ETHICS IN THE UNIVERSITY OF VIRGINIA'S COMPUTER SCIENCE PROGRAM

A Technical Report submitted to the Department of Computer Science

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

Jerry R. Pinto-Gomez

Spring, 2023

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Briana Morrison, Department of Computer Science

Ethics in the University of Virginia's Computer Science Program

CS4991 Capstone Report, 2023

Jerry R Pinto Gomez
Computer Science
The University of Virginia
School of Engineering and Applied Science
Charlottesville, Virginia USA
jjf5pf@virginia.edu

ABSTRACT
Because computer science (CS) classes at the University of Virginia (UVA) do not include enough content about ethics, students have to gain this knowledge from other classes. I propose introducing these discussions into CS classes at UVA based on an analysis of CS courses at other universities. Examining other curriculums would allow us to find one or more courses that provide the best model for incorporating ethics discussions into the CS department. The anticipated outcome is creating a workforce more likely to make ethical decisions in their professional lives. After incorporating these changes into the UVA CS curriculum, we would need to evaluate how students perceive the changes and whether they are an improvement on the previous curriculum.

1. INTRODUCTION

Ethics in computer science is not something that is rarely brought up or discussed within CS classrooms here at UVA. Students' only exposure to ethical questions pertaining to their work comes from their own research or from social, technical, system (STS) classes that cover ethical issues in general. STS classes do not provide enough discourse on ethics since they do not just focus on CS but rather engineering in general. Post-graduation, this lack of knowledge brings about ethical dilemmas within professional work since these recent grads do not have the tools necessary to make the best choices. Training may be given by their employer but regardless of that the lack of an ethical background can arise and create ethical issues. These issues could be easily prevented by simply incorporating ethics learning within CS courses.

2. RELATED WORKS

De Witte (2022) talked about how Stanford University had a professor, Kathleen Creel, introduce embedded ethics into their CS curriculum. Rather than having a separate ethics course, Creel works with the CS faculty to introduce assignments, lectures, and discussions within the existing CS classes. The introduction of this program dates to 2020 when Stanford first launched its embedded EthiCS program. The result of the program can be seen from Creel's statement that "students have been eager to develop the skillset to help them discuss and deliberate on the ethical dilemmas they could encounter in their professional careers."

Florida (2023), on the other hand, discussed Columbia's relatively new introduction of ethics into its CS courses. Professor Chaintreau saw a need for a greater emphasis on ethics in the CS curriculum since CS students would have to deal with ethical discussions in their professional lives. Some examples had Students think about the implications of their work and determine whether it is necessary. If not, the students consider how it may be unethical and search for solutions on how deal with these ethical implications of their work.

Grosz, et. al, (2019) discusses a Harvard-based pilot program which integrates ethics into CS courses within its curriculum. The way the programmed functions is by having an embedded teaching assistant who works with faculty course heads. With these teaching assistants, courses get provided new ethics content within CS courses that students are already required to take. The result of this program showed that at least 70% of students in these courses responded positively to a plethora of questions regarding whether they saw a point in these ethical assignments and they showed genuine interest. Because of this positive response the piloted program became a part of the CS curriculum at Harvard and its influence can be seen through Stanford's own movement to implement an embedded EthiCS program.

Hedayati-Mehdiabadi (2022) discussed how CS students make ethical decisions and what the best approach to take in order to teach ethical problems in CS. The paper conducted a study in which students were given ethical scenarios and participated in online discussions with their peers. Afterwards each student was interviewed one-on-one and asked questions that would help the researchers understand what worked best to engage CS students with ethics. The research ended up with the conclusion that students made ethical decisions when they related to a real-world story, showed care for users, recognized fallacies, felt responsible for their creations, and perceived significance of the ethical issues. This research also highlighted things that negatively influenced the students and led them to make poor decisions.

3. PROPOSED DESIGN

Discussion of the state of CS ethics in UVA and how to improve them.

3.1. Review of Current Curriculum

The current state of CS ethics at UVA is mainly done in CS3240, a software development class, where students are exposed to the CS code of ethics and are required to do some brief assignments which have them face some ethical scenarios they may encounter in their professional careers. They then go over this content one more time in a quiz with another ethical scenario to analyze.

Any other ethics learning is done through separate courses at UVA. These classes are also not always required and in the case of engineers they do not cover enough on CS ethics. The issue is that we are currently emphasizing that ethics is not an integral part of CS but rather something students need to learn on their own.

