# EECS 3311 – Project Report
# Fall 2019


**TEAM MEMBERS:**

Sarwat Shaheen (214677322)
Nafis Ahmed Awsaf (215306095)


## EECS Logins of team members:

sarwat12
awsaf11

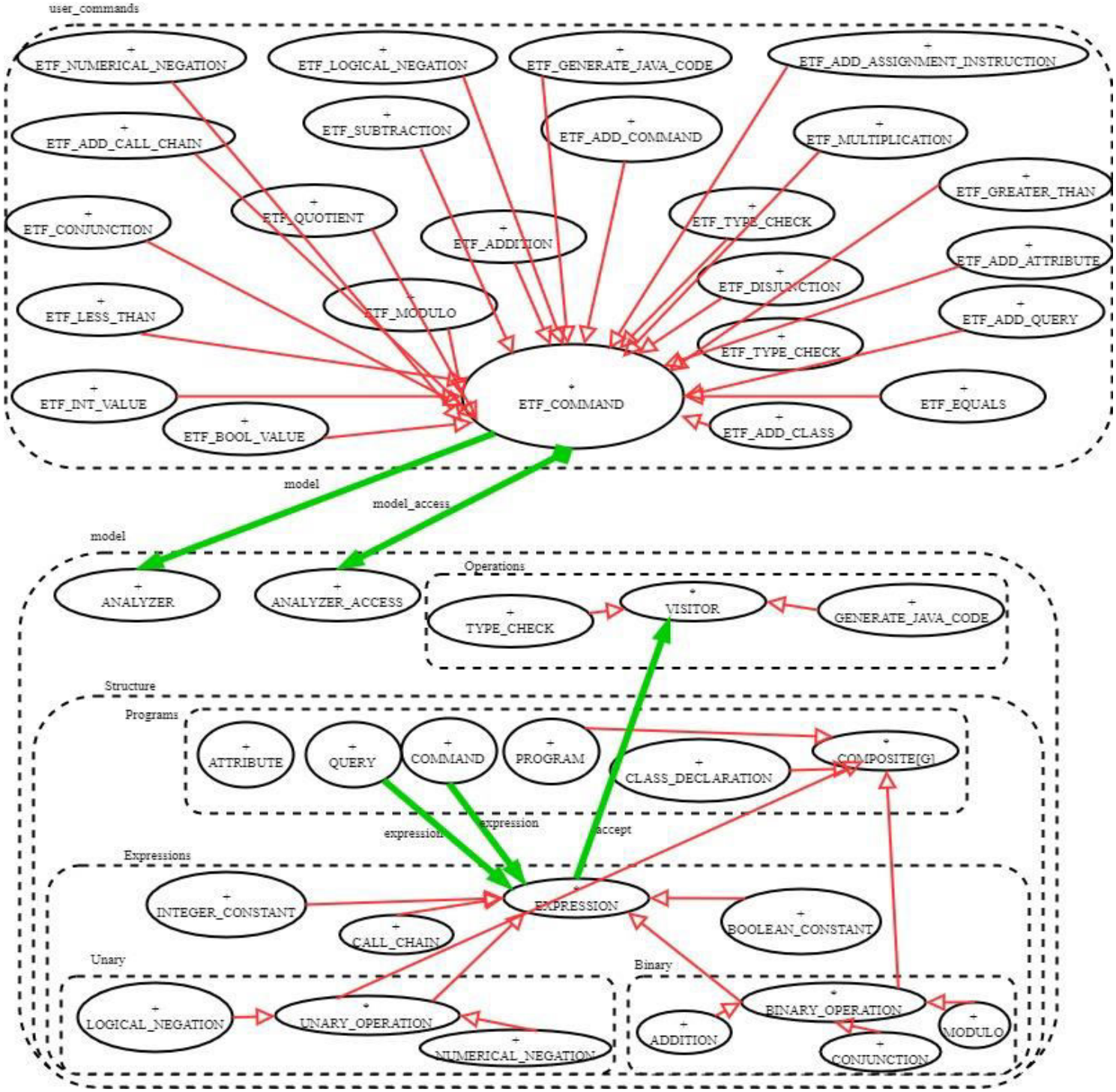
## EECS login of submitting account:

sarwat12

**BON DIGRAMS OF OUR DESIGN**

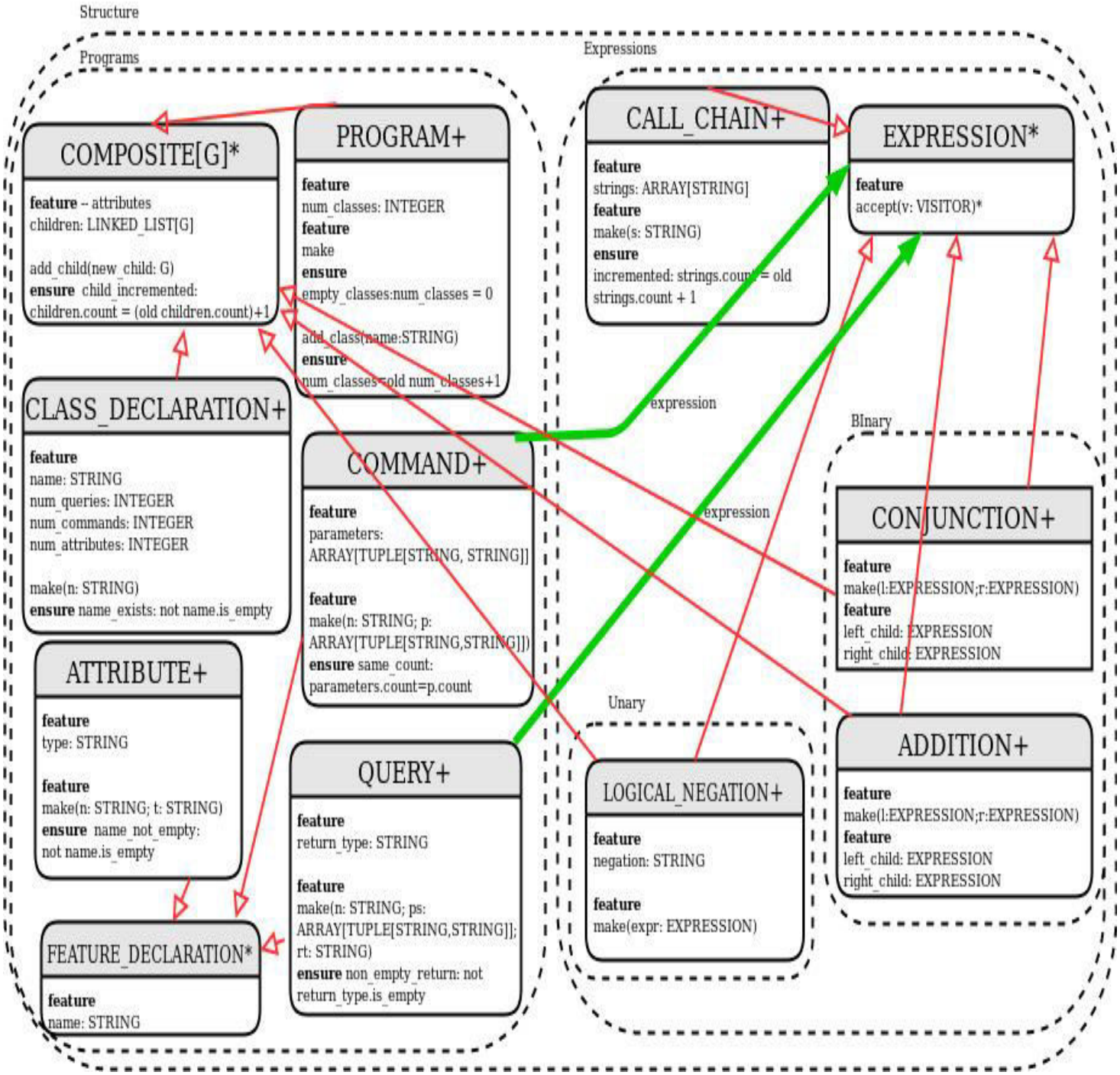
**BON DIAGRAM 1**

The following diagram details the relationship between all relevant classes within the project implementation. All classes in this diagram are shown in concise/compact view.



