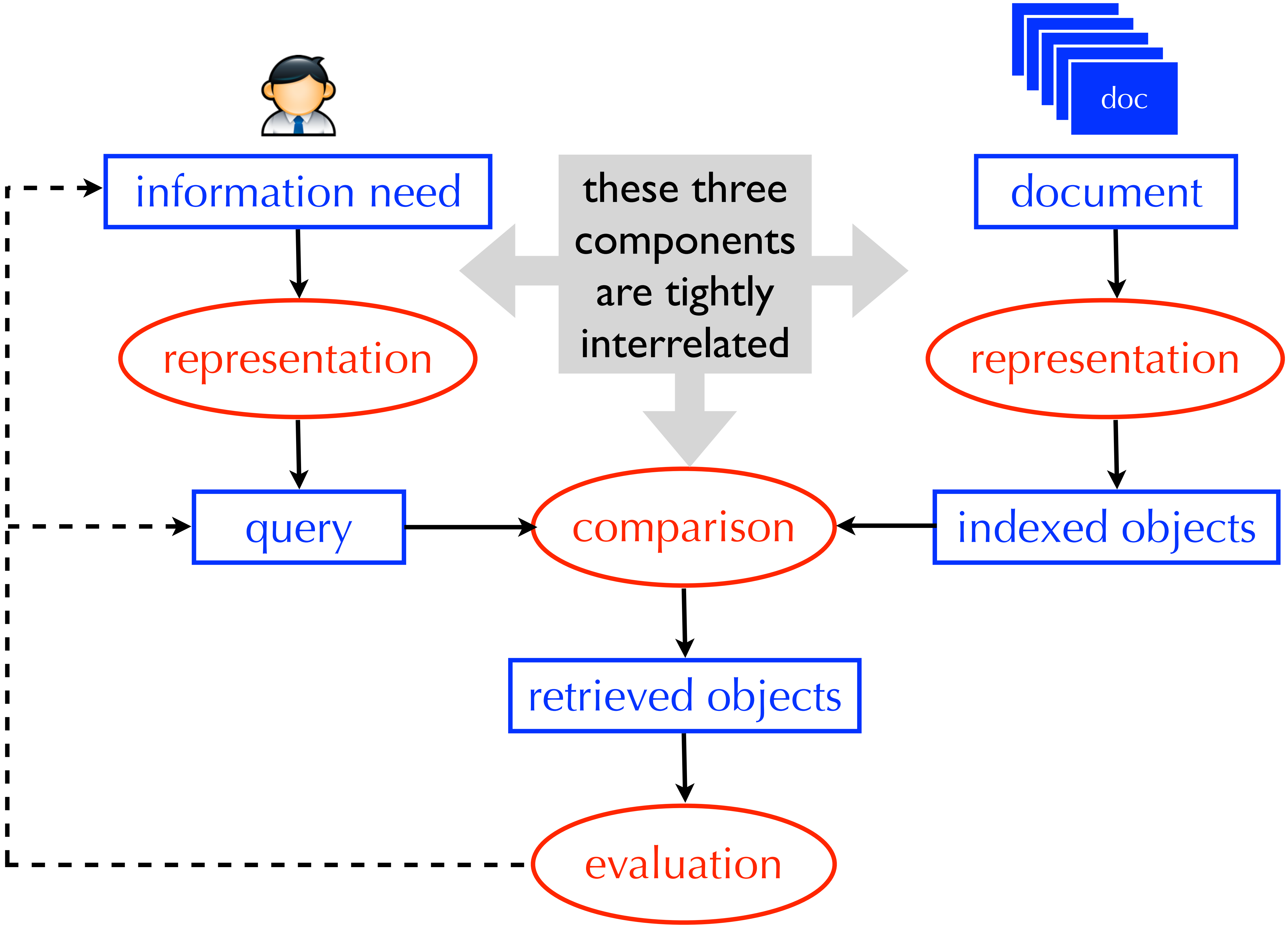
Document Representation

Jaime Arguello
INLS 509: Information Retrieval
jarguell@email.unc.edu

September 19, 2016

Document Representation



Document Representation

- How should this document be represented?

Log in / create account

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia

Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact Wikipedia

Toolbox

Print/export

Languages
Deutsch
Español
Bahasa Indonesia

Article | Discussion | Read | Edit | View history

Gerard Salton

From Wikipedia, the free encyclopedia

Gerard Salton (8 March 1927 in Nuremberg - 28 August 1995), also known as Gerry Salton, was a Professor of Computer Science at Cornell University. Salton was perhaps the leading computer scientist working in the field of information retrieval during his time. His group at Cornell developed the SMART Information Retrieval System, which he initiated when he was at Harvard.

