

pyTLEX 1.0 + jTLEX 3.0: Translation and Visualization

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Problem

The improved version of the **TLEX** visualization tool now supports multiple links between the same nodes. In addition, a more efficient way of displaying the TimeML graph nodes has been implemented.

Timeline visualization has been improved with a refactoring of the display of timepoints. With the current system, time pairs are connected via a line, which improves the clarity and organization.

The last major improvement in **TLEX** was the addition indeterminacy pair-related functionality. These timepoints are now colored red and a list of the pairs appears as a modal.

Finally, a whole new Python Library (**pyTLEX**) has been created and tested. It is derived from the existing **jTLEX** library with improved and adapted functionality.

pyTLEX supports the creation of a timeML graph from timeML annotated text, a timeML file or sets of nodes and links. This graph yields information about its partitions and their timelines. Lastly indeterminacy and inconsistency detection functionalities are supported by the library.

Current System

Qualitative temporal graphs that are derived from annotations on text (TimeML annotations) explicitly reveal only the partial orderings of events and times. For many purposes, however, a total ordering (a timeline) is more useful.

Unfortunately, timelines are rarely explicit in text, and usually cannot be extracted directly. The TLEX algorithm specifies an exact, end-to-end solution, to the task of extracting multiple timelines from TimeML annotated texts. TLEX transforms TimeML annotations into a collection of main and subordinated timelines arranged into a trunk-and-branch style structure.

jTLEX offered the solution proposed by the TLEX algorithm into an easy-to-use Java library. With it, a Web application called **TLEX: Timeline Extraction**, was created where annotated text from TimeML files or the files themselves can be uploaded and analyzed.

TLEX, with its two components; TLEX backend and TLEX frontend, aids researchers in the field by implementing a novel solution to the problem of visualizing temporal graphs.

pyTLEX also offers this solution, but through an easy-to-use Python library. This expands past the limitations of the Java language, and allows for more development using the TLEX algorithm.

Visualization Bug Fixing and pyTLEX Partitioner

Some of my main contributions to the improvement of the visualization tool were: the color change of subordination links (from red to orange), inclusion of functionality that allows to upload (and process) several files without having to refresh the page, and the earliest stages of the timeline refactoring.

pyTLEX's Partitioner was my main task during the semester. Generally following the algorithm from **jTLEX**, the output consists of a dictionary with four entries (different to the output of **jTLEX**). The entries are: main partitions, subordination partitions, subordination links and suggested links.

Suggested links are a new concept (and also a contribution of mine) to the **pyTLEX** library. A script is run before the output of the partitioner is returned and it tries to suggest a **TLINK** between a time expression from one of the partitions and the Document Creation time expression from the main partition. These are the suggested links

Summary

TLEX: Timeline Extraction handles graphic displaying of all the elements obtained from the timeline extraction task using **jTLEX**. Improvements to the visualization has made the timelines easier to navigate, view, and modify.

The **pyTLEX** library is a successful translation of **jTLEX**, with improvements to the approaches of several classes. With this, the **TLEX** algorithm is now accessible to python developers.

Requirements

- Gradle >= 7.1
- JDK >= 11.0.1
- Node.js >= 14.17.0
- npm >= 6.14.13
- z3-solver >= 4.8.12.0
- pytest_cov >= 2.5.1 (testing only)
- pytest >= 3.4.2 (testing only)



