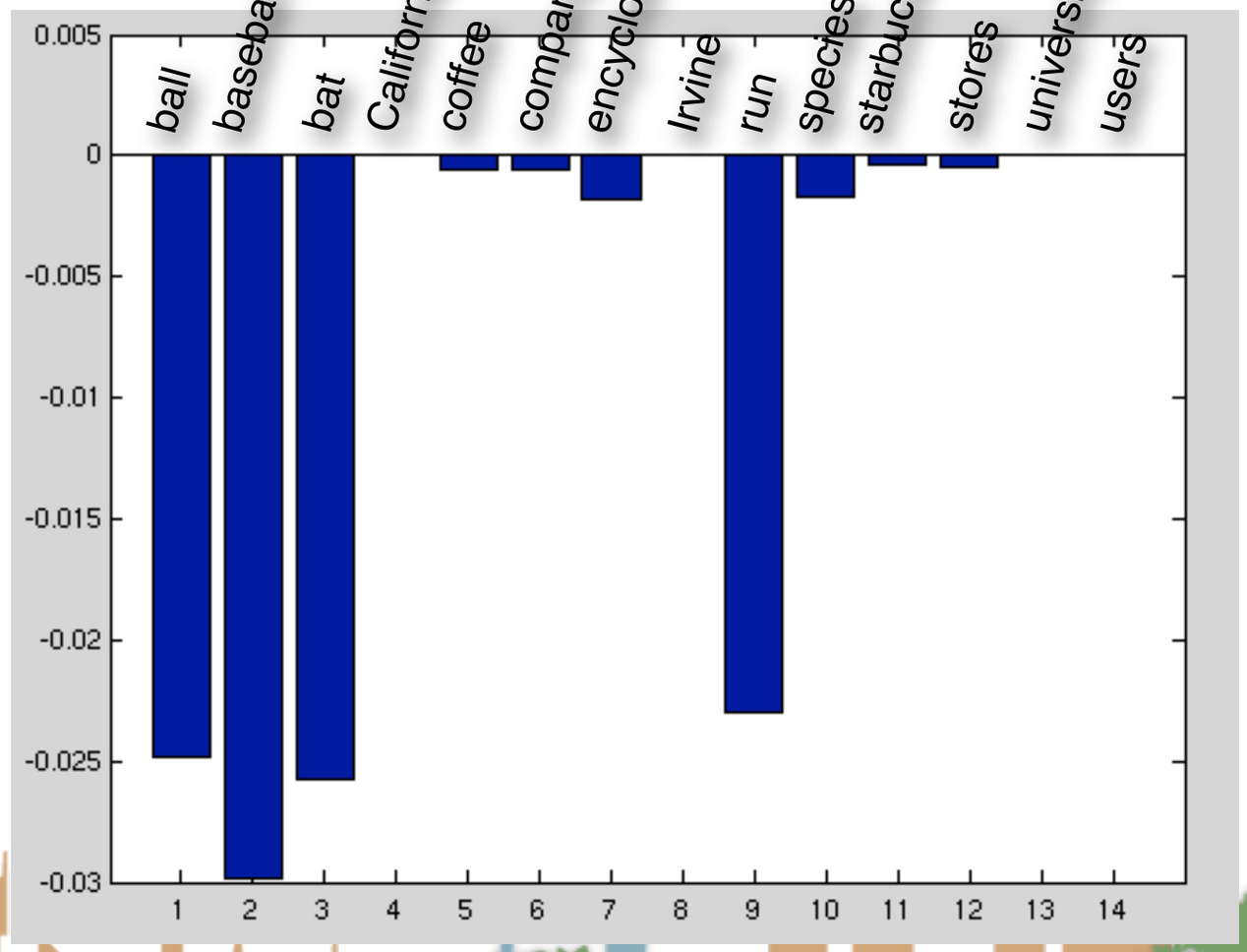
- Show “M”

```
>> M = inv(Sk)*Uk'

M =

  Columns 1 through 10

   -0.0248   -0.0299   -0.0257    0.0000   -0.0006   -0.0005   -0.0018    0.0000   -0.0230   -0.0017
   -0.0000   -0.0000    0.0000   -0.0280    0.0000    0.0000    0.0000   -0.0280   -0.0000   -0.0000
    0.0006    0.0008    0.0005    0.0000   -0.0263   -0.0305   -0.0021    0.0000    0.0006   -0.0024

  Columns 11 through 14

   -0.0004   -0.0005    0.0000    0.0000
   -0.0000    0.0000   -0.0280   -0.0259
   -0.0241   -0.0290    0.0000    0.0000
```

First concept is selecting for wikipedia?