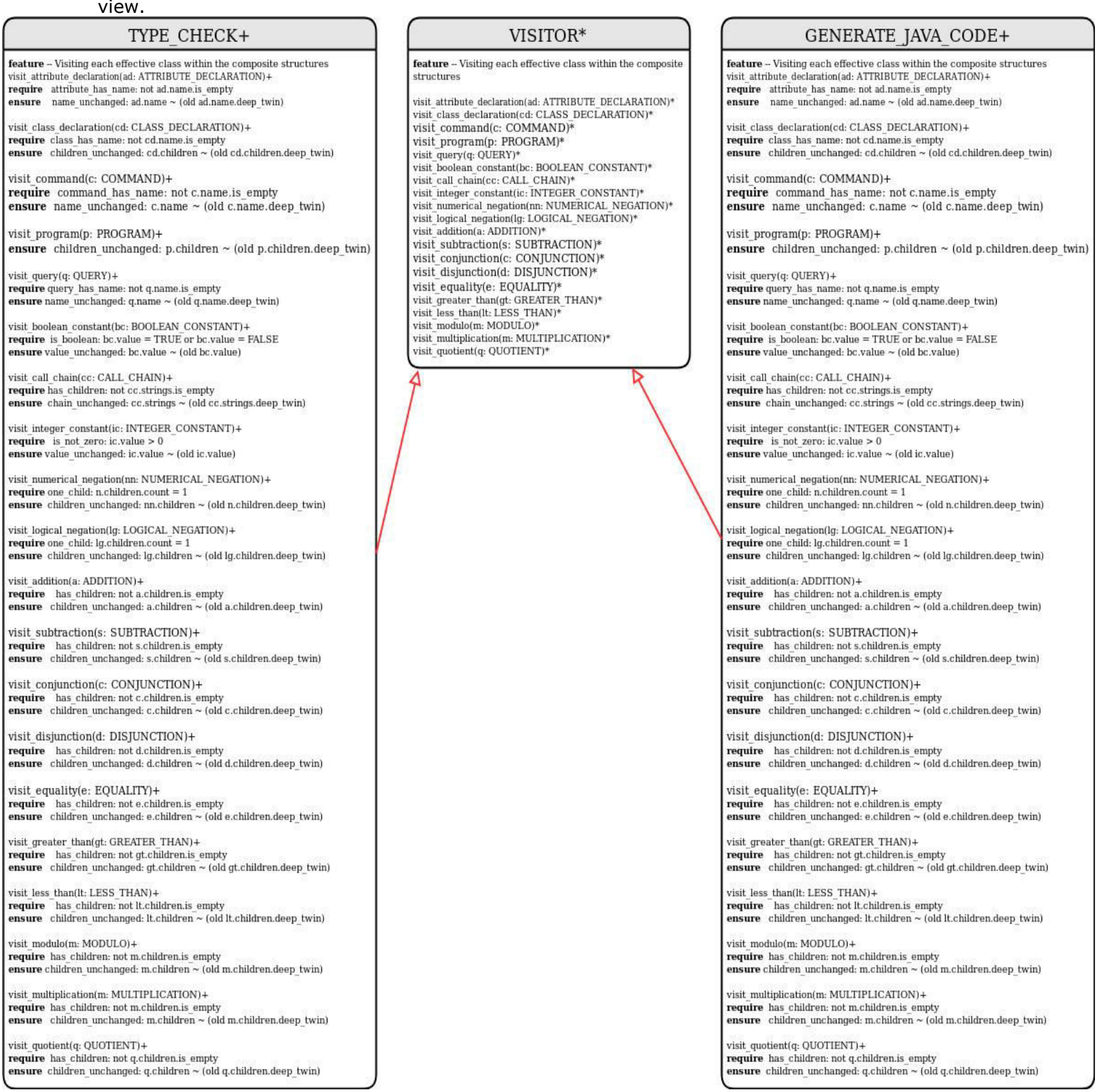
**BON DIAGRAM 2**

The following diagram details the architecture between all relevant classes within the programming language/expressions **structure**. Critical classes are shown in expanded/detailed view.



