KNOWLEDGE MEDIA
KMi
INSTITUTE

More than a thousand words…

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Multimedia and Information Systems
Knowledge Media Institute
The Open University

http://kmi.open.ac.uk/mmis

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kmi.open.ac.uk

KMi

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Projects

All Projects [99]

Hot [42]

Active [13]

Classics [42]

Research Themes

Future Internet

Knowledge Management

Multimedia & Information Systems

Narrative Hypermedia

New Media Systems

Semantic Web & Knowledge Services

Social Software

KMi Tools

Projects | Hot

SPOTLIGHTED HOT PROJECTS

Service Web 3.0
Future Internet Semantic Web and Knowledge Services
Coordinating the research, standardization, and dissemination activites creating the internet of billions of web services.

ECOSENSUS
Knowledge Management
Electronic/Ecological Collaborative Sensemaking Support System

The UK Multimedia Knowledge Managment Network
Multimedia and Information Systems
Enhance communication between the experts in both academia and industry

Future Internet

Knowledge Management

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Narrative Hypermedia

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Semantic Web & Knowledge Services

Social Software

The Open University

KMi project portfolio

Since 1995: 104 projects & 55 technologies

Current year

30 live projects (£2.3m ext, £1.2m internal)

- 17 EU
- 7 UK
- 1 US
- 5 internal (iTunes U, SocialLearn, ...)

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PHAROS Project

"Lighting the way for European audiovisual search"

Funded IP by EU under IST-FP6

PHAROS
Lighting the way for European audiovisual search

Platform for searcH of Audiovisual Resources across Online Spaces

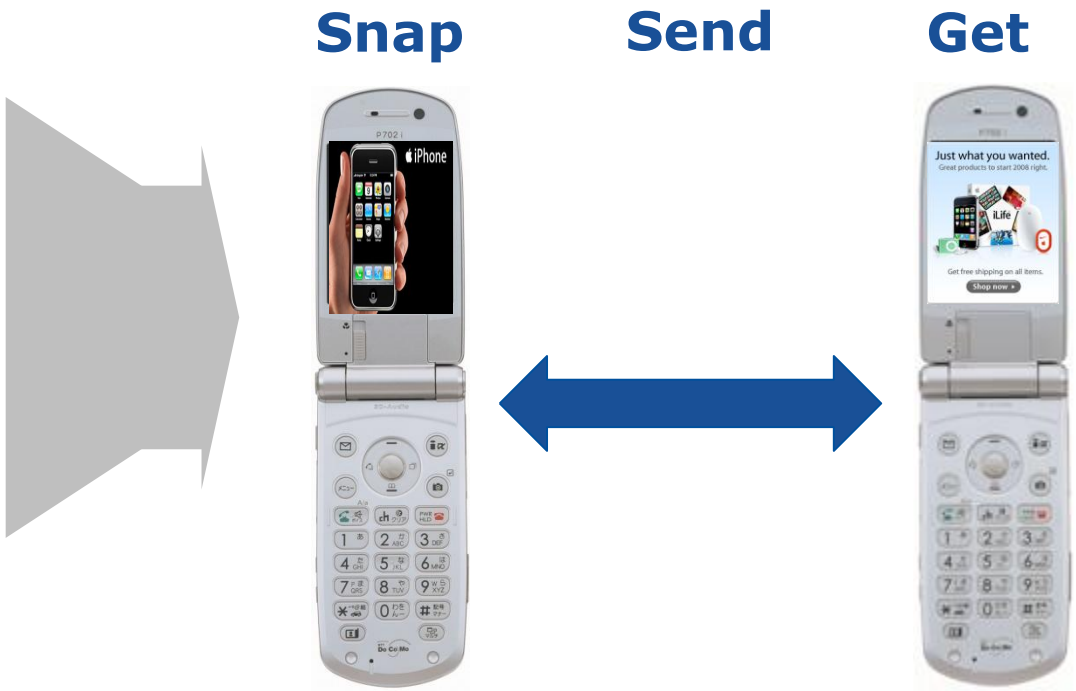
The Open University

Multimedia queries

Built by the monks and nuns of the Nipponzan Myohoji, this was the first Peace Pagoda to be built in the western hemisphere and enshrines sacred relics of Lord Buddha. The Inauguration ceremony, on 21st September 1980, was presided over by the late most Venerable Nichidattsu Fujii, founder and …

Commercial example

Snap.Send.Get™



Medical image retrieval

[CLEF 2004 collection]

New search types

text	video	Images	speech	sound	sketches	multimed	query / doc
							text
				✔			video
							images
							speech
							music
							sketches
							multimedia

Example

you roar and get a wildlife documentary

The semantic gap

1m pixels with a spatial colour distribution

faces & vase-like object

victory, triumph, ...

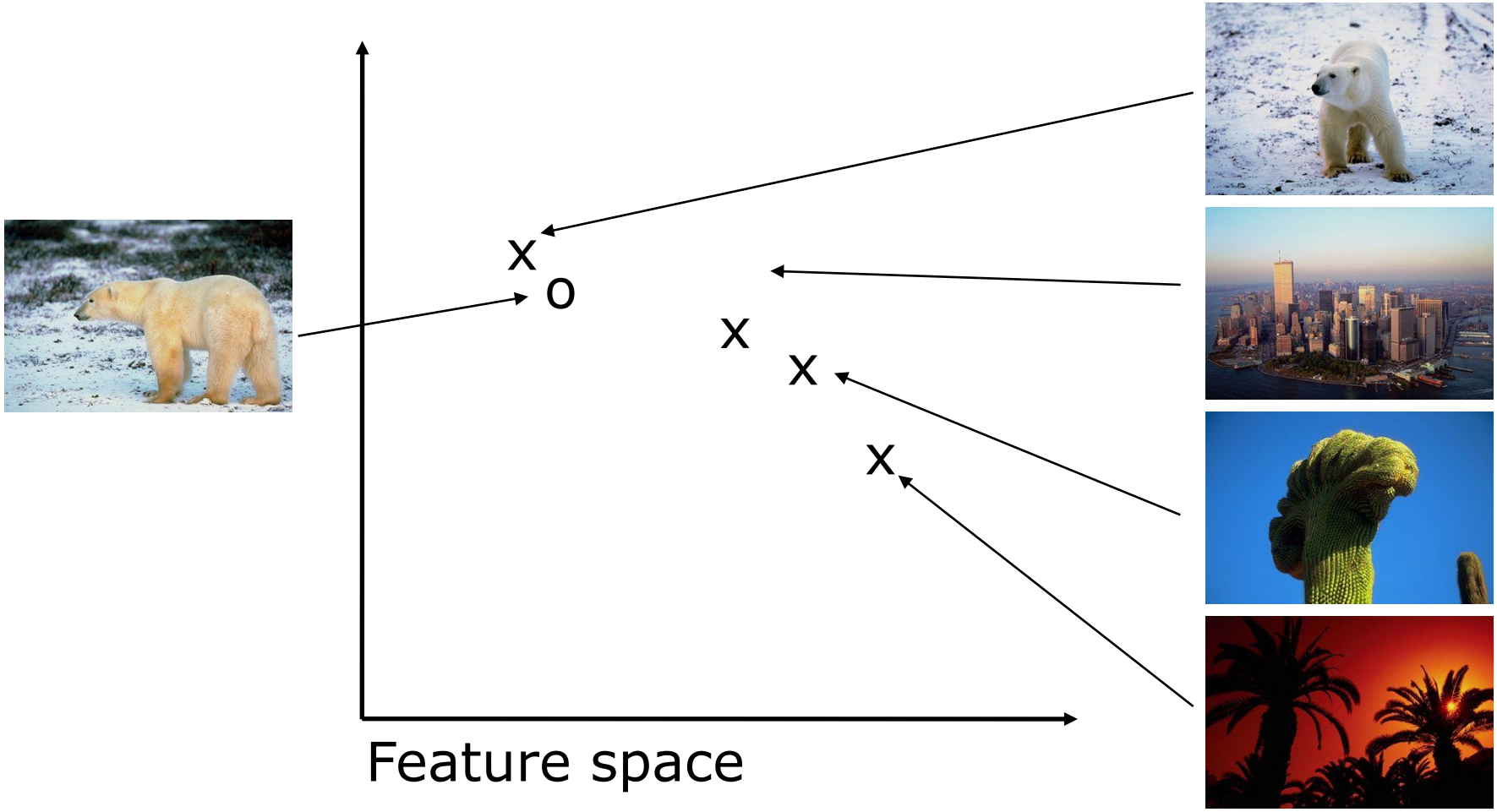
Piggy-back retrieval

	text	video	images	speech	music	sketches	multimed
query / doc							
text							
video							
images							
speech							
music							
sketches							
multimedia							

Content-based retrieval

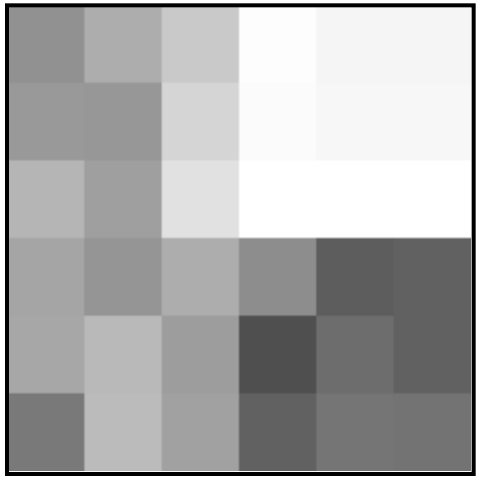
query / doc	text	video	images	speech	music	sketches	multimedia
text							
video							
images							
speech							
music							
sketches							
multimedia							