Implementation

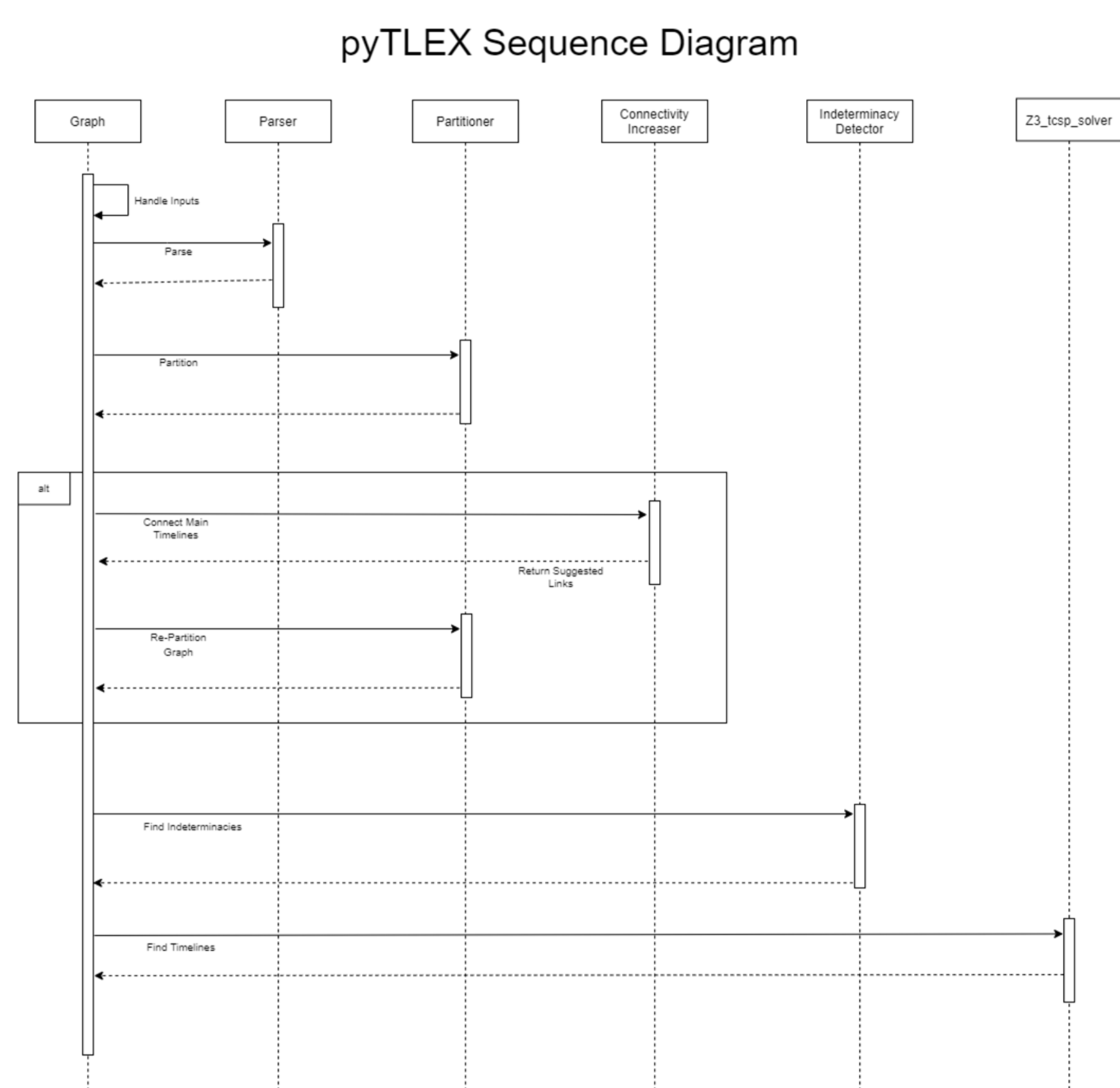


The **TLEX** backend was implemented using the Java based Spring Boot framework in the IntelliJ Integrated Development Environment. The **TLEX** frontend was developed using ReactJS in the Visual Studio Code Integrated Development Environment.

TLEX: Timeline Extraction uses the **jTLEX** library constructed in Java using the Eclipse Integrated Development Environment and tested using the JUnit testing framework. The **pyTLEX** library written in Python using Pycharm and tested using Pytest.