Demo

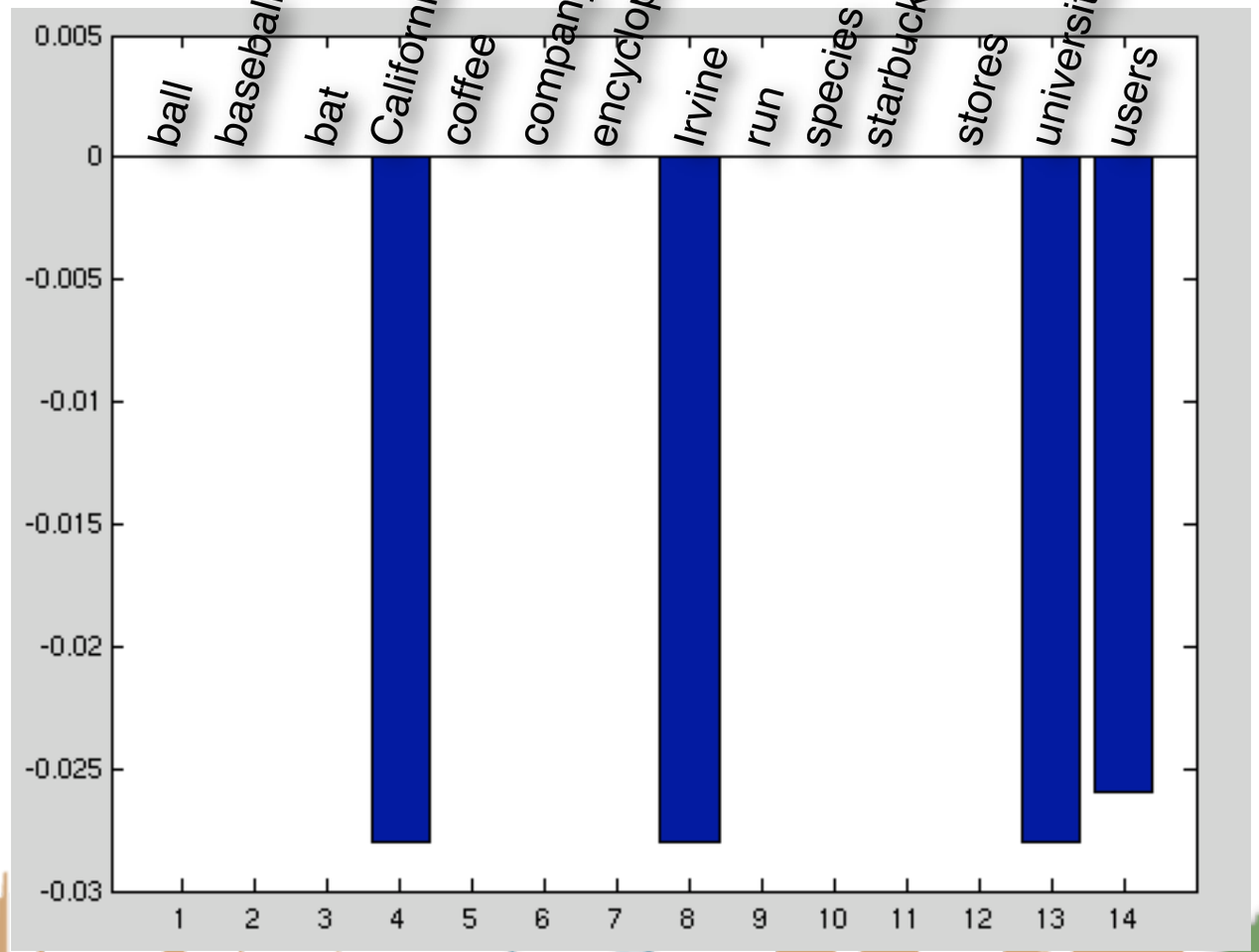
- Demonstrate what SVD is capturing
  - 1st concept (1st row of M)



First concept is selecting for baseball?

