

Chapter 10

Natural Language Processing Applications in Language Assessment: The Use of Automated Speech Scoring

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ABSTRACT

Natural language processing is a subfield of artificial intelligence investigating how computers can be utilised to understand and process natural language text or speech to accomplish useful things in various areas, and it draws on various disciplines, such as computer science, linguistics, and robotics. Natural language processing applications, including automated speech recognition and scoring, have several exciting prospects for language testing and assessment practices. These prospects include addressing practical constraints associated with test administration and scoring, securing standardisation in test delivery, ensuring objectiveness and reliability in scoring procedures, and providing personalised feedback for learning. This chapter focuses on automated speech scoring and its applications in language testing and assessment and discusses how these systems can be employed in assessment contexts. The chapter also discusses the potential benefits and drawbacks of automated speech scoring while focusing on construct-related and practical challenges surrounding such systems.

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INTRODUCTION

Artificial Intelligence has been considered one of the most significant technologies to transform any aspect of our lives, including but not limited to business, communication, education, and health. Artificial intelligence can be defined as “the integration of artificial (not a natural process, but one induced by machines) and intelligence (skills of learning, to extract concepts from data and to handle uncertainty in complex situations)” (González-Calatayud et al., 2021, p. 1). However, artificial intelligence cannot be considered a single technology and encompasses several methods and approaches, such as natural language processing, machine learning, and automated decision-making (Caspari-Sadeghi, 2023).

Natural language processing refers to a subfield of artificial intelligence that investigates the ways computers could be utilised to understand and process natural language text or speech to accomplish various tasks and activities in different areas. As a research and application area, natural language processing draws on several disciplines, such as computer science, linguistics, robotics, and electrical and electronic engineering (Chowdhury, 2003). Natural language processing applications entail obtaining knowledge about how people grasp and utilise language so that suitable means and methods can be generated to enable computer systems to understand and process natural languages to fulfil the functions or tasks of interest (Chowdhury, 2003). Machine translation, automated speech recognition, and language processing are among the widespread applications of natural language processing. Specifically, applications requiring text and speech processing (e.g., speech recognition, speech segmentation, sentence tokenisation) may offer new prospects for language testing and assessment (Chapelle & Chung, 2010).

In the context of language testing and assessment, automated essay scoring and automated speech scoring technologies have great potential for the assessment of written essays and spoken responses. Such natural language processing applications have provided many exciting prospects for language testing and assessment practices, such as addressing practical constraints associated with test administration and scoring, securing standardisation in test delivery, ensuring objectiveness and reliability in scoring procedures, providing personalised feedback for learning, and reporting assessment results to test takers in a timely manner (Enright & Quinlan, 2010; Xu et al., 2021; Van Moere & Downey, 2016). In close parallel to an increasing need for automated scoring systems and their apparently substantial benefits, a growing body of literature has been concentrating on how to utilise automated scoring technologies to assess particularly productive language skills (i.e., speaking and writing skills) (e.g., Latifi & Gierl, 2021; Shin & Gierl, 2021; Xu et al., 2021; Yoon & Bhat, 2018).

As such, this chapter focuses on automated speech scoring and its applications in the field of language testing and assessment. The rationale behind this decision

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