Introduction:

My research delves into the perceptions of undergraduate engineering students in the US and UK regarding Artificial Intelligence (AI) in their curricula. Specifically, the project is interested in how these perceptions impact their career choices post-graduation and if students are aware of biases in AI. The study focuses on current undergraduate, or Generation-Z students, who were born in the mid to late 1990s as this generation is expected to enter a workforce that is heavily influenced by AI technology.

As engineering programs incorporate AI modules into their curricula, it is crucial to understand how these topics are being taught to Gen-Z students, if they recognize the biases embedded in AI technologies, and if there is interest from these students to pursue a career in AI. For the first phase of my thesis, I interviewed faculty members from two well-respected universities, one located in the US and the other in the UK. For this paper, I will discuss the responses of three out of the six academics that were interviewed. The purpose of this stage was to gather data that would assist me in answering my research questions and facilitate future interactions with student participants later in the thesis. My findings indicated that faculty members' attitudes toward integrating AI into the curriculum varied significantly across all six academics, but the three academics chosen for this paper had particularly unique positionings and responses with their thoughts on AI- engineering education. The discussions around AI ethics and biases were particularly illuminating, demonstrating that there is no universal approach to this complex issue.

Literature review:

The intersection between global economic competition, technological innovation, and the rise of AI, particularly within the fields of Science, Technology, Engineering, and Mathematics (STEM), positions AI engineering education in the US and UK at a pivotal crossroads. This calls for exploring national policies fostering innovation for economic growth and societal advancement, as described by (Kennedy & Odell, 2014; Liu, 2022), in order to position the current engineering contexts of both countries. At the same time, as highlighted by (Chu et al., 2022), the use of AI in higher education has become more popular in recent years- specifically among undergraduate, engineering, Gen-Z students across a variety of subjects- making the awareness of AI biases even more imperative. After setting the scene by describing the current engineering profiles in both the US and the UK, the thesis will then go on to describe current AI usage in higher education to illustrate the environments the faculty members are situated in.

In the United States, the science, technology, and innovation (STI) policy is intricately linked with political decisions that often dictate the direction of technological funding and environmental initiatives (Branscomb, 1992; Liu, 2022). This relationship reveals a historical trajectory where the allocation of funds and the scaling of sustainable projects have been influenced by governmental priorities, reflecting the broader challenge of aligning scientific progress public and enviorment welfare.

Contrastingly, the United Kingdom's approach towards STI policy has historically favoured commercialization and privatization, aiming to maintain its leadership and competitive edge in technology and engineering sectors (Gregory, 2008; Wren, 2001). This strategy is seen

through initiatives designed to enhance public understanding of science and foster competitive STI policies, which are integral in shaping future trends and addressing societal challenges.

Furthermore, the culture surrounding engineering education in both nations warrants a critical evaluation. The reliance on self-reported data and the scarcity of cross-national studies contribute to a partial view of the effectiveness of engineering education (Stains et al., 2018; Gasman & Perna, 2011). This scenario necessitates a nuanced understanding of engineering education's pedagogical approaches and perceptions, particularly among underrepresented groups, to ensure an inclusive future.

Within this context of the evolving policy, the advent of artificial intelligence (AI) in engineering curricula emerges as a pivotal area of exploration. According to Crompton and Burke (2023)- who conducted a systematic review of current AI in higher education studies- the recent developments of artificial intelligence in education (AIEd) highlight significant trends, including a marked increase in publications and shifts in research focus from the United States to China, reflecting the global dynamic changes of AI research in education. Their systematic review shows the growing interest in AI applications specifically in STEM subjects and outlines the diverse roles AIEd plays in assessment, prediction, and personalized learning.

An earlier review of AI in HE, conducted in 2021, (Crompton et al., 2021; Zawacki-Richter et al., 2019) identified undergraduate STEM students as having the most exposure to AI in HE after its use by students to learn new languages with computer science and engineering- based studies composing 16% and 12% of the projects analysed. Though indicates a diversified application of AI across various educational fields, though with a significant tilt towards STEM disciplines, a later study from 2022 found that

This exploration into the complexities of STEM education, STI policy, and the challenges of diversity and inclusion sets a critical foundation for this paper.

It underscores the essential role of engineering education in preparing Gen-Z students for a future deeply intertwined with AI technologies, highlighting the need for policies and curricula that promote inclusivity, innovation, and societal well-being (Kennedy & Odell, 2014; Liu, 2022). The insights provided by Crompton and Burke (2023) into the current state and potential directions for AI in engineering education serve as a vital complement to this discourse, enriching our understanding of the challenges and opportunities that AI presents in the realm of engineering education.

