

BIOLOGICAL DISCOVERIES WITH SPACEGRAPH

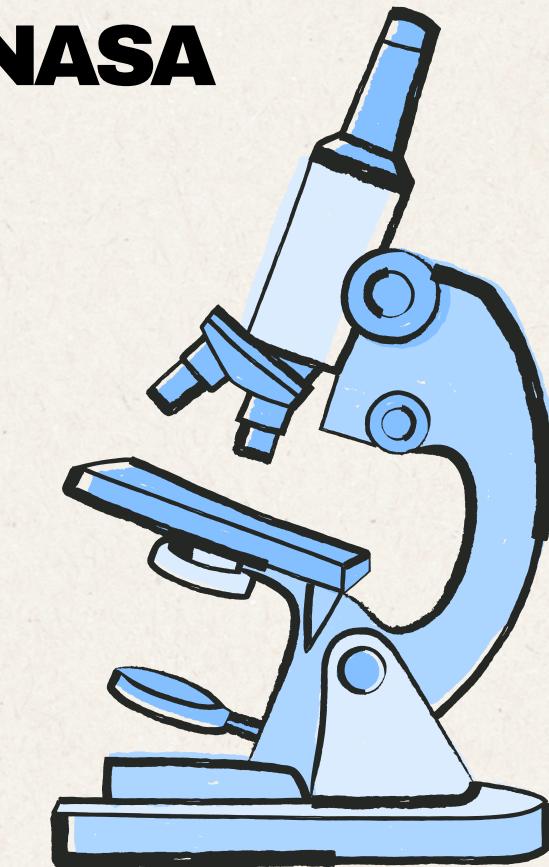


Finding better ways to access and find research provided by NASA

NAME OF PROJECT:
Space Graph

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PRESENTED TO:
NASA Space apps
challenge committee



The Problem: organizing NASA's vast space-bio data

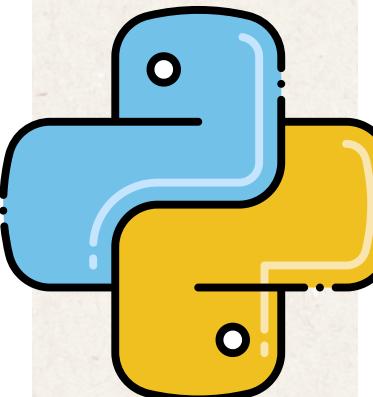
- There are too many publications across NASA's many data sites
 - It's hard to look through each site and publication to find the paper you need
 - For teens, biological terminology and data sites can be really complex and inaccessible
 - The current setup can discourage novices looking to upgrade their knowledge, or frustrate experienced professionals
 - All of this can lead to an avoidance of NASA's open source data all together



The Solution: Using SpaceGraph!

We used Python to:

- Create a search engine that can find studies based on keyword searches, making data more accessible
- Develop a graph of keyword-clusters based on search terms. This shows the relationship between different important terms found throughout studies and allows users to select studies belonging to those clusters
- A web application based on Streamlit to display the above in a user friendly manner



SpaceGraph would help:

Youth

People who want to learn more about publications in areas of interest without needing to navigate a complex dataset filled with hundreds of studies. It is also written in python, making it much easier to understand the code behind the dashboard.

Researchers & Professionals

Who need fast lookup across clusters of data using simple keyword searches and filters. Additionally, they can expand on the design to include their datasets of choice at the relationship between different keywords and publications.

Novices

Many people are discovering NASA's biological data for the first time, and this would help sort out all the overwhelming publications and information out there.

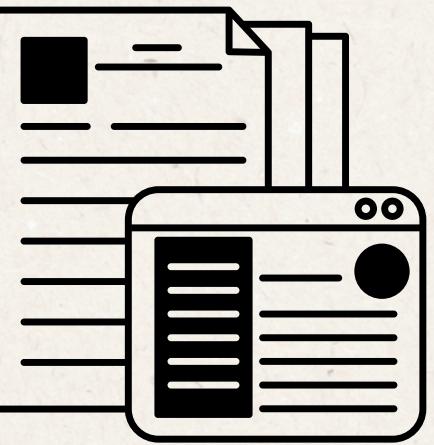
Key Elements of SpaceGraph



Search

Identifying important keywords based on not just titles, but the whole abstracts of 608 space biology publications.

