

Content was King and Metadata Ruled

~20 years of Research and Development at
Netherlands Institute for Sound and Vision & Friends

Roeland Ordelman



A black and white photograph of Bill Gates. He is shown from the chest up, wearing glasses and a white shirt. His right hand is propped under his chin, and he is looking slightly to the right with a gentle smile.

Content
is King

Bill Gates 1996

Retrieval



BEELDEN VOOR DE TOEKOMST

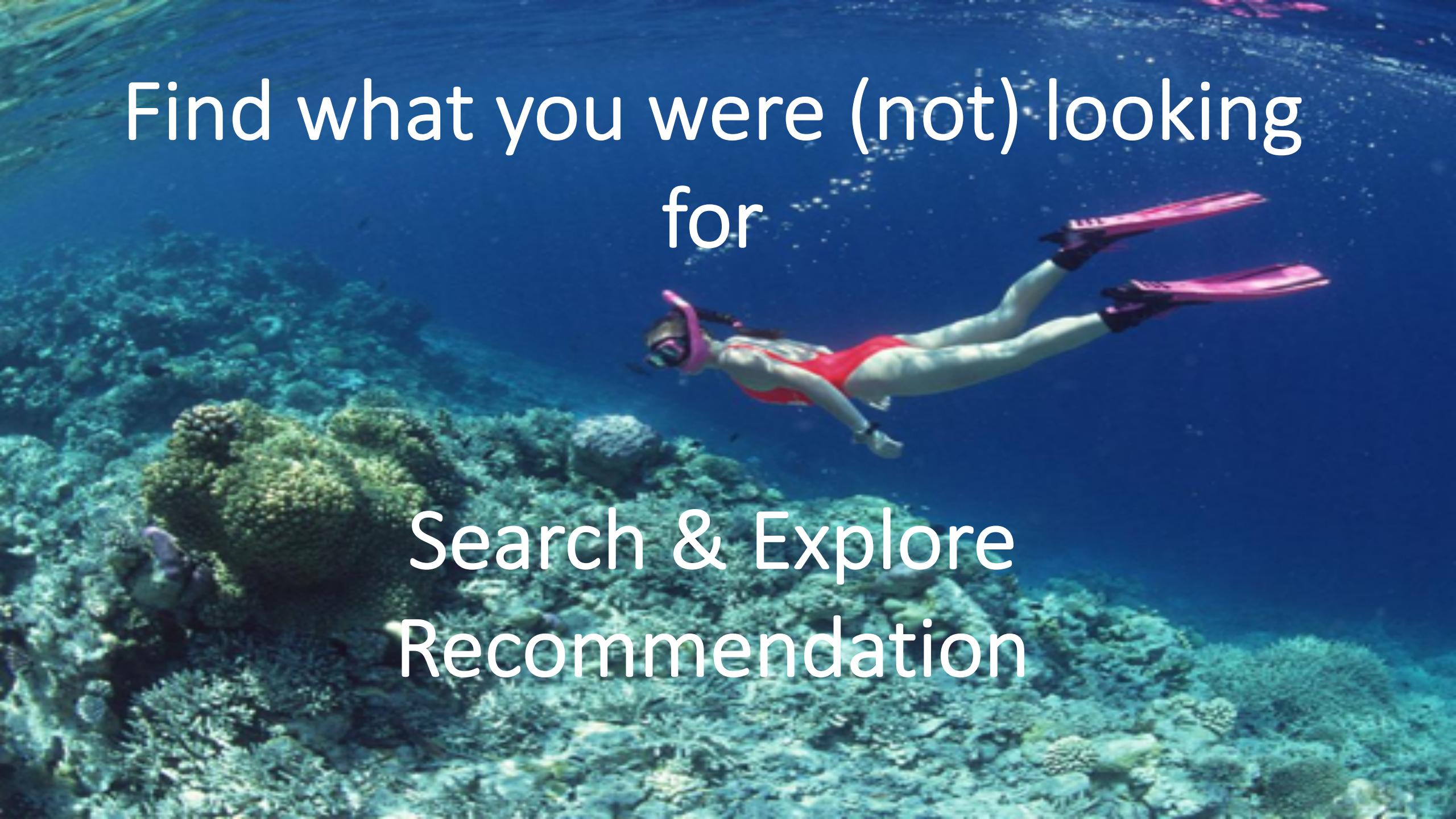
2007 – 2014 LARGE DIGITIZATION PROGRAM

IMAGES FOR THE FUTURE

The background of the image is a wide-angle photograph of the ocean. The water is a deep blue, with small, white-capped waves visible across the surface. Above the horizon, the sky is a lighter shade of blue, dotted with wispy, white clouds.

Millions of hours of audiovisual content in
media archives

‘BIG DATA’

A photograph of a person snorkeling over a vibrant coral reef. The person is wearing a red and white swimsuit, a pink snorkel mask, and pink flippers. They are swimming horizontally, facing left. The water is clear blue, and the coral reef below is a mix of green and brown hues. The background shows more of the ocean and some distant coral structures.

Find what you were (not) looking
for

Search & Explore
Recommendation



Content
is King

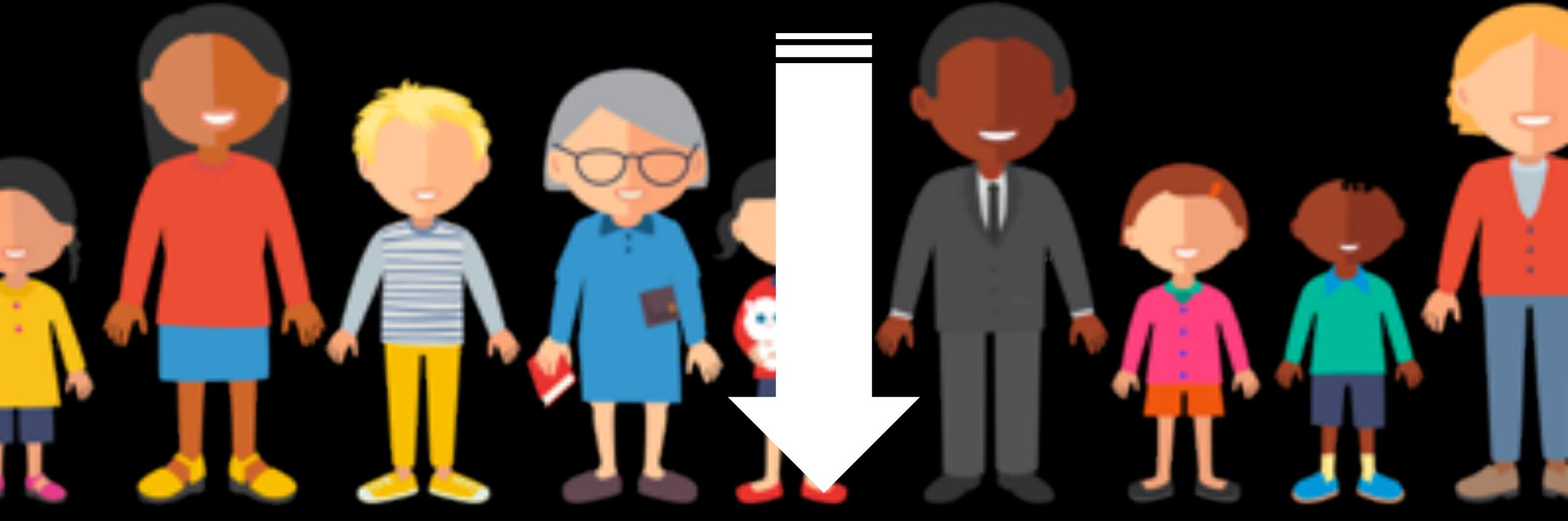
Bill Gates 1996



Archivist

But Metadata Rules

Information Need



SEARCH:

QUERY = semantics

Semantic Gap



```
10101010110101101001010101101010101010101011010  
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101001010000101010101110010110010100101010110100  
0001101010100101001101000101010101101010101010101  
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(UN)STRUCTURED

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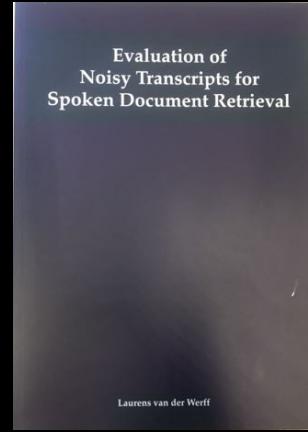
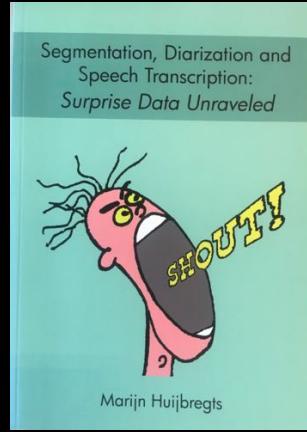
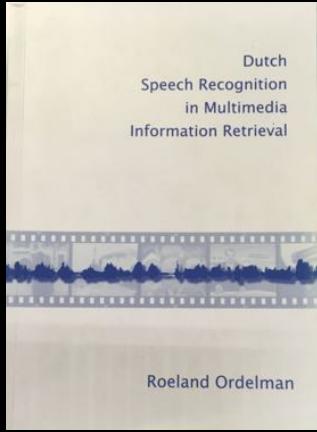
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10101010110101001010101101010101010101010101010101010101010101  
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Semantic Computing

Multimodal video analysis



Spoken document retrieval

1998-2010

Improve quality of Dutch ASR for searching

Segmentation & who speaks when

When is ASR quality good enough for searching?



Audiodatabank

Op deze pagina is een beschrijvend begin gemaakt met de presentatie van geluidsmateriaal (onder andere documentaires en interviews) waarin Willem Frederik Hermans aan het woord is. De bestanden zijn doorzoekbaar gemaakt met een combinatie van **schakelen** die in Nederland nog niet vaak is toegepast. Klik [hier](#) voor hulp bij het zoeken.



tranen der acacia's

zoek fragment