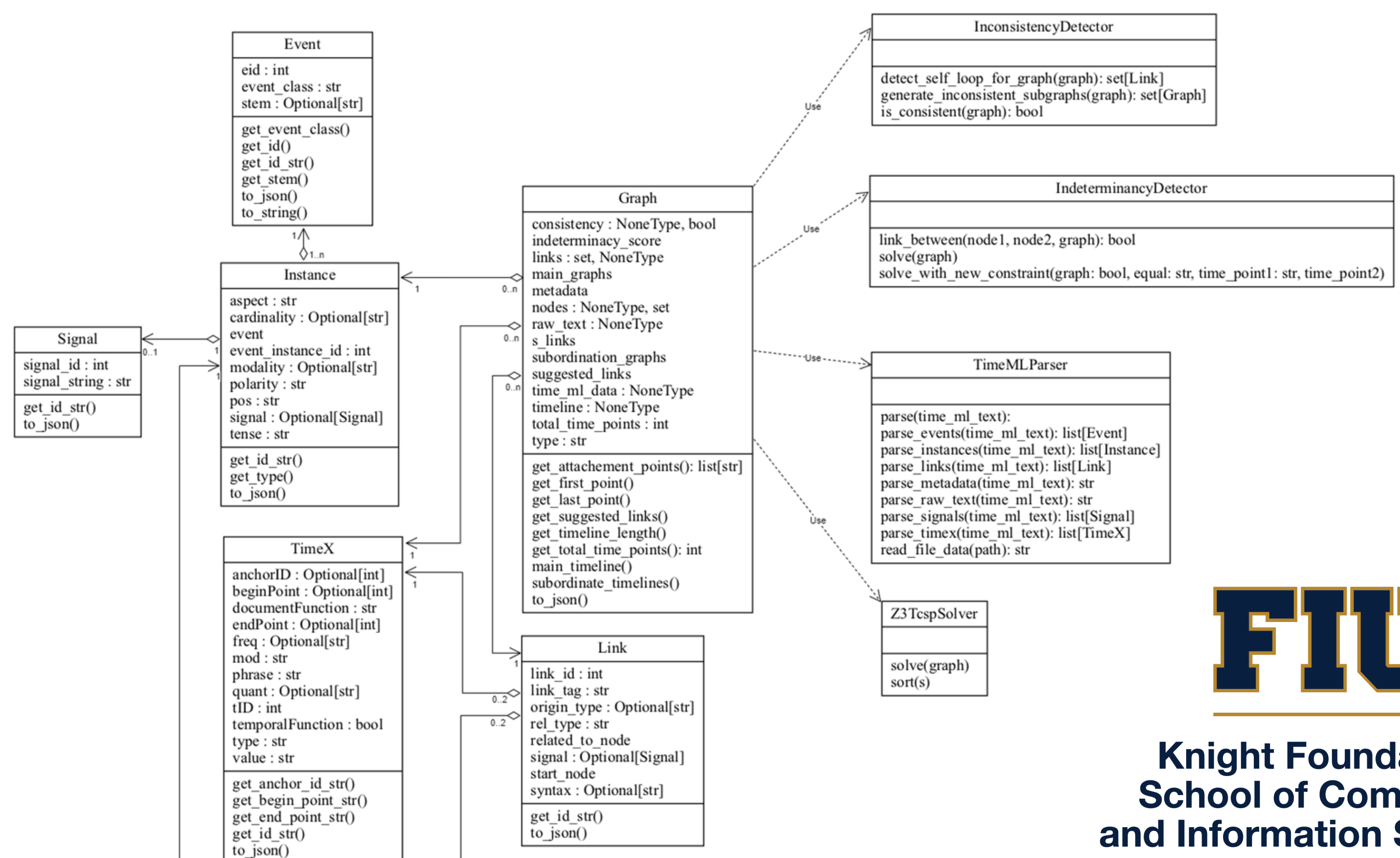
To effectively support team collaboration, we managed versions of the web application, **jTLEX** library, and **pyTLEX** library with subversion VCS.

Sequence Diagram



Verification

Purpose	Method	Preconditions	Expectation	Result
(1) Check that the pyTLEX TimeMLParser catches all annotations	Count the number of annotations and compare to the number of each object returned	Valid TimeML File	All Objects Caught	Equal Count, Successful
(2) Conduct a System Test of pyTLEX	Count the number of each individual object from jTLEX and compare that to the output from pyTLEX	Valid TimeML File	All Objects Caught	Equal Counts, Successful
(3) Show that the pyTLEX output matches jTLEX	Run both jTLEX and pyTLEX to receive json output	Valid TimeML File	Equivalent JSON output	Equivalent JSON Output Received
(4) Assess the changes to TLEX Visualization	Run both, the upload and the paste option of the tool to see if the output matches previous versions	Valid TimeML File	Graph displays the same as previous versions	Graph displays correctly like past versions



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