Salton was born Gerhard Anton Sahlmann on March 8, 1927 in Nuremberg, Germany. He received a Bachelor's (1950) and Master's (1952) degree in mathematics from Brooklyn College, and a Ph.D. from Harvard in Applied Mathematics in 1958, the last of Howard Aiken's doctoral students, and taught there until 1965, when he joined Cornell University and co-founded its department of Computer Science.

Salton was perhaps most well known for developing the now widely used Vector Space Model for Information Retrieval[1]. In this model, both documents and queries are represented as vectors of term counts, and the similarity between a document and a query is given by the cosine between the term vector and the document vector. In this paper, he also introduced TF-IDF, or term-frequency-inverse-document frequency, a model in which the score of a term in the a document is the ratio of the number of terms in that document divided by the frequency of the number of documents in which that term occurs. (The concept of inverse document frequency, a measure of specificity, had been introduced in 1972 by Karen Sparck-Jones[2].) Later in life, he became interested in automatic text summarization and analysis[3], as well as automatic hypertext generation[4]. He published over 150 research articles and 5 books during his life.

Salton was editor-in-chief of the Communications of the ACM and the Journal of the ACM, and chaired SIGIR. He was an associate editor of the ACM Transactions on Information Systems. He was an ACM Fellow (elected 1995), received an Award of Merit from the American Society for Information Science (1989), and was the first recipient of the SIGIR Award for outstanding contributions to study of information retrieval (1983) -- now called the Gerard Salton Award.

Elements of a Document Representation

- Document attributes (metadata)
  - source, publication date, language, length, etc.
- Controlled vocabulary index terms
- Free-text index terms
  - terms selected from the document text itself
  - may also include text from <u>outside</u> the document (e.g., anchor text)
  - lots of room for creativity!

Elements of a Document Representation


Log in / create account

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia

Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact Wikipedia

Toolbox

Print/export

Languages
Deutsch
Español
Bahasa Indonesia

Article Discussion Read Edit View history

Gerard Salton

From Wikipedia, the free encyclopedia

Gerard Salton (8 March 1927 in Nuremberg - 28 August 1995), also known as Gerry Salton, was a Professor of Computer Science at Cornell University. Salton was perhaps the leading computer scientist working in the field of information retrieval during his time. His group at Cornell developed the SMART Information Retrieval System, which he initiated when he was at Harvard.

Salton was born Gerhard Anton Sahlmann on March 8, 1927 in Nuremberg, Germany. He received a Bachelor's (1950) and Master's (1952) degree in mathematics from Brooklyn College, and a Ph.D. from Harvard in Applied Mathematics in 1958, the last of Howard Aiken's doctoral students, and taught there until 1965, when he joined Cornell University and co-founded its department of Computer Science.

Salton was perhaps most well known for developing the now widely used Vector Space Model for Information Retrieval[1]. In this model, both documents and queries are represented as vectors of term counts, and the similarity between a document and a query is given by the cosine between the term vector and the document vector. In this paper, he also introduced TF-IDF, or term-frequency-inverse-document frequency, a model in which the score of a term in the a document is the ratio of the number of terms in that document divided by the frequency of the number of documents in which that term occurs. (The concept of inverse document frequency, a measure of specificity, had been introduced in 1972 by Karen Sparck-Jones[2].) Later in life, he became interested in automatic text summarization and analysis[3], as well as automatic hypertext generation[4]. He published over 150 research articles and 5 books during his life.

Salton was editor-in-chief of the Communications of the ACM and the Journal of the ACM, and chaired SIGIR. He was an associate editor of the ACM Transactions on Information Systems. He was an ACM Fellow (elected 1995), received an Award of Merit from the American Society for Information Science (1989), and was the first recipient of the SIGIR Award for outstanding contributions to study of information retrieval (1983) -- now called the Gerard Salton Award.

controlled-vocabulary index terms

Categories: 1927 births | 1995 deaths | American computer scientists | Computer pioneers | Harvard University alumni | Harvard University faculty | Cornell University faculty | Fellows of the Association for Computing Machinery | Guggenheim Fellows

Elements of a Document Representation

anchor text
(nearby terms?)

Text Processing

gerard salton 8 march 1978 in nuremberg 28 august 1995 also know as gerry salton was professor of computer science at cornell university salton was perhaps the leading computer scientist working in the field of information retrieval during his time his group at cornell developed the smart information retrieval system which he initiated when he was at harvard

- Our goal is to describe content using content
- After mark-up removal, down-casing, and tokenization, what we have is a sequence of terms
- What are the most descriptive words?

Log in / create account
Article Discussion Read Edit View history

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact Wikipedia
Toolbox
Print/export
Languages
Deutsch
Español
Bahasa Indonesia

Gerard Salton

From Wikipedia, the free encyclopedia

Gerard Salton (8 March 1927 in Nuremberg - 28 August 1995), also known as Gerry Salton, was a Professor of Computer Science at Cornell University. Salton was perhaps the leading computer scientist working in the field of information retrieval during his time. His group at Cornell developed the SMART Information Retrieval System, which he initiated when he was at Harvard.