1	Over het onderscheid tussen wetenschap en literatuur. Een gesprek met Willem Frederik Hermans (19 maart 1992)	[01.49:02 tot 01.51:05]	beluisteraudio
2	Over het onderscheid tussen wetenschap en literatuur. Een gesprek met Willem Frederik Hermans (19 maart 1992)	[00.14:41 tot 00.17:14]	beluisteraudio
3	Over De naadlooschige Multatuli. Een gesprek met Willem Frederik Hermans (1976)	[00.11:05 tot 00.11:25]	beluisteraudio
4	Over Age Bijaart. Een gesprek met Willem Frederik Hermans (omstreeks 1980)	[00.12:28 tot 00.12:41]	beluisteraudio
5	Waarom schrijven? (lezing op Nijenrode, 1 augustus 1983)	[00.13:13 tot 00.13:22]	beluisteraudio
6	Eerste zinnen van romans (18 januari 1987)	[00.43:53 tot 00.48:56]	beluisteraudio
7	Eerste zinnen van romans (18 januari 1987)	[00.35:35 tot 00.38:04]	beluisteraudio



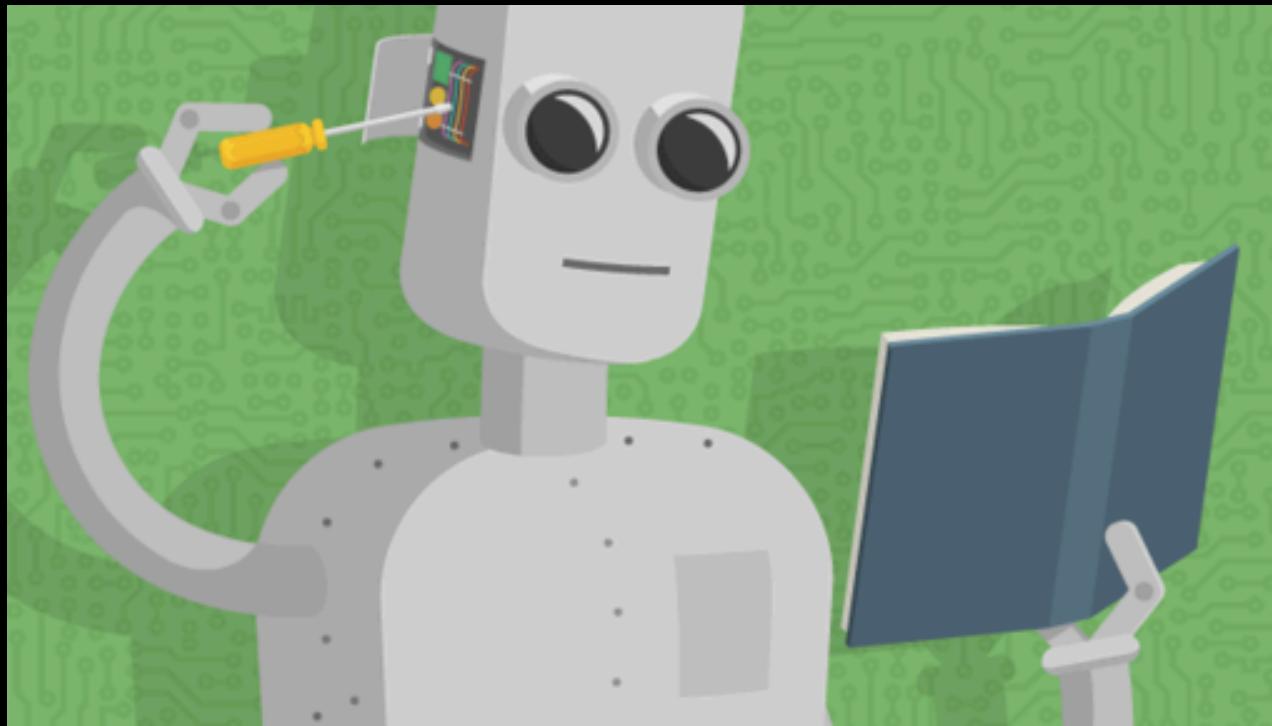
GROTE VARIATIE IN SPRAAK

Fysieke verschillen tussen mensen

Emoties

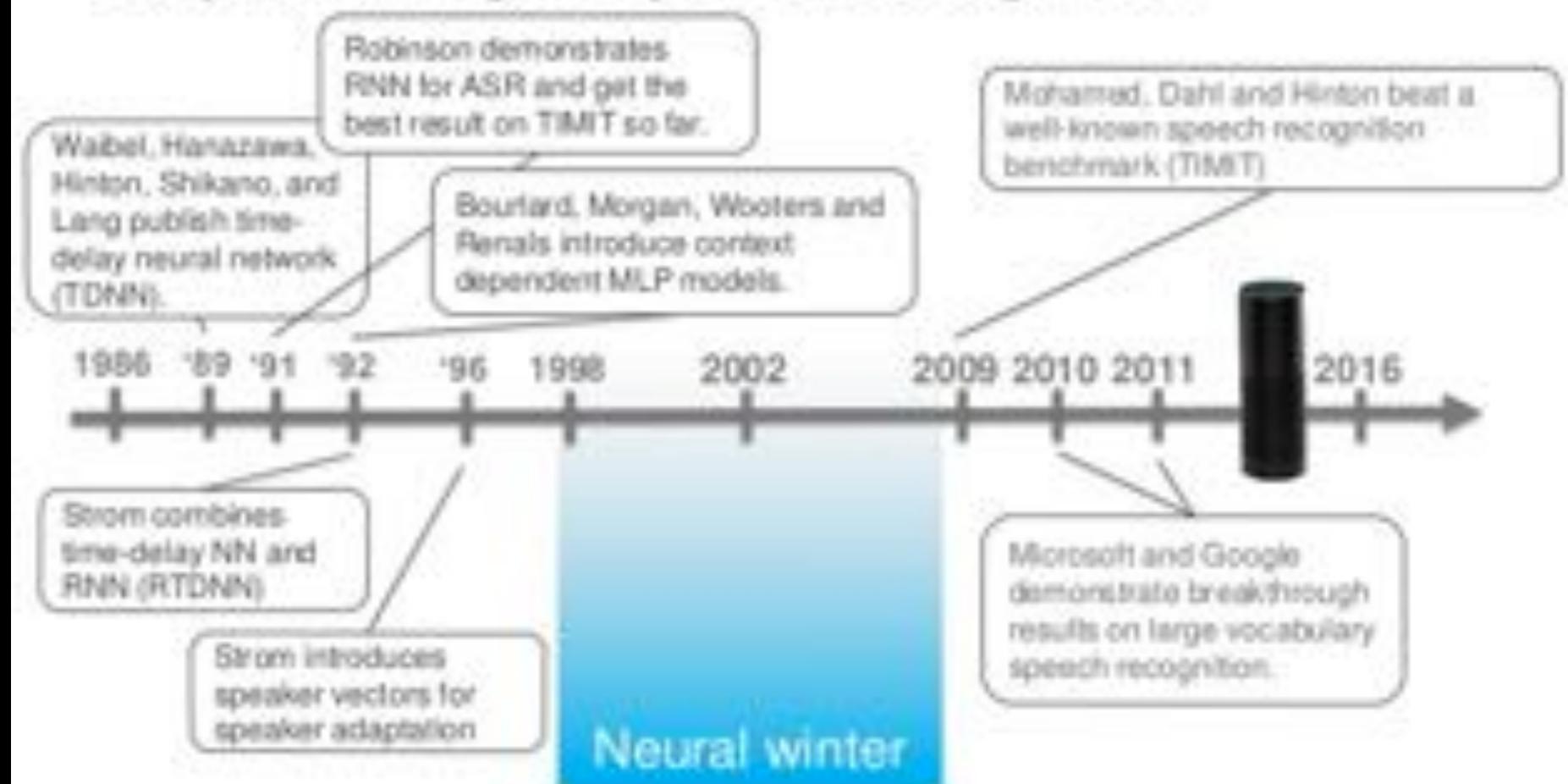
Type spraak (voorgelezen – spontaan)

Akoestische condities



MACHINE
LEARNING

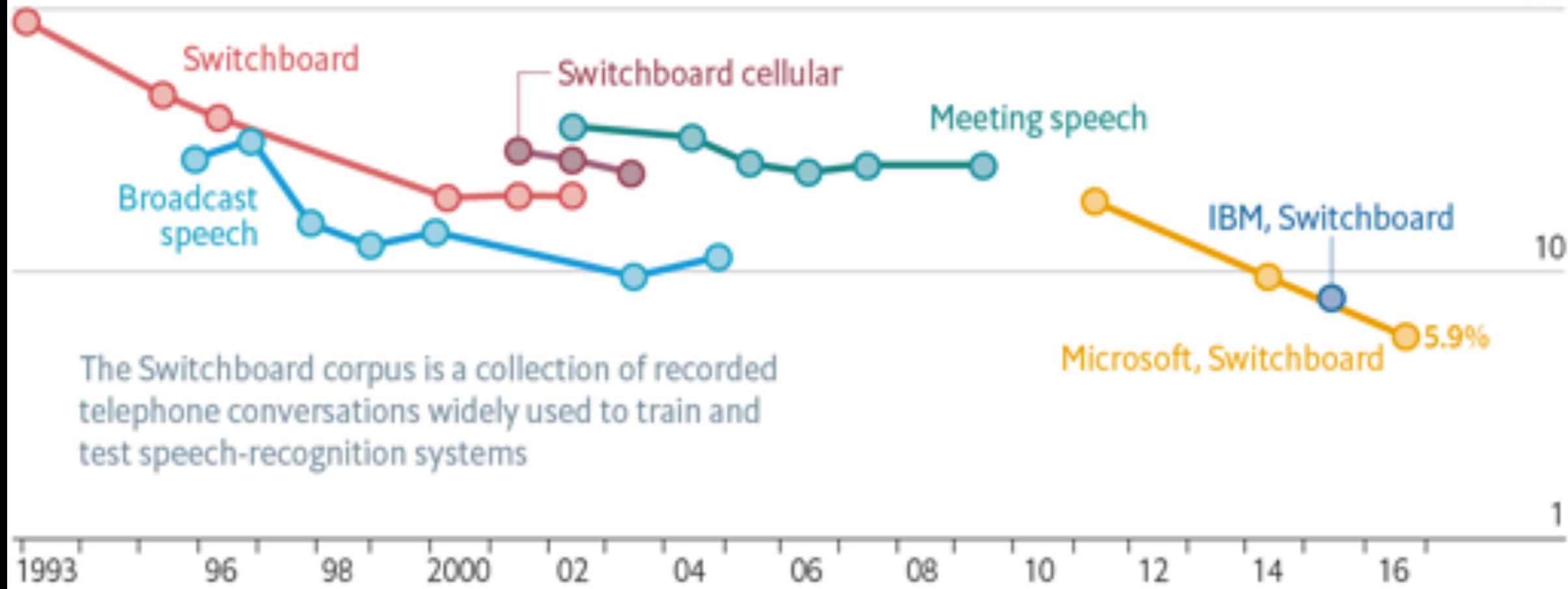
Deep Learning in Speech Recognition



Loud and clear

Speech-recognition word-error rate, selected benchmarks, %

Log scale
100



The Switchboard corpus is a collection of recorded telephone conversations widely used to train and test speech-recognition systems

