



# Building Faculty Relationships through Innovative Bibliometric Services



**POLYTECHNIQUE  
MONTREAL**

TECHNOLOGICAL  
UNIVERSITY

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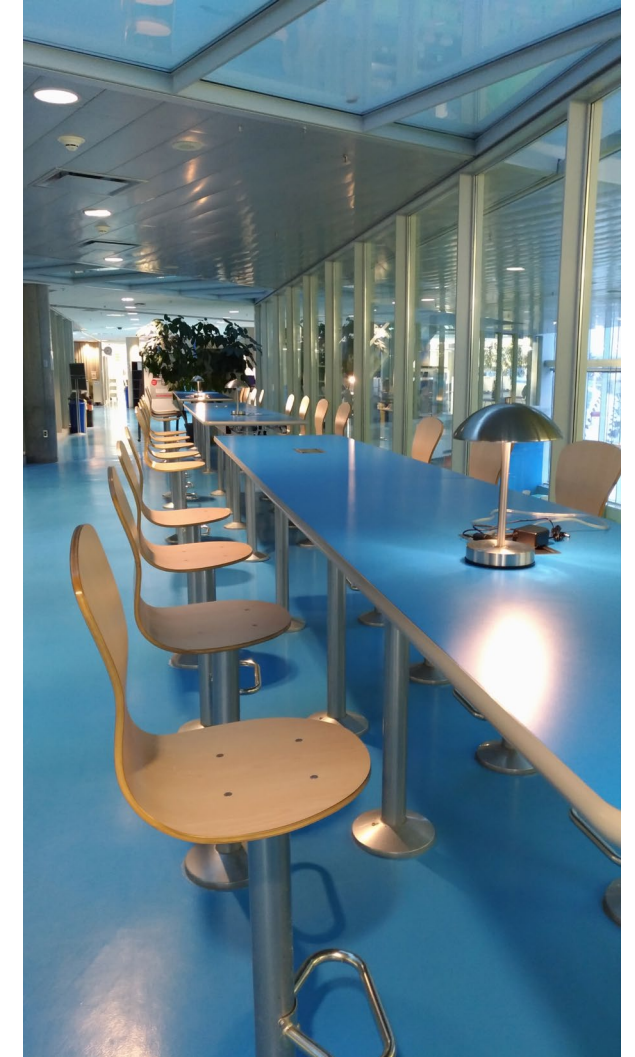
## Polytechnique Montréal and Bibliometric Services

Polytechnique Montréal is an **engineering university** affiliated to Université de Montréal.

- 284 professors
- 7 departments specializing in various engineering fields

Variety of bibliometric services, on demand.

- Two reference librarians (us!) performing bibliometric analyses
- Main database used: Web of Science
- No subscription to InCites or SciVal
- Compendex sometimes used (now contains some affiliations info from Scopus)



**We work in a very serious institution, but for this presentation...**

We needed to anonymize everything that we present today. In order for this to be a little more lively, we present to you this work we did for the department of...



**Fun Engineering!**



We might also be talking about their great research in various themes of this fun imaginary world!

## Creating Informal Research Teams

The beginning of an interesting "bibliometrical" relationship with a department

First request: Produce a mapping of the research themes of the department of Fun Engineering, from an objective outsider's point of view

- To guide reflections about strategic development regarding professors' recruitment
- To help create small informal research teams
- To strengthen collaborations inside the department.

**Important:** This was not an evaluation or a ranking, no comparisons.

Each professor's publications themes were to be analyzed (e.g., Prof. A publishes 60% of his articles in rainbow engineering and 40% in dragon engineering.)

**Challenge:** Identify and choose the main research subjects to group professors.

# Creating Informal Research Teams

## Steps:

1. In Web of Science, search for all publications written by the Fun Engineering department.
2. Keep the Web of Science categories with most publications as the main themes, then add other categories related to the main ones.
3. Check how many publications from each professor are in each theme.
4. Determine in which categories each professor publishes the most and in which proportions.