Salton was born Gerhard Anton Sahlmann on March 8, 1927 in Nuremberg, Germany. He received a Bachelor's (1950) and Master's (1952) degree in mathematics from Brooklyn College, and a Ph.D. from Harvard in Applied Mathematics in 1958, the last of Howard Aiken's doctoral students, and taught there until 1965, when he joined Cornell University and co-founded its department of Computer Science.

Salton was perhaps most well known for developing the now widely used Vector Space Model for Information Retrieval[1]. In this model, both documents and queries are represented as vectors of term counts, and the similarity between a document and a query is given by the cosine between the term vector and the document vector. In this paper, he also introduced TF-IDF, or term-frequency-inverse-document frequency, a model in which the score of a term in the a document is the ratio of the number of terms in that document divided by the frequency of the number of documents in which that term occurs. (The concept of inverse document frequency, a measure of specificity, had been introduced in 1972 by Karen Sparck-Jones[2].) Later in life, he became interested in automatic text summarization and analysis[3], as well as automatic hypertext generation[4]. He published over 150 research articles and 5 books during his life.

Salton was editor-in-chief of the Communications of the ACM and the Journal of the ACM, and chaired SIGIR. He was an associate editor of the ACM Transactions on Information Systems. He was an ACM Fellow (elected 1995), received an Award of Merit from the American Society for Information Science (1989), and was the first recipient of the SIGIR Award for outstanding contributions to study of information retrieval (1983) -- now called the Gerard Salton Award.

Term-Frequencies

top 20

rank	term	freq.	rank	term	freq.
1	the	34	11	as	9
2	of	29	12	he	9
3	a	20	13	vector	8
4	in	20	14	an	8
5	and	19	15	s	7
6	salton	18	16	term	7
7	model	15	17	for	7
8	was	12	18	automatic	7
9	information	11	19	paper	6
10	retrieval	10	20	gerard	6

Log in / create account

Article | Discussion | Read | Edit | View history

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact Wikipedia
Toolbox
Print/export
Languages
Deutsch
Español
Bahasa Indonesia

Gerard Salton

From Wikipedia, the free encyclopedia

Gerard Salton (8 March 1927 in Nuremberg - 28 August 1995), also known as Gerry Salton, was a Professor of Computer Science at Cornell University. Salton was perhaps the leading computer scientist working in the field of information retrieval during his time. His group at Cornell developed the SMART Information Retrieval System, which he initiated when he was at Harvard.

Salton was born Gerhard Anton Sahlmann on March 8, 1927 in Nuremberg, Germany. He received a Bachelor's (1950) and Master's (1952) degree in mathematics from Brooklyn College, and a Ph.D. from Harvard in Applied Mathematics in 1958, the last of Howard Aiken's doctoral students, and taught there until 1965, when he joined Cornell University and co-founded its department of Computer Science.

Salton was perhaps most well known for developing the now widely used Vector Space Model for Information Retrieval[1]. In this model, both documents and queries are represented as vectors of term counts, and the similarity between a document and a query is given by the cosine between the term vector and the document vector. In this paper, he also introduced TF-IDF, or term-frequency-inverse-document frequency, a model in which the score of a term in the a document is the ratio of the number of terms in that document divided by the frequency of the number of documents in which that term occurs. (The concept of inverse document frequency, a measure of specificity, had been introduced in 1972 by Karen Sparck-Jones[2].) Later in life, he became interested in automatic text summarization and analysis[3], as well as automatic hypertext generation[4]. He published over 150 research articles and 5 books during his life.

Salton was editor-in-chief of the Communications of the ACM and the Journal of the ACM, and chaired SIGIR. He was an associate editor of the ACM Transactions on Information Systems. He was an ACM Fellow (elected 1995), received an Award of Merit from the American Society for Information Science (1989), and was the first recipient of the SIGIR Award for outstanding contributions to study of information retrieval (1983) -- now called the Gerard Salton Award.

Term-Frequencies

top 20

rank	term	freq.	rank	term	freq.
1	the	34	11	as	9
2	of	29	12	he	9
3	a	20	13	vector	8
4	in	20	14	an	8
5	and	19	15	s	7
6	salton	18	16	term	7
7	model	15	17	for	7
8	was	12	18	automatic	7
9	information	11	19	paper	6
10	retrieval	10	20	gerard	6

IMDB Corpus

term-frequencies

rank	term	frequency	rank	term	frequency
1	the	1586358	11	year	250151
2	a	854437	12	he	242508
3	and	822091	13	movie	241551
4	to	804137	14	her	240448
5	of	657059	15	artist	236286
6	in	472059	16	character	234754
7	is	395968	17	cast	234202
8	i	390282	18	plot	234189
9	his	328877	19	for	207319
10	with	253153	20	that	197723

