Deep Learning-Based E-Learning Solution for Identifying and Bridging the Knowledge Gap in Primary Education

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Educational teaching apps are primarily available in app stores to educate students in various contexts. Lack of educational resources, physical and mental health conditions, and poverty cause some students to skip school and move on to the next school grade without completing the course content of the previous grade. Most of the available apps focus on specific content to cover. The Smart Primary Education Tutor (SPET) teaching app specifically focuses on the missed content by analyzing their knowledge gap and providing lessons to cover the missed content. The main objective of SPET is to develop a methodology to identify the gap in student knowledge and fill the knowledge gap by teaching using smart techniques. SPET is determined to identify students' interactions (attention, emotions) with the system to identify students' ability to use the learning tool, identifying gaps in students' knowledge levels compared to their actual grades using activities and voice-based technologies, teaching to cover the knowledge gap by providing engaging activities and lessons and evaluating students by conducting a final assessment and analyze students' knowledge and performance obtained through the system. Students between the ages of 5 and 8 are targeted in the community to apply. The solution embeds deep learning-based models including attention classification models using head posture estimation, facial expression recognition, and eye gaze estimation, speech recognition models to identify provided verbal answers, handwriting recognition models to evaluate student performance, and smart teaching. The child emotion recognition model achieved 93% accuracy. The Attention span evaluation model achieved 85% accuracy. The handwritten numerical and English character data recognition model which detects answers for the final assessment paper achieved 85% percent of accuracy.

Keywords: *attention classification, knowledge gap, handwritten recognition, smart tutor*