Northeastern University
Khoury College of Computer and Information Sciences

Plagus – Plagiarism Detector For Source Code

CS5500 – Group 6

Hassan Khan
Samuel Raphael
Yichuan Philip Ma
Pierre-Alexandre Mousset

Overview of Plagus

- Detect plagiarism in Python and TypeScript
  - Renaming variables
  - Expression Modification
  - Function Composition

- Web-application
  - Angular Front-End
  - Java Back-End

- Presentation Plan:
  - UI Mockups
  - System Architecture
  - UML Design
  - Algorithm Theory

User-Interface : Home Page

File upload

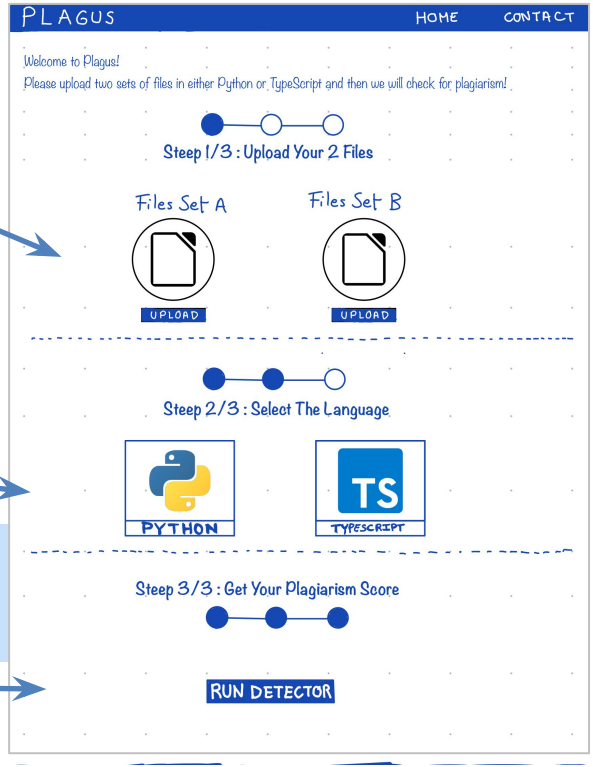
- The first step for the user is to drag and drop or upload two set of files
- An error message will appear if :
  - Less than 2 sets of files have been submitted
  - Files are too large

Programming languages

- The user will have to select on one of the two programming languages supported by our software

Run the detector

- The final step is to run the detector
- A loading icon will pop-up by using (Ajax)



User-Interface : Home Page

Navigation

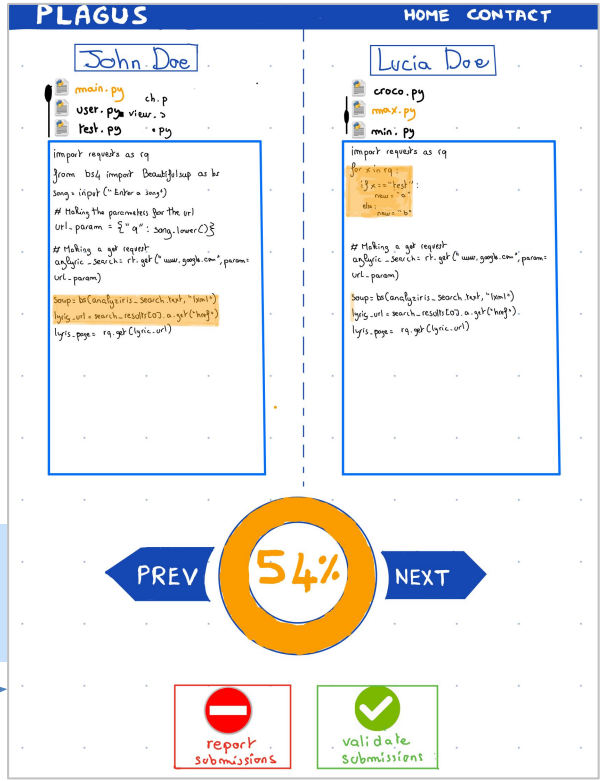
- Student first and last name
- List of the files submitted (current file displayed has a different font-color
- The user won't be able to go to the next step if the system displays error messages