Stopwords

- A stopword is a term that is discarded from the document representation
- Typically the <u>same</u> set of stopwords is used in processing all documents in the collection
- Stopwords are typically function words: determiners (a, the), prepositions (on, above), conjunctions (and, but)
- May also be corpus-specific: “plot” in the IMDB corpus
- Assumption: stopwords are unimportant because they are frequent in <u>every</u> document

Lemur Stopword List
first 60 (sorted alphabetically)

a	all	amongst	anywhere	become	besides
about	almost	an	apart	becomes	between
above	alone	and	are	becoming	beyond
according	along	another	around	been	both
across	already	any	as	before	but
after	also	anybody	at	beforehand	by
afterwards	although	anyhow	av	behind	can
again	always	anyone	be	being	can
against	am	anything	became	below	cannot
albeit	among	anyway	because	beside	canst

Term-Frequencies

after stopword removal

rank	term	freq.	rank	term	freq.
1	salton	18	11	paper	6
2	model	15	12	document	6
3	information	11	13	acm	6
4	retrieval	10	14	1975	4
5	vector	8	15	frequency	4
6	s	7	16	science	4
7	term	7	17	cornell	4
8	automatic	7	18	award	3
9	gerard	6	19	0	3
10	space	6	20	8	3

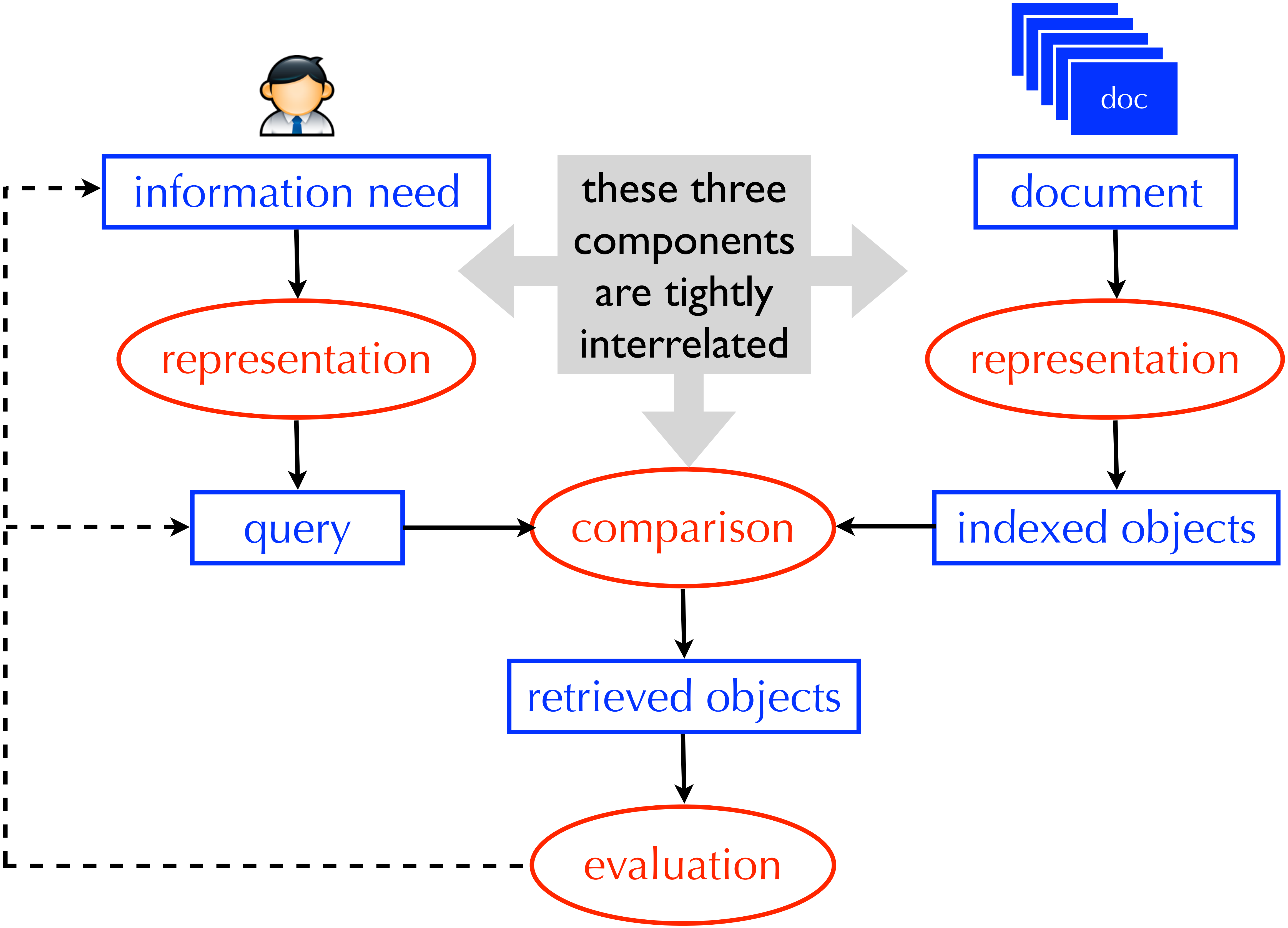
Creating a Stopword List

- Sort vocabulary based on frequency in the corpus
- Examine the most frequent words
- Examine a query-log to see which frequent terms may be important
- 38% of unique AOL queries contain at least one stopword (may or may not be important - more later)
- 0.025% of unique AOL queries are nothing but stopwords
  - longest: i want something else to get me through this (third eye blind lyrics)

Trends in Stopword Removal

- The earliest systems used stopword lists of 200-300 terms
- To improve efficiency and effectiveness
- Very frequent terms were problematic for early retrieval models (e.g, OR operations in ranked boolean)
- Web search engines generally do not remove stopwords
- The latest trend is to index stopwords and (possibly) ignore them at query-time if they seem unimportant
- Newer retrieval models are better at handling very frequent terms (later lecture)

Document Representation



AOL Query-Log Examples

stopword removal

wrong lyrics

- am i wrong lyrics
- i was wrong lyrics
- wrong again lyrics
- where did i go wrong lyrics
- wrong lyrics
- got me wrong lyrics
- what went wrong lyrics

change

- be the change you want in others
- how can i change me
- change
- where is my change
- i want my change
- never change

buy house

- who will buy my house
- buy a house
- buy my house
- buy house
- we buy house
- how to buy a house

calculate bmi

- calculate bmi
- calculate my bmi
- how to calculate your bmi
- how to calculate bmi

Morphological Analysis

Morphology

- the study and description of word formation (as inflection, derivation, and compounding) in language

