

Study on the Impact of Using Virtual Reality in Developing Students' Soft Skills

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Abstract— The integration of Virtual Reality (VR) into higher education has gained significant attention for its ability to provide immersive and experiential learning opportunities. This pilot study examines the impact of using VR on Year-2 students' engagement, learning, and professional skills development within the Ethical and Professional Issues module in a UK University, with a specific focus on employability skills. The research utilizes BodySwap, a VR simulation tool designed to enhance students' soft skills, particularly job interview skills. Through interactive and immersive experiences, students engaged in simulated interviews, receiving real-time feedback on their articulation, body language, eye contact, and use of filler words.

To evaluate the effectiveness of VR-based interview training, feedback collected from students is used for sentiment analysis. The study examines deep learning models for sentiment analysis techniques for classification. BERT and DistilBERT are applied to detailed feedback from participants. Each approach is used to classify feedback into either positive or negative categories, with the most effective method determined based on accuracy, precision, recall and F1-Score. DistilBERT model slightly outperform the BERT model with higher speed and lower resources.

Keywords— Virtual Reality, Soft Skills, Employability, BERT Transformer

I. INTRODUCTION

Employability involves not only domain-specific knowledge but also transferable soft skills such as communication, emotional intelligence, confidence, and adaptability. These skills are particularly crucial in the context of job interviews, where the ability to present oneself effectively can significantly influence employment outcomes. Virtual Reality (VR) has emerged as a medium for supporting employability skills development in higher education, particularly through immersive simulations that enable experiential learning. The use of VR for soft skills training especially in the context of job interviews has gained increasing attention due to its ability to simulate real-life, high-pressure interactions in a controlled and repeatable environment [4].

Several VR platforms have been developed to simulate interview scenarios. Tools such as *VRJobInterview*, *InterviewVR*, and *VirtualSpeech* have been used in educational and clinical settings to provide students with realistic practice opportunities. These tools often include features like real-time feedback, AI-generated avatars, and self-assessment mechanisms. For example, *VirtualSpeech* combines VR-based simulations with learning modules and has been shown to improve users' public speaking and interview confidence [10]. These platforms highlight a growing trend toward immersive technologies that focus on reflective and interactive learning. However, many studies emphasize that effectiveness depends heavily on the level of realism, interactivity, and feedback provided. Without intuitive controls or scenario-specific feedback, the learning benefits may be minimal or even negative [6].

This paper builds on prior work by implementing **Bodyswap**, a commercially available VR platform designed to enhance soft skills in immersive and role-based learning. Bodyswap uses AI-driven avatars and first-person perspective simulations to allow users to experience job interviews [2]. In this study, qualitative analysis is conducted to identify the themes that contributed to the students' learning and development. Furthermore, sentiment analysis was performed with the aim of classifying the responses collected from students who participated in the use of the Bodyswap platform and build a classification model for future use.

II. RELATED RESEARCH

Studies in various domains such as Engineering, Medicine, and Psychology are explored the use of virtual reality to enhance students' soft skills.

In [8], the author employs an educational strategy, combining Quality Function Deployment (QFD) with a virtual reality simulation to foster soft skills such as teamwork, communication and motivation among engineering students. Situating students in a realistic, immersive environment that closely mimics real-world QFD implementation in industry, encouraging positive peer interaction and overcoming initial apathy or fear.

The authors in [7] review existing work on using VR that enhance skills such as collaboration, communication, creativity, and critical thinking in education context. In fields

like medicine and engineering, immersive environments improve conceptual understanding and procedural competence in ways difficult or unsafe to replicate in traditional classrooms. Collaborative VR further enhances group learning experiences, though many implementations still lack mechanisms for meaningful peer interaction in VR settings.

A work investigated the use of virtual reality (VR) body-swapping to enhance self-assessment in job interview training. In their study, participants experienced three different VR conditions remaining in their own perspective, observing themselves from an external viewpoint, or embodying the recruiter's avatar to evaluate their own interview performance. The findings showed that both the out-of-body and recruiter perspectives significantly improved participants' ability to assess their verbal and nonverbal communication skills compared to the first-person mode. The study suggests that embodied VR can effectively support soft skills training, though its impact may be limited by short-term effects and practical challenges[9].