Features and distances



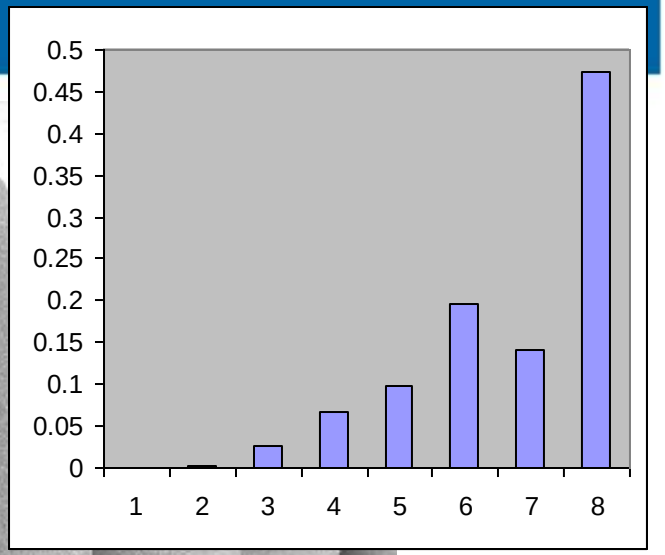
Digital Image

Content of an image



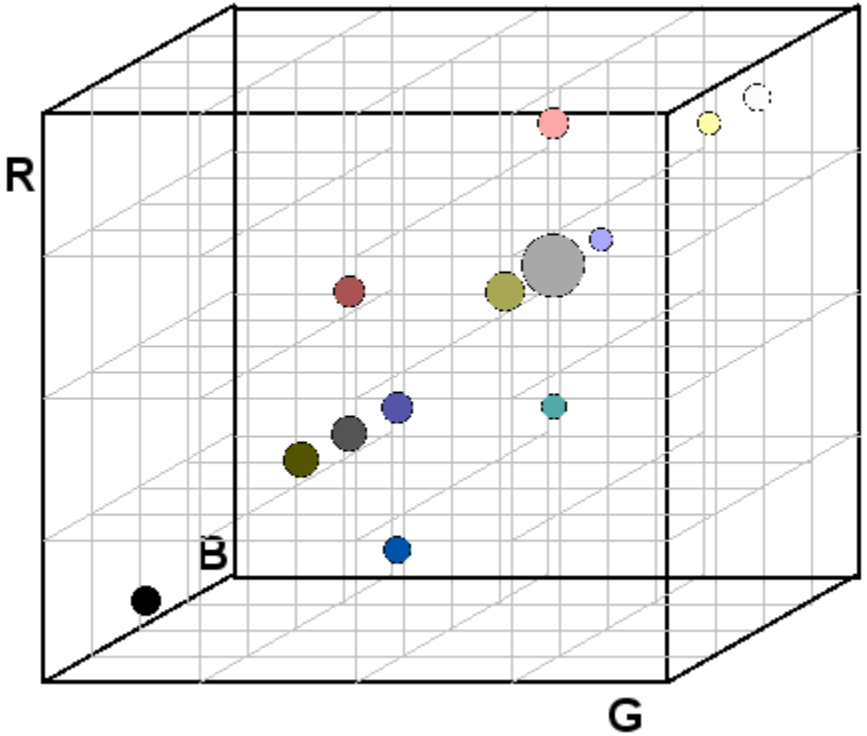
145	173	201	253	245	245
153	151	213	251	247	247
181	159	225	255	255	255
165	149	173	141	93	97
167	185	157	79	109	97
121	187	161	97	117	115

Histogram



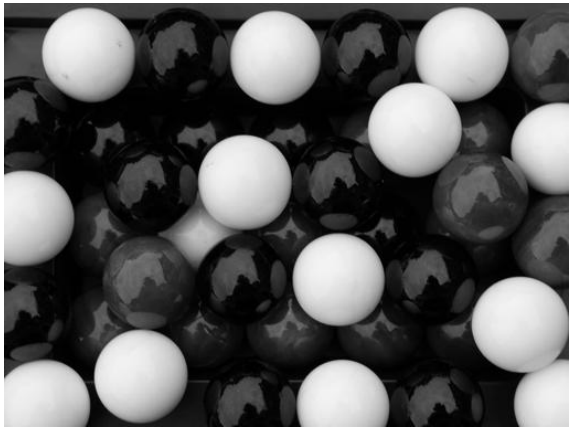

```
1:   0 -  31
2:  32 -  63
3:  64 -  95
4:  96 - 127
5: 128 - 159
6: 160 - 191
7: 192 - 223
8: 224 - 255
```

