SONAR - Social Network Analysis of Researchers

Adil Numan Çelik - Mehdi Saffar - Mehmet Umut Öksüz

Advised by: Suzan Üsküdarlı - H. Birkan Yılmaz

Boğaziçi University - Istanbul, Turkey

Problem Statement

To create a software that gathers information about published articles and their authors; provides a user-friendly interface to analyze and visualize relationships that exist between authors, articles and topics.

Motivation

- Providing a robust software to researchers who want to **extract valuable information** from published articles.
- Provide an easy-to-use, intuitive user-interface, **with no installation required**
- **Construct a network** from a list of articles provided by the user through 3rd-party APIs
- **Calculate SNA metrics** on different types of nodes and edges based on variable parameters
- **Visualize** this data as a graph where node and edge attributes have distinct colors

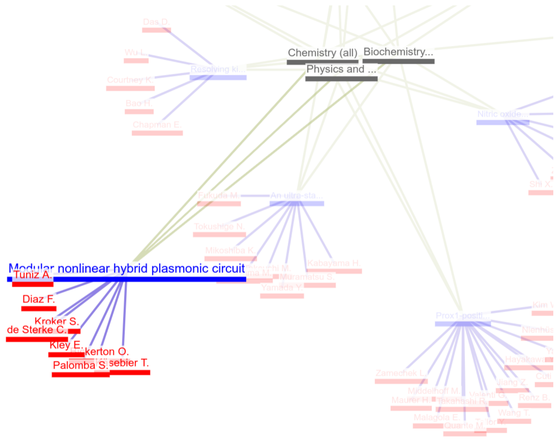

Fig. 1: Highlight nodes

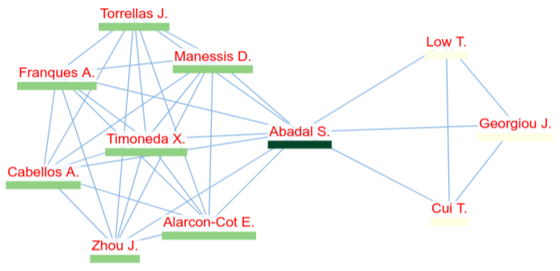

Fig. 2: Interesting bridge pattern

How it works

Users login to SONAR through `https://cmpe492-sonar-frontend.vercel.app`. They upload a DOI list of the articles they would like to analyze. Once the articles are processed, users can proceed to visualization. They can **configure which types of nodes and edges they would like to see** in their graph. In the visualization page, they can assign weights to SNA metrics depending on their goal. Once they are satisfied with the results, they can **export the graph as a JSON file**.

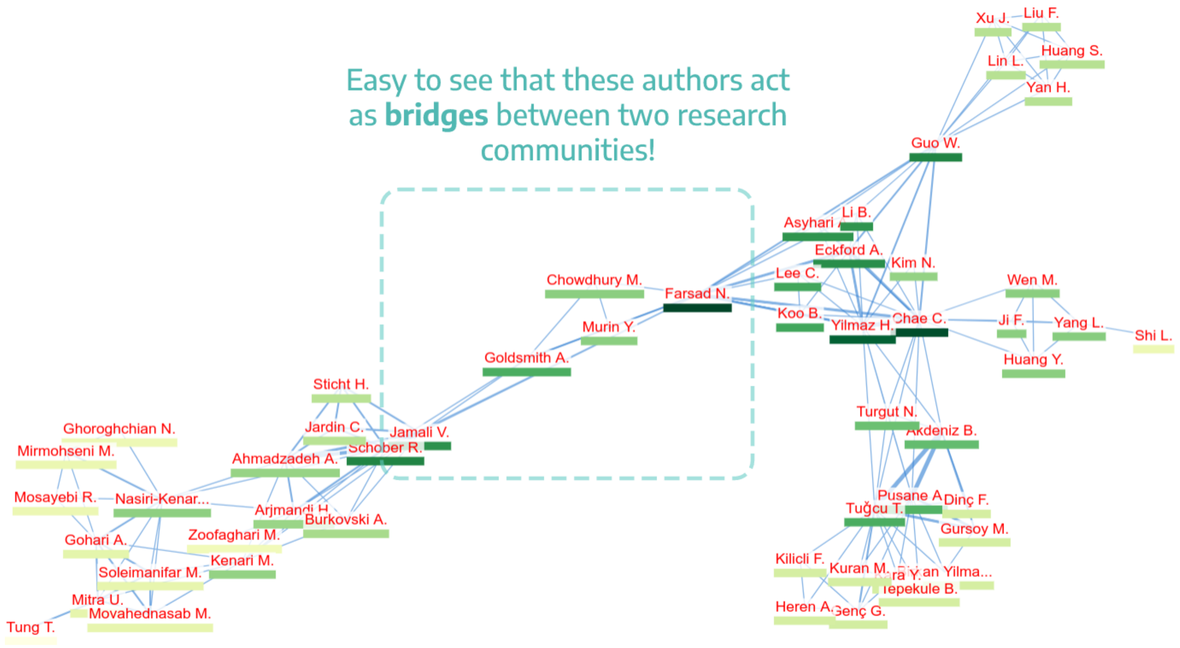

Fig. 3: Example of Co-authorship graph in nanonetworking

How system works:

- **Fetch the data** from 3rd party APIs
- **Process the data** in the backend to create the basic nodes and edges
- With the help of `WebAssembly`, `WebWorkers` and Python `NetworkX` library, create remaining edges and **calculate various SNA metrics**
- **Visualize the graph** in Javascript using `react-force-graph` library

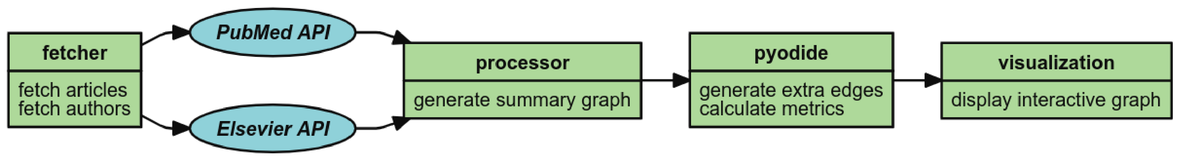

Fig. 4: Summarized data flow

Evaluation

As planned, we managed to create:

- An **easy to use** graphical user interface
- A robust visualization tool that calculates **social network analysis metrics**

What is missing:

- Statistical analysis tools
- Node and edge filtering on graph visualization

Future Work

Following functionalities can be added to SONAR to improve and extend its use on various aspects:

- Better graph visualization and processing performance
- More interactive user experience (user profiles and notifications)
- Persistent graph configuration
- More interaction modes (filtering, deleting nodes and edges, etc.)

Conclusion

SONAR helps users obtain **a powerful visual network analysis that they can configure in a short time**. With SONAR, it is easy to discover the most influential documents in a field and the most collaborative authors and much more data using social network analysis metrics.

References

[1] Elsevier. *Elsevier*. URL: `https://dev.elsevier.com/`.

[2] NetworkX. *NetworkX*. URL: `https://networkx.org`.

[3] PubMed. *PubMed*. URL: `https://pubmed.ncbi.nlm.nih.gov/`.

[4] Pyodide. *Pyodide*. URL: `https://pyodide.org/en/stable`.

Try it!

`cmpe492-sonar-frontend.vercel.app`