Efficient Literature Searches using Python

Blair Bilodeau

May 30, 2020

University of Toronto & Vector Institute

VECTOR INSTITUTE

CCÉS CSSC

Société statistique du Canada
Statistical Society of Canada

Workshop Goals

- Me trying to read all the new papers posted on arXiv

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- Discuss the goal of focused literature searches v.s. reading new updates.

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- Practice!

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- Avoid keeping track of all new papers – many will quickly become irrelevant to you.

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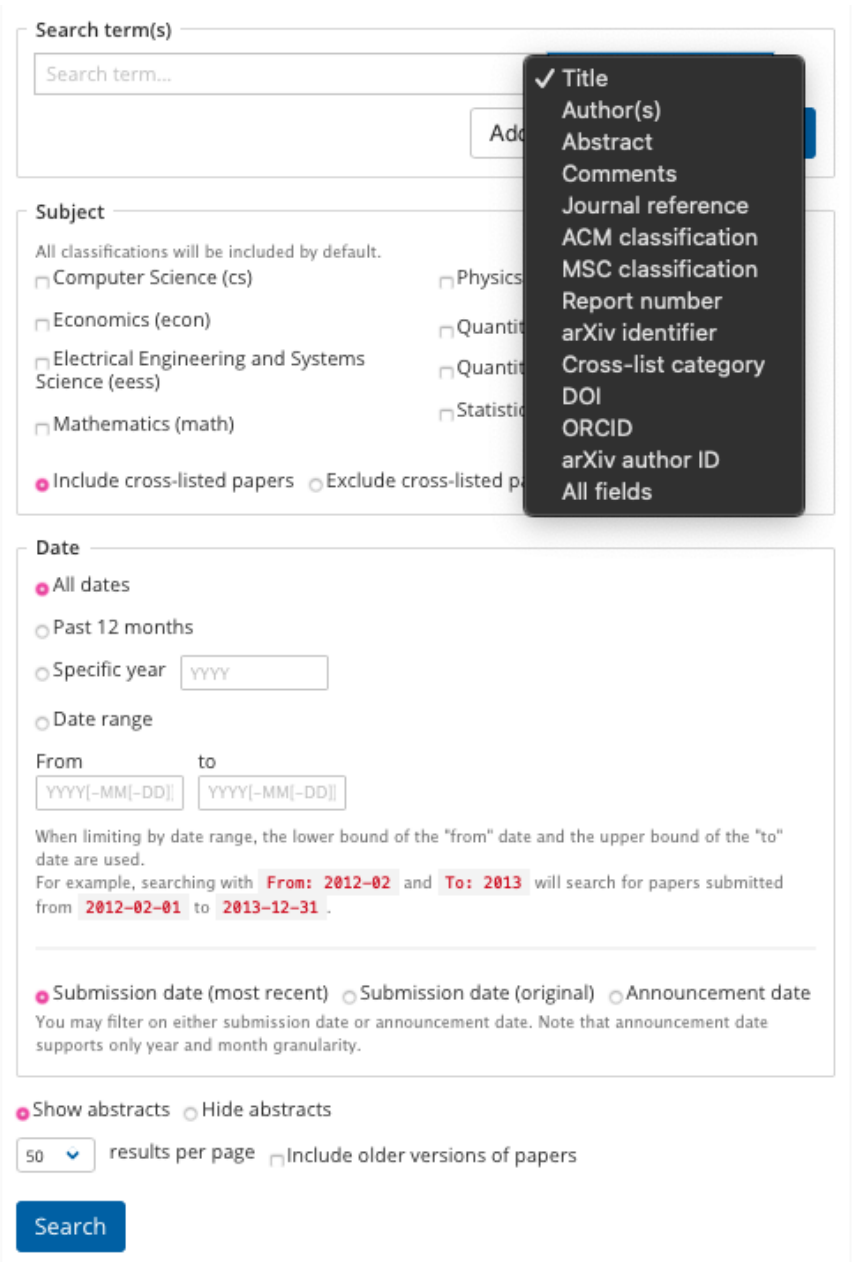
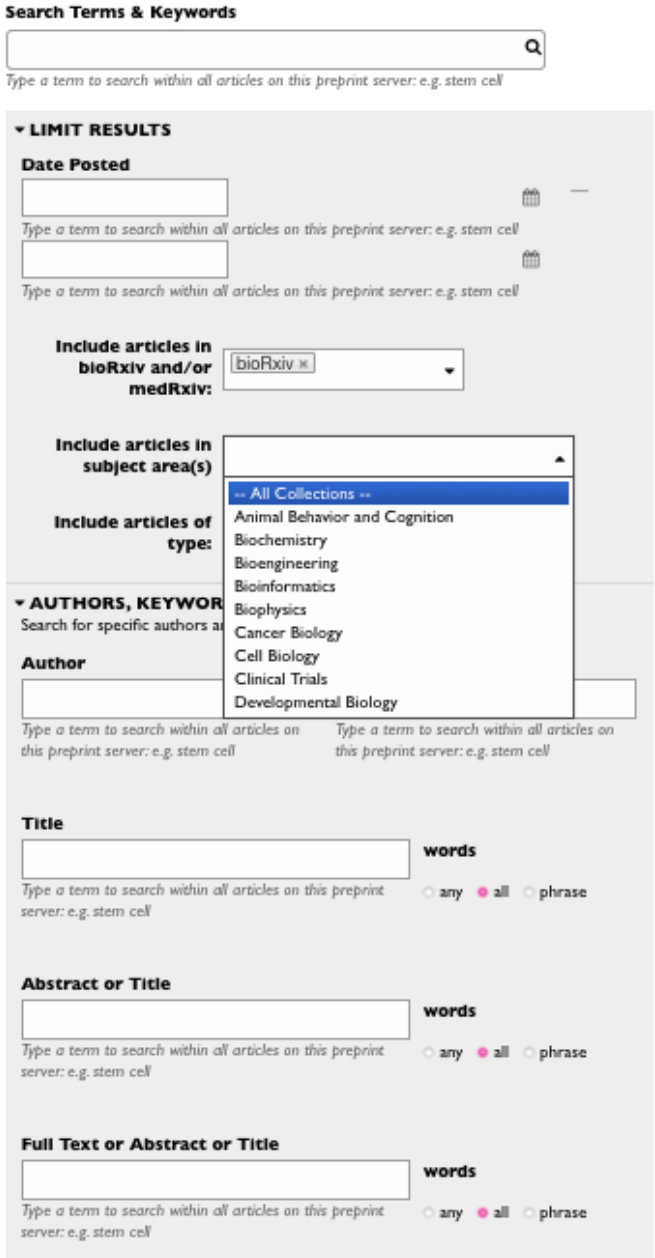
- Easy to get lost in a sea of papers