Colour histogram

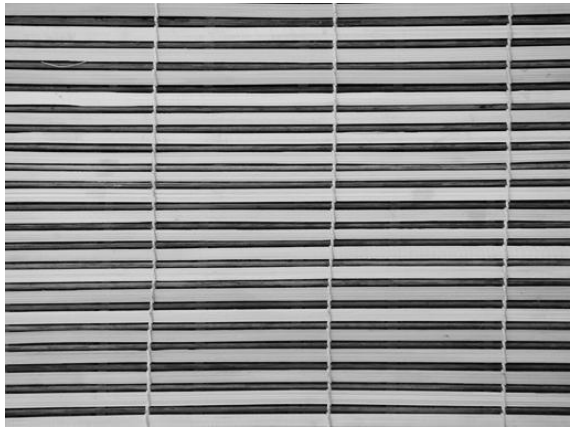


Texture

coarseness

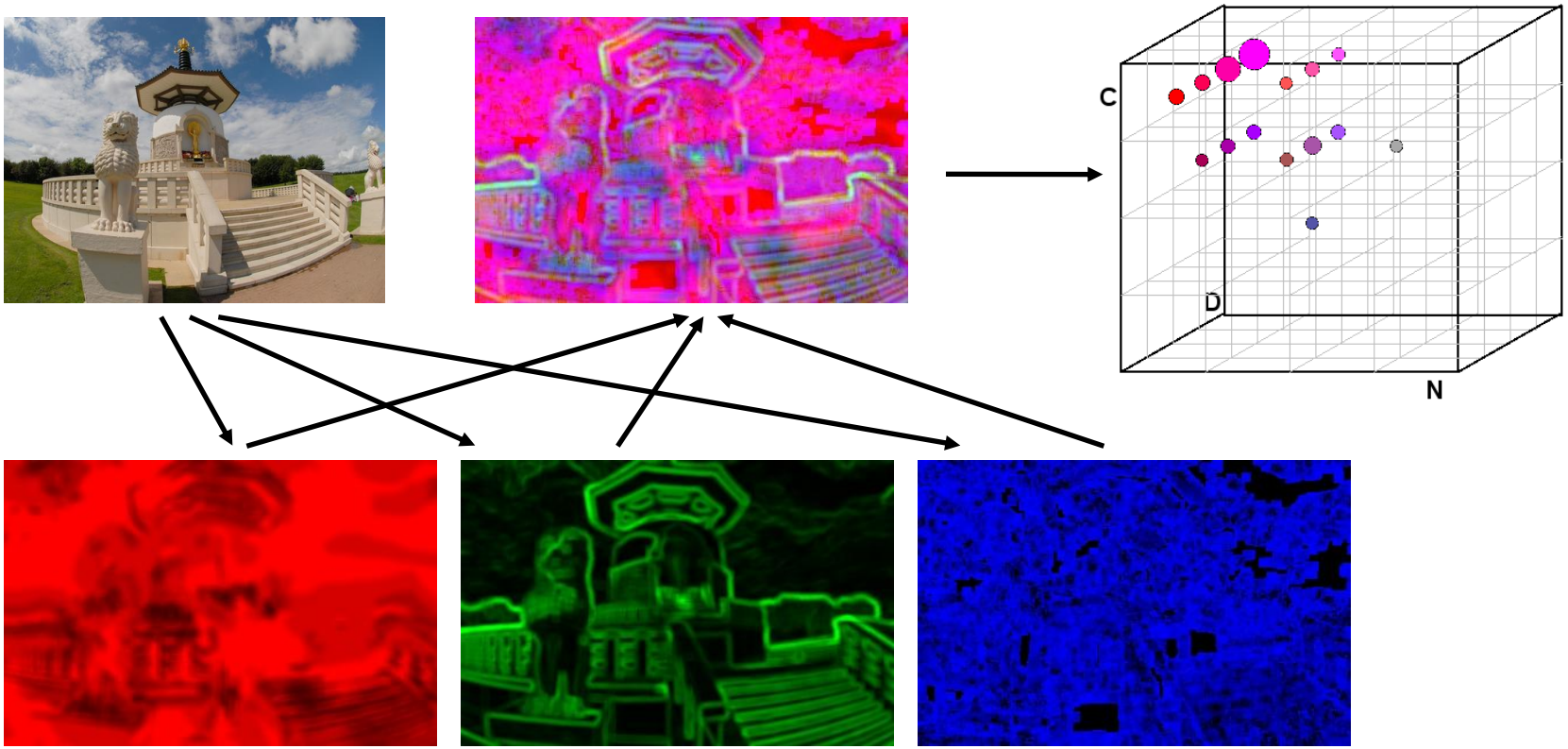


contrast



directionality

Texture histograms

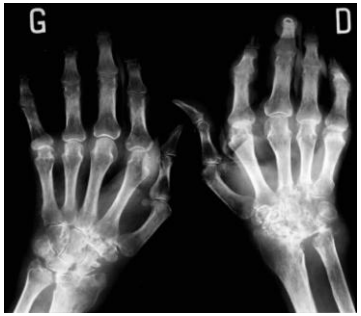


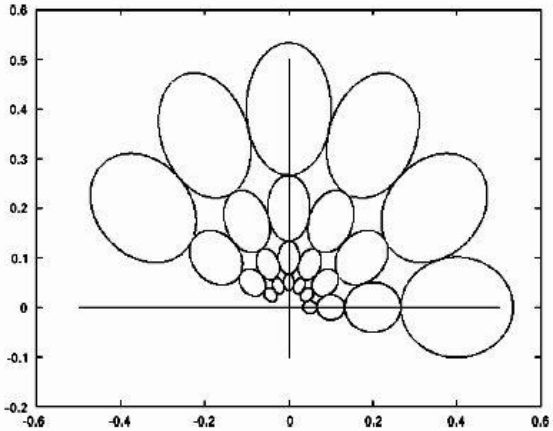
coarseness contrast directionality

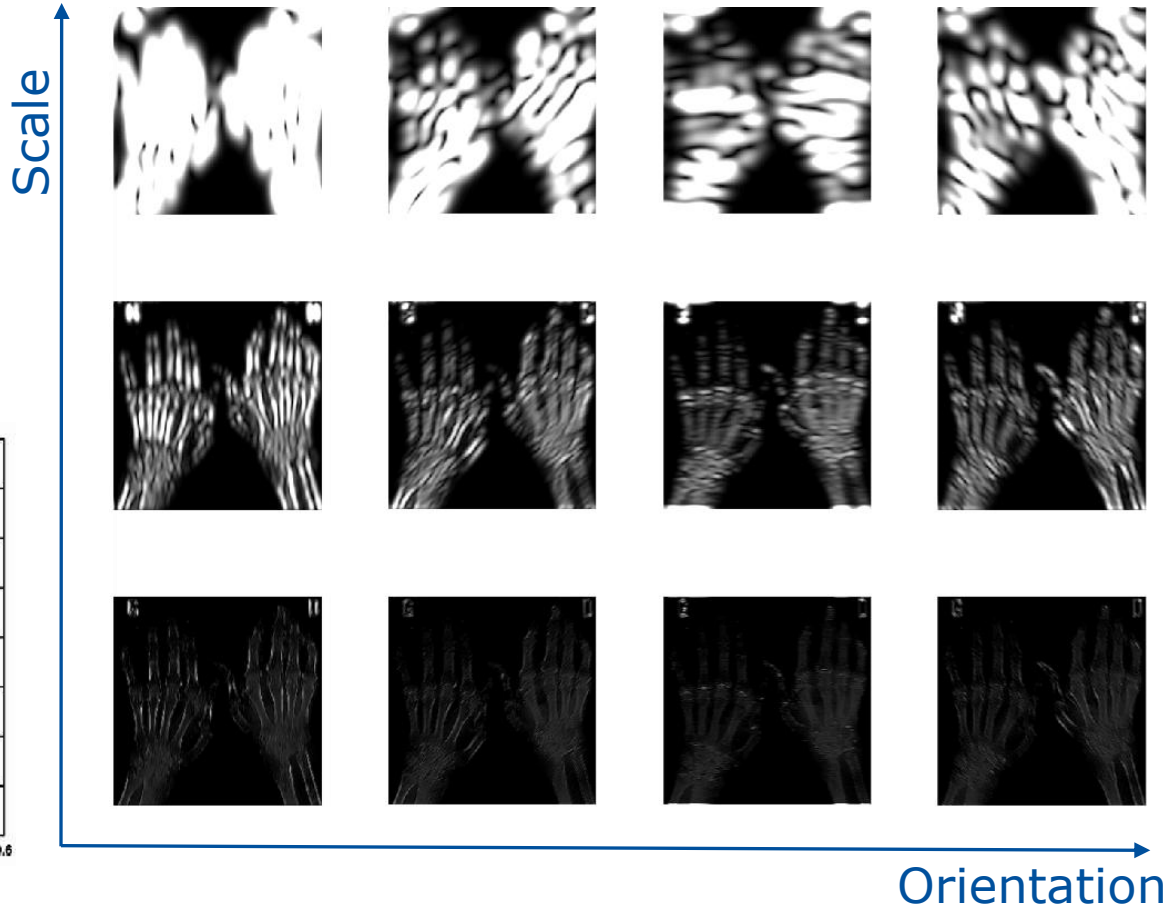
[with Howarth, *IEE Vision, Image & Signal Proc* 15(6) 2004; Howarth PhD thesis]

Gabor filter design

Query





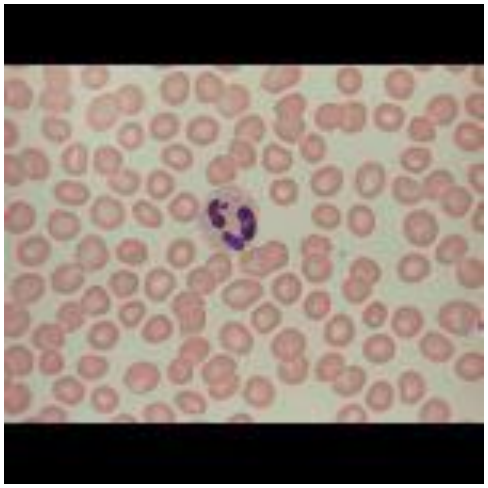


[with Howarth, CLEF 2004]