# Creating Informal Research Teams

Web of Science									
2009-2019 Publications									
	Rainbows	Magical animals	Popcorn	Castle	Charms	Magical people	Fun		
Prof A	15%	40%	0%	5%	3%	35%	3%	100%	
Prof B	0%	25%	0%	0%	25%	0%	50%	100%	
Prof C	82%	14%	0%	2%	1%	0%	2%	100%	
Prof D	2%	17%	11%	45%	0%	5%	22%	100%	
Prof E	0%	32%	0%	42%	0%	2%	25%	100%	
Prof F	0%	7%	0%	0%	0%	0%	93%	100%	
Prof G	0%	0%	0%	0%	0%	0%	100%	100%	
Prof H	0%	0%	0%	0%	59%	0%	41%	100%	
Prof I	1%	38%	3%	21%	0%	6%	32%	100%	
Prof J	0%	0%	65%	0%	0%	0%	35%	100%	
Prof K	0%	0%	37%	11%	5%	0%	47%	100%	
Prof L	0%	43%	7%	7%	29%	0%	14%	100%	
Prof M	0%	0%	0%	0%	44%	0%	56%	100%	
Prof N	100%	0%	0%	0%	0%	0%	0%	100%	
Prof O	0%	0%	0%	0%	80%	0%	20%	100%	
Prof P	0%	15%	0%	0%	0%	0%	85%	100%	
Prof Q	0%	57%	0%	0%	0%	0%	43%	100%	
Prof R	3%	19%	0%	9%	19%	9%	41%	100%	
Prof S	4%	0%	40%	4%	16%	0%	36%	100%	
Prof T	0%	0%	0%	50%	0%	0%	50%	100%	
Prof U	0%	5%	5%	0%	90%	0%	0%	100%	
Prof V	0%	33%	0%	33%	33%	0%	0%	100%	
Prof W	0%	0%	0%	0%	62%	0%	38%	100%	
Prof X	0%	0%	57%	9%	22%	9%	4%	100%	
Prof Y	3%	5%	21%	5%	3%	3%	62%	100%	
Prof Z	0%	18%	0%	0%	27%	9%	45%	100%	

## With colour filters: possible teams

	Rainbows	Magical animals	Popcorn
Prof A	15%	40%	
Prof E	0%	32%	
Prof I	1%	38%	
Prof L	0%	43%	
Prof Q	0%	57%	
Prof R	3%	19%	

	Rainbows	Magical animals	Popcorn	Castle	Charms
Prof H	0%	0%	0%	0%	59%
Prof L	0%	43%	7%	7%	29%
Prof M	0%	0%	0%	0%	44%
Prof O	0%	0%	0%	0%	80%
Prof R	3%	19%	0%	9%	19%
Prof U	0%	5%	5%	0%	90%
Prof W	0%	0%	0%	0%	62%
Prof X	0%	0%	57%	9%	22%
Prof Z	0%	18%	0%	0%	27%

### Notes:

- There are **only percentages** to avoid absolute output comparisons.
- A list of the Web of Science categories for each theme was provided. For instance, the theme Magical animals included dragons, unicorns, and centaurs!

## Creating Informal Research Teams

Problem: Some categories in Web of Science are too broad and do not give enough information.

Solution: Using Compendex that has a more granular classification.

Difficulty: Harder to search in Compendex by affiliation and department.

Next steps:

5. Search the publications for each professor in Compendex.
6. Establish new group categories with Compendex classification indexes related to the Fun Engineering department.
7. Determine again in which categories each professor publishes the most and in which proportions.

# Creating Informal Research Teams

Compendex has more specific classifications in engineering so there are more categories and a different portrait.

