F25.09: Using an LLM-Based Agent to Support Students Learning How to

Program

Overview

Students from a variety of undergraduate academic programs struggle to learn how to program. To avoid mixing the learning of a rigid and restricted programming language syntax at the same time students learn computational thinking, some instructors use a pseudocode-first approach, in which students describe their solutions in informal language. However, pure pseudocode is not compilable, and students depend on their instructors to receive feedback.

Currently, the Artificial Intelligence industry is advancing pretty rapidly, which can be clearly evidenced by the number of new models and tools that are trained on Large Language Models (LLMs) such as ChatGPT, Bard, LLaMA, GitHub Copilot and Galactica. These models and tools proved to be effective in generating automated solutions to generate code from natural language, however it is still unknown how good they are in helping the computer programming learning process. We hypothesize that they may serve as a framework to support learning, if they are used in a controlled and guided way. Therefore, as part of this project we aim to understand how an approach that mediates the interaction between students and LLM can aid the process of learning how to program. Thus, in this project we aim to preliminarily answer the following question:

How effective is an approach based on LLMs in helping students learn computer

programming? **What the student will DO and LEARN**

The student will work on supporting on research to determine the effectiveness of using the proposed conversational agent for learning by comparing how students produce code with and without the agent, how students perceive the approach, and how they learn programming concepts. This will be done via laboratory studies in which students will be asked to work on some programming problems.

The undergraduate student will also work with a PhD student on details of the implementation of our agent, which is an interface to interact with a conversational agent which connects to ChatGPT (and/or Llama) API. This implementation also counts with a backend interface that mediates the interaction to avoid that full solutions go to the students learning how to program.

The student will learn how to conduct lab studies, how to conduct social/behavioral studies involving humans, work with large language models (and their APIs), and learn how to analyze data.

Additional benefits
Learn how a research lab that studies human aspects of computer science works. Increase their network.

Additional qualifications
Commitment; curiosity; good communication skills; expectation management.

Time commitment

6 hrs/week for 30 weeks