Sources: Microsoft; research papers

Benchmarking

NBEST (NL/VL)

MediaEval (EU) -- multimediaeval.org

TRECVID (US) -- trecvid.nist.gov



[Set collection \(Audiovisual Collection\)](#)[Set project \(Roeland test: Media Suite\)](#)

Searching in : Audiovisual Collection

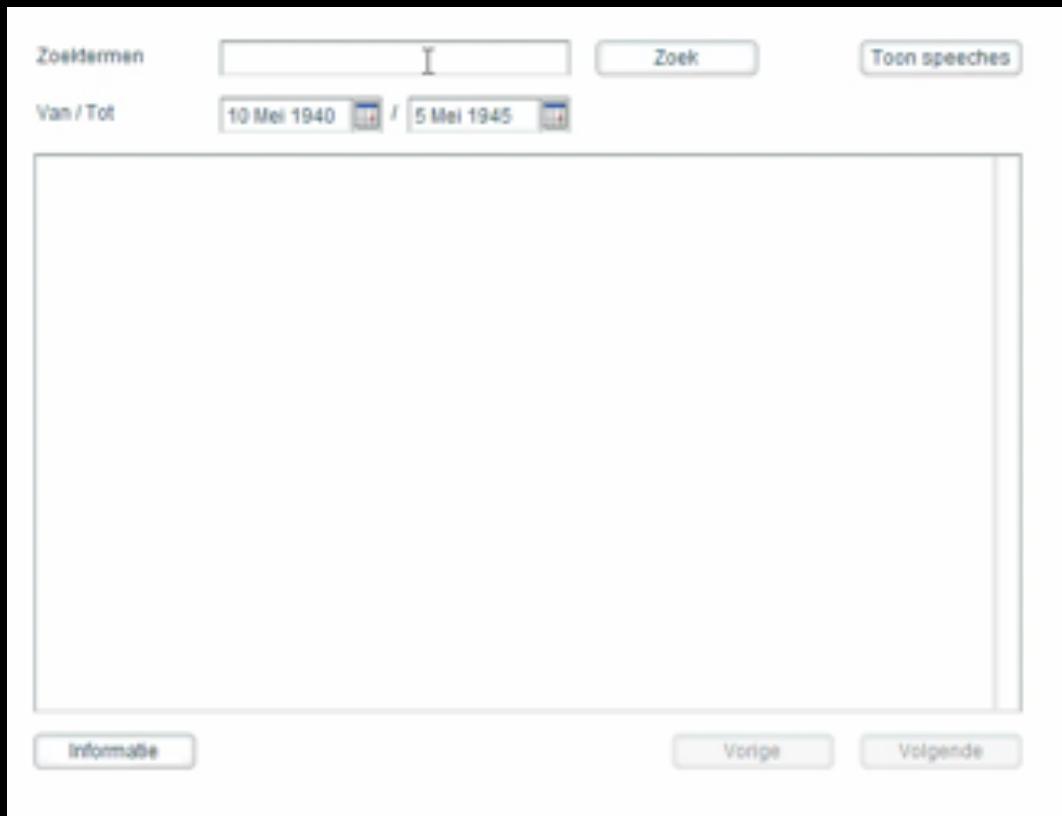
Total amount of records in this collection: 1883516

[Clear search](#)

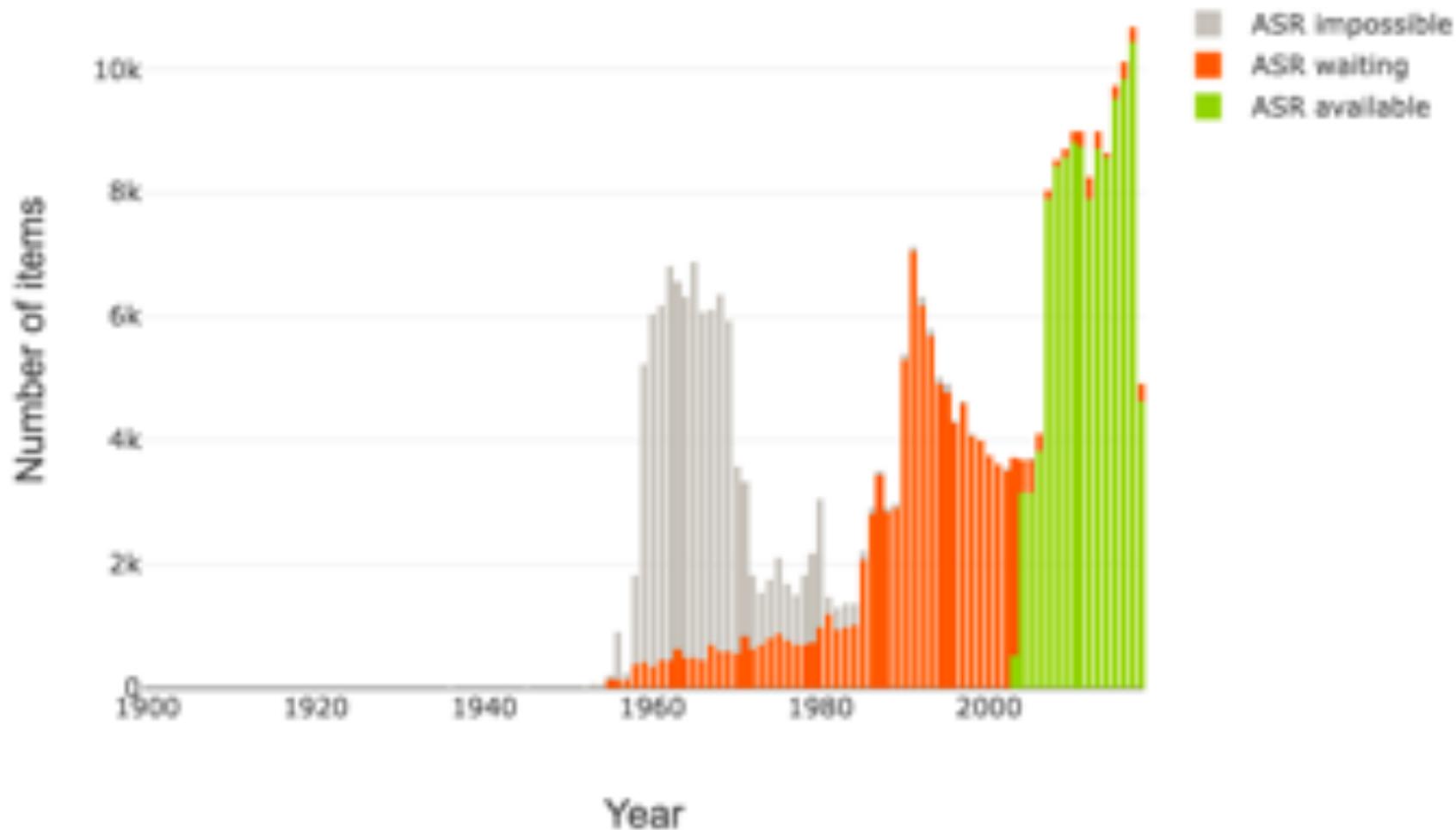
Radio Oranje

Zoektermen Zoek

Van / Tot /



ASR availability for TV news and current affairs per year



File Edit View Insert Cell Kernel Widgets Help

Run C Markdown

Notebook saved Not Trusted

Python 3

How complete are the metadata fields?

The Media Suite allows you to see how complete a metadata field is - for how many of the available documents this completeness over time. Here, we go one step further and compare multiple metadata fields.

Write your own (Python) code to analyze the data in the Media Suite

Comparing metadata field over time for different fields

Imagine if we want to use information from two metadata fields over time. Then we need to be sure that both fields are present in the time frame we are interested in

Example - MISV archive: Plotting the completeness of genre at the levels of series, season, programme, segment