Preprint Server Search Options





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Biorxiv Options

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Biorxiv Options

- No known options to me, besides this project with a broken link.
  (`https://github.com/gokceneraslan/biorxiv-sanity-preserver`)

Customized Python Script

Why Python?

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Access the Scripts

`https://github.com/blairbilodeau/arxiv-biorxiv-search`

Downloading Python

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If you don't see the following, you have to install.

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blairbilodeau@Blairs-MacBook-Pro ~ % python3
Python 3.7.5 (v3.7.5:5c02a39a0b, Oct 14 2019, 18:49:57)
[Clang 6.0 (clang-600.0.57)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

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If you do see that, great! You're now in a python environment. Either spend some time in there (try typing `print('hello world!')`) or type `exit()` to leave. Take a break for the next slide.

Downloading Python

Option 1: Directly Download Python

Go to `https://www.python.org/downloads/` and download Python 3.
(The actual version doesn't matter as long as it's Python 3.x.x)

Option 2: Use Anaconda

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Common Troubleshooting Tips

- Make sure the default python path is python3 if you have both installed
- On Windows, add python to your path environment
    - Computer: Properties: Advanced System Settings: Environment Variables: Path: add ";C:\Python36" (or whichever version) to the end

Python Libraries

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Installing Libraries

We will use `pip`, which is automatically included with installations.

To install a library named `name`:
open up terminal or command prompt and type `pip install name`.
On windows, you may need to type something like
`C:\Python36\Scripts\pip install name` or
`C:\Python36\Scripts\pip.exe install name`