The keyword search saves you the time and energy of finding related papers yourself!



Repository lookup

SpaceGraph gathers data from multiple datasets, using both API calls and CSV files through a convenient dashboard!

It can be expanded in the future to add more datasets.



Clustering

SpaceGraph creates clusters of keywords based on important terms across abstracts of all papers.



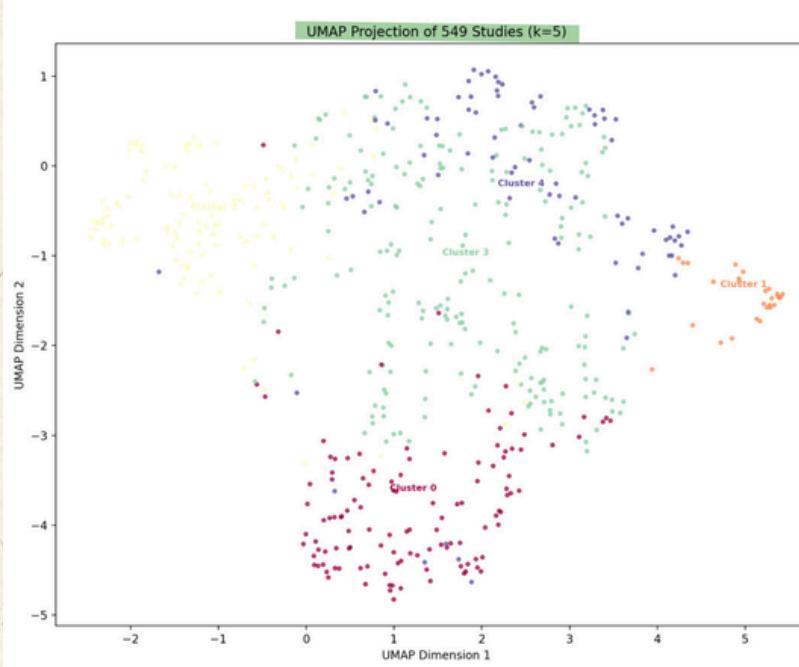
Expandable engine

The application handles CSV-listed publications as well as web based API calls. It has the flexibility to filter based on clusters of related keywords and can be expanded by experts.

Future improvements

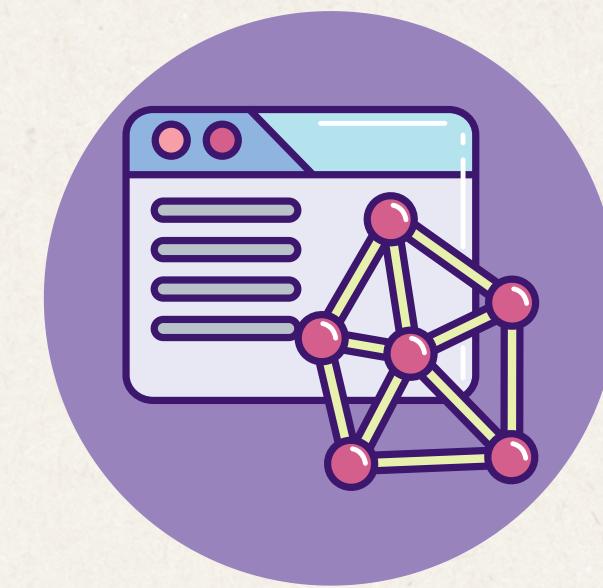
AI Summaries

To make it even easier for people to look into papers, we could implement an AI Summary to go through the paper and pick up important keywords. Additionally, it could present the problem, methodology and conclusion.



Interactive

Right now, there is only one interactive graph. To make the user interface more friendly, having multiple dynamic graphs can help users explore concepts and connections between topics in different and interesting ways.



Knowledge graph

We could portray the relationship between keywords, primary author names, and other attributes of a publication. This way, users can see patterns between authors, topics and published dates. A visual representation of this also helps present this relationship in a more comprehensive format.



Demo:

1

SpaceGraph: NASA Space Biology Study Explorer

Use SciBERT-powered semantic search and clustering to explore relevant space biology research.