Merriam-Webster Dictionary

Morphology

- Inflectional morphology: changes to a word that encode its grammatical usage (e.g., tense, number, person)
  - say vs. said, cat vs. cats, see vs. sees
- Derivational morphology: changes to a word to make a new word with related meaning
  - organize, organization, organizational
- Compounding: combining words to form new ones
  - shipwreck, outbound, beefsteak
  - more common in other languages (e.g., german)
  - lebensversicherungsgesellschaftangestellter

Morphological Analysis
in information retrieval

- Basic question: words occur in different forms. Do we want to treat different forms as different index terms?
- Conflation: treating different (inflectional and derivational) variants <u>as the same index term</u>

Morphological Analysis
in information retrieval

- Conflation: treating different (inflectional and derivational) variants as the same index term

image	*images*	*imaging*	*imag* (root form)*
df=6	*df=4*	*df=3*	*df=6*
1, 4	1, 4	1, 4	1, 12
10, 1	10, 5	10, 5	10, 11
15, 2	16, 1	16, 1	15, 2
16, 1	68, 1		16, 3
33, 5			33, 5
68, 7			68, 8

docid , term frequency

Morphological Analysis
in information retrieval

- What are we trying to achieve by conflating morphological variants?
- Goal: help the system ignore <u>unimportant</u> variations of language usage

Morphological Analysis
in information retrieval

Google

repairing computer

[Guide to Computer Troubleshooting and **Repair** - **PC** ...](#)
www.daileyint.com/hmdpc/manual.htm - Cached
PC's are actually much easier to **repair** these days than in the early 90's when I wrote my original guide for technicians I was training. The number of discrete ...

[Online **Computer** Training Courses - For all beginners and experts ...](#)
www.beyourownit.com/ - Cached
Want to learn about **computers**? You've found the right place! On this website, you'll be able to find everything from simple **computer repair** articles and **computer** ...

[**Repairing** basic **computer** hard ware problem (system disk failure ...](#)
www.instructables.com/.../**Repairing**-basic-**computer**-hard-ware-and... - Cached
May 10, 2008 – THIS GUIDE IS NOT YET FINISHED, I WILL ADD MORE INFORMATION WHEN I GET A CHANCE.If you need any help with **fixing** a **computer** ...

[**Computer-Repair** Technicians](#)
www.collegeboard.com › ... › Majors & Careers Central › Profiles - Cached
Computer-repair technicians maintain and **repair computers**, scanners, printers, monitors, and other computer equipment. Learn more about this career at ...

[**Computer repair** NYC | Laptop **repair** ny | **PC repair** NY](#)
i**fix**ny.com/ - Cached
Computer repair ny. Data recovery nyc. We offers a full range of **computer fix** and technical support with free diagnostics and estimates, also iPhone BlackBerry ...

