SE 491 WEEKLY REPORT 3
9/26/2024 - 10/02/2024

Group number: sdmay25-30

Project title: *Explainable AI for source code applications*

Client &/Advisor: *Arushi Sharma*

Team Members:
Manjul Balayar
Kellan Bouwman
Sam Frost
Akhilesh Nevatia
Ethan Rogers

Weekly Rotation
Manjul Balayar
Kellan Bouwman
Sam Frost
Ethan Rogers
Akhilesh Nevatia

<u>Weekly Summary</u>

This was a substantial week of development, with a much more focused effort between each team member. The priorities were labeling, alignment, configuration, adding clusters, hyperbolic clustering, and activations, with the aim to run the full pipeline. We are preparing the repository to be scaled for further development. A substantial amount of progress was made towards having a fully functional pipeline.

- **Past week accomplishments**

The main area of progress taken this week was the refactoring of code, which is being developed in a new directory in the NeuroX library, being NeuroXCode. Another new directory for unit testing, NueroXCode_Test, was also created. We designed a directory structure that facilitates scaling of the entire pipeline. We have now added a more permanent structure for extracting layer activations, including better clustering. The process activations, clustering, labeling, and alignment modules have been restructured. We cleaned up the repository, adding unit tests to prepare for CI/CD pipelines.

Manjul Balayar:
- Implemented evaluation methods into NeuroXCode, refactoring alignment and testing it.
- Look into various metric techniques for clustering.
- Implementing metrics for our clusterings pipelines.

Kellan Bouwman:
- Cleaned up readme for tested code
- Developed base new library for refactoring
- Setup Library for scaling and growth
- Refactored a handful of base files into new library

Sam Frost:
- Created testing directory and recreated directory structure
- Unit tests for NeuroXCode

Akhilesh Nevatia:
- Incorporated the get_extractions class with the clustering code I wrote
- Skimmed through hyperbolic clustering
- Ported my code from previous branch to branch off dev
- Started organizing my ported code in a format suitable for our new neuroxcode library

Ethan Rogers:
- Restructured activation scripts
- Removed redundant code pieces
- Created an initial local testing script
- Deepened understanding of the first pipeline portion

- **Pending issues**

Manjul Balayar: N/A
Kellan Bouwman: N/A
Sam Frost: N/A
Akhilesh Nevatia: N/A
Ethan Rogers: I want (linux?) VS code integration!

Individual Time Contributions

Name	Hours This Week	Total Hours
Manjul Balayar	7	19
Kellan Bouwman	11	26
Sam Frost	6	18
Akhilesh Nevatia	8	16
Ethan Rogers	8	19

o **Plans for the upcoming week**

Manjul Balayar:
- Testing metrics I implemented work fine with current clustering models
- Understand hyperbolic clustering
- Look into metrics for hyperbolic clustering

Kellan Bouwman:
- Develop additional metrics
- Import new models, for evaluation (focus on scalability)
- Start developing pipeline for metrics

Sam Frost:
- Take feedback from meeting and improve tests
- Continue building unit tests
- Set up runners for CI/CD

Akhilesh Nevatia:
- Get clustering code in the right structure for the library
- Start testing it out on the colab notebook / pronto
- Look at follow-ups from Arushi regarding Hyperbolic Clustering
- Debug code wherever necessary

Ethan Rogers:
- Further expand test notebook to other pipeline components
- Ensure activations functions are expandable to multiple datasets with any amount of layers
- Check with Arushi regarding direction
- Check with IT on getting VS-code SSH operational?!

<u>Summary of weekly advisor meeting</u>

Began with updating Arushi what we have been working on, and what we will do to continue our progress. Arushi shared that we are making good progress, but the priority at the moment is to get a working pipeline built, and then continue to work on NeuroXCode. The pipeline is currently pip installable but errors exist.

There has been an update with how we are to implement the labeling component of the project. Moving towards GPT instead of Gemini. When the prompts are finalized, the labels will be able to be finalized as well. Introduction of DSPy, not certain we are to move forward with it. When the annotation and visualization tool is completed, those will be able to use those to assist in labeling.

Akhilesh focused on refactoring the code for clustering. He made a branch of dev, and worked in NeuroXCode/src/clustering. Has both .sh scripts and python, so that it is available through the shell as well as pip. Wants to focus on getting the code tested. Arushi brought up changing what we are using for clustering. Nothing final yet, but she wants to keep both as considerations.

Arushi once again brought up that the current priority is to have a minimal functional pipeline, and that it is not important that it has absolutely everything.

Ethan wanted to check in to see if the work he's done on activations is on the right track. NeuroXCode/src/process_activations. Once the pipeline is working, filtering may need some additional criteria.