3.2. Methods to Tackle Ethics

Weighing what options we have for implementing more ethics into CS courses.

3.2.1. Separate Course

One option for improving ethics discussion is to require students to take a CS ethics course dedicated to teaching students about ethics models and having them discuss different scenarios they may face in the workplace. This would mean improving our current method of teaching ethics by having more discussion within our ethics learning courses.

3.2.2. Integrated Content

The other option would be to get rid of the separate ethics courses and expand ethics discussions within required CS courses. The benefits of this can be seen through the program EthiCS which is already being

implemented in schools like Harvard and Stanford. These programs have received better engagement from students. Research also shows that students respond better to ethical discussions when the case studies they talk about are directly related to the work they are doing (Grosz, 2019).

3.3. Implementing

Discussing how the University could go about implementing either separate or embedded ethics courses.

3.3.1 Separate

Implementing a separate ethics course for CS would involve having a new required course that all CS students would have to take. This would result in needing professors who could teach this course as well as altering again the requirements of all CS students. Essentially the class would be in an STS style without the necessity of having to write a thesis paper.

3.3.2. Embedded

To implement the alternative, we would have to introduce assistant professors. We would essentially follow the programs that are already implemented at Harvard and Stanford. This update would not change any requirements within the CS curriculum other than making STS redundant for engineering CS majors.

4. RESULTS

From these two options it appears that choosing to embed ethics into the CS curriculum would be a much better alternative than requiring a separate course. It would not only be a lot simpler than introducing a new requirement but, Grosz (2019) showed through the EthiCS program that students were a lot more receptive to the content taught in the embedded courses. So in order for UVA to bring ethics into CS they would simply need to follow the path of Harvard and Stanford, and introduce an assistant professor who could help incorporate ethics learning into the current CS courses. The content that would be introduced into CS courses should also follow Hedayati-Mehdiabadi (2022) as an outline. Through the use of this outline, we can make sure that CS students are engaging positively with ethical discussions and are actually learning how to become ethical members of the workforce. The expected outcome would be students learning more about ethics than engineering CS students currently learn about in their STS classes.

5. CONCLUSION

The incorporation of ethics into our CS courses at UVA is fundamental. By fully embedding ethics in our curriculum, as other schools have done, we can equip our graduates with the necessary tools to effectively navigate ethical dilemmas in the workplace. Cultivating a more equitable and socially responsible tech industry requires a commitment to ethical considerations, and integrating ethics into CS education is a crucial step in that direction. We must continue to prioritize ethical education to promote a culture of responsible innovation and prioritize the well-being of those affected by our work.

6. FUTURE WORK

This research has been shown that there is a way to incorporate better discussions within CS courses, so now the issue is how to fully get this implemented. For this change to occur there needs to be enough support from everyone. Advocation for an embedded ethics course can be spread within students

and can also be spread through conversations with their faculty and advisors. If enough people within the CS department show an interest towards change, then we can create a movement within the university body to make the required change to the CS curriculum.

REFERENCES

Melissa De Witte. 2022. New program embeds ethics into computer science courses. *Stanford Report*. Retrieved February 28, 2023 from https://news.stanford.edu/report/2022/06/28/new-program-embeds-ethics-computer-science-courses/

Robert Florida. Weaving Ethics Into Columbia's Computer Science Curriculum | Columbia Science Commits. Retrieved February 28, 2023 from https://science.fas.columbia.edu/news/weaving-ethics-into-columbias-computer-science-curriculum/

Barbara J. Grosz, David Gray Grant, Kate Vredenburgh, Jeff Behrends, Lily Hu, Alison Simmons, and Jim Waldo. 2019. Embedded EthiCS: integrating ethics across CS education. *Commun. ACM* 62, 8 (July 2019), 54–61. DOI:https://doi.org/10.1145/3330794

Amir Hedayati-Mehdiabadi. 2022. How do Computer Science Students Make Decisions in Ethical Situations? Implications for Teaching Computing Ethics based on a Grounded Theory Study. *ACM Trans. Comput. Educ.* 22, 3 (September 2022), 1–24. DOI:https://doi.org/10.1145/3483841

Stanford University? Building an Ethical Computational Mindset. *Stanford HAI*. Retrieved March 19, 2023 from https://hai.stanford.edu/news/building-ethical-computational-mindset