Methodology :

In order to understand how the integration of Artificial Intelligence (AI) in engineering curricula influences the career aspirations of Generation-Z engineering students, the methodology described here was utilized for this project. Central to this inquiry is the qualitative exploration of faculty perspectives from esteemed universities in the US and the UK, aiming to uncover the nuances of AI's role in engineering education. This approach is specifically chosen to delve into

the intricacies of pedagogical strategies, the incorporation of AI ethics, and the broader implications for student engagement and career planning.
Acknowledging the critical gap in research concerning the underrepresentation of women and minorities in STEM fields, especially in AI, this project employs a comparative and international lens to examine the experiences of undergraduate students with AI modules. The selection of this focus is driven by the recognition of Generation-Z's imminent entry into a workforce deeply impacted by AI technologies, necessitating a comprehensive understanding of their educational trajectories and future career paths.
To this end, the methodology detailed in Chapter 4 encompasses a multi-faceted approach, integrating faculty interviews, a Qualtrics survey aimed at students, and further in-depth interviews with students. This methodological choice reflects a commitment to capturing the complex, lived experiences of students and faculty alike, providing a rich, qualitative dataset from which to draw insights. Notably, the study emphasizes self-identification regarding underrepresentation, seeking to untangle how individual backgrounds influence perceptions and engagements with AI in engineering education.
By focusing on the faculty's input through interviews, this research sheds light on the diverse attitudes towards AI curriculum integration, pedagogical approaches, and the conversations surrounding AI ethics and biases. This exploration not only sets the stage for understanding the educational environment in which students navigate but also offers crucial insights into the preparatory measures necessary for equipping underrepresented groups with the skills and knowledge to thrive in an AI-driven future.
This methodological groundwork serves as the basis for the present report, which zeroes in on the faculty interview component of the broader research project. It underscores the importance of dissecting faculty perspectives as a means to inform and enrich our understanding of the challenges and opportunities that AI presents in the realm of engineering education. Through this lens, the report endeavors to contribute valuable insights into the pedagogical dynamics at play, setting a context for further investigation into the implications for student career aspirations in the field of AI.

This methodological approach leveraged the adaptability and depth of semi-structured interviews aligned with the work of Kallio et al. (2016), allowed for a thematic exploration of AI's pedagogical integration. and reinforced by Lury's (2020) discourse on evolving research methodologies, this format fostered an environment where educators could share their experiences and challenges in integrating AI into the curriculum.

Ethical considerations were paramount, with each participant receiving detailed consent forms and information sheets, underscoring the research's ethical foundation. A thematic analysis of the interviews revealed six key themes, directly informing my research questions and highlighting the potential for AI modules to foster an awareness of AI biases among undergraduate students.

While my thesis encompasses a broader scope of data collection, this paper zeroes in on the faculty interviews, offering a focused lens through which to examine educators' insights on AI in engineering education. The perspectives gleaned from these discussions are invaluable, laying the groundwork for further inquiry and pedagogical refinement aimed at enhancing AI's role in engineering curricula.

Findings

Considering the requirement to include Academic A and seeking converging/diverging responses on AI integration in engineering curricula, ethics, and biases awareness, the selection would logically include Academics A, C, and E. Here's why:
Academic A explicitly teaches AI courses, offering a broad overview and advanced AI tools for autonomous agents to undergraduates. This provides a direct perspective on AI's technical and ethical aspects, making their input indispensable for understanding AI's curriculum integration and the emphasis on biases and ethics.
Academic C represents a diverging viewpoint by not teaching AI explicitly but incorporating it mainly in assessment contexts. This contrast with Academic A's approach offers insights into the subtler, indirect ways AI and its ethical considerations might be introduced to students, highlighting variability in AI integration and the discussion of biases across faculties.
Academic E is involved in supervising students on machine learning projects and is in the process of developing an AI module. Their experience supervises project-based learning and module development offers a balanced viewpoint between Academic A's direct teaching approach and Academic C's indirect AI integration. Academic E's involvement in both hands-on projects and the planning of future AI education provides a comprehensive view on the evolving nature of AI teaching methods, including how biases and ethics are addressed in a non-traditional classroom setting.
Choosing Academics A, C, and E allows for an examination of the spectrum of AI integration in engineering education, from direct coursework and specialized AI modules to project supervision and assessment strategies. This selection covers the range of teaching methodologies, the inclusion of AI ethics and biases in the curriculum, and anticipates future directions in AI education.