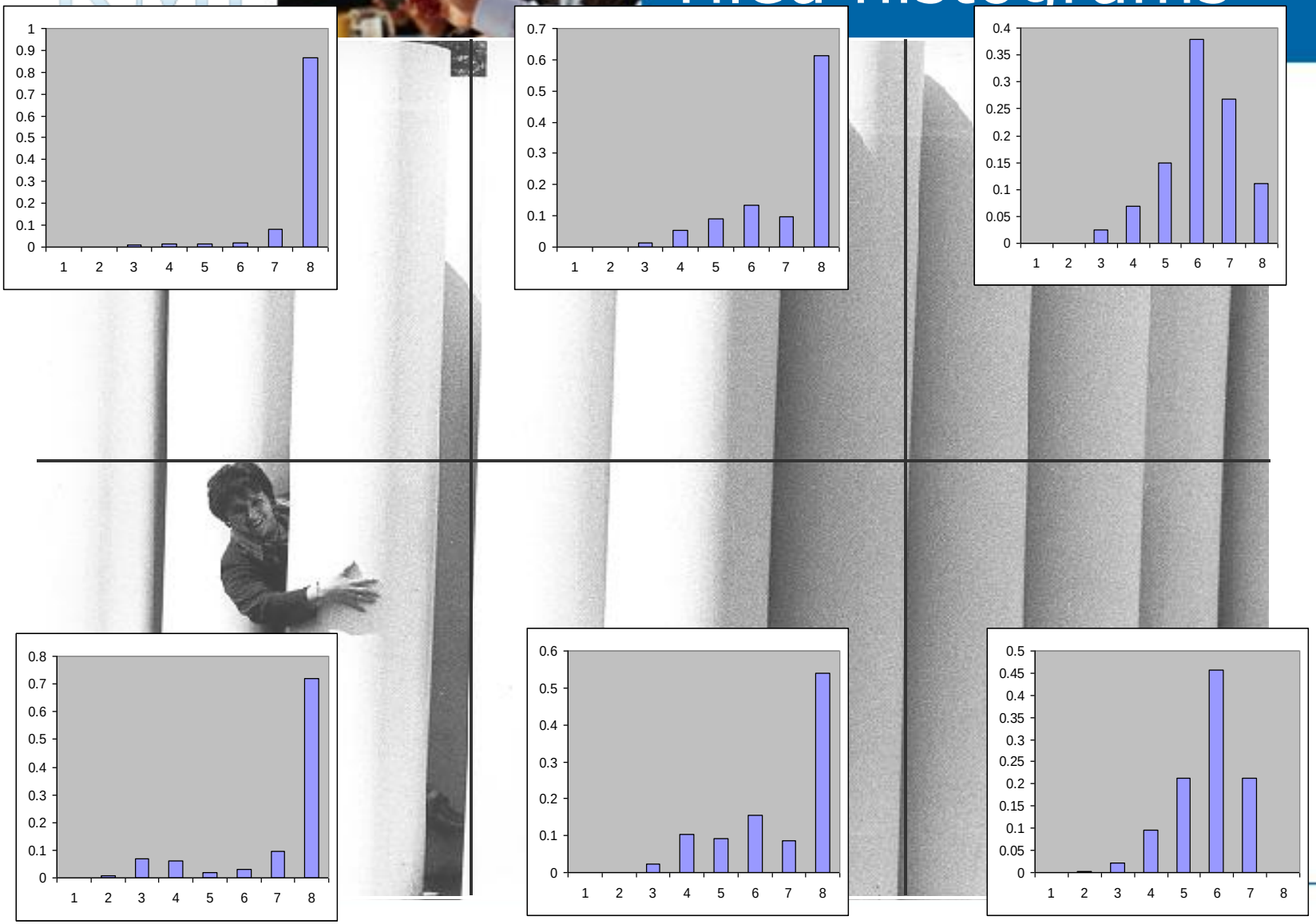
Image CLEF 2004

Medical image collection, 8725 images, 25 topics

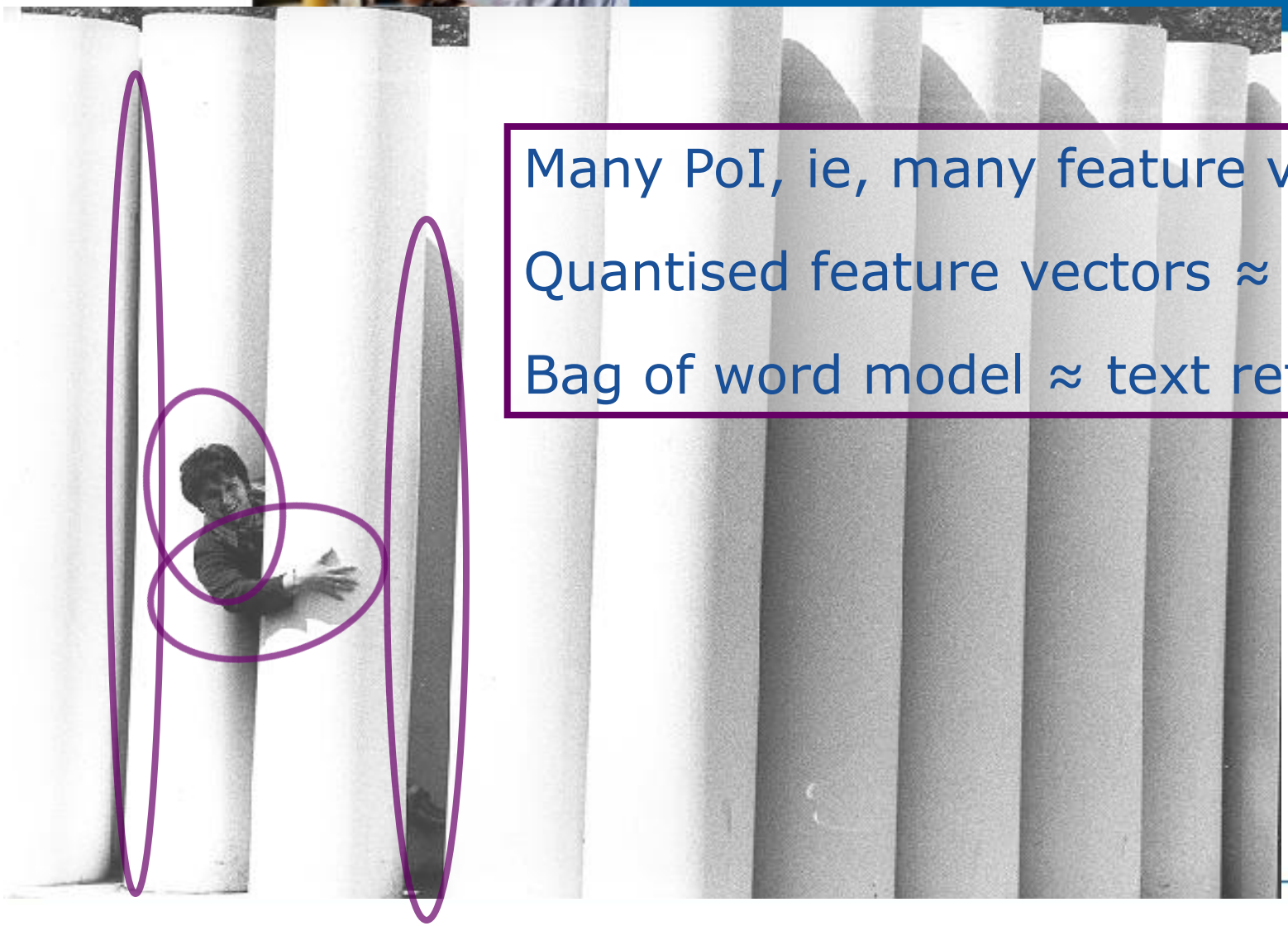
mean average precision 34.5%, 3rd within 1% of 1st