Detection

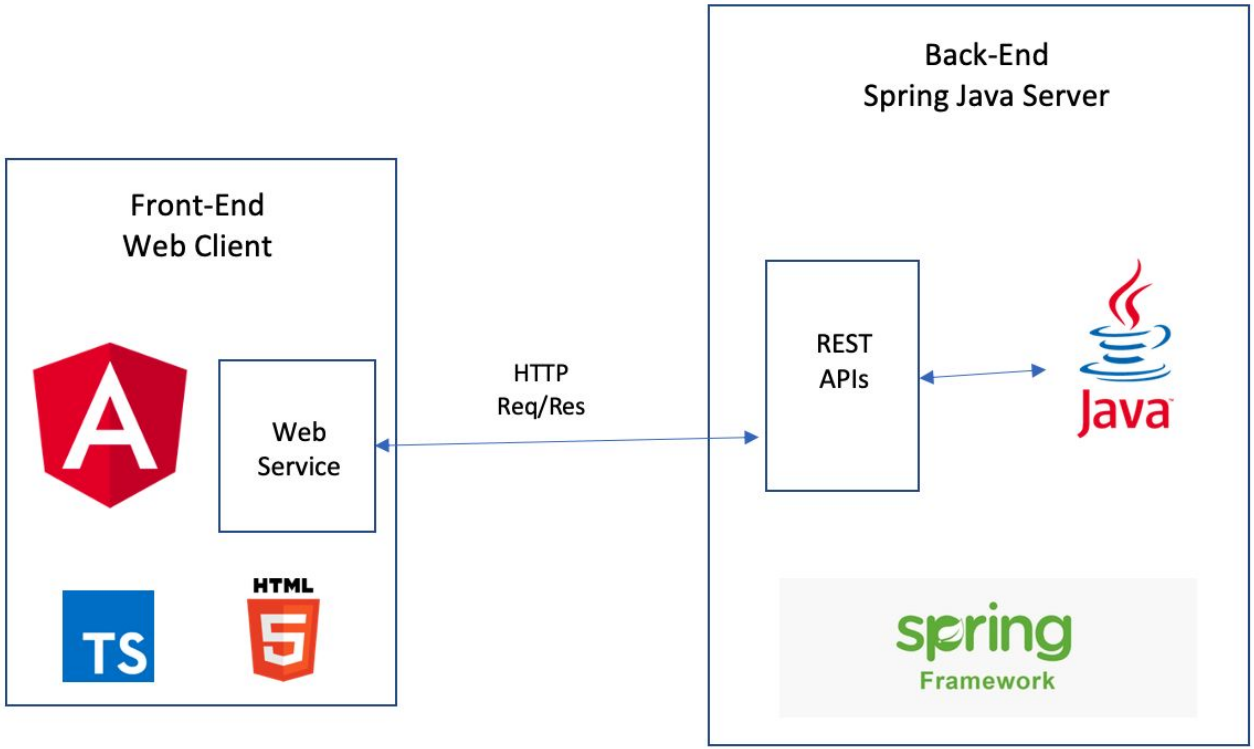
- Code that is likely to be plagiarism is highlighted
- A global plagiarism score is displayed
- The user can navigate between the different set detected by our detector

Report

- At the end of the review, the professor can either report the student to the school administration or not



System Architecture



Data Structure - File Integrity Over the Web?

```
{
        submission_1:  [
            {
                id: 1,
                Type: ‘Python’,
                Name: ‘test1.py’,
                code : ‘def main(): \n for i in the range (5) : \n print(i) \n main()’
            },
            {
                id: 2,
                type: ‘Python’,
                name: ‘test2.py’,
                code : ‘def main(): \n for i in the range (10) : \n print(i) \n main()’
            }
        ]
       submission_2:  [
            {
                id: 1,
                Type: ‘Python’,
                Name: ‘test3.py’,
                code : ‘def main(): \n for i in the range (15) : \n print(i) \n main()’
            },
            {
                id: 2,
                type: ‘Python’,
                name: ‘test4.py’,
                code : ‘def main(): \n for i in the range (10) : \n print(i) \n main()’
            }
        ]
 }
```

