Machine Learning Technology to Support Automated Motivational Interviewing Fidelity Feedback and Communication Science

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**Abstract** (maximum 250 words)

Understanding Motivational Interviewing’s (MI) mechanisms of effect and evaluating clinicians’ fidelity to the model relies upon behavioral coding, which is time-consuming, labor-intensive, and expensive. In the past decade, machine learning (ML) techniques have begun providing an efficient alternative to intensive cognitive tasks. This abstract will describe our three efforts to utilize ML to accelerate feedback to clinicians and scaling up tests of MI theory. First, supervised classification models were used with an existing coded data set to train an algorithm to code new data. Forty transcribed audio-recordings from weight loss counseling sessions with African American adolescents with obesity and their caregivers were first manually coded with the Minority Youth-Sequential Coding of Process Exchanges, a qualitative coding scheme to identify key communication behaviors. The accuracy of several classification models (Naïve Bayes, Support Vector Machine (SVM), Latent Class Allocation) using lexical, contextual, and semantic features was tested. Results indicated accuracy comparable to that of human coders. Specifically, the SVM model achieved 75% accuracy. This approach demonstrates great promise toward the goal of automatic coding of treatment session data. Second, Markov models were used to evaluate communication transitions with the goal of determining causal sequences of communication. Finally, we focus on predicting the outcome of patient-provider communication sequences in the context of the clinical dialog. Specifically, we consider prediction of the motivational interview success based on an observed sequence of coded patient-provider communication exchanges as a sequence classification problem and proposed deep learning, in particular, Recurrent Neural Networks (RNNs) as the solution. Experimental results indicate that the deep learning-based approach is significantly more accurate than the approach based on probabilistic models in predicting the success of motivational interviews (87% versus 70% and 61% accuracy by RNN, Markov Chain and Hidden Markov Model. These results indicate that the proposed method can be used for real-time monitoring of progression of clinical interviews and more efficient identification of effective provider communication strategies, which in turn can significantly decrease the effort required to develop behavioral interventions and increase their effectiveness.

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