In this work, Bodyswap is used to provide students a feedback on their soft skills such as speech clarity, eye contact, filler word usage, and body language. The focus on evaluating its effectiveness among computer science students at a UK university, a population known to have a good technical foundation but often requiring support in developing interpersonal and professional skills.

This study aims to evaluate whether immersive VR training can lead to improvements in students' interview preparedness and skills development. This work contributes to a growing body of research exploring how immersive technologies can be integrated into higher education to meet evolving workforce demands.

III. METHODOLOGY

1. Integrating VR in PEI module

Professional and Ethical Issues (PEI) is a year-2 module that aims to address professional and ethical issues in the digital environment. This includes topics such as ethical issues of AI, big data, and cyber security. Topics related to electronic Information, risks, misuse and criminal activity are also covered in the module. One of the module learning outcomes is to develop students' employability skills and enable them to plan for improvement and continuing professional development. One of the employability skills required is to develop their interview skills. Therefore, the Virtual Reality lab was introduced to be part of the module for the academic year-2024-2025. The students attended scheduled sessions to use the VR lab that has Bodyswap simulation installed on it.

2. Data gathering and Pre-Processing

The data used in this study was collected from two sources: an anonymous survey distributed to students and detailed feedback obtained through the module platform. A total of 59 students participated in the survey, while 100 students shared in-depth feedback about their experience using virtual reality (VR) in learning and development.

The collected text data for the sentiment analysis was converted to lowercase to maintain consistency. Punctuation was then stripped using Python's string.punctuation module. Stopwords were removed with the help of NLTK's stopwords corpus to reduce noise in the data.

Duplicate entries were manually identified and eliminated. To address potential class imbalance, basic checks were performed to ensure there were no severe discrepancies. Manual annotation of data into (positive, negative) labels is manually implemented using Large Language Models (LLM). Finally, tokenization was carried out using the basic_english tokenizer provided by the torchtext library.

3. Model Architecture and Experimental Setup

BERT and DistilBERT models are utilized due to their strengths in natural language processing and sequence modelling, enabling an evaluation of sentiment analysis performance on student feedback.

a. BERT (Bidirectional Encoder Representations from Transformers):

BERT is a state-of-the-art pretrained transformer model that captures rich contextual information by processing text bidirectionally. Its deep architecture and attention mechanisms allow it to understand nuanced semantic relationships and handle complex language patterns, making it highly effective for sentiment analysis tasks, especially when dealing with varied and domain-specific feedback[3].

The BERT model is pre-trained using Masked Language Modelling (MLM) and Next Sentence prediction (NSP), enabling rich contextual embeddings. The model used for training the collected data consists of 12 transformer layers, each designed to capture complex language patterns and contextual relationships. It features a hidden size of 768 and includes 12 attention heads, enabling the model to focus on different parts of the input text simultaneously. For implementation, the model was accessed using the transformers.pipeline("sentiment-analysis") function from the Hugging Face Transformers library. Figure-1 depicts the model architecture of BERT.

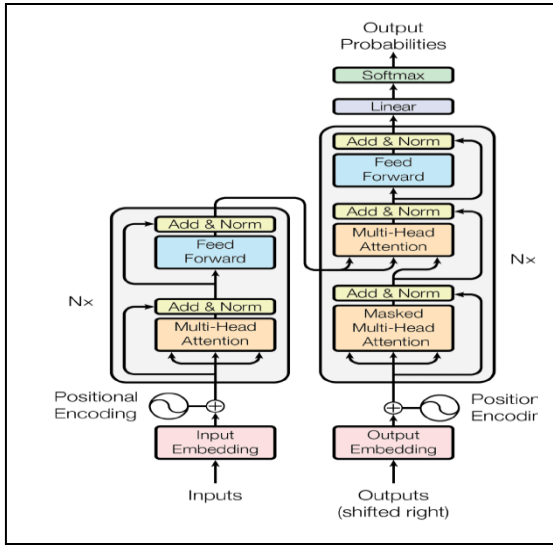


Figure-1 BERT Architecture.

b. DistilBERT:

DistilBERT is a distilled, compressed version of BERT that retains most of its performance while reducing model size and inference time. This model provides a balance between accuracy and efficiency, making it well-suited for practical applications where computational resources are limited or real-time analysis is required. Evaluating DistilBERT alongside BERT helps to understand trade-offs between speed and predictive power. Figure-2 shows the architecture of DistilBERT