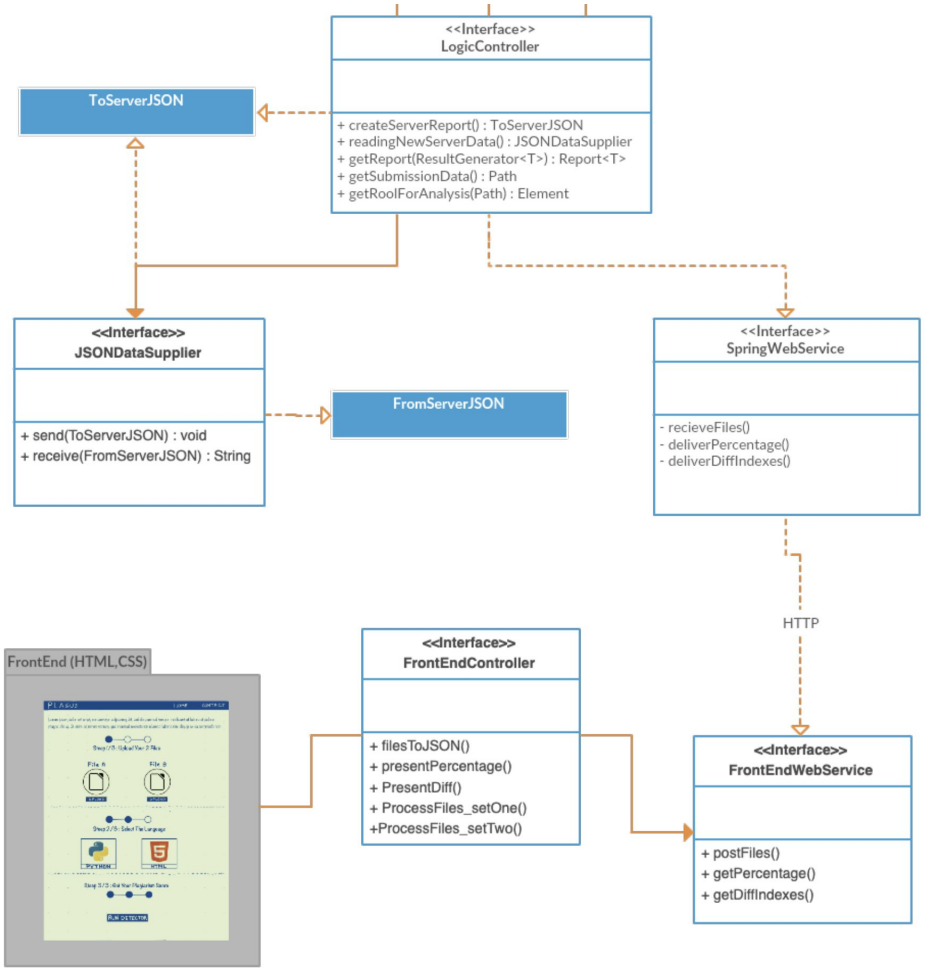
```
def main():
    for i in range(5):
        print(i)

main()
```

Solution: Base64 Encode/Decode

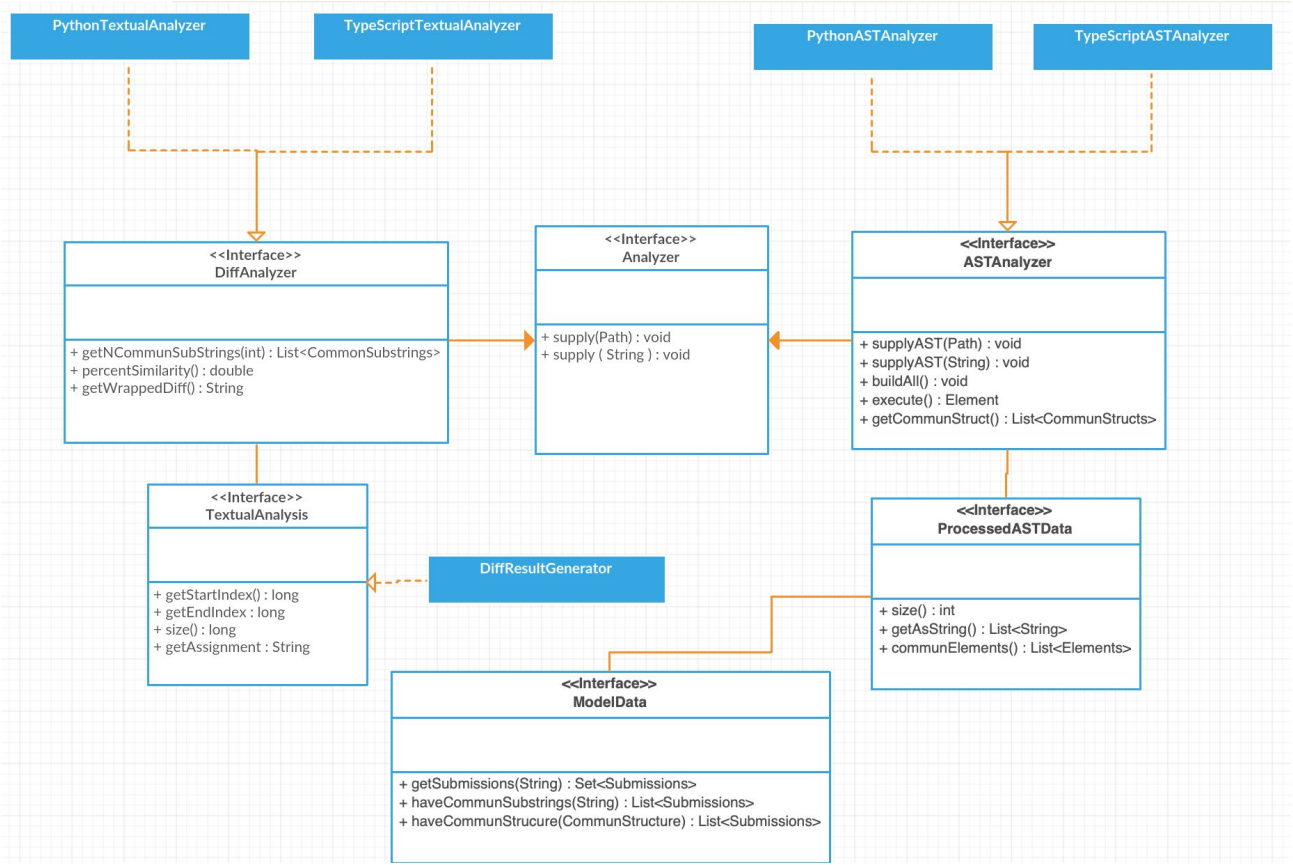
TS Front-End => atob(FileToDecode)