**Compendex**  
**Publications de 2009-2019**

	Rainbow	Dragons	Unicorns	Popcorn	Candies	Castles	Enchantment	Charms	Cakes	Pies	Fairies	Leprechaun	Centaurs	Wands	Chocolate	Joy	
Prof A	2%	18%	7%	1%	32%	10%	3%	24%	0%	1%	1%	5%	2%	0%	0%	5%	100%
Prof B	56%	0%	0%	0%	0%	0%	0%	16%	19%	0%	0%	0%	8%	0%	0%	0%	100%
Prof C	1%	61%	1%	5%	13%	1%	1%	2%	0%	0%	4%	5%	0%	0%	0%	5%	100%
Prof D	0%	0%	8%	1%	22%	7%	2%	7%	0%	1%	7%	25%	0%	13%	0%	6%	100%
Prof E	43%	0%	13%	4%	2%	1%	4%	0%	0%	1%	6%	9%	12%	0%	0%	6%	100%
Prof F	1%	0%	4%	0%	0%	0%	0%	0%	49%	1%	15%	2%	22%	0%	0%	6%	100%
Prof G	2%	0%	7%	4%	5%	1%	5%	1%	3%	28%	1%	0%	40%	0%	0%	3%	100%
Prof H	2%	4%	0%	0%	5%	46%	0%	7%	0%	0%	4%	11%	0%	1%	0%	19%	100%
Prof I	0%	0%	41%	31%	1%	0%	0%	1%	2%	2%	9%	3%	1%	4%	0%	6%	100%
Prof J	0%	1%	12%	3%	1%	0%	1%	1%	1%	2%	26%	3%	1%	41%	0%	8%	100%
Prof K	6%	0%	2%	2%	33%	1%	14%	7%	19%	2%	0%	1%	2%	2%	0%	9%	100%
Prof L	1%	0%	11%	11%	3%	1%	5%	4%	2%	32%	5%	0%	17%	0%	0%	8%	100%
Prof M	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Prof N	0%	57%	1%	2%	21%	2%	4%	1%	0%	0%	2%	0%	0%	0%	0%	10%	100%
Prof O	5%	1%	2%	4%	14%	2%	0%	1%	42%	3%	4%	2%	7%	0%	0%	12%	100%
Prof P	4%	12%	0%	0%	0%	33%	0%	0%	0%	0%	0%	6%	0%	0%	0%	45%	100%
Prof Q	5%	17%	4%	4%	15%	2%	1%	1%	31%	4%	1%	2%	1%	0%	0%	10%	100%
Prof R	8%	2%	20%	4%	0%	8%	12%	6%	13%	0%	6%	0%	4%	7%	0%	9%	100%
Prof S	2%	7%	15%	4%	18%	0%	0%	18%	0%	0%	6%	10%	12%	0%	0%	8%	100%
Prof T	2%	2%	7%	1%	21%	1%	1%	6%	0%	2%	0%	0%	1%	2%	28%	26%	100%
Prof U	28%	0%	5%	6%	7%	4%	22%	5%	9%	0%	0%	3%	0%	0%	0%	11%	100%
Prof V	28%	0%	5%	6%	7%	4%	22%	5%	9%	0%	0%	3%	0%	0%	0%	11%	100%
Prof W	3%	1%	46%	0%	0%	0%	3%	4%	7%	9%	12%	0%	0%	4%	0%	9%	100%
Prof X	11%	0%	1%	29%	7%	0%	5%	2%	14%	1%	3%	5%	3%	1%	0%	18%	100%
Prof Y	46%	1%	3%	2%	18%	2%	2%	0%	12%	3%	1%	1%	0%	0%	0%	11%	100%
Prof Z	3%	4%	6%	0%	15%	0%	10%	1%	22%	4%	1%	0%	0%	0%	0%	35%	100%



## Creating Informal Research Teams

The results were presented at a departmental assembly.

Based on this data, each professor could:

- Have a portrait of how their own publications are categorized in the databases.