```
In [25]: # get the values over time for each metadata level
# must specify date interval, as otherwise lines won't match between queries
collection = "misv-catalogue-aggr"
dateField = "bg:publications.bg:publication.bg:sortdate"
minDate = "01-01-1800"
maxDate = "31-12-2050"
#specify labels for the different fields
labels= ["series genre", "season genre", "programme genre", "segment genre"]
# specify the fields
fields = ["bga:series.bg:genres.bg:genre", "bga:season.bg:genres.bg:genre", "bga:genres.bg:genre", "bga:segment.bg:genre"]
# plot the graphs
showMetadataCompletenessOverTimeForFields(fields, labels, dateField, collection, minDate, maxDate)
```

(time-labeled) ENTITIES

People,
Places,
Events,
Topics,
Quotes,
Answers,
Opinions,
Advices,
Excuses,
Promises, ...

```
<word wordID="president" beginTime="4.970" endTime="5.420">
  <score AM="-15300.08789" LM="-1053.25122" COMBINED="-16353.33887"/>
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<word wordID="gezegd" beginTime="8.390" endTime="8.850">
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```

Thesaurus



Automatische Term Extractie

classification comment link metadata

Add classifications

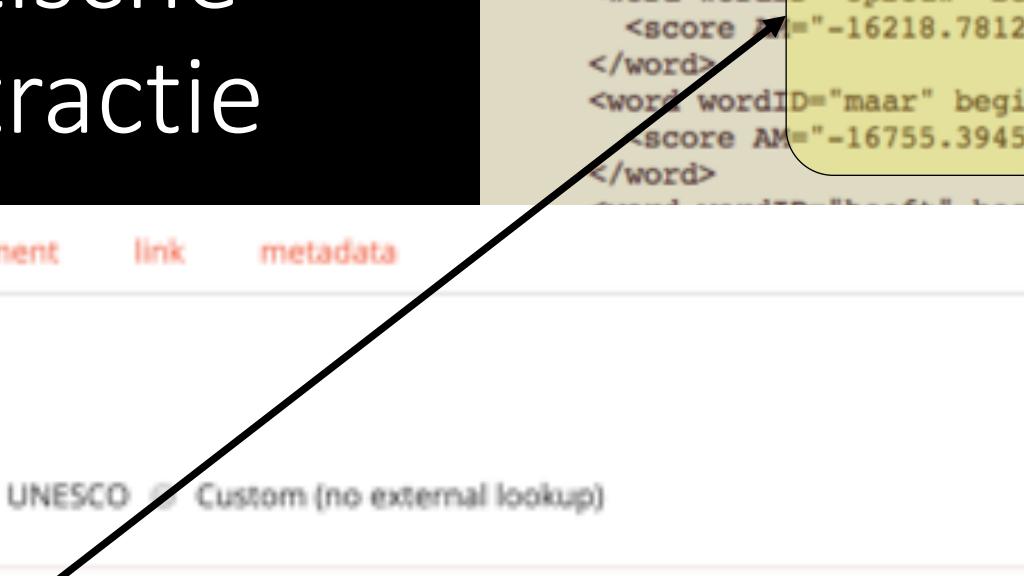
Vocabulary: GTAA UNESCO Custom (no external lookup)

Obama

Obama, Barack PERSOON

Obama, Michelle PERSOON

PRIVATE DELETE



```
<word wordID="president" beginTime="4.970" endTime="5.420">
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<word wordID="opbouw" beginTime="5.420" endTime="5.720">
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```



