REPORT

#semanticClimate

Creating climate dictionary from IPCC WG1 Chapter3: Human effect on Climate System

Under the supervision of

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CONTENTS

Snapshots:

Introduction:

It's been years since people are aware of the climatic changes and one of the reasons behind them are none other than human activities. People of the United States decided to set up a global institution that would report about the climatic changes, the causes and its effects: The International Panel on Climate Change (IPCC). The IPCC reports are published every five years. #semanticClimate is a citizen science initiative where a group of young Indian students focused on making the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) semantic. Their goal is to enhance the accessibility and usability of the AR6 chapters by developing tools and community protocols that enable the data and findings to be more easily understood, searched, and used in various applications. Creating software tools for investigating literature on climatic changes and encouraging community involvement through activities like hackathons, datathons, data workshops, and panel discussions are the two main projects being worked on.

The objectives of #semanticClimate are:

- Converting the IPCC reports from PDF to HTML
- Extracting the terms from the reports and searching for their meaning and contextual significance
- Terms are then linked to Wikidata, wikipedia and AMI-dictionaries are created
- Designing various structures for navigation, search functionality and presentation

There are in total 7 IPCC reports with various different chapters focusing on the climate and its issues around the globe. The IPCC reports are as follows:

1. **WG1("Climate Change 2021: The Physical Science Basis")**: with 12 chapters
2. **WG2("Climate Change 2022: Impacts, Adaptation and Vulnerability"**): with 18 reports
3. **WG3(""Climate Change 2022: Mitigation of Climate Change"**): with 17 reports
4. **AR6 Synthesis Report (syr)**
5. **SR15-** special report on global warming of 1.5ºC
6. **SRCCL-** special report on climate change and land
7. **SROCC-**special Report on the Ocean and Cryosphere in a Changing Climate

As a part of **#semanticClimate**, my task was:

- To attend the daily meetings
- Explore and learn more about the toolkit developed by #semanticClimate
- To choose a chapter and make a climate dictionary out of it. Therefore, I chose the **IPCC/ar6/wg1/Chapter 3: Human Influence on the Climate System**

Summary of IPCC/ar6/wg1/Chapter 3: Human Influence on the Climate System

This chapter analyzes how human activities have affected the climate and how the climate models developed accurately stimulate the observed changes and variations. This chapter combines techniques for identifying and linking climate change, emphasizing its long-term and widespread effects. It evaluates the impact of humans on the atmosphere, cryosphere, seas, and biosphere, among other climatic components.

The Earth System Model Evaluation Tool (ESMValTool) and the NCAR Climate Variability Diagnostic Package (CVDP), which provide thorough and quality-controlled assessments of climate models, are two examples of sophisticated approaches for model evaluation used in this chapter.

***Influence on Atmosphere and Surface*:**

The Hadley and Walker circulations are part of the tropical troposphere, and the extent of the tropics is indicated by the downwelling branch of the Hadley cell in the subtropics.

***Influence on Cryosphere*:**

Since 1950, there has been a noticeable decline in the amount of snow cover in the spring in the Northern Hemisphere, which is most likely due to human activity.

***Influence on Ocean*:**

In order to understand the implications of human warming, including warming rates, sea level rise, and carbon uptake, accurate ocean simulation in climate models is essential. Important metrics for assessing climate models and tracking changes in ocean climate are temperature and heat content of the ocean.

***Influence on Biosphere*:**

Globally averaged land carbon sinks are accurately simulated by Earth system models, however there are notable regional differences. Though this is somewhat compensated by other causes, new research indicates that CO2 fertilization is the primary cause of the increasing amplitude of the atmospheric CO2 seasonal cycle.

Methods:

#semanticClimate Tools:

For achieving the above-mentioned goals, following tools are necessary:

- **amilib:** A library developed that makes it simpler for people to convert the PDF and improve their semantics
- **amiclimate**: A collection of tools designed especially for the analysis and synthesis of materials associated with climate change with external semantic databases**.**
- **docanalysis:** It is a Command Line Tool that operates text analysis of documents, including sectioning, NLP/text mining, and dictionary creation, by importing corpora (CProjects).
- **pygetpapers:** A tool that can retrieve scientific articles from open access repositories based on the queries made. [fig 2]

Git commands

The output file can be added in the github repository using following commands:

- Git status
- Git add (file name)
- Git commit -m “Add file name”
- Git push

The Summary.md file was added on the “smriti_test” branch in the markdown format using git commands.