Demo

- Demonstrate what SVD is capturing
  - 2nd concept (2nd row of M)



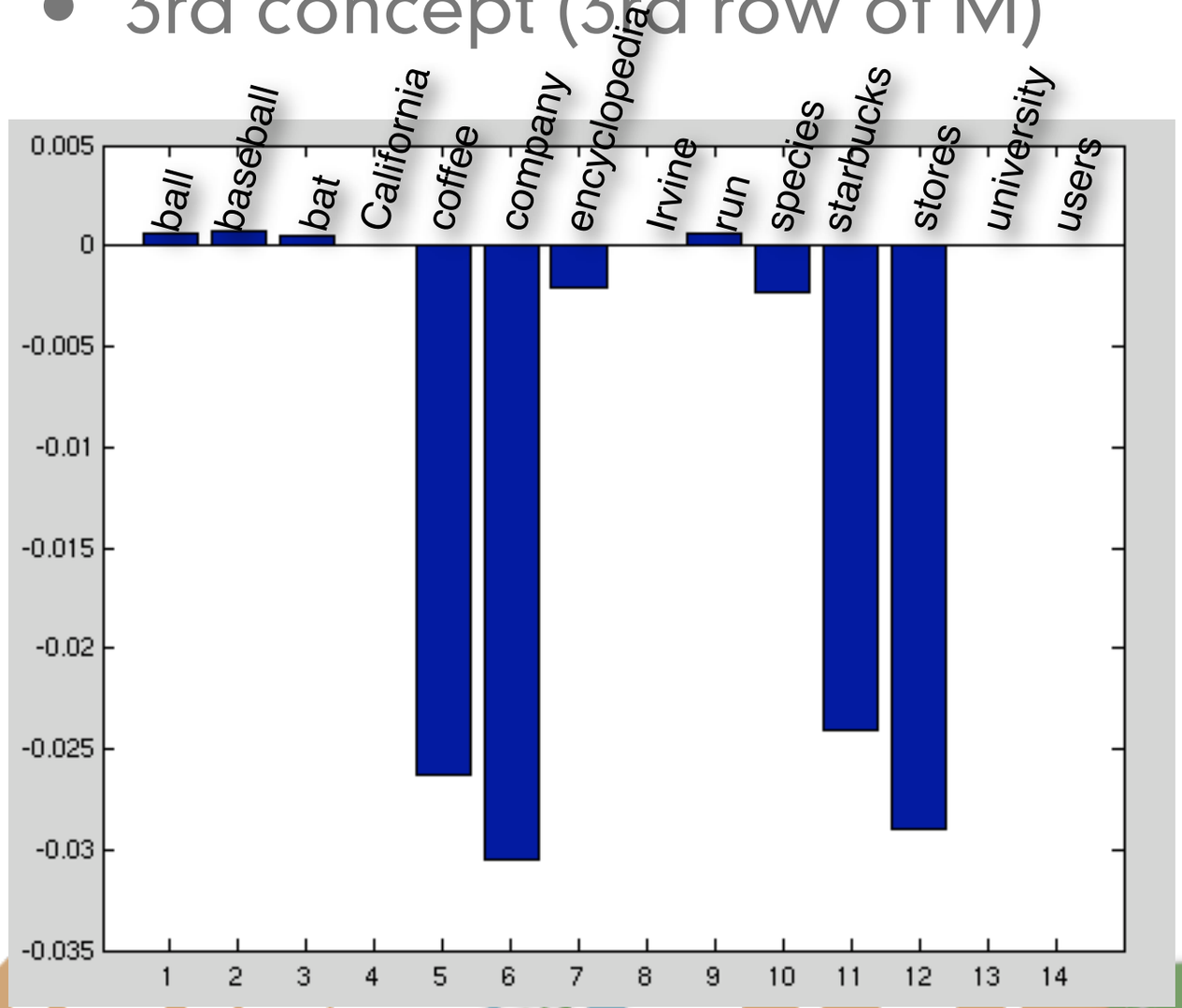
First concept is selecting for wikipedia?

Second concept is selecting for UCI?

First concept is selecting for wikipedia?

Demo

- Demonstrate what SVD is capturing
  - 3rd concept (3rd row of M)



Third concept is selecting for coffee?