Search Studies: e.g., radiation effects, bone loss, Mars

Filter by Cluster Theme:

Results (549 studies found)

- > <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4136787/>: Mice in Bion-M 1 space mission: training and selection
- > <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3630201/>: Microgravity induces pelvic bone loss through osteoclastic activity.

2

Search Studies:

Filter by Cluster Theme: Cluster 3: Spacef...

Results (79 studies found)

- > <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4136787/>: Mice in Bion-M 1 space mission: training and selection
- > <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11988870/>: Stem Cell Health and Tissue Regeneration in Microgravity

3

Search Studies:

Filter by Cluster Theme:

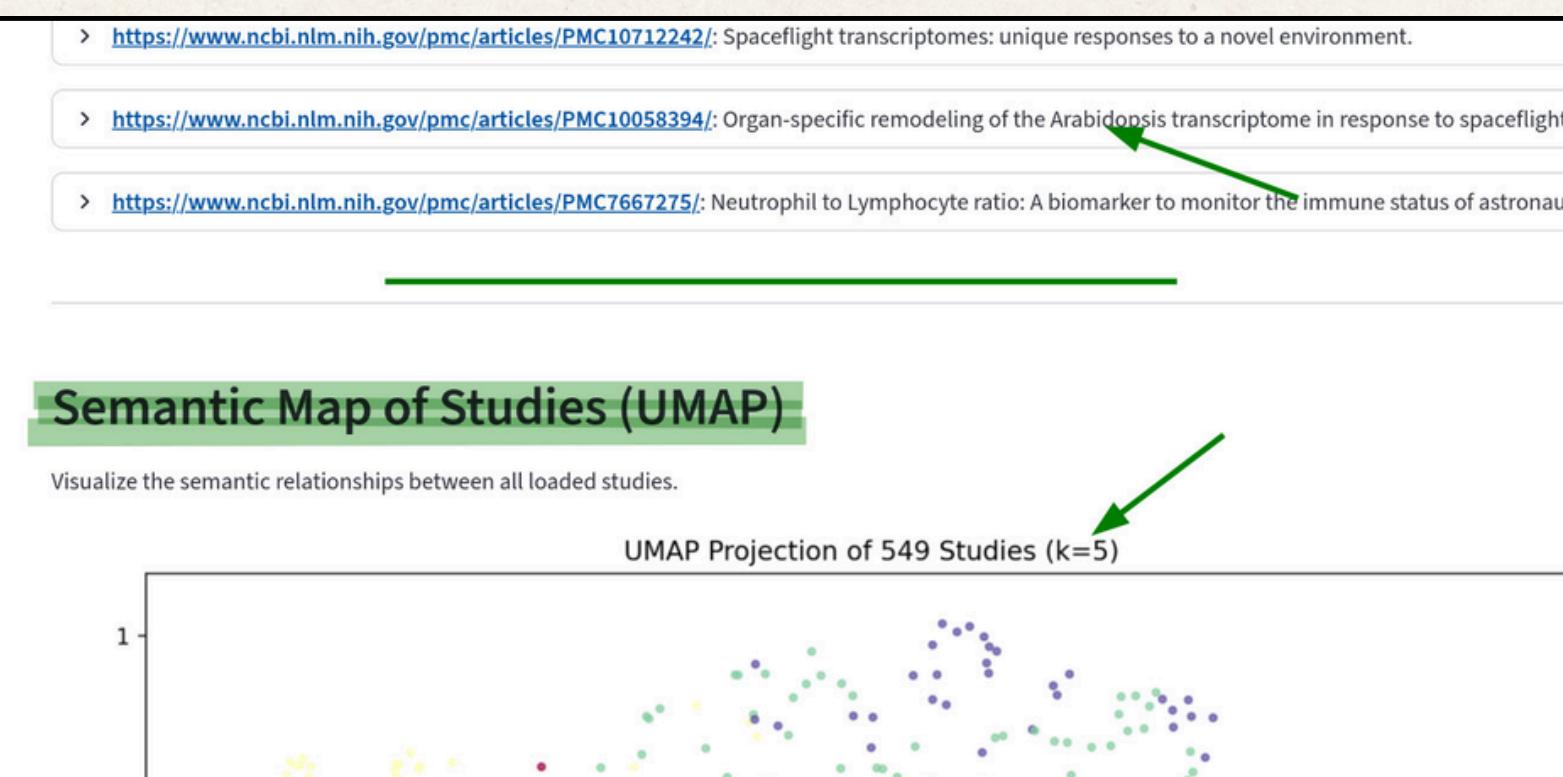
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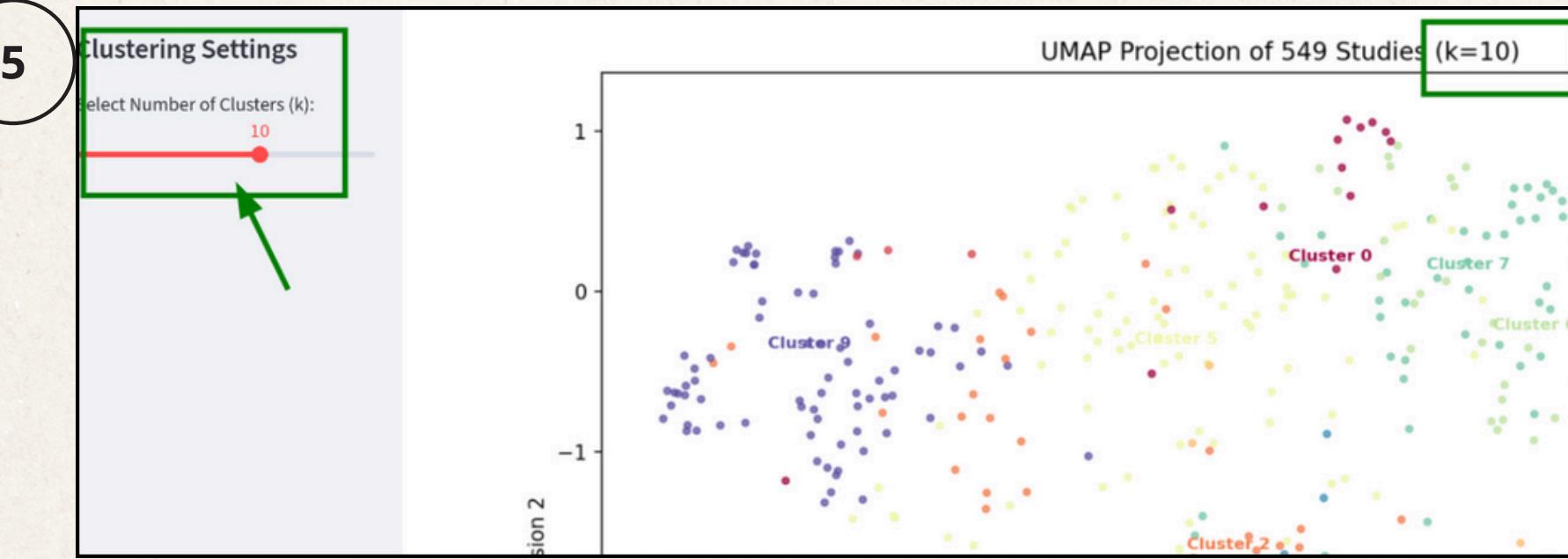
Filter by Cluster Theme:

- Cluster 0: Proteins, Protein, Cell
- Cluster 1: Space, Genome, Sequences
- Cluster 2: Bone, Mice, Spaceflight
- Cluster 3: Spaceflight, Space, Microgr...

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THANK YOU!

Visit the github page

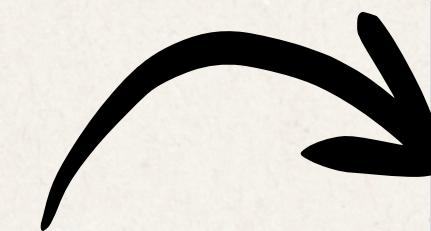
Github Repo

<https://github.com/ananya-kolluru/nasaspacesapps-2025>

NASA Dataset

https://github.com/jgalazka/SB_publications/tree/main

<https://science.nasa.gov/biological-physical/data/>



ananya-kolluru/nasaspacesapps-2025

Code for Space Biology Knowledge Engine



1 Contributor 0 Issues 0 Stars 0 Forks

ananya-kolluru/nasaspacesapps-2025: Code for Space Biology Knowledge Engine

Code for Space Biology Knowledge Engine. Contribute to ananya-kolluru/nasaspacesapps-2025 development by creating an account on GitHub.

