Bringing Ethics and Justice into CS1 Courses through Data that Shows an Incomplete Picture

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ABSTRACT

Computer scientists should be aware that their work may have an impact on society. In an effort to integrate ethics and justice with technical content in CS education, we designed a novel CS1 activity. Our goals were: to leave typical CS1 learning goals unchanged, to include open-ended questions while meeting the constraints of a large CS1 course, and to pose challenging questions that students perceive as relevant to their computing practice and personal life. In this poster, we discuss the details of the activity we designed, which includes a coding portion where students write code to plot admissions data and a discussion portion centered around the story behind the data and its limits.

1 INTRODUCTION

It is increasingly apparent that ethics and justice need to be integrated throughout the entire CS curriculum [3]. Several instructors have developed an approach that involves modifying CS assignments so that the programming aspects stay the same, but the problem domain has a social or ethical component [1, 2, 3]. In this paper, we build on this approach and describe the design of a novel CS1 project activity about the power and limitation of data and how it relates to a social issue.

2 ACTIVITY DETAILS

We designed a CS1 coding and discussion activity to address several goals: 1) Leave typical CS1 technical learning goals unchanged 2) Center on an issue relevant to students. 3) Prompt CS1 students to think about what can or cannot be answered with data or solved computationally. CS students are used to solving well-defined problems and would benefit from opportunities to define their own projects in early courses. This is a challenge since CS1 courses are often large and dependent on automatic grading. 4) Ground the assignment in ethics-related skills students might need to apply while coding in the real world. While there are plenty of scenarios for computer scientists to think about ethical dilemmas, such as algorithmically allocating resources fairly, students may reject those lessons if they do not envision themselves on a career path where they would encounter that task. We thus focus the assignment not on the more general skill of evaluating the possibility of solving the problem with computing.

The activity asks students to write Python code to plot trend lines in data read from a .csv file. The CS learning goals were to give students in a CS1 class taught with C++ an opportunity to learn the basics of Python, including File I/O, built-in functions, package usage, etc. These are the same goals as a typical assignment in a CS1 course at our institution. The data the assignment asks students to plot is enrollment data for a particular university broken down by race and shown over time.

In a class-wide discussion, students discuss what the data says, what it means, and the extent to which it illustrates the presence of an issue claimed by Asian college applicants that they faced admissions bias in the form of higher expectations on some application criteria [4]. While there may be surface level conclusions the students jump to, the discussion is scaffolded to help the students come to their own conclusion that more information is needed to tell whether the data supports claims of admissions bias. This allows for focusing on the limitations of computing in light of complex multi-dimensional societal issues.

3 CONTRIBUTIONS AND FUTURE WORK

Contributions of this work include: 1) Details of a CS1 assignment that addresses the goals and challenges outlined earlier and 2) An approach to integrating ethics and justice in CS courses by drawing attention to the limits of data and computational methods relative to social issues. In the future, we plan to deploy this assignment in a large CS1 course at a public US university and use qualitative methods to analyze the discussion and a post- survey to capture student perceptions.

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SIGCSE 2022, March 3–5, 2022, Providence, RI, USA

ACM ISBN 978-1-4503-9071-2/22/03. https://doi.org/10.1145/3478432.3499101