Morphological Analysis
in information retrieval

- The query “computer repairs“ will match all combinations of:

computer		repair
computers		repairs
computing	and	repaired
computation		repairing
computational		repairable
::		::

Morphological Analysis
in information retrieval

- In English, conflating morphological variants is usually done using a stemmer
- Stemming: automatic suffix-stripping
- English word variations occur at the end of a word
- root/stem + suffix
  - **repair** + **s/ed/ing/able**
- A stemmer conflates different variations by reducing them to a common root/stem

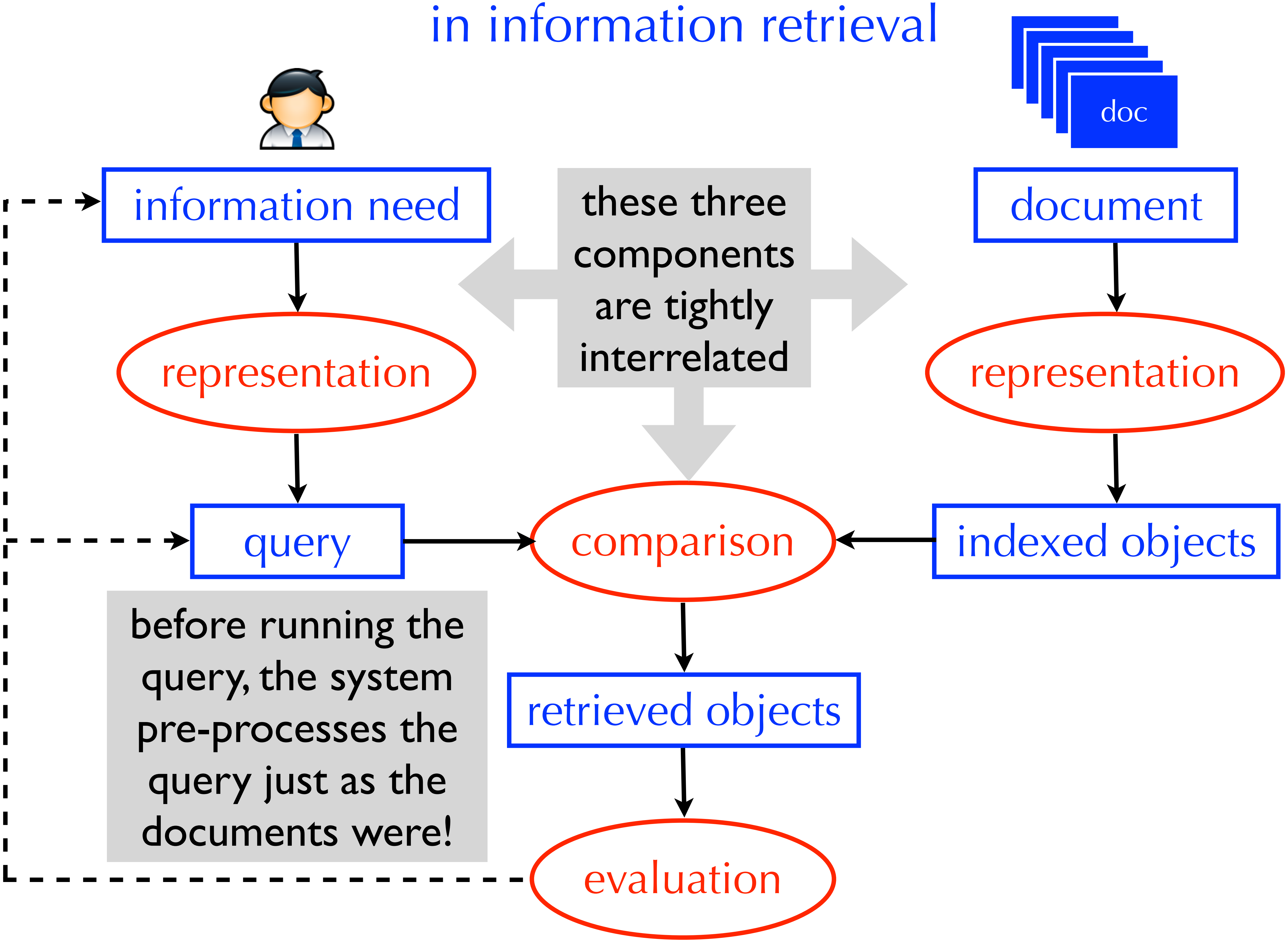
Morphological Analysis
in information retrieval

- In some cases, whatever is left after suffix-stripping is not even a word (e.g., comput)
- Is this a problem?

computer	repair
computers	repairs
computing	repaired
computation	repairing
computational	repairable
::	::

Morphological Analysis

in information retrieval



Morphological Analysis

the porter stemmer **(porter '80)**

- A long list of rules that are applied in sequence
  - apply the rule that removes the longest suffix
  - check to see that the stem is likely to be a root (replac+ement vs. c+ement)
- Fast, effective, and, therefore, <u>very</u> popular

Martin Porter's Home Page

No doubt you came here out of idle curiosity from the <u>Porter Stemming Algorithm</u> page. Before you hastily return, you are welcome to look at the following.

