

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Previous Research

The previous research by Jiang & Pardos, (2021) the research problem is the impact of fairness considerations in machine learning models used in educational technologies, particularly in predicting college student success and graduation rates, to avoid algorithmic bias and unfair treatment of certain demographic groups. The method approach to solving the problem involved employing strategies for mitigating algorithmic bias in the grade prediction task, implemented in three stages of the LSTM prediction pipeline: data construction, model training, and inference. Adversarial learning was utilized to improve group fairness while maintaining overall accuracy in the grade prediction model. In order to address disparities in graduation rates based on racial, gender, or socioeconomic categories and to reduce historical equity gaps, the weight loss by sample technique was implemented. The results of the study showed that including race explicitly in the model input led to the most unfair results, while adversarial learning achieved the best fairness scores. Grade label balancing was effective in improving grade prediction for underrepresented groups. Weighting the loss function by grade label was found to mitigate prediction quality disparities, while re-weighting by race improved fairness for underrepresented groups. Adding sensitive attributes to the model input improved accuracy but could lead to discrimination against certain groups. Removing sensitive attributes in the prediction stage helped mitigate bias. The study highlighted the importance of addressing equity and fairness in machine learning algorithms to avoid widening achievement gaps and emphasized the effectiveness of adversarial learning combined with grade label balancing in achieving fairness in grade prediction models.

The previous research by Vasquez Verdugo et al., (2022) explain about fairness scoring. The problem addressed in the paper is the identification of students at high risk of dropout after the first year in a Chilean college with three bachelor

programs. The study focuses on analysing fairness in educational data mining algorithms used to predict student dropout rates, considering factors such as admission processes, past academic performance, socio-economic status, and college academic performance. The goal is to systematically explore fairness issues in machine learning models and provide decision-makers with tools to understand and address unfairness risks in higher education settings. The method approach to solving the problem of identifying students at high risk of dropout after the first year in a Chilean college involves a systematic fairness analysis approach applied in a higher educational context. This approach comprises five independent modules: framing the context, analysing potential fairness issues, evaluating mitigation approaches, reporting unfairness risks, and measuring the cost of fairness. The analysis includes exploring data context, stress testing, and implementing mitigation strategies to address fairness concerns. Additionally, the approach involves engaging stakeholders to define the objective and use of the model, as well as utilizing various mitigation techniques such as pre-processing, in-processing, and post-processing strategies. The results of the study show that the FairEd framework identified demographic groups, such as female students and those from public high schools, that would be underserved by algorithms predicting student dropout in Chilean higher education. The study also found that fair outcomes can be achieved through pre-processing mitigation strategies, but this may lead to a loss in predictive power, raising questions about the usefulness of a fair version of the dataset in a data mining pipeline.

Sonnleitner & Kovacs, (2020) from Austria research discuss fairness scoring that has problem disparities in students' and teachers' views of fairness in assessment processes. The study's goal is to discover these inequalities using the Fairness Barometer tool in order to improve instructors' assessment methods and expand teacher development opportunities. The study used an online questionnaire administered to students and teachers in the classroom to measure opinions of fairness in assessment processes. The Fairness Barometer tool was used to collect data and investigate profile differences between students and teachers. Profile similarity scores were computed to measure perception discrepancies and

indicate areas where assessment methods may be improved. The study discovered significant variety in profile patterns, demonstrating that both students and teachers may distinguish distinct characteristics of assessment fairness. Some teachers demonstrated differences in almost every assessed feature when compared to their students, while others provided nearly identical responses to their students on fairness issues. These findings imply that the Fairness Barometer tool has the ability to reveal unique strengths and flaws in individual teachers' evaluation approaches, facilitating improvements in assessment procedures.

2.2 Definition of perception

Perception is a process where humans can make the process of observing something that is complex in responding to something and the information around it by using our own five senses so that we are able to know, understand and also realize something (Simanjuntak et al., 2021). Humans can relate to their surroundings through the process of perception. This association can be established using the human senses of sight, hearing, smell, touch, and taste. Perception also determines how the researcher sees a phenomenon. Humans do not only depend on the gesture of colour and shape for a given thing in producing a perception, but human perception may also be influenced by the semantic meaning that exists with what happens or what is perceived around.

2.3 Type of perception

The type of student perception used in this study is essential since it will influence the conclusions obtained from the results. According to (Sakti et al., 2023), there are two types of perceptions namely, perceptions that are negative and perceptions that are positive.

2.3.1 Positive Perception

Positive perception is an individual's evaluation of an object or information with a positive attitude or as expected from the perceived object or from existing rules. Individual happiness with the object that is the source

of his perception, individual knowledge, and individual experience of the viewed item are the causes of a person's positive perception.

2.3.2 Negative Perception

Negative perceptions are individual responses to specific objects or information that are negative, contrary to what is expected from the perceived object or from existing rules. Individual dissatisfaction with the object being perceived, the presence of individual ignorance, and the absence of individual experience with the object being perceived can all lead to the emergence of a negative perception, and vice versa.

2.4 Definition of assessment

Assessment is the process of gathering and discussing information from various sources and activities in order to develop a deep understanding of what students know, understand, and can do with their knowledge as a result of their educational experiences. The process restarts when assessment results are used to plan and modify subsequent learning (Tontus, 2020). Assessment is a methodical field for thinking about student progress, evaluating programs, and determining the efficiency of educational activities. It is the process of planning, implementing, clarifying, developing, gathering, evaluating, understanding, and redesigning to improve student learning and growth. The assessment has a higher impact on student learning than teaching, and it has a significant influence on how students respond to their studies. Assessment provides learners with information on what their teachers consider significant, and thus what they should focus on. Thus, assessment serves as a guidance for studying in a targeted manner.

2.5 Definition of assessment fairness

Assessment is defined as the "process of gathering and analyzing information from various and varied sources to gain a profound insight into students' knowledge and comprehension, as well as their ability to apply their knowledge as a result of their educational experiences" (Md Din et al., 2023). The term 'fairness' is defined as "the quality of treating people equally or in a way that

is right or reasonable” by the Cambridge Advanced Learners’ Dictionary (Rezai, 2022). Assessment fairness is how the lecturer can give score equal to the students. Assessment fairness evaluation is the practice of methodically evaluating and quantifying the fairness of a decision-making process, system, or algorithm. This assessment entails examining many aspects and criteria to see if the process or system is devoid of biases and prejudice. The purpose is to provide fair treatment and outcomes for all individuals or groups involved. Assessment fairness seeks to increase responsibility and trust by ensuring that decisions are fair and equal.

2.6 Criteria of assessment fairness

Assessment fairness is a key concept in educational contexts, since it ensures that all students have equal opportunities to display their knowledge and skills. The concept of fairness in assessment includes a variety of criteria designed to reduce bias and promote equality among test takers (Rezai, 2022).

2.6.1. Transparency

Students or participants should be clearly informed about the assessment criteria, procedures, and expectations. The assessment process should be transparent to all stakeholders (Gonsalves & Lin, 2024).

2.6.2. Freedom from bias

Assessments should be free from any biases related to gender, race, ethnicity, socioeconomic status, religion, or other irrelevant factors. This requires careful examination of assessment materials and procedures to identify and eliminate potential sources of bias.

2.6.3 Equality and Equity

The distinction between equality and equity is crucial in understanding assessment fairness. Equality refers to providing the same conditions for all test-takers, such as identical resources and time limits. However, equity recognizes that different learners may require varied support to achieve similar outcomes due to diverse backgrounds and needs.