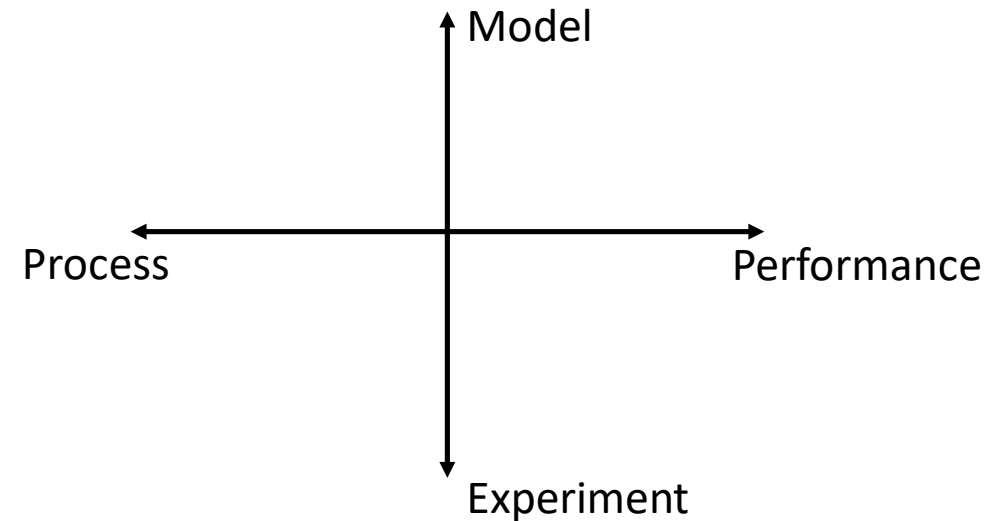
And all the professors could:

- Develop new collaborations amongst themselves.
- Identify gaps in research subjects in order to help target researchers for hiring, at a time where Polytechnique plans to hire a lot of new professors.

## Positioning Competing Groups

Second request: to position on a graph the articles of competing research groups

- To feed reflections on recruitment strategy
- What we provided in the end: list of articles, links and abstracts from competing labs in a format from which the articles could be classified and put in the graph
- This work was not entirely bibliometrical, but it led to one happy patron!



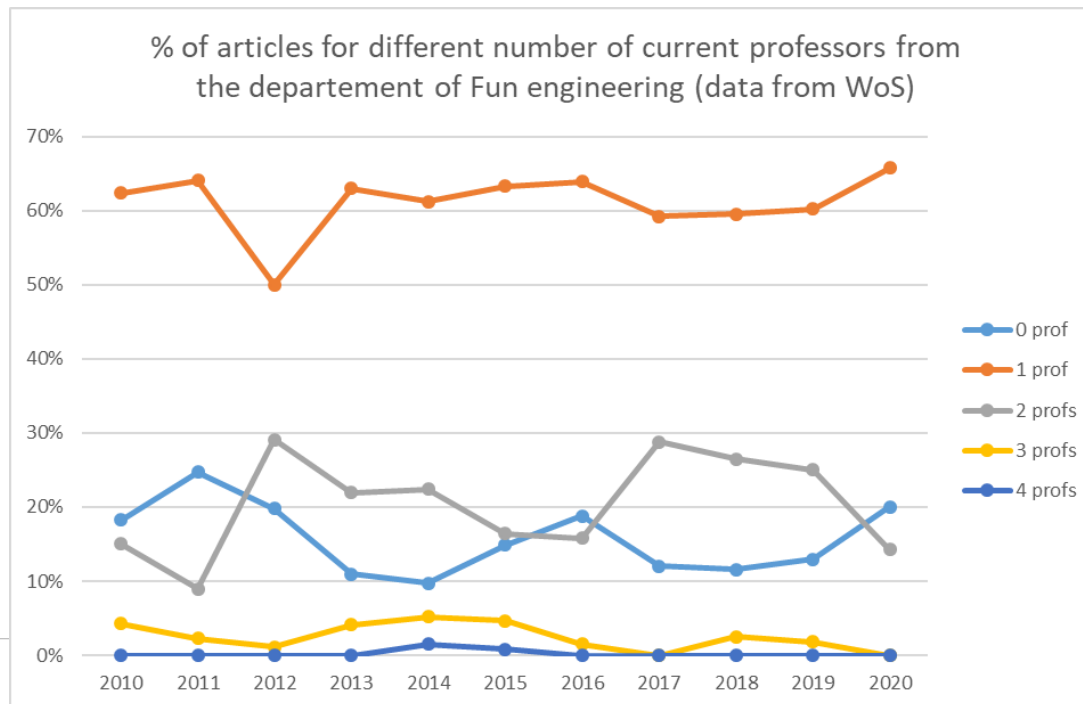
# Collaboration

Third request: Do the current professors in Fun Engineering collaborate together?

