Toward the Deployment of a Chatbot to Augment Computer Science Education

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Extended Abstract

Over the last few years, human life has been significantly improved by many technological innovations, especially due to considerable advances in the field of Artificial Intelligence. In particular, the most noticeable impact of such progress on everyday life is given by *Conversational Agents*, also known as *Chatterbots*, and later shortened to *Chatbots* [2]. Such solutions consist of computer applications capable of simulating conversations with one or more human users in a lifelike way; in certain cases, chatbots make themselves perceived as so realistic that humans do not realize they are in fact talking with a machine. Currently, the use of chatbots is increasingly frequent in many areas, such as (1) customer service, in which chatbots assist users in finding quick and easy solutions to most common problems, (2) job assistance, provided to practitioners working on various tasks, and (3) teaching support in academic contexts, where chatbots accompany the teacher, explaining in a more interactive way some topics that may be complex for students [1, 5].

Chatbots in education are becoming more and more popular due to the advantages they guarantee toward personalized learning, ease of use, and accessibility. Such benefits have been observed in various contexts, from primary and secondary education to university and vocational training [3]. One of the most recent chatbots proposed in the literature is *Hermias*, presented by Petousi et al. [4], which is aimed at helping high school students in the learning of History. The chatbot falls under the *Bots of Conviction (BoCs)*, which shift the focus from offering information to provoking reflection. Namely, Hermias seeks to encourage contemplation among students by engaging in conversation with them, assisting in the study of History, and encouraging historical empathy through the persona of a young slave in the Ancient Agora of Athens, Greece.

We aim to follow the path traced by Petousi et al. [4], by developing a chatbot with three-fold intentions, i.e., we are interested in (1) encouraging the engagement of high school students in the field of Computer Science, particularly about the topic related to networks, (2) improving their interest toward the history of Computer Science and the progress of this discipline over the decades, and (3) raising students' awareness on women in Science, escaping the common belief that *STEM* subjects are mainly for males.

Therefore, we propose *CAIHL*, a chatbot envisioned to help students understand the concepts of computer networks, with an eye on the history of the

subject and its pioneers. In particular, CAIHL impersonates *Hedy Lamarr*, a leading figure in Computer Science who made substantial contributions to the field of networks. Known both as a scientist and actress, she is widely recognized as the matriarch of the technologies underpinning modern Wi-Fi. As such, she is an ideal candidate for elucidating fundamental concepts of computer networks and wireless transmission protocols to students, and also encouraging female students to pursue their interests in STEM fields. Through the persona of Hedy Lamarr, students can be captured in the learning of computer science, as the curiosity in her personal history acts as a Trojan horse, which initially engages students by means of history and trivia, and finally brings them to learn. While Hermias [4] represents a historical figure whose main purpose is to encourage the study of History itself, CAIHL is aimed at tickling students' curiosity via the presentation of the fascinating persona of a scientist-and-actress who really existed, to capture their interest and then shift it toward computer science.

We plan to evaluate CAIHL in a real context, by experimenting with its usage in a high school classroom setting. Namely, we design our investigation based on the pedagogical method of participatory learning, which shifts the focal point away from the teacher and toward the students themselves. The primary objective is to foster communication and integration among students, empowering individuals to actively participate and engage with both the teacher and their peers. In such a context, the teacher's role evolves to a facilitator, guiding discussions, posing questions, and coordinating contributions, while the students actively engage through the means of the chatbot. We hypothesize that the employment of CAIHL in a real education environment can boost the effectiveness of lectures, by stimulating the curiosity of students and making them the protagonists of the learning.

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