This (jerkily) spinning can is the work of <u>Philip Holmes Esquire</u>, ingenious graphic designer and inventor of visual puns. I could never have thought up anything so clever. (Apologies to the Dr Pepper people!)

Morphological Analysis

the porter stemmer (porter '80)

- Example step (1 of 5)

Step 1a:

- Replace ***sses*** by ***ss*** (e.g., stresses → stress).
- Delete ***s*** if the preceding word part contains a vowel not immediately before the ***s*** (e.g., gaps → gap but gas → gas).
- Replace ***ied*** or ***ies*** by ***i*** if preceded by more than one letter, otherwise by ***ie*** (e.g., ties → tie, cries → cri).
- If suffix is ***us*** or ***ss*** do nothing (e.g., stress → stress).

Step 1b:

- Replace ***eed***, ***eedly*** by ***ee*** if it is in the part of the word after the first non-vowel following a vowel (e.g., agreed → agree, feed → feed).
- Delete ***ed***, ***edly***, ***ing***, ***ingly*** if the preceding word part contains a vowel, and then if the word ends in ***at***, ***bl***, or ***iz*** add ***e*** (e.g., fished → fish, pirating → pirate), or if the word ends with a double letter that is not ***ll***, ***ss*** or ***zz***, remove the last letter (e.g., falling→ fall, dripping → drip), or if the word is short, add ***e*** (e.g., hoping → hope).
- Whew!

Morphological Analysis

the porter stemmer **(porter '80)**

- Original Text

gerard salton 8 march 1978 in nuremberg 28 august 1995 also know as gerry salton was professor of computer science at cornell university salton was perhaps the leading computer scientist working in the field of information retrieval during his time his group at cornell developed the smart information retrieval system which he initiated when he was at harvard

- Stemmed Text

gerard salton 8 march 1978 in nuremberg 28 august 1995 also know as gerri salton wa professor of comput scienc at cornel univers salton wa perhap the lead comput scientist work in the field of inform retriev dure hi time hi group at cornel develop the smart inform retriev system which he initi when he wa at harvard

Morphological Analysis

the porter stemmer (porter '80)

- false positives: two words conflated to the same root when they shouldn't have been

organization/organ
generalization/generic
numerical/numerous
policy/police
university/universe
addition/additive
negligible/negligent
execute/executive
past/paste
ignore/ignorant
special/specialized
head/heading

Morphological Analysis

the porter stemmer **(porter '80)**

- false negatives: two words <u>not</u> conflated to the same root word when they should have been

european/europe
cylinder/cylindrical
matrices/matrix
urgency/urgent
create/creation
analysis/analyses
useful/usefully
noise/noisy
decompose/decomposition
sparse/sparsity
resolve/resolution
triangle/triangular

AOL Query-log Examples

stemmed queries

russian translat
- russian translations
- russian translator
- russian translation
- russian translate

secret
- secret
- secretions
- secrets
- secretion

stock for sale
- stockings for sale
- stocking for sale
- stocks for sale

smokei mountain nation park
- smokey mountains national park
- smokey mountain national park
- smokey mountains national parks

cat fenc
- cat fencing
- cat fences
- cat fence

strawberri plant
- strawberry planting
- strawberry plants
- strawberries planting

AOL Query-log Examples

stopped + stemmed queries

bui comput

- buy a computer
- buying a computer
- we buy computers
- how to buy a computer
- buying computers

rid raccoon

- get rid of raccoons
- how to get rid of raccoons
- how to get rid of a raccoon
- what to use to get rid of raccoons
- how do i get rid of a raccoon

auto repair

- auto repairables
- how to auto repairs
- auto repair do it yourself
- do it yourself auto repair
- auto repair .com
- do it yourself auto repairs
- auto repair

water diet

- the water diet
- the all water diet
- water and diet
- water diet
- water diets

AOL Query-log Examples

stopped + stemmed queries

planet orbit sun

- why is there only one planet in each orbit around the sun
- why do the planets orbit the sun
- planets that orbit the sun

plant shade

- plant shade
- plants for shade
- plants that do well in shade
- plants that like shade
- plants shade
- planting in the shade

univers

- universalism
- universism
- other universe
- university
- our universe
- across the universe
- the universe within
- universities

Morphological Analysis
evaluation results

- Stemming
  - English: 0-5% improvements
  - Finnish: 30% improvement
  - Spanish: 10% improvement
- Compound Splitting
  - German: 15% improvements
  - Swedish: 25% improvement

(Hollink *et al.*, 2004)

Morphology Across Languages
European Parliament Corpus

- Number of unique terms (remember, these are translations of the same text):
  - English: 150,725
  - Spanish: 213,486
  - Portuguese: 219,121
  - Danish: 367,282
  - Finnish: 709,049
  - German: 401,929

To Stem or Not To Stem

	small corpus	large corpus
users care more about recall	?	?
users care more about precision	?	?

