### Searching scientific literature like a pro

Judith van Stegeren

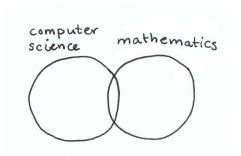
University of Twente

15th June 2018



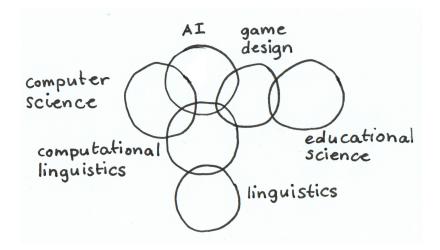
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### When searching is hard

- 1. fuzzy problem statement
- 2. when doing exploratory search

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- 3. interdisciplinary research
- 4. ambiguous keywords
- 5. large research field

"Papers submitted to ACL conferences should in principle **cite and compare to all relevant prior work**, regardless of when and how that work was presented to the community, and must credit work that influenced them."

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- 1. correct
- 2. complete
- 3. repeatable

Databases

# Google Scholar Scopus



More info: https://www.ru.nl/ub  $\rightarrow$  zoeksystemen

# Google Scholar

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### The good

- 1. inclusive
- 2. automated
- 3. links to public content
- 4. ranking system
- 5. fast minimalist UI

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# Google Scholar

### The good

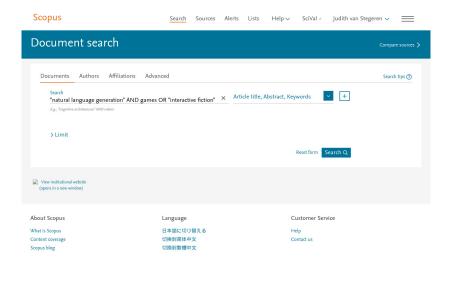
- 1. inclusive
- 2. automated
- 3. links to public content
- 4. ranking system
- 5. fast minimalist UI

### The bad

- 1. inclusive
- 2. automated
- 3. links to (non-peer-reviewed) public content
- 4. intransparent ranking system

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5. lack of options for refining results



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# Scopus®

### The good

- 1. all publications are peer-reviewed
- 2. lots of sorting options
- 3. lots of refinement options
- 4. for CS researchers: includes ACM and IEEE databases!

#### The bad

- 1. Does not have all field-specific databases
- 2. No one-click downloading
- Only access via institute (not logged in = no search bar)

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Search techniques: snowball method



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Search techniques: snowball method



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### Search techniques: time travel



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### Search techniques: time travel



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### When searching is hard

- 1. fuzzy problem statement
- 2. when doing exploratory search

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- 3. interdisciplinary research
- 4. ambiguous keywords
- 5. large research field

### Search techniques: systematic search

 $1. \ \ {\rm Problem \ statement \ and \ search \ goal}$ 

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- 2. Keyword table
- 3. Search log
- 4. Process results

Example: choosing keywords

#### Problem statement

# To what extent do parents influence the mathematics achievement of their children?

- A) influence, parents, mathematics, achievement, children
- B) parents, mathematics, achievement, children
- C) influence, parents, mathematics, achievement
- D) parents, mathematics, achievement

Example from Scientific information, Petri de Willigen (2018) = > (=> = ) a contraction

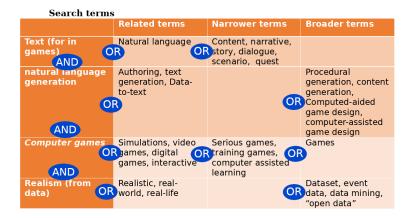
### Keyword table

#### Search terms

	Related terms	Narrower terms	Broader terms
Text (for in games)	Natural language	Content, narrative, story, dialogue, scenario, quest	
natural language generation	Authoring, text generation, Data- to-text		Procedural generation, content generation, Computed-aided game design, computer-assisted game design
Computer games	Simulations, video games, digital games, interactive	Serious games, training games, computer assisted learning	Games
Realism (from data)	Realistic, real- world, real-life		Dataset, event data, data mining, "open data"

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## Search query with AND and OR



### Search query with AND and OR

Query in conjunctive normal form!

$$\bigwedge_{i=0}^{n} \big(\bigvee_{j=0}^{m} \mathsf{keyword}_{i,j}\big)$$

Example:

```
"natural language generation"
AND
"computer games" OR "video games" OR "serious games"
AND
"open data" OR "event data"
```

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## Search log

Date	ID	Database	Search query	Number of hits	Remarks
14/6	1	Scopus	"natural language generation" AND "computer games"	2	Only 2 results. Maybe "computer games" is too narrow
14/6	2	Scopus	"natural language generation" AND "computer game" OR "digital games" OR "video game"	5	Still not many hits.
14/6	3	Scopus	"natural language generation" AND game	37	Some of the publications are about NLG for sports games.
14/6	4	Scopus	"natural language generation" OR "text generation" AND "computer game" OR "digital games" OR "video game"	7	Slightly better but still not enough hits. And my starting paper is not included in the results.
14/6	5	Scopus	generation AND "computer game" OR "digital games" OR "video game"	1352	Great! But this also includes procedural content generation for things other than text.
14/6	6	Scopus	generation AND "computer game" OR "digital games" OR "video game"		Problem: "generation" also leads to generation as a noun.