**BON DIAGRAM 3**

The following diagram details the architecture between all relevant classes within the programming language/expressions **operations**. Critical classes are shown in expanded/detailed view.



Details of how our design obeys the following design principles:

– **Information Hiding**
Ans: The principle of information hiding states the principle of separation of the design decisions within a class or project and making specific implementation features hidden from the client's perspective. In our project, the critical class where we implemented information hiding principle is in the **ANALYZER** class, where the constructor make is hidden from the rest of the classes in the project, except **ANALYZER_ACCESS**. This enables specific implementation details to be hidden from the client, **ETF** users, and other classes within the structure/operations cluster.
**Hidden and may be changed**: Underlying implementation in all the classes of operations/structure along with **ANALYZER**.
**Not hidden and stable**: The abstract user interface commands available to the clients as specified by the child classes of the **ETF_COMMAND.**

– **Single Choice Principle**
Ans: The Single Choice Principle states that whenever a program needs to support a set of specified features, they should all be included in one class, so that any future changes to such features take place in one module rather than going through changes separately.
The primary instance of the single choice principle is demonstrated in the **COMPOSITE[G]** where the **children: LINKED_LIST[G]** is declared along with the feature **add_child**. Any child classes which inherit from **COMPOSITE[G]** further avoids re-declaring **children: LINKED_LIST**. If the underlying implementation of child changes from using a **LINKED_LIST** to an **ARRAY**, that change can be made only in the **COMPOSITE[G]** class, without the need for changing any subsequent child classes.
Another instance of obeying the single choice principle in our project is in the **FEATURE_DECLARATION** class where the **name: STRING** feature is declared which is then inherited by the **ATTRIBUTE, COMMAND, and QUERY** classes respectively. Any further changes in this feature would only need to be dealt with in the **FEATURE_DECLARATION** class, and duplicate changes may be avoided.

– **Open-Close Principle**
Ans: The open-closed principle states that some parts of our project should be open for modification and other parts should be closed from further changes.
An instance of obeying the open-closed principle in our project in within the composite and visitor patterns used in the overall implementation.
The program structure and expressions cluster is **closed** for modification, which means adding any further structural classes would violate the single choice principle and would require making multiple changes in the visitor pattern implementation.
The program operations which are supported by the project through the use of the visitor pattern is **open** for modification. New operations can be added and will be supported by the program structure/expressions without having to violate single-choice principle.

– **Uniform Access Principle**
Ans: The Uniform Access Principle states that the notation of features used throughout a class should not change regardless of whether it is an attribute or a routine.
An instance of obeying this principle can be found in the **ANALYZER** class where the **out** feature, responsible for pretty printing the current state of the program, can be uniformly called without having worrying about the feature being an attribute or a routine. The same principle can also be found in the **program_status** and **class_status** features in the classes **PROGRAM** and **CLASS_DECLARATION** respectively.

– Obeying Any other design principle that we discussed in lectures

* Principles of **polymorphism and dynamic-binding** have been used in the **CLASS_DECLARATION** class, where the **children** linked_list is declared initially of static type **FEATURE_DECLARATION**. But when accessed dynamically, the objects might be either an **ATTRIBUTE, COMMAND, or a QUERY**, making the children a **polymorphic LINKED_LIST**.

* Principles of **cohesion** has also been obeyed in our project through the use of the visitor pattern. The program operations supported in the project are grouped together according to similar functionality and kept separate from the program structure. The operation implementations are kept in separate classes in order to only perform their respective tasks.

*Principles of **Generics** have also been used in the project, primarily in the **COMPOSITE[G]** class, where clients of the class can specify a composite structure of any time just by inheriting it. In our project, class **PROGRAM** is a composite of **CLASS**, and **BINARY_OPERATION** is a composite of **EXPRESSION**. Both classes are able to specify their composite types just through the use of **inheritance and generics**, allowing for re-usable code.