The four git commands are used for uploading any files in the github repository. [Fig 8 a,b]: shows how the wordlist and dictionary was added through the command line.

Steps to create climate dictionary:

Step 1: The very first step for creating the dictionary was to clone the `amilib` repository on the system which was done through command line. We need to specify the location and then use the git command “git clone https://github.com/petermr/amilib.git”. [Fig 3]

Step 2: Now, the `amilib` repository will be successfully cloned in the given location. Then the next step is to create our own branch. The dictionary of the chapter selected will be created on our specific branch and not on the main branch. The branch name I created was **“smriti_test”.**

Step 3: From the chapter, words related to climate were picked up manually and a wordlist was created which was saved in the txt format. The name of the dictionary had to be saved related to the chapter’s name so it was saved as human_influence.txt. [Fig1]

Once this was done, now I run 2 commands on the command line for creating the html and xml dictionary. The following commands are used:

dictionary in xml format, the command is:

```
amilib DICT --words
C:\Users\asus\Desktop\Semantic\amilib\test\resources\wordlists\human_influence.txt --dict
C:\Users\asus\Desktop\Semantic\amilib\temp\words\human_influence_wikipedia.xml –
Wikipedia
```

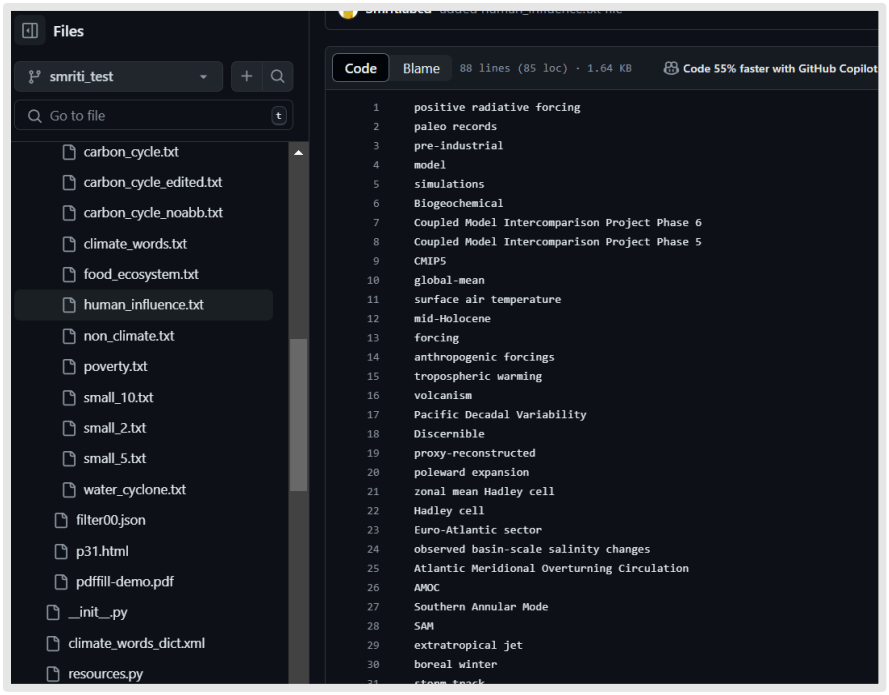
Dictionary in html format, the command is:

```
amilib DICT --words
C:\Users\asus\Desktop\Semantic\amilib\test\resources\wordlists\water_cycle.txt --dict
C:\Users\asus\Desktop\Semantic\amilib\temp\words\html\water_cycle_wikipedia.html –
wikipedia
```

LINKS for the Output:

- *Link to the summary of the chapter in Markdown:* *https://github.com/petermr/amilib/blob/smriti_test/Summary.md*
- *Link to the wordlist created from Chapter 3:* *https://github.com/petermr/amilib/blob/smriti_test/test/resources/wordlists/human_influence.txt*
- *Link to Dictionary in XML format:* *https://github.com/petermr/amilib/blob/smriti_test/temp/words/human_influence_wikipedia.xml*
- *Link to Dictionary in HTML:* *https://github.com/petermr/amilib/blob/smriti_test/temp/words/html/human_influence_wikipedia.html*

Snapshots:



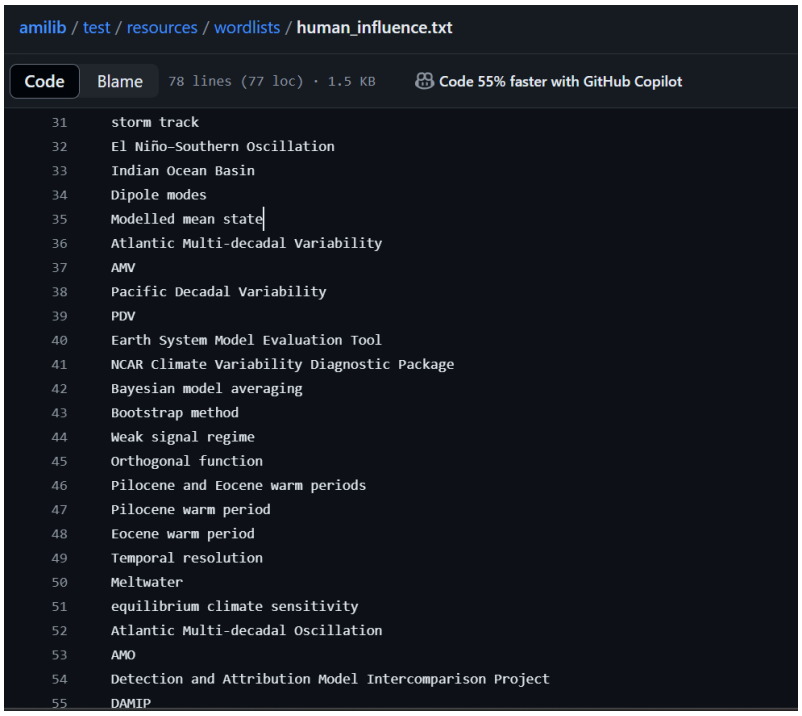


Fig 1. Wordlist created from chapter 3

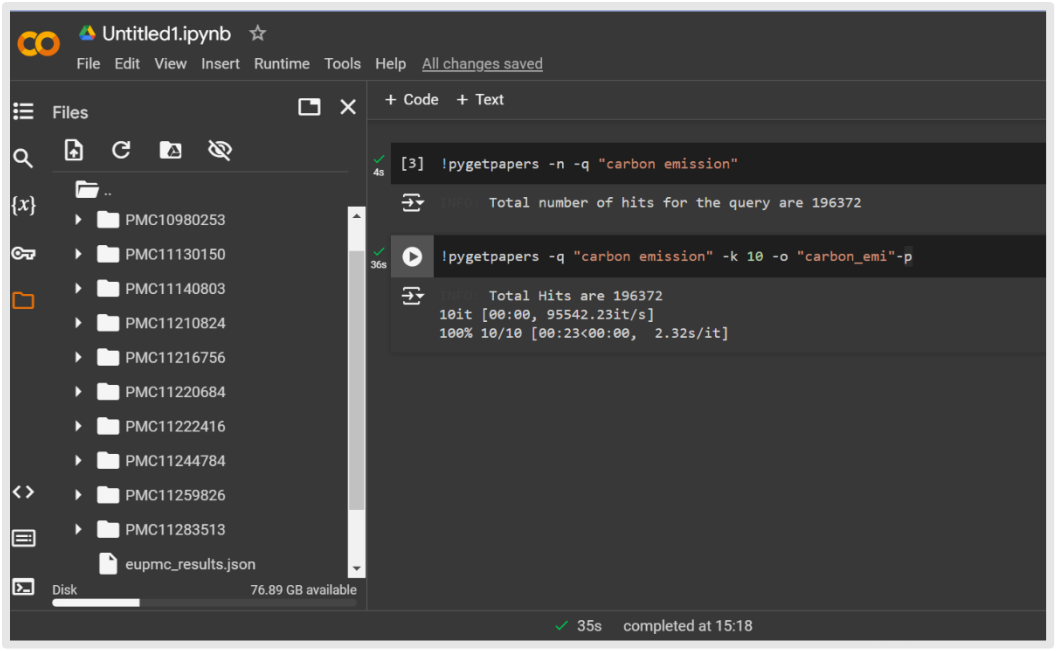


Fig2. Literature search with pygetpapers

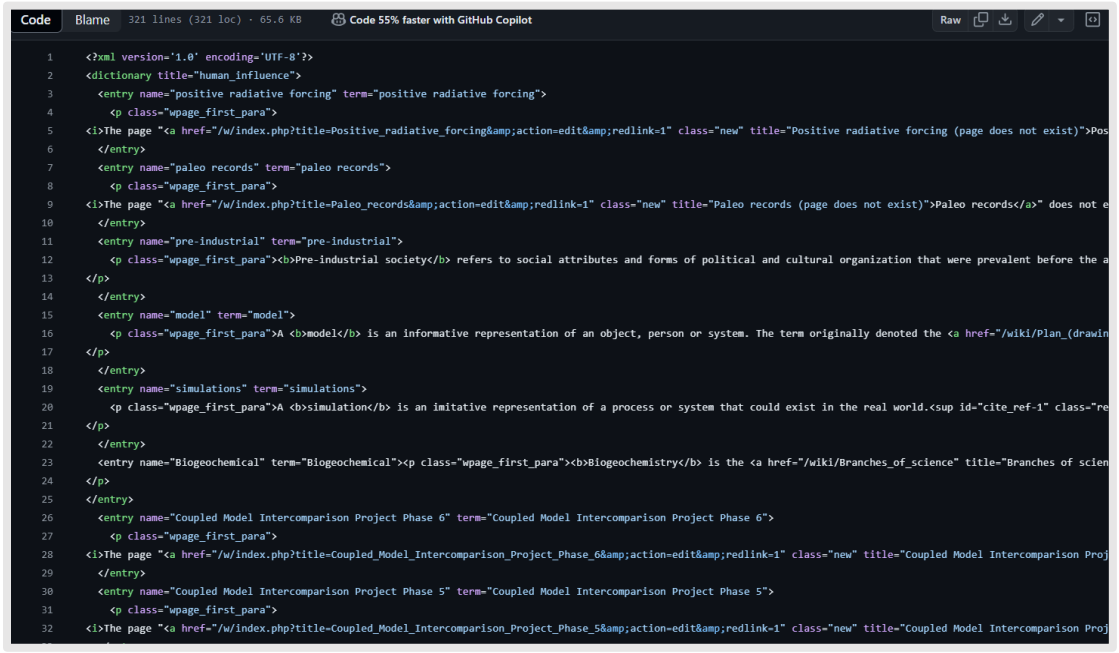
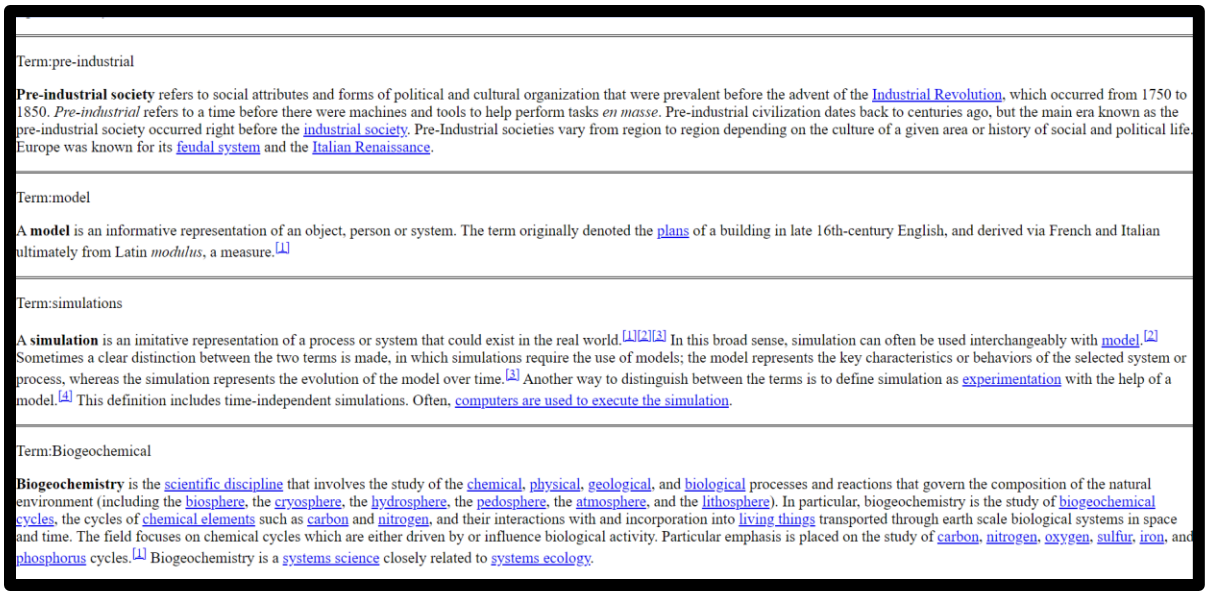