```
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</word>
```

CROWDSOURCING

Waisda?: Video Labeling Game
<http://waisda.nl/>

Waisda?

Kies een video. Vul woorden in die omschrijven wat je ziet en hoort. Je scoort punten als jij en iemand anders tegelijkertijd hetzelfde woord invullen.

feedback

1 speler	1 speler	De Wandeling (nog 17 min)	Barend&Van Dorp (1998 - 1999) aft.61 (nog 20 min)
Speel mee!	Speel mee!	Speel mee!	Speel mee!

Boer zoekt vrouw (nog 16 min)
Barend&Van Dorp (1998 - 1999) aft.43 (nog 21 min)

Waisda? helden Eendagsvliegen Hoogste treffers Actiefste kloppers

1. maarten	1. maarten	1. maarten	1. maarten
2. Ramondi	2. annelles	2. Ramondi	2. Ambrosius
3. Bart	3. -	3. Bart	3. Bart
4. Ambrosius	4. -	4. Ambrosius	4. Ramondi

Done 00:00



``computer vision''

[Home](#) | [Feedback](#) | [Colofon](#) | [Technologie](#)**Gelabeld door onze video labelling technologie**

Peter Pan Speedrock
Editie: 2003
Fragment: Drummer

Top 5 best bekeken optredens

Urban Dance Squad
Editie: 1990

Laatste reacties op fragmenten

Johan: Jacco de Groot
over "GITAREST" bij Johan, 2001



Ronald: Dramatisch slechte registratie, je ziet de artiesten niet. Loep bijleveren
over "GITAREST" bij DEUS, 1995

Welkom bij de vernieuwde site van
hollandsglorieoppinkpop!

Nieuwsgierig naar de mogelijkheden van deze
site? Bekijk dan de uitleg in de player
hiernaast.

Als je niet kan wachten met het zien van je
favoriete band, start dan direct met zoeken!

ZOEK OPTREDENS

Multimodal Search



FP7 EU-project

ACCESS TO
AUDIO-VISUAL ARCHIVES
2010-2014

METADATA + SUBTITLES

SPEECH/SPEAKER ANALYSIS

VIDEO SEGMENTATION

FACE SEARCH

VISUAL CATEGORY SEARCH

INSTANCE SEARCH (LOGOS, PLACES)

EVENT SEARCH

QUERY BY EXAMPLE

COMBINING INFORMATION SOURCES
RECOMMENDATION AND LINKING

USER INTERFACE

Text

Audio

Video

Search

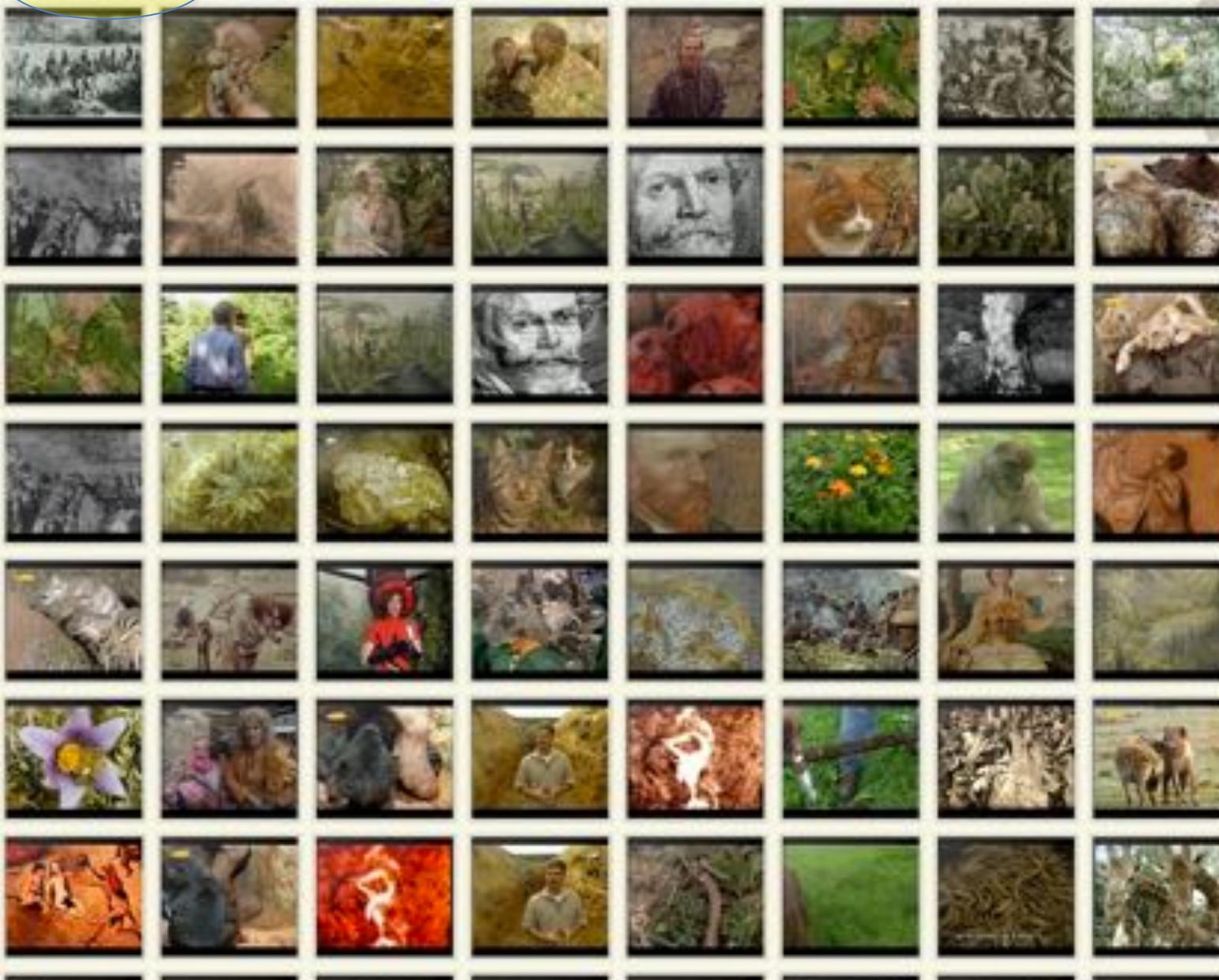
Visual

RETRIEVED RESULTS (Found 883 segments in 281 videos. Showing 499 segments)

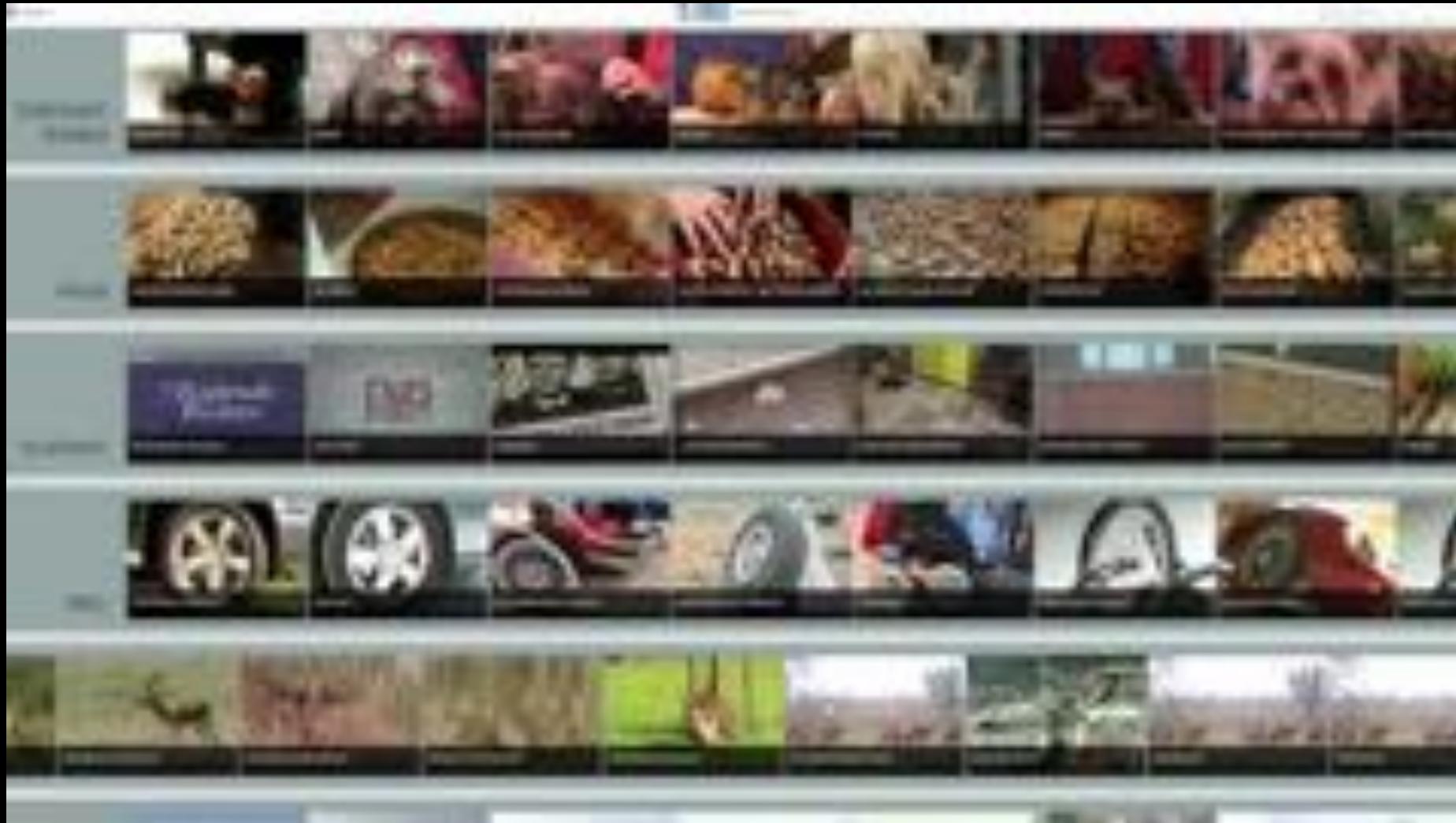
VIEW: THUMBNAILS | COMPACT | DETAILED | TRAINING IMAGES [499]



RETRIEVED RESULTS (Found 883 segments in 281 videos. Showing 499 segments)

View: [THUMBNAILS](#) | [COMPACT](#) | [DETAILED](#) | [TRAINING IMAGES \(43\)](#)

