

Computer Theory (LIS3042)

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Professor's office	IA-239
Term	Autumn 2024
Schedule	Monday & Wednesday (13:00-14:15)
Classroom	CN-220

Important Dates

Project publication: November 11th, 2024

Project deadline: December 4rd, 2024

Project description

The Computer Theory project will be focused in the development of the following research question: **to what extent generative AI tools could be used to provide valid Context-Free Grammars production rules to assess the syntax of a snippets code from a selected programming language.**

The produced system should be test according with one of the following expressions:

1. Arithmetic expressions
2. Control structures
3. Function definitions and calls
4. Assignment operations
5. Boolean expressions
6. Loop Structures
7. Array operations
8. String operations
9. Basic mathematical functions
10. Conditional expressions with ternary operator

The productions of each expressions could be found in the document “***Production options***” attached in the project folder.

The project will consider the qualifying items defined in Table 1

Qualifying item	Points (0-100)
Integrate generative AI tools	10
Integrate solutions from different sources (generative tools + hardcoded production rules)	20
A representation of production rules from generative tools.	30
Publish the system in a repository (e.g., GitHub)	10
Develop an evaluation system (how do you demonstrate that the information produced is correct/coherent?)	30
TOTAL	100

Table 1. Qualifying items considered for the evaluation of the final project.

General considerations

The following consideration must be taken into account for the development of the project

1. The whole project document must be written individually
2. The document must not contain the name of the student (anonymous document)
3. The project method could be developed by a maximum of 4 members
 - a. The team will develop a method to
 - i. Retrieve information from a generative AI tool
 1. Create an appropriate prompt
 - ii. Develop a method to consume the retrieved data from the generative AI tool.
 1. How data will be stored in your system (e.g., JSON, CSV)?
 - iii. Hardcode the generative rules selected by each member from the “Production options” document (attached in the project folder)
 1. This will be used later for test purposes.
4. Each team member must select one of the evaluation elements mentioned in the “Project Description” section.
 - a. For example, you selected arithmetic expressions, then
 - i. Extend the solution developed by the team.
 - ii. Developed an independent function
 1. Generate the corresponding prompt(s) for the generative AI tool
 2. Store the response from the generative AI tool

- iii. Design and develop a method which considers the productions provided in the “Production options” file.
- iv. Compare the CFG produced by the generative AI tool with the productions provided in the “Production options” file.
- v. Test your method with at least five examples.

Sections covered in the document.

The content of each section could be expanded.

1. Introduction
 - a. About Context-Free Grammars
 - b. Generative AI tools
 - i. OpenAI
 - ii. ...
2. Justification
 - a. to what extent generative AI tools could be used to provide Context-Free Grammars production rules to validate the syntax of a snipped code from a selected programming language .
3. General Objective
 - a. Develop a method based on CFG to validate the syntax of a programming language function through generative AI tools.
4. Particular Objectives
 - a. Identify the capabilities of AI tools to generate the appropriate CFG for a particular programming language function structure.
 - b. Develop a method to retrieve information from Generative AI tools in JSON format.
 - c. Design an algorithm to validate an input function through the CFG generate by the generative AI
5. Methodology
 - a. <<Here goes the team´s idea of how to solve this problem>>
 - i. <<Add a diagram of the solution>>
 - b. <<Here goes your method to solve a particular evaluation element (see project description and general considerations point three)>>
 - i. <<Add a diagram of the solution>>
6. Results and Evaluation
 - a. <<In this section you test the proposal method against a predefined set of snipped code (three examples)>>
7. Analysis
 - a. <<In this section you provide an analysis of the evaluation results>>
8. Conclusions
 - a. <<Are generative AI tools capable to produced quality CFG production rules to evaluate the syntax of a snipped code from a selected programming language?>>
9. References
 - a. Any reference used to developed the solution