### Example: too narrow

	ID	Database	Search query	Number of hits	Remarks
14/6	1	Scopus	"natural language generation" AND "computer games"	2	Only 2 results. Maybe "computer games" is too narrow
14/6	2	Scopus	"natural language generation" AND "computer game" OR "digital games" OR "video game"	5	Still not many hits.
14/6	3	Scopus	"natural language generation" AND game	37	Some of the publications are about NLG for sports games.
14/6	4	Scopus	"natural language generation" OR "text generation" AND "computer game" OR "digital games" OR "video game"	7	Slightly better but still not enough hits. And my starting paper is not included in the results.
14/6	5	Scopus	generation AND "computer game" OR "digital games" OR "video game"	1352	Great! But this also includes procedural content generation for things other than text.
14/6	6	Scopus	generation AND "computer game" OR "digital games" OR "video game"		Problem: "generation" also leads to generation as a noun.

### Example: too broad

Date		Database	Search query	Number of hits	Remarks
14/6	1	Scopus	"natural language generation" AND "computer games"	2	Only 2 results. Maybe "computer games" is too narrow
14/6	2	Scopus	"natural language generation" AND "computer game" OR "digital games" OR "video game"	5	Still not many hits.
14/6	3	Scopus	"natural language generation" AND game	37	Some of the publications are about NLG for sports games.
14/6	4	Scopus	"natural language generation" OR "text generation" AND "computer game" OR "digital games" OR "video game"	7	Slightly better but still not enough hits. And my starting paper is not included in the results.
14/6	5	Scopus	generation AND "computer game" OR "digital games" OR "video game"	1352	Great! But this also includes procedural content generation for things other than text.
14/6	6	Scopus	generation AND "computer game" OR "digital games" OR "video game"		Problem: "generation" also leads to generation as a noun.

### Export results to CSV

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### Post-processing with Scopus CSV

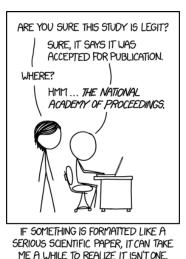
Comment	Authors	Title	Year
	Scott D.R.	The multilingual generation game: Authoring fluent texts in unfamiliar languages	1999
Too old		Autonomous avatars? From users to agents and back	2001
		Automatic commentary system based on multiple viewpoints with different amount of information	2004
		High-quality speech translation in the flight domain	2006
		Emotionally driven natural language generation for personality rich characters in	2007
Template based authoring aids. Might be useful.		interactive games	
Curious to see how this works. Might show how interactive fiction has developed over the years. Too bad it's from 2007.	Szilas N., Barles J., Kavakli M.	An implementation of real-time 3D interactive drama	2007
Older paper that shows clear links with NLG community.	Strong C.R., Mateas M.	Talking with NPCS: Towards dynamic generation of discourse structures	2008
Useable for NPC dialogue. Sounds useful.		ERIC: A generic rule-based framework for an affective embodied commentary agent	2008
Combination of templating and simple-NLG.	S., Keshtkar F.	Novice-friendly natural language generation template authoring environment	2009
About NLG for instruction giving. Part of GIVE challenge. Is 2009 too old?	Boer Rookhuiszen R., Theune M.	Playful vs. serious instruction giving in a 3D game environment	2009
What's the difference between this paper and the other paper from Caropreso?	Caropreso M.F., Inkpen D., Khan S., Keshtkar F.	Automatic generation of narrative content for digital games	2009
Useful for generating dialogue and advice from NPCs.	Van Deemter K.	What game theory can do for NLG: The case of vague language	2009
Paper by my supervisor.	Rookhuiszen R.B., Theune M.	Generating instructions in a 3D game environment: Efficiency or entertainment?	2009
	Kelly C., Copestake A., Karamanis N.	Investigating content selection for language generation using machine learning	2009
Another paper by Klabunde that uses formal modeling.	Klabunde R., Komrumpf A.	User-tailored document planning - A game-theoretic approach	2010
	Benotti L., Bertoa N.	From game tutorials to game partners using natural language generation techniques	2011
	D.L.	DEXTOR: Reduced effort authoring for template-based natural language generation	2011
Short version of another paper by Benotti.	Benotti L., Bertoa N.	Content determination through planning for flexible game tutorials	2011
I hope this is based on a automatically extracted corpus.	Walker M.A., Grant R., Sawyer J., Lin G.I., Wardrip-Fruin N., Buell M.	Perceived or not perceived: Film character models for expressive NLG	2011

### Recap

1. Don't use GoogleScholar unless you know exactly what you are looking for

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- 2. Scopus is your friend
- 3. Search systematically with keywords and a searchlog



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source: https://xkcd.com/1847/

### References

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 Some of these slides were inspired by the course 'Scientific literature' from TGS/UTwente. Some examples by Petri de Willigen and Hanneke Becht.