Theme One: AI Curriculum Integration and Pedagogical Approaches
Academic A: "The courses that I teach are AI courses not necessarily robotics courses but yeah. There are two courses I teach. One is an introductory AI course it's kind of a broad overview of AI and the other is a senior-level course that is more advanced AI tools for autonomous agents. These are both undergraduate" .
Academic C: "No I don't teach AI explicitly... it comes in at least for me mainly when it comes to assessment... I bring that (AI) in to show students how they might use certain AI tools to help them... that’s really probably as far as it goes" .
Academic E: "In the projects that I propose for the third year and for master's students are mainly data analysis and machine learning. So I supervise students on projects that they use machine learning... I don't teach modules that are machine learning if that makes sense" .
Convergence/Divergence: Academic C's peripheral incorporation of AI contrasts with Academic A's direct teaching and Academic E's supervisory role in AI-involved projects, reflecting diverse pedagogical approaches within engineering curricula.
Theme Two: Faculty Perceptions and Interactions with AI in Higher Education

Academic A: "Occasionally I would say I mean a lot of it is embedded already in in things so you know just you know spam filters for instance use AI so anytime I'm using email I'm you know under the hood using AI but explicitly using AI tools relatively rarely occasionally" .
Academic C: "AI is very broad. So probably every day even if it's 'cause you know from what I'm hearing AI extends to you know certain functions in Microsoft Word. So yeah probably every day. But then you know AI in the in the sense of say the ChatGPTs and the newer AI... at least once a month I'd say yeah" .
Academic E: "I usually do research so in my research I use different algorithms of machine learning to predict, to classify, to analyse data that I have. So yeah in my other than teaching I have research that I use machine learning algorithms in" .
Convergence/Divergence: All academics recognize routine interactions with AI, though Academic C provides a nuanced perspective on the frequency of engaging with advanced AI tools, aligning with the broader understanding of AI's embeddedness in daily academic tasks.
Theme Three: Ethics and Biases in AI Education
Academic A: "We require a course in ethics and many of the core AI courses have an ethics module embedded in them. So yeah so I think these are critical aspects" .
Academic C: [No specific quote provided, implying a need for further discussion on ethics and biases within AI education from Academic C's perspective.]
Academic E: "We need to have clear guidelines for the educators, for the staff, and for the students as well. So this would be yeah... Easily usable" .
Convergence/Divergence: While Academics A and E emphasize structured approaches to ethics in AI, the lack of a direct quote from Academic C suggests an area for further exploration within their pedagogical framework.
Theme Four: Student AI Biases Awareness
Academic A: "There may be the case that students will become over-reliant on AI tools such as copilot and ChatGPT and kind of lose the ability to do these things on their own" .
Academic C: [Lack of direct quote suggests a need to address student AI biases awareness more explicitly in future discussions.]
Academic E: "At the moment is a way to solve coursework and solve sort of assessment and a way... Yeah hopefully this would be, I think the only way this can be putting on the right track is to let students know how to solve it and when sorry how to use it and when to use it" .
Convergence/Divergence: The expressed concerns by Academics A and E about student reliance and awareness of AI contrast with the absence of a direct statement from Academic C, indicating divergent levels of engagement with this issue.
Theme Five: Interdisciplinary AI Topics and Demand for AI Education
Academic A: "Yes to both of them yeah definitely" in response to student demand for AI and robotics.
Academic C: "…the demand is there but the demand is also being met because they have optional modules that they can take…where if they wanted to focus more on AI and other digital tools they can do that.. so yeah… the demand is definitely there and being met as well" .
Academic E: "As I said because there there have been numerous requests from students that they they they are interested in this topic... We thought that it's it's it's time now to propose this module" .
Convergence/Divergence: All academics acknowledge the growing student demand for AI education, with Academic C highlighting existing module options that meet this demand, complementing the initiatives described by Academics A and E.

Theme Six: The Future of AI for Students
Academic A: "AI is going to become more and more ubiquitous. I mean like you asked the question before about you know kind of day-to-day usage of AI. And I said you know explicit use of AI tools only occasionally but so much of what we do these days has you know AI embedded in it you know email... It's only gonna become more more ubiquitous" .
Academic C: "…we'll probably have to adapt it to becoming kind of like…the calculator where eventually… for wholly written pieces of work we would expect them (students) to use… an AI generator for quite a big portion of it… (we) probably have to think about readjusting out assessments as well as rubrics to accommodate for that…" .
Academic E: "Helping, helping AI tools are very... Very good and they help I think the essence of these tools is to help people to make things easier to make things not only easier but also to produce meaningful and helpful results. But we need to know how. That's that's the thing. Because it's a new thing now and it's affecting our our our way of teaching" .
Convergence/Divergence: The recognition of AI's growing ubiquity unites all academics, though Academic C specifically anticipates significant shifts in assessment strategies, highlighting a proactive approach to integrating AI into educational frameworks.
These comprehensive quotes and discussions offer a nuanced view of each academic's stance on AI's role in engineering education, reflecting a blend of convergent views on AI's importance and divergent approaches to its integration, ethics, and future implications.

Chu, H., Tu, Y., & Yang, K. (2022). Roles and research trends of artificial intelligence in higher education: A systematic review of the top 50 most-cited articles. *Australasian Journal of Educational Technology, 38*(3), 22–42. https://doi.org/ 10.14742/ajet.7526