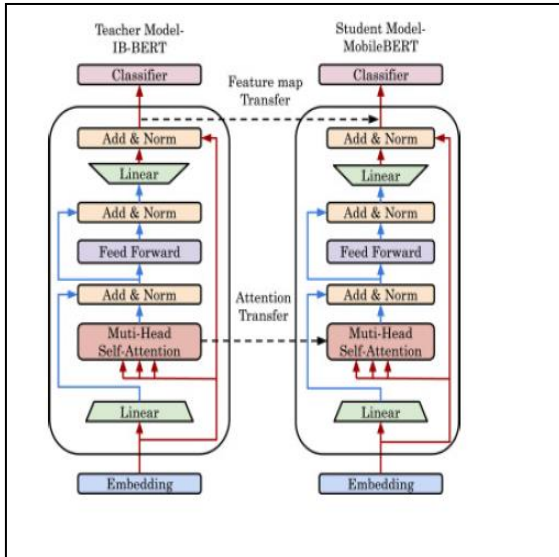


Figure-2 DistilBERT Model Architecture

IV. FINDINGS AND ANALYSIS OF RESULTS :

This section explore qualitative and sentiment analysis. Qualitative analysis is conducted to analyse and understand students' learning experience by identifying overall trends and identifying themes of each category. This is followed by the sentiment analysis of the results of the selected models and evaluate the performance on each model.

Initial insights from the anonymous survey's non-textual data, collected from select questions, are presented in Figure 3. As shown in the first chart, the majority of students (93.2%) agree that using VR in their learning and work is helpful, while 6.8% find it less useful. When asked if they recommend that future students use the VR Job Interview Simulator and similar VR tools, 91.5% responded positively, with 8.5% expressing less or no agreement as shown in the second chart. The third chart shows 83% of students reported that they learned either a lot or

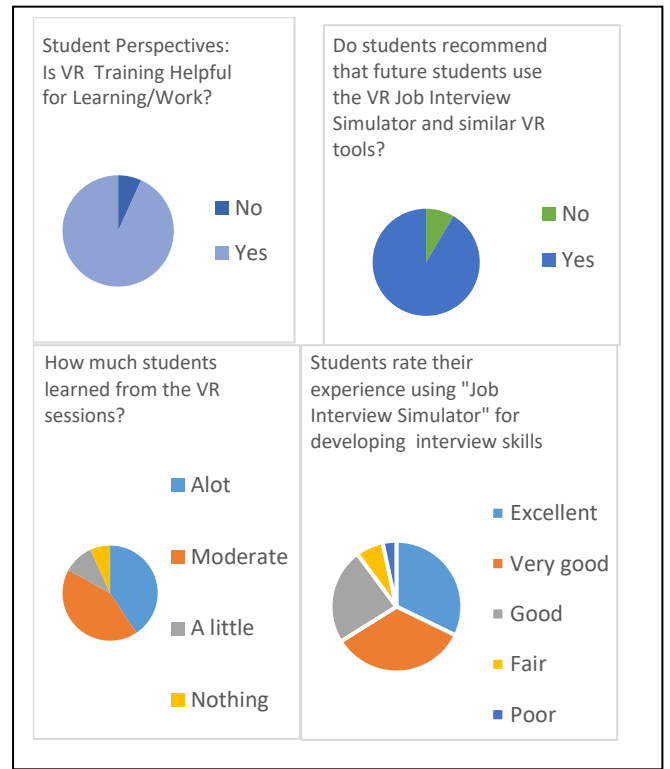


Figure-3 Students' Feedback Responses on attending VR Session

a moderate amount from the experience, demonstrating a positive impact on their learning. However, 17% of students indicated that they learned little or nothing, reflecting a less significant benefit for this group. The last chart indicates that a majority of students, 89.8%, reported that they developed their soft skills through the experience while 10.2% of students felt that their soft skills showed only fair improvement or no development at all.