Browsen door beeldconcepten



00:04:48:00 - 00:05:14:04 [speaker-labels] Niehe, Ivo
00:05:26:00 - 00:05:43:03 [face-labels] Niehe, Ivo
00:05:54:15 - 00:05:58:04 [face-labels] Niehe, Ivo
00:05:59:00 - 00:05:14:21 [face-labels] Niehe, Ivo
00:05:19:01 - 00:05:34:15 [face-labels] Niehe, Ivo
00:05:34:13 - 00:05:38:13 [speaker-labels] Niehe, Ivo
00:05:45:00 - 00:05:47:23 [face-labels] Niehe, Ivo
00:05:47:13 - 00:05:50:12 [speaker-labels] Niehe, Ivo
00:05:50:13 - 00:05:53:12 [face-labels] Niehe, Ivo
00:05:57:00 - 00:05:53:04 [face-labels] Kim Jong-un
00:05:58:13 - 00:05:58:13 [face-labels] Niehe, Ivo
00:05:59:19 - 00:05:59:19 [face-labels] Kim Jong-un
00:05:59:19 - 00:05:59:24 [face-labels] Kim Jong-un
00:05:59:19 - 00:05:59:24 [face-labels] Niehe, Ivo
00:06:00:13 - 00:06:18:13 [speaker-labels] Niehe, Ivo
00:06:13:00 - 00:06:22:01 [face-labels] Niehe, Ivo
00:06:15:00 - 00:06:16:21 [face-labels] Niehe, Ivo
00:06:26:19 - 00:06:28:21 [face-labels] Kim Jong-un
00:06:52:19 - 00:06:52:24 [face-labels] Kim Jong-un
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00:06:53:13 - 00:06:58:13 [speaker-labels] Niehe, Ivo
00:06:57:15 - 00:06:57:04 [face-labels] Niehe, Ivo
00:06:57:23 - 00:06:57:00 [face-labels] Niehe, Ivo
00:06:57:13 - 00:06:57:13 [speaker-labels] Kim Jong-un
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00:06:49:18 - 00:06:49:17 [face-labels] Niehe, Ivo
00:06:43:00 - 00:06:53:24 [speaker-labels] Kim Jong-un
00:06:56:13 - 00:06:56:13 [speaker-labels] Kim Jong-un
00:06:57:06 - 00:06:57:13 [face-labels] Kim Jong-un
00:06:03:12 - 00:06:07:15 [face-labels] Niehe, Ivo
00:06:06:13 - 00:06:11:13 [speaker-labels] Niehe, Ivo
00:06:13:00 - 00:06:18:11 [face-labels] Niehe, Ivo
00:06:16:13 - 00:06:26:13 [speaker-labels] Kim Jong-un
00:06:25:00 - 00:06:32:01 [face-labels] Niehe, Ivo
00:06:33:00 - 00:06:37:24 [speaker-labels] Kim Jong-un
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00:06:38:00 - 00:06:47:24 [speaker-labels] Niehe, Ivo
00:06:46:00 - 00:06:57:24 [speaker-labels] Kim Jong-un
00:06:52:13 - 00:06:53:13 [speaker-labels] Kim Jong-un
00:06:52:13 - 00:06:52:13 [face-labels] Niehe, Ivo
00:06:57:21 - 00:06:58:09 [face-labels] Kim Jong-un
00:06:58:03 - 00:06:59:03 [face-labels] Kim Jong-un