Our first step:

- Export the department's publications from WoS to Excel.
- Match the names of current professors in the authors list to find how many of the current professors are authors of each article.

Results:



Which led to more inquiring about their collaboration:

- Number of authors per article?
- With other departments?
- With other institutions?
- National or international level?

## Collaboration

With other departments and other professors from Polytechnique Montréal

	Smooth Engineering	Cool Computing	Fun Engineering	Engineering Games	Winter Technology	Amazing Engineering	Mutant Systems
Smooth Engineering	532	3	40	51	2	36	4
Cool Computing	3	312	53	1	44	42	13
Fun Engineering	40	53	399	67	48	37	9
Engineering Games	51	1	67	170	42	0	3
Winter Technology	2	44	48	42	294	13	3
Amazing Engineering	36	42	37	0	13	370	124
Mutant Systems	4	13	9	3	3	124	319

Breakdown of articles with a **single author** from the Fun Engineering department:

	Zero other prof from Poly	One other prof from Poly	Two other profs from Poly	Three other profs from Poly	Total
Total	610	84	11	4	709
2010	50	6	2		58
2011	50	5	2		57
2012	39	4			43
2013	39	6		1	46
2014	69	10	1	2	82
2015	66	12	2	1	81
2016	74	11			85
2017	59	14	1		74
2018	62	9	1		72
2019	61	2	2		65
2020	41	5			46

## Collaboration

Global overview of the Fun Engineering department collaborations

- Detailed collaboration information **for all articles** from the department:

WoS Unique ID	Publication year	# of authors	Collaboration between current Fun profs?	# of current Fun profs	Collaboration with profs from other Poly departments?	# current profs from other departments	International collaboration?	# institutions from Canada (except Poly)
WOS:000565...	2020	2	No	0	No	0	No	2
WOS:000562...	2020	4	Yes	2	No	0	Yes	2
WOS:000546...	2020	7	No	1	Yes	2	Yes	0

- From this table, it is possible to create pivot tables of any information they want.
- From the 60% with only 1 professor from the departement, down to about 20% with no other type of collaboration from the above table.
- Very granular and specific information.

## Benefits of Collaboration

- Many studies show that collaboration is beneficial:
  - « The positive correlation between scientific collaboration and citation count suggested the benefits of collaboration. » - [Shen et al, 2021](#)
- Clear view of current situation -> To stimulate intra-departmental collaboration and overall collaboration.
- Initial focus on internal collaboration, which led to looking at the collaboration with other institutions across Canada and internationally.
- Hopefully, the information provided was/will be used for recruiting new professors.

### Reference:

Shen, H., Xie, J., Li, J. et al. The correlation between scientific collaboration and citation count at the paper level: a meta-analysis. *Scientometrics* 126, 3443–3470 (2021). <https://doi.org/10.1007/s11192-021-03888-0>

## Shaping the Future

Participation in shaping the Fun Engineering department's future ... but also ideas about the future of bibliometric services at Polytechnique and how we want our expertise to be recognized.

- Projects in which bibliometrics was **not used for evaluation**.
- Importance of **objectivity**.
- Participation in understanding the **current state** of collaboration.
- Quantitative analysis and factual information **leading to discussions**.

Eventually, **becoming a partner** for different projects across Polytechnique with recognition that bibliometric analysis can **provide a new perspective** and be **beneficial in various ways**.

# THANK YOU!

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