Table-1 Feedback Analysis

Comment	Theme	Examples of Theme	Count of Occurrences
Positive Comments Total= 453	SD	(Skills Development) Boost communication skills, enhance & practice body language, boost self-confidence, reduce anxiety	208
	ME	(Motivation and Engagement) Enjoyable/fun experience, motivating, more time for practice, immersive/interactive simulation, priceless experience..	50
	FS	(Feedback and Support) Colour-grade, in-depth, detailed and immediate feedback, suggests improvement, support self-confidence and self-awareness.	104
	REF	(Real Feel of the Experience) Immersive nature, Realistic, real world, role playing.	79
	UTA	(Usability and Technical Aspects) Easy to use, comfortable, reliable	12
Negative Comments Total= 18	NEC	Technical Glitches, eye contact scoring system inaccurate and unreliable, uncomfortable background noise, occasional glitches with voice recognition, avatar hands lopsided, not easy to use. auditory delay, lacked natural dynamics, demotivating if the score is low.	18

A total of 16,170 words were collected from students' feedback. The comments were analysed using iterative coding [1], allowing key themes to emerge from the data. The feedback was grouped into the following themes:

- **Skills Development (SD):** Includes communication skills, confidence building, and self-reflection.
- **Motivation and Engagement (ME):** Covers students' enjoyment and their motivation to continue practicing.

- **Feedback and Support (FS):** Relates to the real-time feedback provided by the VR simulator.
- **Real Feel of the Experience (RFE):** Captures how real and immersive the simulation felt to students.
- **Usability and Technical Aspects (UTA):** Refers to the ease of use and any technical challenges of the VR tool.

Feedback themes, description, the count of occurrences, positive and negative comments are summarised in Table-1. A general look at the students' feedback shows that a vast majority of their comments (97%) are positive (expressed in 453 positive comments) whereas only 3% expressed the negative opinion in 18 negative comments. These results demonstrate students' high engagement with using VR in the module.

A more detailed analysis is conducted using deep learning models [5]. Firstly, manual sentiment label distribution is conducted using Large Language Model (LLM). The sentiment label distribution diagram in Figure-4 shows a high positive feedback and a significant majority of responses fall under the positive category. Only a small portion of the feedback is categorized as negative, suggesting that small number of students had unfavorable experiences.

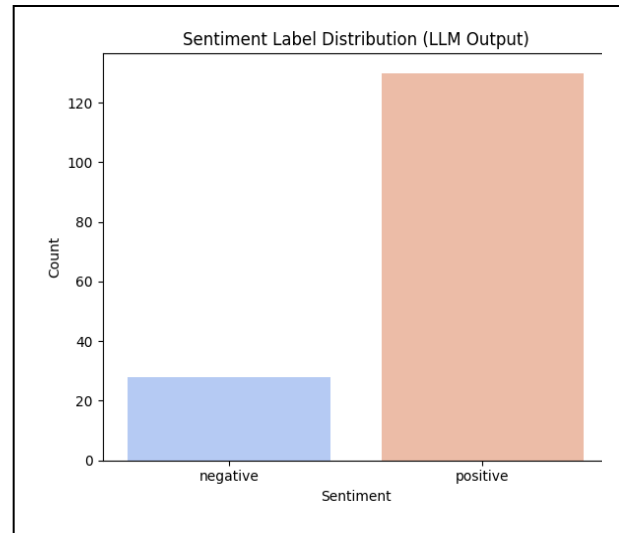


Figure-4 Sentiment Label Distribution

The deep learning models for sentiment analysis were evaluated using accuracy, precision, recall, and F1-score, as shown in Table 2. To get an insight of the performance of the two transformer-based models on the binary classification task (negative vs. positive), confusion matrices were generated, as illustrated in Figure 5.

Table-2 Comparison of results of the three models.

Model	Accuracy	Precision	Recall	F1-Score
BERT	84.2%	88.3%	93.1%	90.6%
DistilBERT	86.1%	89.7%	93.6%	91.7%