Tiled histograms



Points of interest

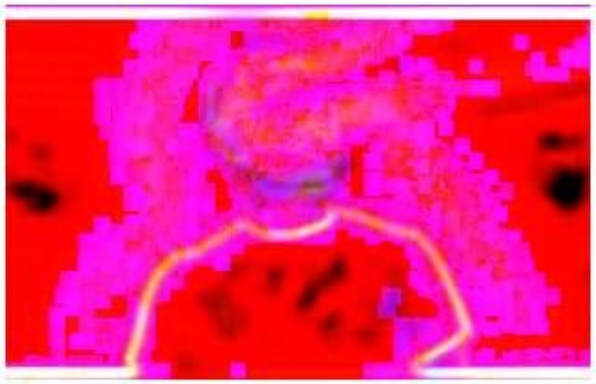


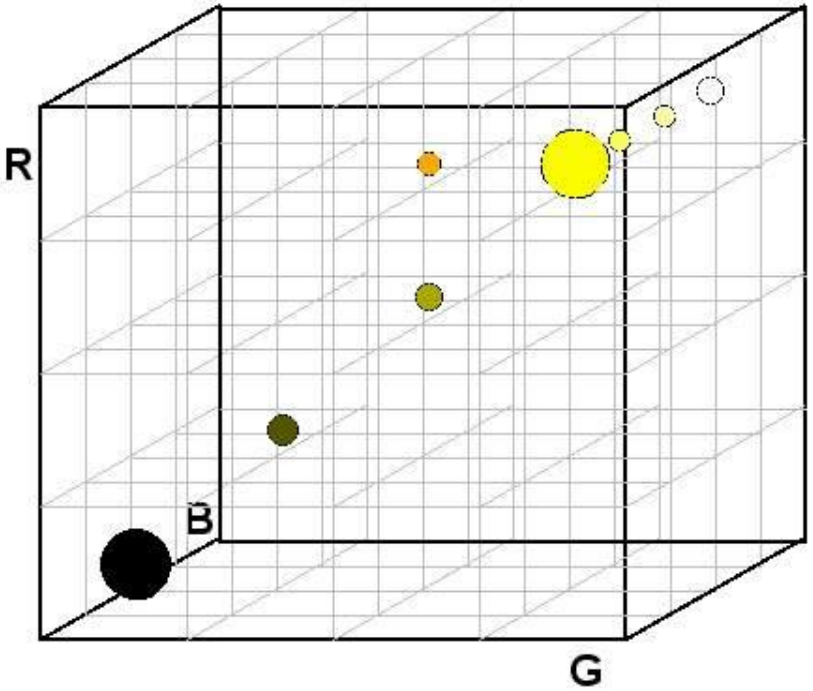
Many PoI, ie, many feature vectors

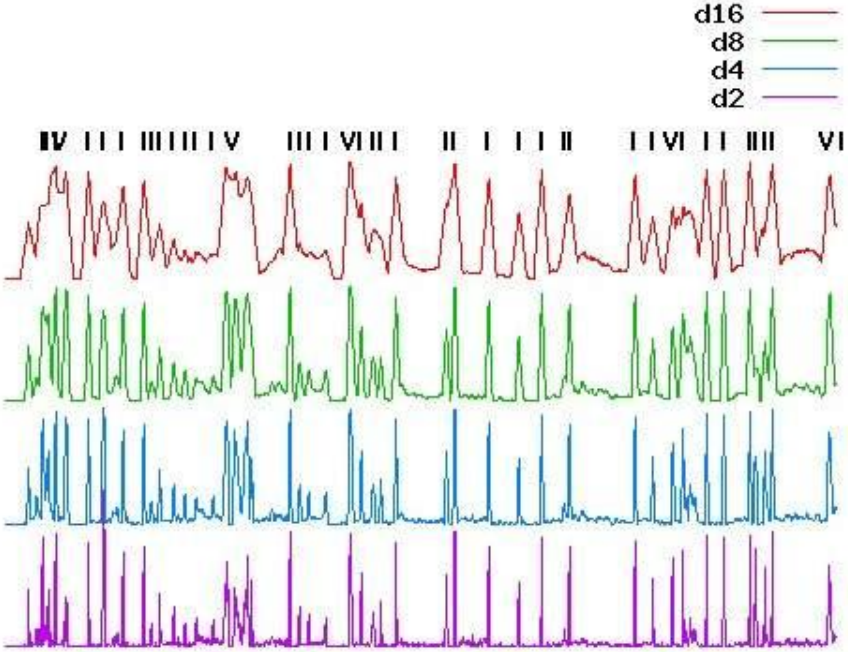
Quantised feature vectors ≈ words

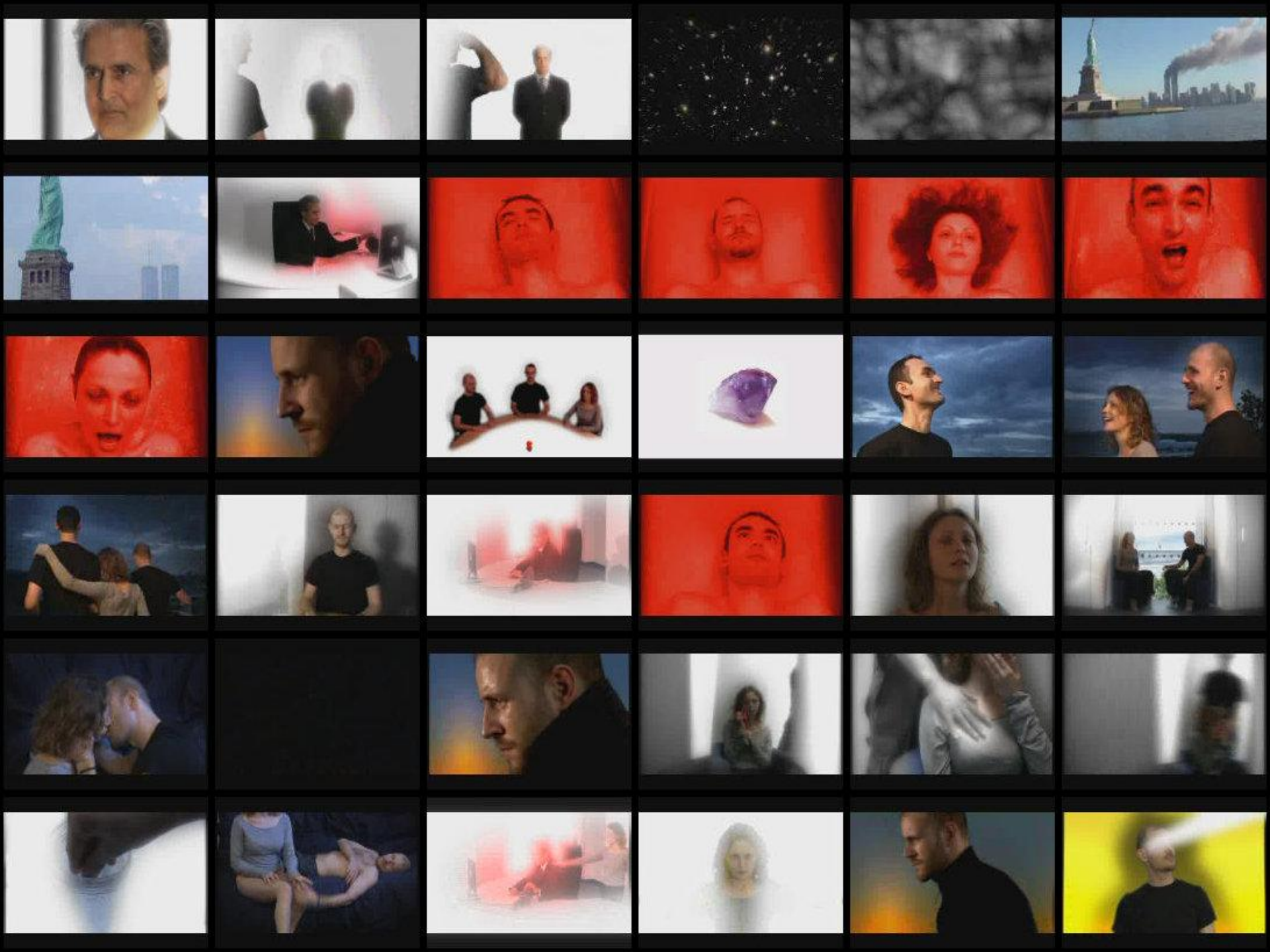
Bag of word model ≈ text retrieval

[Vlad Tanasescu: Anticipation, SCiFi trailer, 2007]




