Language Engineering Profile
(MEI 1st Year)

GE - Grammar Engineering
Trabalho Prático 2 (TP2)

2025/26

Static Source Code Analyzer

As we have seen in TP1, there are many types of static source code analysis techniques, each with different goals and challenges, and that provide feedback about source code. The goal of TP2 is to implement one such technique for a simple *imperative programming language* (`IPL`), ideally the static analysis technique that the group has studied in TP1.

Specifically, the students should follow the following steps in the development of the project:

1. Design the `IPL` language and its grammar. The language should at least allow the declaration of atomic and composed variables (e.g., lists, dictionaries or sets), conditional expressions, and different kinds of loop constructs (e.g., `while` or `for` loops);

2. Study and discuss the quality of the proposed `IPL` grammar according to the attributes and metrics studied in the classes;

3. Use `Lark` to process the proposed `IPL` grammar and retrieve the abstract syntax tree (AST) for `IPL` programs;

4. Use `Lark` visitor classes (either `Visitor`, `Transformer` or `Interpreter`) to perform semantic elaboration of the AST. You should at least perform (simple) scope analysis and type checking;

5. Use `Lark` visitor classes to extract intermediate representations from `IPL` ASTs. You should at least extract the *control flow graph* (CFG);

6. Implement a static analysis technique for `IPL` programs. The specific technique, and level of complexity, will be discussed with the lecturer during the classes. It should address the issue of extensibility/customization by the user.

Students should write and deliver a small report in LaTeX article format, with a maximum of 10 pages, reporting each of the steps described above. The students are also expected to present their results to the class in a 10-15 minute presentation, followed by questions from the instructors and colleagues.

The artifacts (report and support materials for the presentation) will be delivered via the Blackboard e-learning platform. The deadlines are set on the course unit website.