INFUSING ETHICS IN THE DATA SCIENCE CURRICULUM

E. Milonas
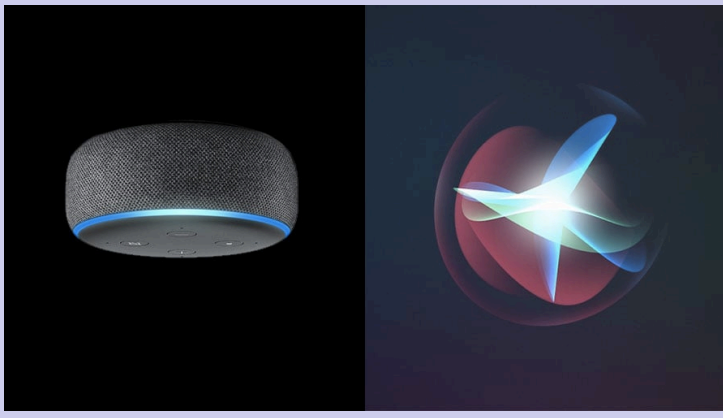
Department of Computer Systems
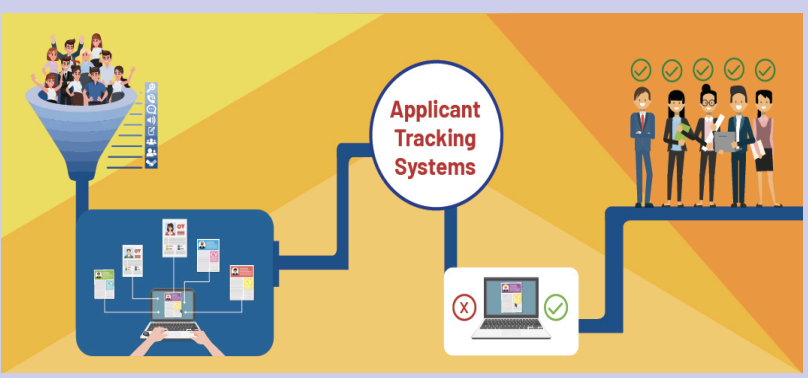
ABSTRACT

Intelligent technology is being woven into the fabric of everyday life and is an integral part of society. Developing intelligent systems requires technical expertise such as knowledge of natural language processing or machine learning and a deep awareness and understanding of ethics and societal impact. Mastering knowledge of ethics and societal impact falls on the shoulders of Data Science professionals and programmers responsible for designing and implementing intelligent systems' decision-making aspects. Preparing Data Science students to meet intelligent technology implementation demands requires incorporating and reinforcing ethical and societal impact topics throughout the Data Science curriculum beginning with the introductory courses and continuing to the advanced courses.

INTRODUCTION

During the past few decades, the world has changed as a result of advances in technology. These have impacted and transformed society both professionally and personally. Advanced technologies today are powered by machine learning algorithms. These algorithms examine trends in data and form relationships by recognizing the patterns in the data. They use these relationships to solve complex problems. Examples of machine learning

Virtual personal assistant Siri and Alexa	Fare Calculating Systems for Uber or Lyft	Customized user experience Facebook "friends" & Amazon "customers who shopped also shopped for"	User support systems "Chat"	Search engine Recommendation Systems "did you mean" or "searches related"	Job applicant system Systems for screening potential job applicants	Financial forecasting and screening systems determine & predict risk

PURPOSE OF THE STUDY

The importance of Machine Learning algorithms will increase exponentially as demand for new and more advanced intelligent technologies increases. The need for advanced intelligent technologies warrants computer professionals and programmers to possess technical sophistication and an understanding of ethical and societal issues and concerns to prevent bias. This study aims to assist undergraduate Data Science majors in becoming aware that Machine Learning algorithms can potentially generate bias and that such bias can exclude individuals or groups of people. These students need to gain awareness as they will ultimately be the designers and coders of these Machine Learning algorithms.

STUDY METHODOLOGY

Quantitative Analysis: Statistical analysis of learning outcomes and student and Industry Advisory Board surveys. **Qualitative Analysis**: Content analysis of focus group sessions

Learning Outcomes	Class Activities
Identify the ethical issues of bias in machine learning algorithms	• Analysis of real-world cases • Weekly responses to topics related to algorithm bias (readings, TED Talks, news) • Current events related to ethics posted on Blackboard's discussion board • Guest lecturers/speakers • Team project • Homework, quizzes and/or exams
Identify the ethical dilemmas associated with algorithm bias including the various standpoints and the possible consequences	• Analysis of real-world cases • Weekly responses to topics related to algorithm bias (readings, TED Talks, news) • Current events related to ethics posted on Blackboard's discussion board • Guest lecturers/speakers • Team project • Homework, quizzes and/or exams
Identify student responsibility as future computer professionals	• Guest lecturers/speakers • Team project • Quizzes and exams
Identify the prescribed ethical standards set by institutions such as ACM/IEEE or ABET	• Team project • Homework, quizzes and/or exams

FUTURE DIRECTIONS

Evaluate Spring 2021 Introduction to Data Science course.

Compare and contrast findings from the Fall 2020 and the Spring 2021 course sections.

Based on findings, revise the course topics, learning outcomes, and class activities.