Fig3. Dictionary in xml format



Term:pre-industrial

Pre-industrial society refers to social attributes and forms of political and cultural organization that were prevalent before the advent of the Industrial Revolution, which occurred from 1750 to 1850. *Pre-industrial* refers to a time before there were machines and tools to help perform tasks *en masse*. Pre-industrial civilization dates back to centuries ago, but the main era known as the pre-industrial society occurred right before the industrial society. Pre-Industrial societies vary from region to region depending on the culture of a given area or history of social and political life. Europe was known for its feudal system and the Italian Renaissance.

Term:model

A **model** is an informative representation of an object, person or system. The term originally denoted the plans of a building in late 16th-century English, and derived via French and Italian ultimately from Latin *modulus*, a measure.[1]

Term:simulations

A **simulation** is an imitative representation of a process or system that could exist in the real world.[1][2][3] In this broad sense, simulation can often be used interchangeably with model.[2] Sometimes a clear distinction between the two terms is made, in which simulations require the use of models; the model represents the key characteristics or behaviors of the selected system or process, whereas the simulation represents the evolution of the model over time.[3] Another way to distinguish between the terms is to define simulation as experimentation with the help of a model.[4] This definition includes time-independent simulations. Often, computers are used to execute the simulation.

Term:Biogeochemical

Biogeochemistry is the scientific discipline that involves the study of the chemical, physical, geological, and biological processes and reactions that govern the composition of the natural environment (including the biosphere, the cryosphere, the hydrosphere, the pedosphere, the atmosphere, and the lithosphere). In particular, biogeochemistry is the study of biogeochemical cycles, the cycles of chemical elements such as carbon and nitrogen, and their interactions with and incorporation into living things transported through earth scale biological systems in space and time. The field focuses on chemical cycles which are either driven by or influence biological activity. Particular emphasis is placed on the study of carbon, nitrogen, oxygen, sulfur, iron, and phosphorus cycles.[1] Biogeochemistry is a systems science closely related to systems ecology.

Fig4. Dictionary in html format

Conclusion:

During my internship, I used Git on a large scale for performing all the tasks that we were supposed to do on a daily basis starting from cloning the repositories on our system to making my own branch. I actively took part in the daily sessions of debugging and testing and it was always a great session with Dr. Peter Murray-Rust, Dr Renu and all my fellow interns.

It was a great opportunity for me to be a part of #semanticClimate and know more about the world of semantic. Also, I am really thankful for being a part of the Annals of Library and Information Sciences (ALIS) Journal, which gave me much more idea about #semanticClimate. During my 12 weeks of internship, I got hands-on experience on Python on command-line as well as with github and git commands which is surely helping me in the upcoming future. It gave me the practical experience of version control and programming language as well.

Hence, I conclude that it was a wonderful 12 weeks of time and I look forward to be a part of #semanticClimate again in the coming future.