Demo

- Execute a query “coffee stores”

```
>> q=[ 0 0 0 0 (1+log2(1))*log2(c/df(5)) 0 0 0 0 0 0 (1+log(1))*log2(c/df(12)) 0 0]

q =

  Columns 1 through 10

         0         0         0         0    1.5850         0         0         0         0         0

  Columns 11 through 14

         0    2.5850         0         0

>> qc=M*q'

qc =

   -0.0023
    0.0000
   -0.1166
```

Using MATLAB For LSA

Demo

- Execute a query

$$sim(q, d_i) = \frac{\vec{V}(q) \cdot \vec{V}(d_i)}{|\vec{V}(q)||\vec{V}(d_i)|}$$

```
>> Cc = inv(Sk)*Uk'*tfidf

Cc =

   -0.9894   -0.1434   -0.0117    0.0000   -0.0020   -0.0189
    0.0000    0.0000    0.0000   -1.0000   -0.0000   -0.0000
    0.0227   -0.0084   -0.2332    0.0000   -0.1147   -0.9653

>> sim = qc'*Cc;
>> sim = sim ./ [norm(Cc(:,1)) norm(Cc(:,2)) norm(Cc(:,3)) norm(Cc(:,4)) norm(Cc(:,5)) norm(Cc(:,6))]

sim =

   -0.0004    0.0091    0.1166   -0.0000    0.1166    0.1166
```

wiki: baseballBat

wiki: bat

wiki: coffee

djp3 paper

starbucks

wiki:starbucks

Using MATLAB For LSA

Demo

- Execute a query “coffee stores”
  - Answer:
    - starbucks (0.1166)
    - wiki:starbucks(0.1166)
    - wiki:coffee (0.1166)
    - wiki:bat (0.0091)
    - djp3 paper (0.0)
    - wiki:baseballBat (-0.0004)

Demo

- Execute a query "baseball bat"

ball baseball bat California coffee company encyclopedia Irvine run species starbucks stores university users

```
>> q=[(1+log2(1))*log2(c/df(1)) (1+log2(1))*log2(c/df(2)) 0 0 0 0 0 0 0 0 0 0 0 0]

q =

  Columns 1 through 10

    2.5850    2.5850         0         0         0         0         0         0         0         0

  Columns 11 through 14

         0         0         0         0

>> qc=M*q'

qc =

   -0.1413
   -0.0000
    0.0037
```

Using MATLAB For LSA

Demo

- Execute a query

$$sim(q, d_i) = \frac{\vec{V}(q) \cdot \vec{V}(d_i)}{|\vec{V}(q)||\vec{V}(d_i)|}$$

```
>> Cc = inv(Sk)*Uk'*tfidf

Cc =

   -0.9894   -0.1434   -0.0117    0.0000   -0.0020   -0.0189
    0.0000    0.0000    0.0000   -1.0000   -0.0000   -0.0000
    0.0227   -0.0084   -0.2332    0.0000   -0.1147   -0.9653

>> sim = qc'*Cc;
>> sim = sim ./ [norm(Cc(:,1)) norm(Cc(:,2)) norm(Cc(:,3)) norm(Cc(:,4)) norm(Cc(:,5)) norm(Cc(:,6))]

sim =

    0.1414    0.1408    0.0035    0.0000   -0.0012   -0.0009
```

wiki: baseballBat

wiki: bat

wiki: coffee

djp3 paper

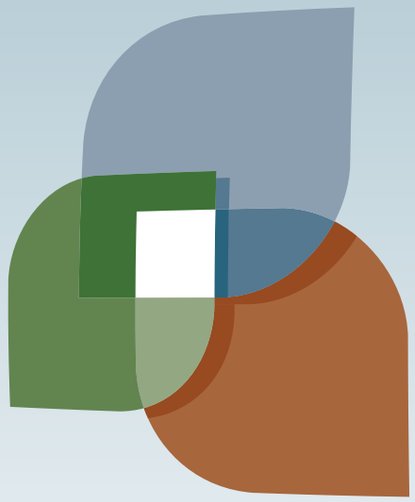
starbucks

wiki:starbucks

Using MATLAB For LSA

Demo

- Execute a query “baseball bat”
  - Answer:
    - wiki:baseballBat (0.1414)
    - wiki:bat (0.1408)
    - wiki:coffee (0.0035)
    - djp3 paper (0.000)
    - wiki:starbucks (-0.0009)
    - starbucks (-0.0012)



LUCI

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