To Stem or Not To Stem

	small corpus	large corpus
users care more about recall	yes	maybe
users care more about precision	maybe	maybe

- Google seems to be doing stemming. They must think it helps

Big Picture

- Text-processing requires making decisions about what to store in the index
- Two big decisions: stopword-removal and stemming
- My own recommendation (take it, leave it, question it)
    - remove stopwords only if you have to (don't have enough disk-space)
    - off-load the job to query-processing (removing stopwords from the query)
    - stem depending on the importance of recall and the size of the collection

What about homonyms?

(words that are spelled the same, but have different meaning)

Words often have multiple senses

- *bank* (noun)
  1. the rising ground bordering a lake, river, or sea
  2. a mound, pile, or ridge above the surrounding level
  3. a steep slope (as in "bank of a hill")
  4. an establishment for the custody, loan, exchange, and issue of money
  5. a supply of something held in reserve
  6. the lateral inward tilt of a vehicle (as an airplane) when turning

(Merriam-Webster Dictionary)

Word Sense Disambiguation

- Given a word in a particular context, automatically predict its correct sense from a finite set (bank 1-6)?

"I stopped by the bank to deposit some cash."

↓

An establishment for the custody, loan, and exchange of money

"I stopped by the food bank to donate some food."

↓

A supply of something held in reserve

- An active area of research since the 1950's
- How would you do this?

Word Sense Disambiguation

- Predict the sense whose definition contains terms that co-occur often with those in the surrounding context

"I stopped by the bank to deposit some cash."

An establishment for the custody, loan, and exchange of money

mutual information from IMDB corpus

money	raise	2.686
debt	money	2.578
dollars	money	2.567
money	cash	2.546
buy	money	2.471
money	gambling	2.436
money	pay	2.427
money	bank	2.387
insurance	money	2.117
money	paid	2.018

Word Sense Disambiguation
in information retrieval

1. Expand the indexed vocabulary so that each sense of a word is a different index term
2. Automatically predict the correct sense for each word in the collection (e.g, bank^1, bank^2 , ... , bank^6)
   - lots of context (i.e., surrounding text)
3. Index the collection as usual
4. At query-time, predict the correct word sense in the query (e.g., “drive-through bank^4 carrboro”)
   - more difficult, not much context
5. Retrieve documents as usual

Word Sense Disambiguation
in information retrieval

- Does it improve (average) retrieval effectiveness?

Word Sense Disambiguation
in information retrieval

- Not much. Why not?

(Sanderson, 1996)

Word Sense Disambiguation
in information retrieval

- Not really a problem for long-queries (other query terms disambiguate the ambiguous ones)
- In theory, can improve performance for short queries
- However, these are precisely the queries for which disambiguation is the most difficult (not much context)

(Sanderson, 1996)

Word Sense Disambiguation
in information retrieval

- There is another reason. What is it?

Word Sense Disambiguation

in information retrieval

united bank
union bank california
union bank
tyra banks show
star bank
republic bank
pnc bank
people bank
outer banks north carolina
outer banks nc
online banking bank america
national bank texas
commerce bank

national bank south carolina
national bank oneida
national bank omaha
national bank marin
national bank alaska
national bank
merchants bank
loans bank account
hotels outer banks nc
hotels outer banks
guaranty bank
freedom bank
farmers merchants bank

Word Sense Disambiguation
in information retrieval

- Wait for it..., Wait for it...

Word Sense Disambiguation
in information retrieval

- Word senses also (more or less) follow Zipf's law: a few are very frequent and most a rare

united bank
union bank california
union bank
tyra banks show
star bank
republic bank
pnc bank
people bank
outer banks north carolina
outer banks nc
online banking bank america
national bank texas
commerce bank

national bank south carolina
national bank oneida
national bank omaha
national bank marin
national bank alaska
national bank
merchants bank
loans bank account
hotels outer banks nc
hotels outer banks
guaranty bank
freedom bank
farmers merchants bank

Word Sense Disambiguation

in information retrieval

No. of senses	Size of set	Most common sense (%)	
2	3145	92	{50}
3	1697	85	{33}
4	1046	79	{25}
5	640	72	{20}
6	448	68	{17}
7	275	63	{14}
8	200	60	{13}
9	141	60	{11}
10	93	53	{10}

Table 10. Percentage of occurrences accounted for by the most common sense of a word. The figures in brackets (shown for comparison) is the percentage that would result if senses occurred in equal amounts. Measurements made on the SEMCOR corpus.

(Sanderson, 1996)