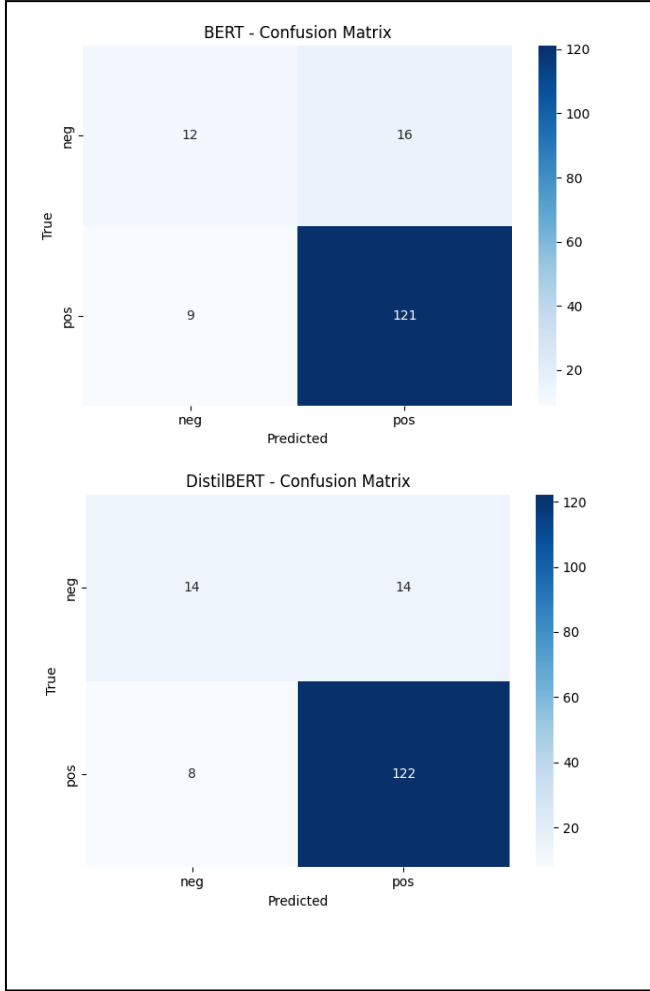


Figure-5 Confusion matrix of the two models

The confusion matrix for the BERT model shows that it correctly identified 121 positive instances (True Positives) and 12 negative instances (True Negatives). However, it misclassified 16 negative instances as positive (False Positives) and 9 positive instances as negative (False Negatives). In comparison, the DistilBERT model shows a slightly better distribution of predictions. It correctly classified 122 positive instances and 14 negative instances, while making fewer errors overall, with only 14 False Positives and 8 False Negatives. Overall, both BERT and DistilBERT models achieved high performance across all metrics, indicating strong capability in sentiment classification. DistilBERT outperformed BERT consistently, achieving an accuracy of 86.1% compared to 84.2% for BERT. Precision and recall scores for DistilBERT were also higher, at 89.7% and 93.6%, respectively, compared

to 88.3% and 93.1% for BERT. The F1-score, which combines precision and recall into a single metric, was 91.7% for DistilBERT and 90.6% for BERT.

The DistilBERT model utilized half the number of transformer layers i.e 6 layers compared to the full BERT architecture. This streamlined design makes the model more lightweight, making it particularly well-suited for small size datasets. It was implemented using the same pipeline() approach and fine-tuned as with the full BERT model.

Despite its smaller size and faster inference time, DistilBERT slightly outperforms BERT across all evaluated metrics. This includes a modest reduction in both types of classification errors, particularly False Positives, which are often more critical in applications where misclassifying a negative as a positive can lead to undesirable outcomes.

The improvement in DistilBERT's performance suggests that the knowledge distillation process used during its training retains much of BERT's representational power while enhancing generalization capabilities.

V. CONCLUSION AND FUTURE WORK

This paper investigate the use of VR in developing students' employment skills. Students participated in using the VR lab that has Bodyswap simulation installed and another group of students used the Web version of the simulation. Feedback from both groups has been gathered via an anonymous survey followed by a detailed feedback gathered via the module platform. Qualitaive analysis revealed that students are highly engaged with using the simulation and indicates that their employability skills are developed.

Two deep learning models were evaluated for sentiment analysis: BERTand DistilBERT. The results demonstrate that DistilBERT is a viable alternative to BERT for sentiment classification tasks, offering comparable and slightly better performance with reduced computational overhead. This makes it particularly suitable for real-time or resource-constrained environments where model efficiency is a priority.

To further enhance the current study, future research could benefit from using topic modelling to automatically identify key themes or topics in students' responses. This could provide deeper insights into areas of skill development and engagement. Furthermore, emotion classification, can be utilised to detect and analyse the emotional tone of student feedback, offering a better understanding of their confidence, motivation, and overall experience. This emotional insight could help tailor VR scenarios more effectively to individual needs.

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