Java BackEnd => Base64.getDecoder().decode(encodedFile)

Class Diagram of Plagus-Communication with Web App



Class Diagram of Plagus-Plagiarism Detection Engine



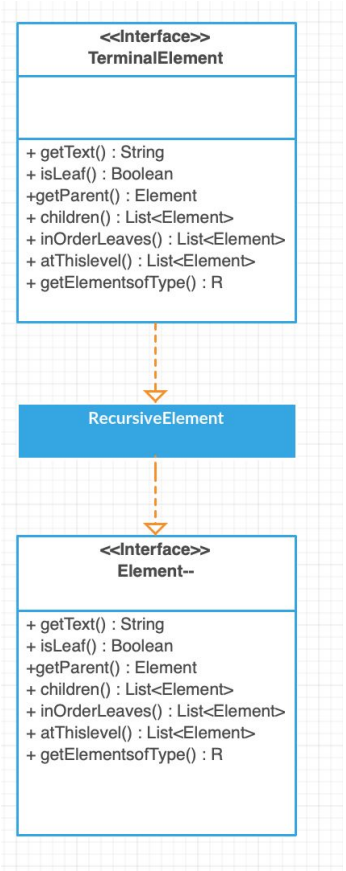
Class Diagram of Plagus-AST Elements

Example:

<expression>=<literal>|<expression><op><expression>|
<var-exp>
<literal>={“abc”, ‘z’, 123, 3.14, true, false, etc…}
<var-exp>={x, y, foo, bar, etc…}
<op>=+|-|*|/|%|&|[bitwise OR |]

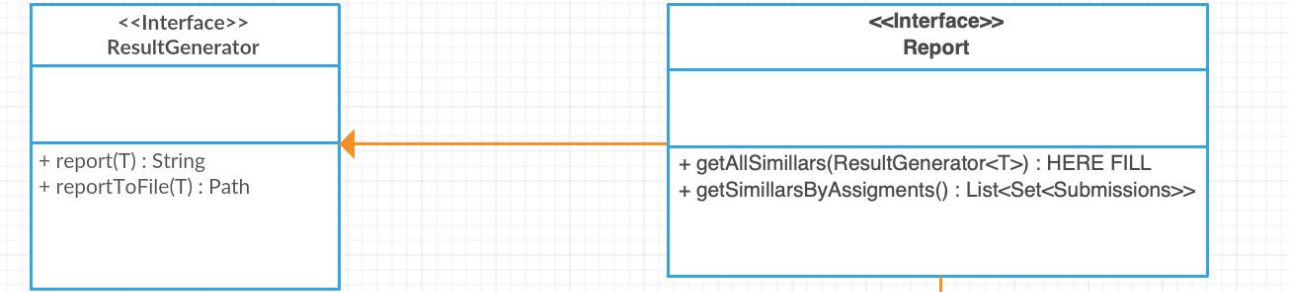
<statement>=var <var-exp>|
<var-exp>[assignment =]<expression>|
<statement>;<statement>|print(<expression>)

We shall use ANTLR for generating and analyzing ASTs in source code.