R
B
G


d16
d8
d4
d2

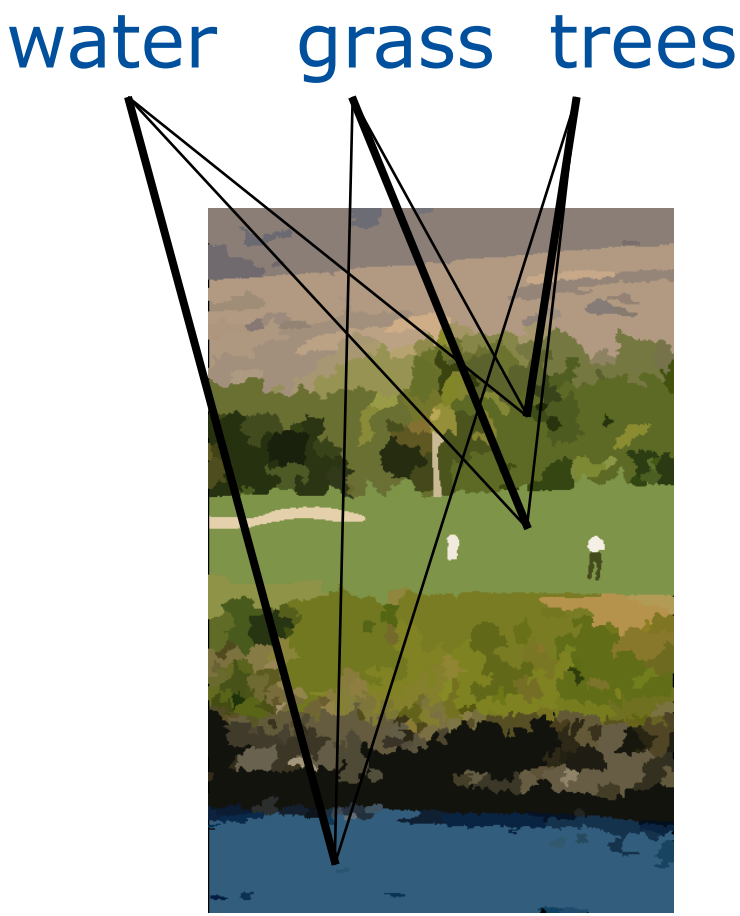


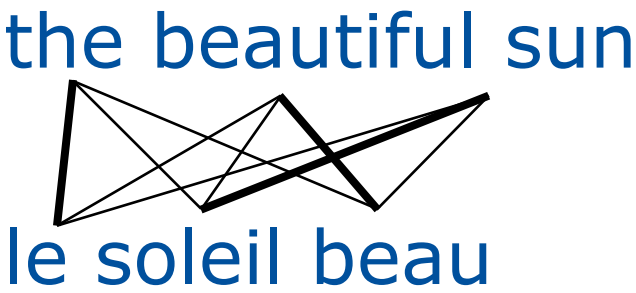
Annotation

{Snow, ice, bear, grass, …

{City, water, building, sky, …}

Automated annotation as machine translation



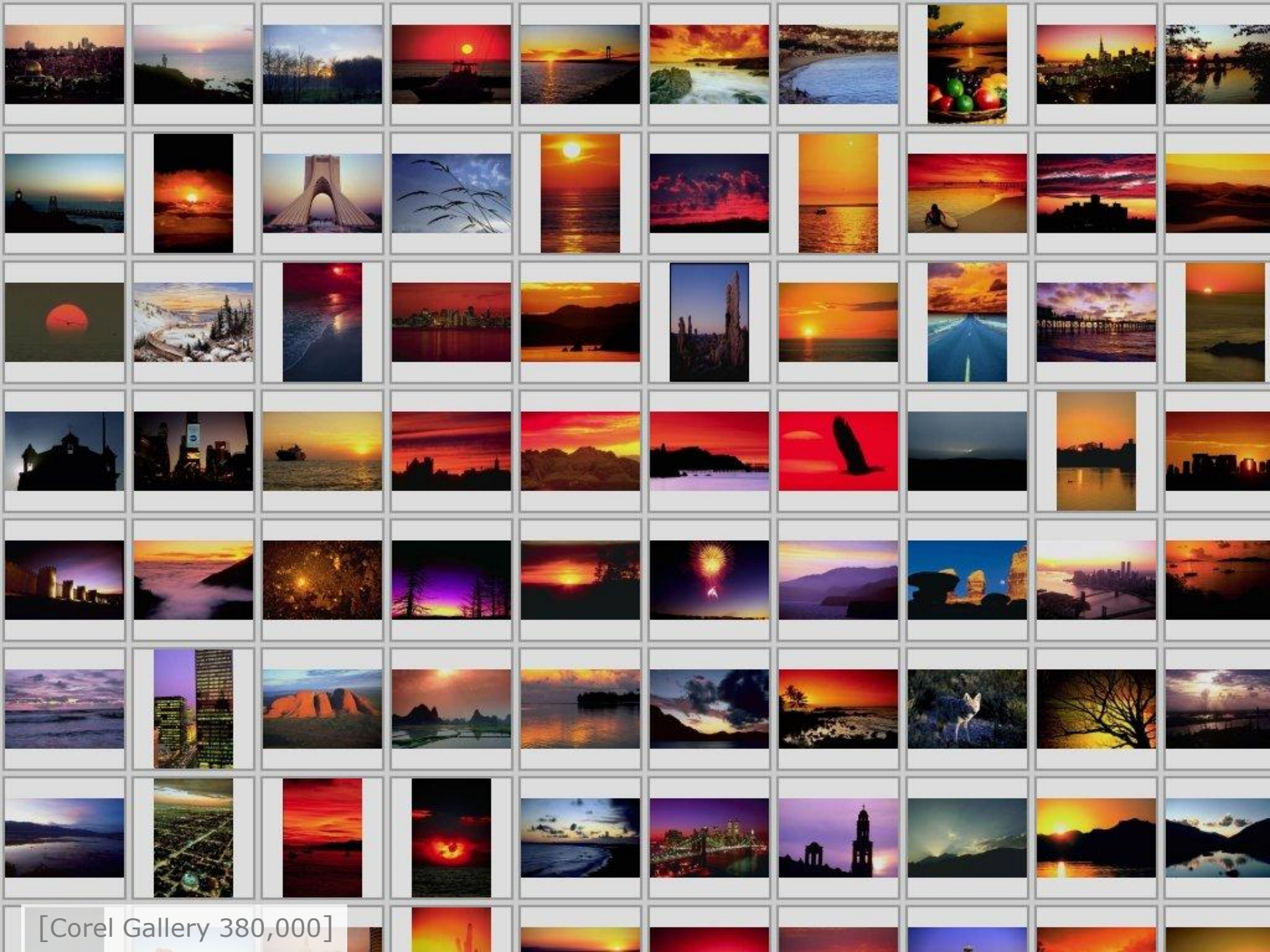


Automated annotation as machine learning

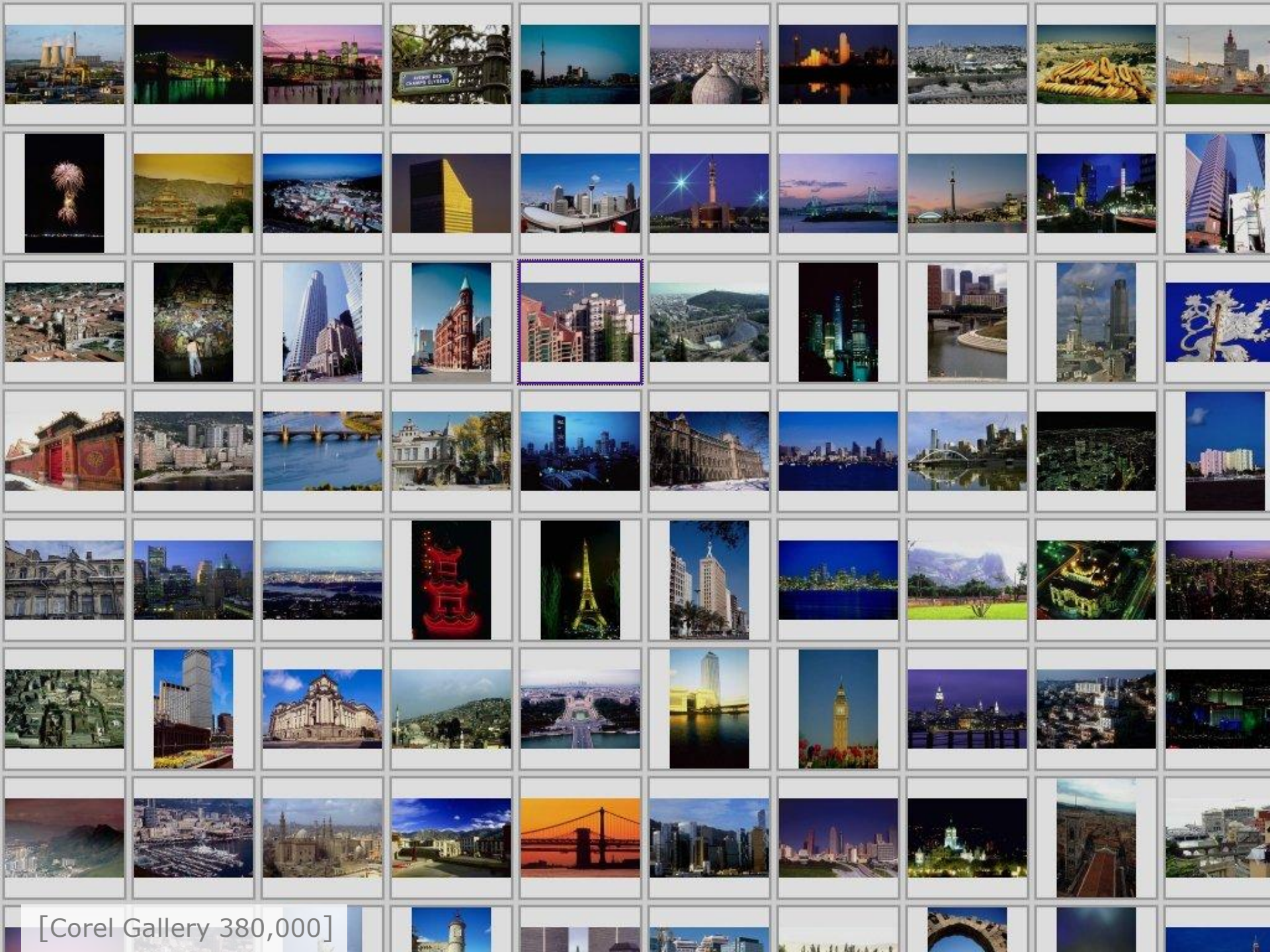
Probabilistic models:

- maximum entropy models
- models for joint and conditional probabilities
- evidence combination with Support Vector Machines

[with Magalhães, SIGIR 2005]
[with Yavlinsky and Schofield, CIVR 2005]
[with Yavlinsky, Heesch and Pickering: ICASSP May 2004]
[with Yavlinsky et al CIVR 2005]
[with Yavlinsky SPIE 2007]
[with Magalhães CIVR 2007, *best paper*]



[Corel Gallery 380,000]



[Corel Gallery 380,000]

A simple Bayesian classifier

$$P(w|I) = \frac{P(w,I)}{P(I)} = \frac{\sum_J P(w,I|J)P(J)}{\sum_J P(I|J)P(J)}$$

$$= \frac{\sum_J P(I|w,J)P(w|J)P(J)}{\sum_J \sum_w P(I|w,J)P(w|J)P(J)}$$

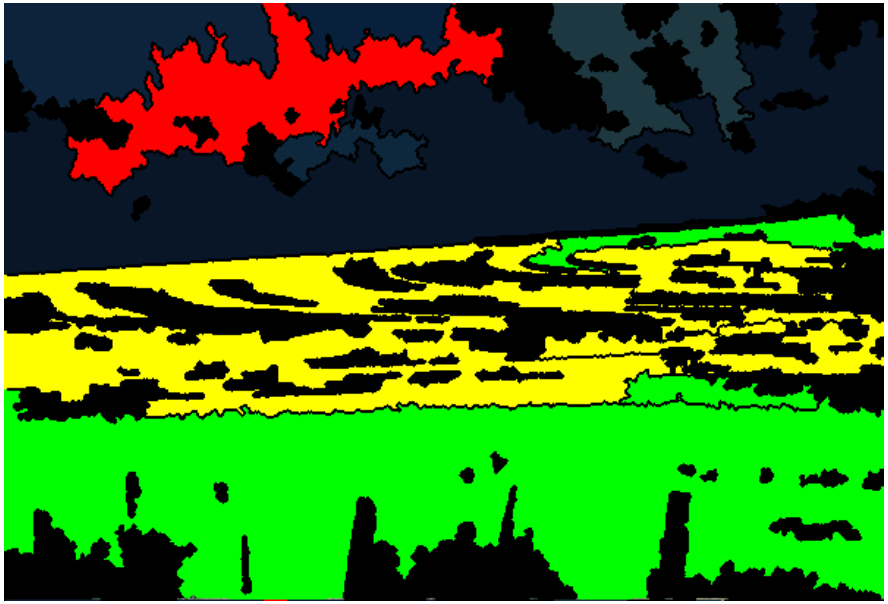
Use training data J and annotations w

P(w|I) is probability of word w given unseen image I

The model is an empirical distribution (w,J)