Python Libraries

For example, to install the package `pandas`,

```
[blairbilodeau@Blairs-MacBook-Pro ~ % pip install pandas
Collecting pandas
  Downloading pandas-1.0.3-cp37-cp37m-macosx_10_9_x86_64.whl (10.0 MB)
     |████████████████████████████████| 10.0 MB 8.5 MB/s
Requirement already satisfied: python-dateutil>=2.6.1 in /Library/Frameworks/Pyt
hon.framework/Versions/3.7/lib/python3.7/site-packages (from pandas) (2.8.0)
Requirement already satisfied: numpy>=1.13.3 in /Library/Frameworks/Python.frame
work/Versions/3.7/lib/python3.7/site-packages (from pandas) (1.17.2)
Requirement already satisfied: pytz>=2017.2 in /Library/Frameworks/Python.framew
ork/Versions/3.7/lib/python3.7/site-packages (from pandas) (2019.3)
Requirement already satisfied: six>=1.5 in /Library/Frameworks/Python.framework/
Versions/3.7/lib/python3.7/site-packages (from python-dateutil>=2.6.1->pandas) (
1.12.0)
Installing collected packages: pandas
Successfully installed pandas-1.0.3
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Requirement already satisfied: python-dateutil>=2.6.1 in /Library/Frameworks/Pyt
hon.framework/Versions/3.7/lib/python3.7/site-packages (from pandas) (2.8.0)
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Requirement already satisfied: pytz>=2017.2 in /Library/Frameworks/Python.framew
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Extra libraries needed for this script...

- `pandas` (data structure tools)
- `requests` (handling opening websites)
- `beautifulsoup4` (parsing HTML)

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- Repeat this for each subject;
- Display the titles and abstracts selected (with other info if desired), with optional exporting of information to `csv` file and downloading of full `pdfs`.

`arxiv_search_function.py` Parameters

```
#######
## Main function
## Parameters:
# sdate        - datetime object        - starting date of search period
# fdate        - datetime object        - end date of search period
# kwd_req      - list of str            - keywords that are required to be in the title or abstract
# kwd_exc      - list of str            - keywords that must not be in the title or abstract
# kwd_one      - list of lists of str   - keywords of which at least one must be included
# athr_req     - list of str            - authors which are required
# athr_exc     - list of str            - authors to exclude
# athr_one     - list of lists of str   - authors of which one must be included
# subjects     - list of str            - subject options are:
#                                           astro-ph, cond-mat, gr-qc, hep-ex, hep-lat, hep-ph, hep-th, math-ph, nlin, nucl-ex, nucl-th,
#                                           physics, quant-ph, math, cs, q-bio, q-fin, stat
# max_records  - int                    - maximum number of results to return
# max_time     - float                  - maximum amount of seconds to be spent searching
# cols         - list                   - arxiv fields to extract
#                                           column options are:
#                                           id, url, title, authors, date, abstract, categories
# export       - str                    - folder location to dump results list in csv
# exportfile   - str                    - by default the file name will be today's date, but you can override this with exportfile
# download     - str                    - folder location to dump returned pdfs into
#                                           (files named using year_lastname format)
```

- `kwd_req, kwd_exc, kwd_one` are the main parameters that allow for custom searching of papers
- All of these are optional – if you don't pass any arguments you will get the first 50 papers from `cs` for the month

`arxiv_search_function.py` **Demonstration**

I will now show an example of running through the code in a Jupyter notebook.

`biorxiv_search_function.py` Parameters

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# kwd          - list of str            - keywords to search for in title and abstract
# kwd_type     - 'all' or 'any'         - whether all keywords are required or just one of them
# athr         - list of max 2 str      - authors which are required
# subjects     - list of str            - subject options (only available if journal is biorxiv) are:
#                                         (Note capitalization and spacing are important for subject)
#                                           Animal Behaviour and Cognition, Biochemistry, Bioengineering, Bioinformatics,
#                                           Biophysics, Cancer Biology, Cell Biology, Clinical Trials, Developmental Biology,
#                                           Ecology, Epidemiology, Evolutionary Biology, Genetics, Genomics, Immunology,
#                                           Microbiology, Molecular Biology, Neuroscience, Paleontology, Pathology,
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#                                           Synthetic Biology, Systems Biology, Zoology
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# cols         - list                   - biorxiv fields to extract
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#                                           title, authors, date, url
# abstract     - bool                   - whether to extract the abstract of every paper returned by search
#                                           (potentially very time consuming)
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Timesaving Workflow

Running the Script

- Create a separate python file to call the functions with parameters you desire, and run that from command line every day.
- See the file `search_examples.py` in my Github.

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Automating the Script

- Mac: used `launchd`
  - Create a shell script to run the python file you want (`search_examples.sh`)
  - Place the file `file.name.plist` in /Library/LaunchDaemons with names changed (currently runs once every 24 hours, can be changed).
  - In command line, type `cd Library/LaunchDaemons` and then `sudo launchctl load file.name.plist`.
- Windows: use Task Scheduler
  - Create a batch file to run the python file you want.
  - Follow the instructions in Task Scheduler after clicking `Create Basic Task`.