**ABSTRACT**

The objective of this work is to propose a machinelearning-based methodology system architecture and algorithms to find patterns of learning, interaction, and relationship and effective assessment for a complex system involving massive data that could be obtained from a proposed collaborative learning environment (CLE). Collaborative learning may take place between dyads or larger team members to find solutions for realtime events or problems, and to discuss concepts or interactions during situational judgment tasks (SJT). Modeling a collaborative, networked system that involves multimodal data presents manychallenges. This paper focuses on proposing a Machine Learning -(ML)-based system architecture to promote understanding of the behaviors, group dynamics, and interactions in the CLE. Our framework integrates techniques from computationalpsychometrics (CP) and deep learning models that include the utilization of convolutional neural networks (CNNs) for feature extraction, skill identification, and pattern recognition. Our framework also identifies the behavioral components at a micro

level, and can help us model behaviors of a group involved in learning.