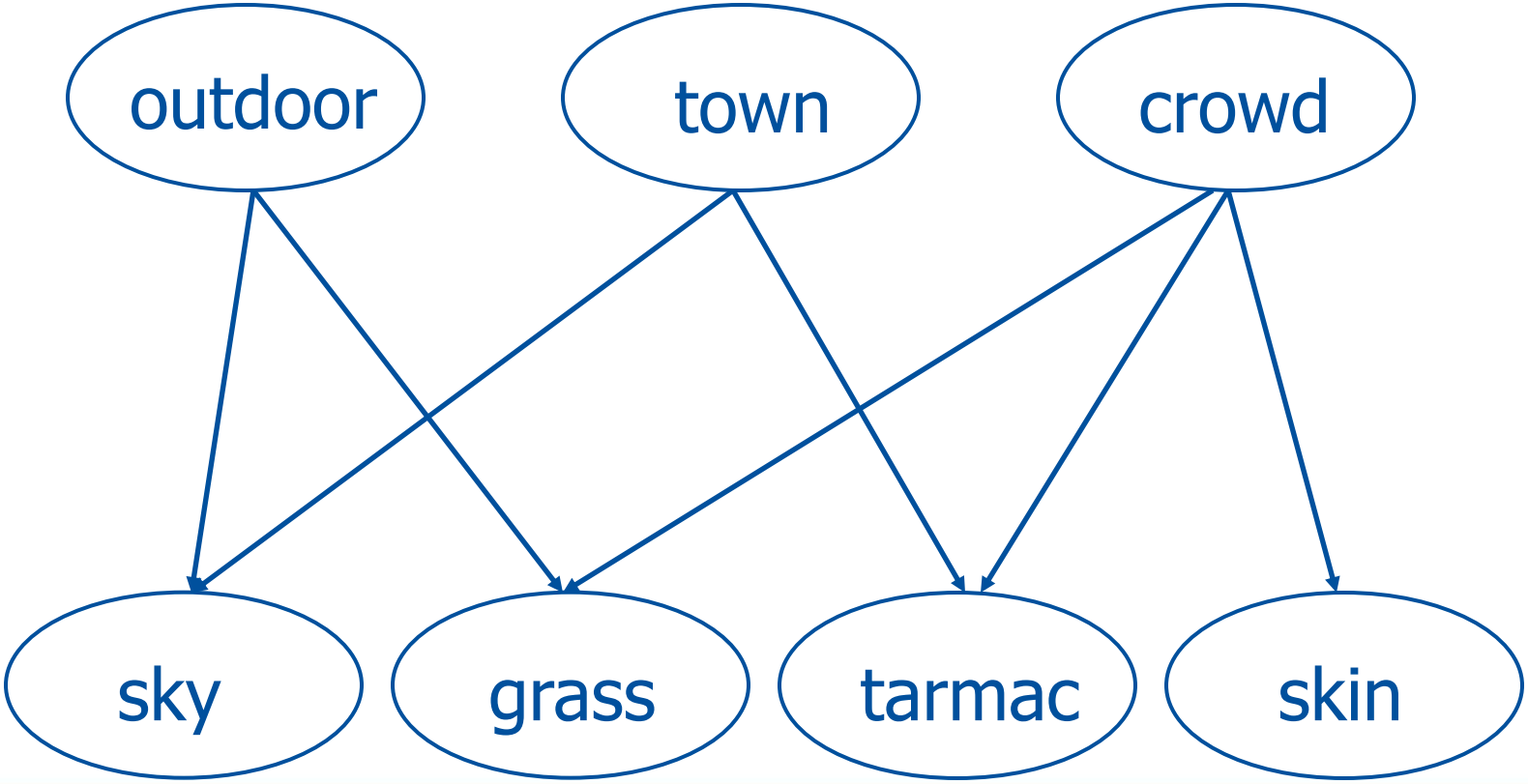
Example: grass classifier

- very likely
- may be
- probably not



Modelling semantic concepts

Bayesian networks from training data



Automated annotation

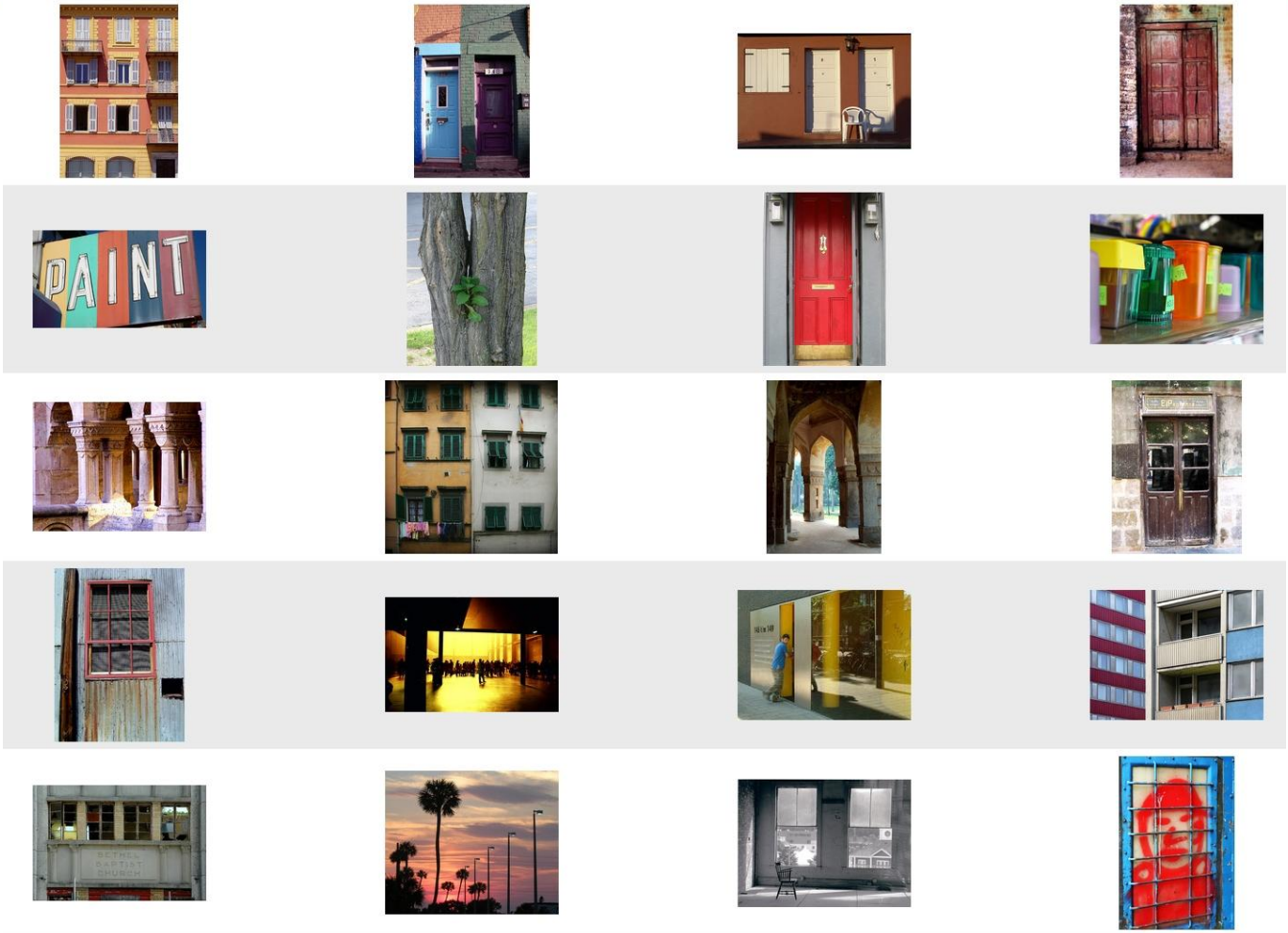
[with Yavlinsky et al CIVR 2005]
[with Yavlinsky SPIE 2007]
[with Magalhães CIVR 2007, best paper]

Automated: water buildings city sunset aerial

[Corel Gallery 380,000]

The good

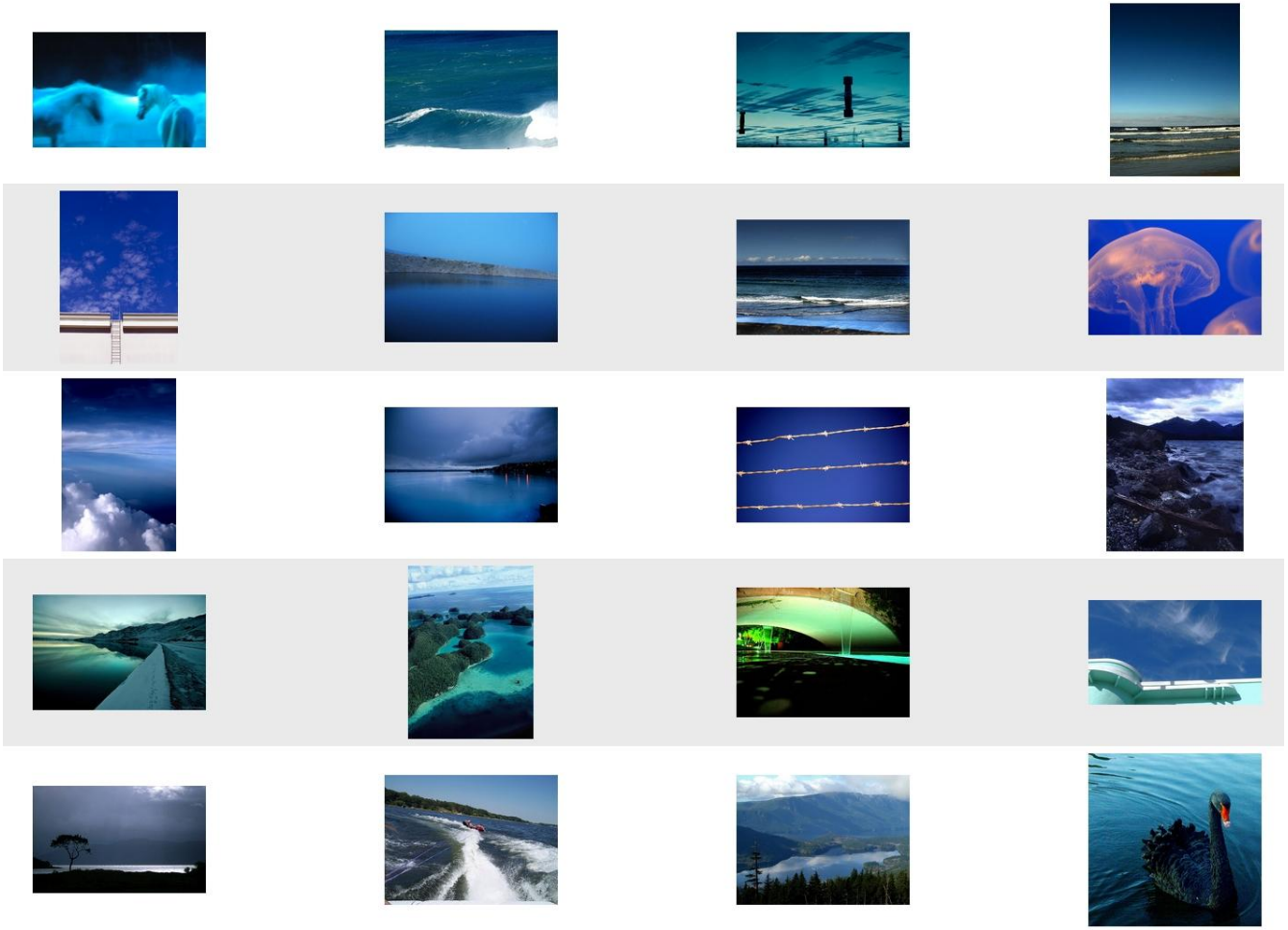
door



[beholdsearch.com, 19.07.2007, now behold.cc (Yavlinksy)]
[images: Flickr creative commons]