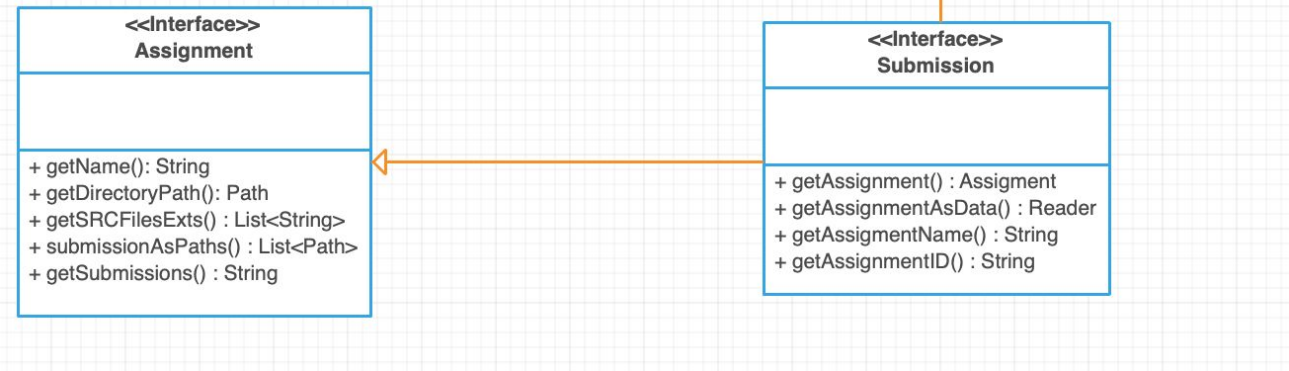


Class Diagram of Plagus-Assignments and Reports

Results



Organization:



Plagiarism Algorithm

- High-Level Algorithm Goals
  - Provide at least one strategy for detecting similarity between at least two sets (src folders) of code.
  - Use enough abstraction that via ASTs that once the language has been processed, there should be no difference between the analysis of ASTs on two different languages.

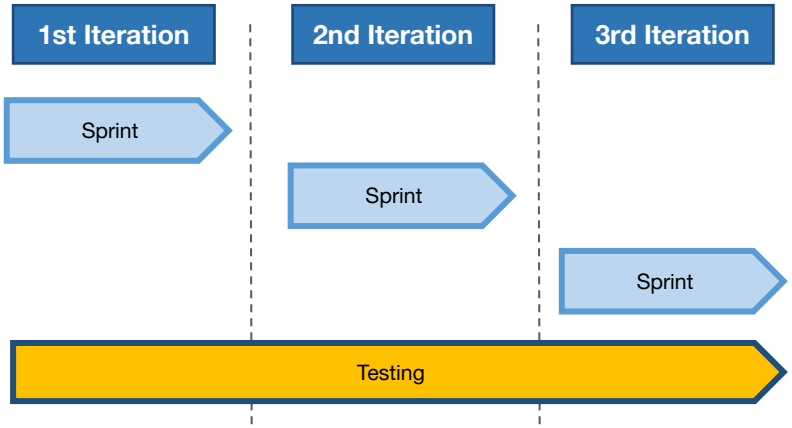
- Preliminary Ideas about how to achieve these goals
  - AST construction via ANTLR.
  - Going beyond CFG: Mapping generated ASTs to specialized versions
    - Scope and Name analysis for functions, variables classes etc. across files.
  - Tracing Objects, Imports across files.

- Where to start
  - Look into the TypeScript grammar quality.
    - 3rd party?
    - Fallback: Vanilla JavaScript or Ruby
  - Learn ANTLR
    - what is realistic to expect from our tools,
    - What to do with expectations.
    - Adapt expectations and research to shape our strategies.

Software Engineering practices

Agile Software Development

- Pair Programming
- 1-2 Week Sprints
- Face to face and whiteboard communication
- Division of the program into small subtasks



Work Distribution

	UX/UI	Architecture	Algorithm	Testing	Documentation
Samuel		x	x		x
Hassan	x	x	x		x
Yichuan			x	x	x
Pierre	x		x	x	x

Northeastern University
Khoury College of Computer and Information Sciences

Thank You from Plagus!

Any questions?

Hassan Khan
Samuel Raphael
Yichuan Philip Ma
Pierre-Alexandre Mousset