00:06:43:21 - 00:06:58:16 [face-labels] Kim Jong-un



ID Segment	
Sequence Number	56
Text/value	Kim Jong-un
Person	Kim Jong-un
Label	
Confidence(score)	0.999450549450549
Generation Method	Facial Recognition

Spraakherkenning combineren met sprekerherkenning

bakkerberg boer bruin dam dekker dijk graaf
groot jansen janssen jones jong
klein kok koning koe krabber lange lee leeuwen linden meer
meer meijer meyer mulder petet schouten smit smith
thom visser vliet vos vries williams
wilson voss

Exhibitionistische zelfverrijking

Zoek!

Alle programma's van: 01-01-2000 tot: 28-10-2013





Video Hyperlinking

- Establish links between an ‘anchor’ video segment and ‘target’ video segment(s) in a repository, based on topical relevance
- Or:
 - Content-based, segment level video recommendation
 - Multimodal search using video segment as a query



Fish and Chips Fillet Featuring Jamie Oliver
by EpicMealTime • 1 month ago • 1,625,276 views
LIKE/FAVORITE this video!!! EpicMealTime featuring a
HD



Queen Elizabeth I //
by Animalcrossing95 • 1 month ago • 1,625,276 views
Just a tribute to Cate Blanchett's Queen Elizabeth I
NEW HD



BEELD EN GELUID



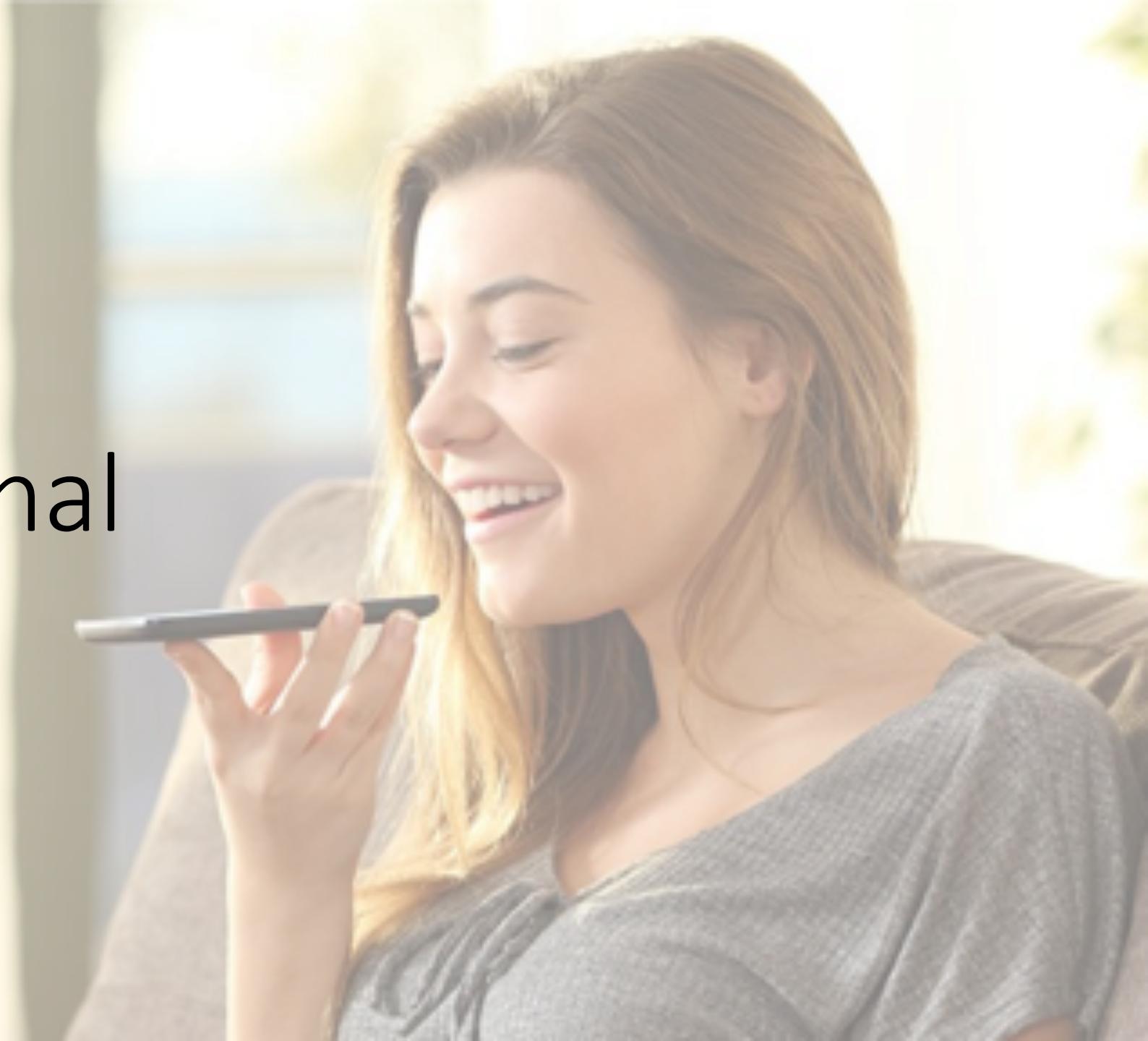
Audio-2-Image Hyperlinking

Cross-media Recommendation



Spoken Conversational Search

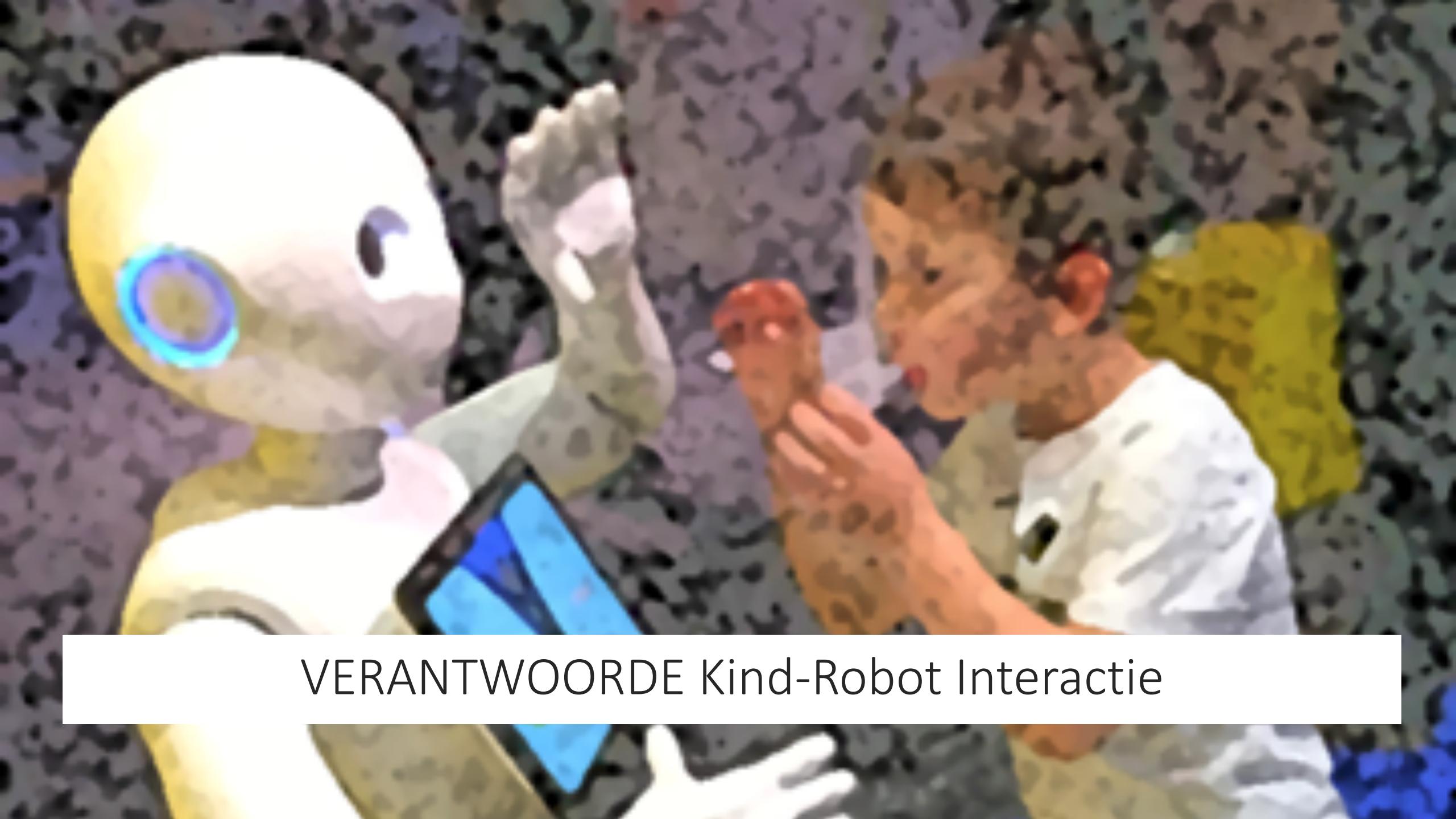
Dialogue to understand
Information Need





Media Suite Kids

Playfully and Responsibly
diving into millions of
hours of premium content

A young child with short brown hair, wearing a white t-shirt, is interacting with a large, colorful robot head. The robot has a yellow and white body, a large white eye with a blue and yellow iris, and a red mouth. The child is holding a smartphone in their right hand, which is positioned near the robot's eye. The background is a camouflage pattern.

VERANTWOORDE Kind-Robot Interactie

Hoe gaan kinderen om met een agent?
Welke informatie zijn ze naar op zoek?
Hoe bieden agents de informatie aan?
In welke mate vertrouwen we de agent?
Vertrouwen we de aangeboden informatie?



LABS ● BEELD EN GELUID

HOME

AB

Welcome to **LABS**
**EXPERIMENT WITH OUR APPLICATIONS,
DATASETS AND API'S**

DEVELOPED BY THE NETHERLANDS INSTITUTE FOR SOUND AND VISION