The bad

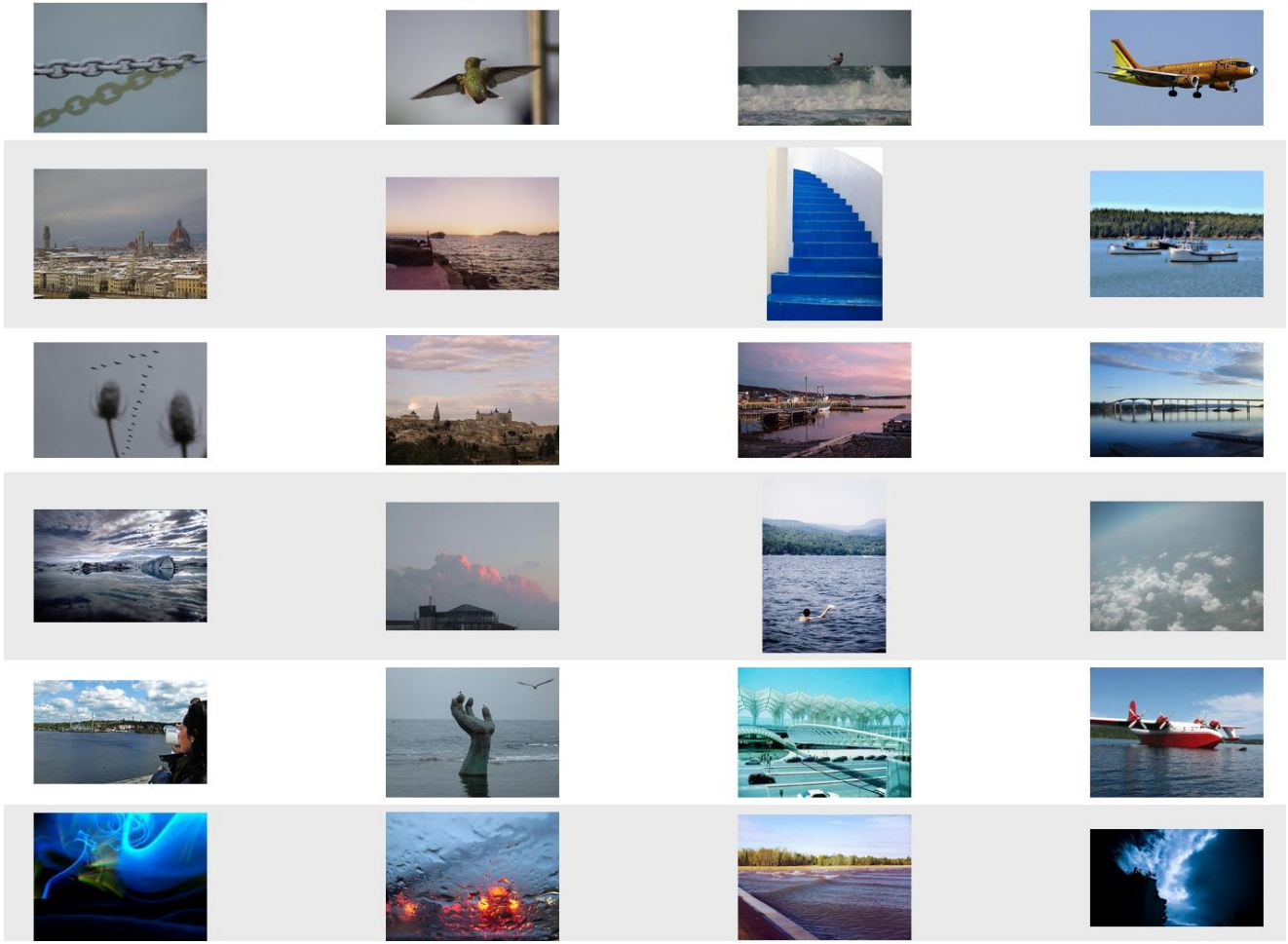
wave



[beholdsearch.com, 19.07.2007, now behold.cc (Yavlinksy)]
[images: Flickr creative commons]

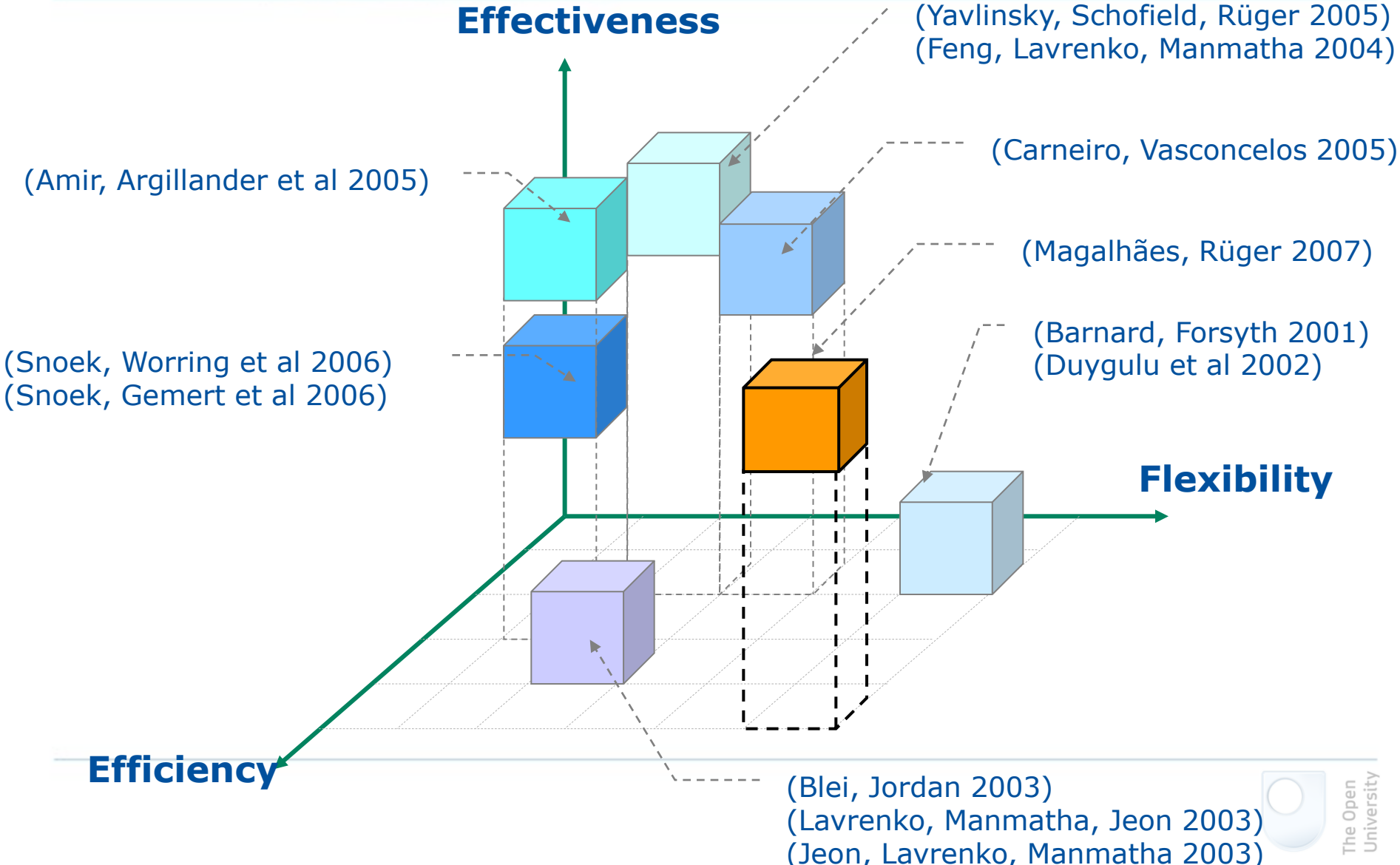
The ugly

iceberg



[beholdsearch.com, 19.07.2007, now behold.cc (Yavlinksy)]
[images: Flickr creative commons]

State of the art



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