Recommender system for mentor-mentee matching

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Definition

- Goal: match mentor and mentee considering their preferences and attributes

- Input data: DBLP Computer Science Bibliography dataset: list of authors and publications

Recommender System

- Based on the solution of the Netflix Price

M = Mentor
m = mentee
t = topics

	M1	M2	M3	M4
m1	1		3	2
m2	3	2	4	
m3		5		4
m4	1		0	2

=

	t1	t2
m1	1	2
m2	0	4
m3	2	0
m4	1	3

X

	M1	M2	M3	M4
T1	1	3	2	5
T2	3	3	4	1

random values

How to build the matrix?

- Mentee Matrix:
  - the mentee give a rate for each of the given topics
  - Better solution: the mentee answer questions and each question gives some point for each topics
- Mentor Matrix: use the Dblp files to extract the main topics among all the publication and determine the fields of each mentor

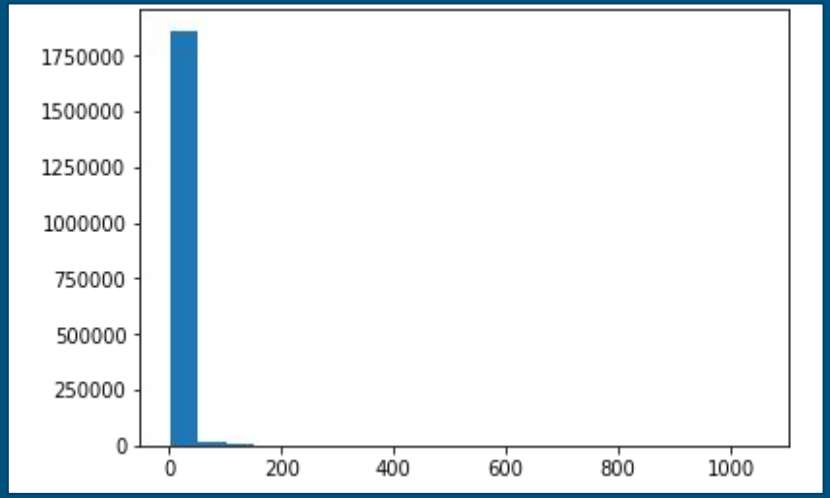
Dblp

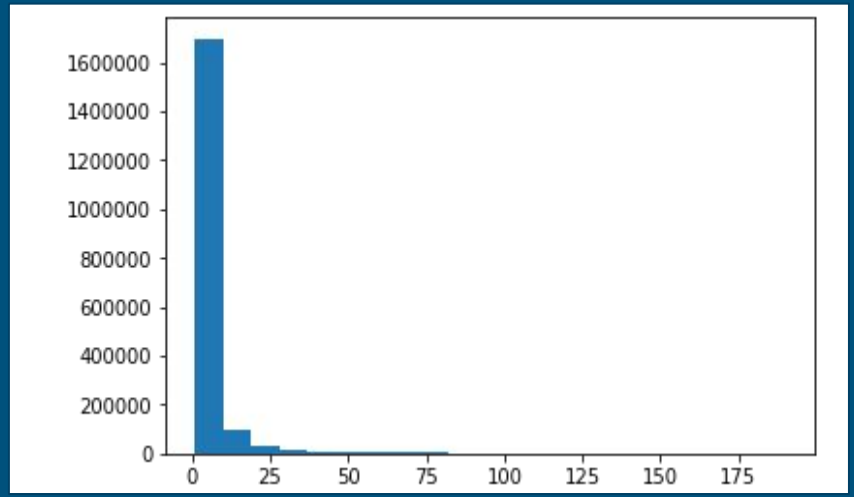
- Xml file of ~50 million of line (2GB)
- Contains article, book, master thesis,...
- Give the author of each publication
- Contains list of possible authors
- Homonymous are distinguished by concatenating an id
- There are disambiguation pages that contains publication of homonymous but they are not distinguished yet

Preprocessing

- Build a mapping author->title
- Group by author.
- Same author can have different name:
  - John Doe or J. Doe
  - Use the item about person that will map John Doe and J. Doe to the same author ID
- Remove the disambiguation pages

Remove Disambiguation





Authors with more than 1010: 2 (0.0001%)
Authors with more than 500: 149 (0.0079%)
Authors with more than 300: 698 (0.0369%)
Authors with more than 200: 2002 (0.1059%)
Authors with more than 190: 2249 (0.1189%)
Authors with more than 50: 26952 (1.4254%)

Topics Extraction

- Preprocessing:
  - Tokenization, lower case
  - Stopword filtering
  - stemming (prefered over lemmatizer):
    - stem(Algorithmic, algorithm) => (algorithm,algorithm)
    - lem(Algorithmic, algorithm) => (Algorithmic, algorithm)

Latent Dirichlet allocation (LDA)

- Each documents represent a mixtures of topics: a documents contains words that belong to different categories.
- The goal of LDA is to retrieve those sets of words used to create the documents by using probability
- Work better with long document that short document

We will use the implementation of Gensim for LDA and use the NLTK library for the preprocessing

LDA

Assumption:

- A author is characterized by a subset of topics => his publications are a mixture of topics => group the titles together to have one document per authors
- We set the number of topics to 20. To many topics will create intersection among them

Measuring the level of expertise of a mentor

- 2 solutions:
  - LDA output a score of the document (titles concatenated) for each author
  - LDA output a score for each titles for each author and then add all the score
    - add is better than average in that case
    - If a mentor wrote a lot about one or 2 topics, using the second technique it will give him a lot of credits in that field
  - => We use the second one because of the second comment

- Scale all the score from 0 to 10. For each topics, the mentor with the highest score get 10, the worst 0 and then scale all the others

Recommendation method

Matrix multiplication: Mentee X Mentor = score matrix

Matching:

- Need to make some choice:
  - 1-1 mapping (1 mentee, 1 mentor)
  - N-1 mapping (N mentee, 1 mentor)
  - …
  - One pair with good score, the second with bad score
  - 2 pairs with average score
- Use a matching algorithm: Gale–Shapley algorithm for example
  - Each mentee ask his highest match, mentor answer maybe if alone or if the score of such mentee is better)

Evaluation of the system

First thing to do is to test edge case:

- Mentee only like one topics => mapped with the with the highest expertise in that topics
- Mentee without any preference should have a mentee with knowledge in many field