

Machine Learning with Crowdsourcing for Constructed Response Assessment: The Case of Free Speech Grading

Vinay Shashidhar

Aspiring Minds

vinay.shashidhar@aspiringminds.com

Nishant Pandey

Aspiring Minds

nishant.pandey@aspiringminds.com

Varun Aggarwal

Aspiring Minds

varun@aspiringminds.com

ABSTRACT

Constructed response grading, also known as subjective evaluation, by pure machine learning approaches are unable to accurately mimic expert grades. We propose a framework that combines machine learning with crowdsourcing. This entails identifying *human intelligence* tasks in the feature derivation step and using crowdsourcing to get them completed. A much more accurate set of features makes machine learning powerful and enables it to solve constructed response grading problems. We show the efficacy of our approach by addressing a hitherto unsolved problem of automatic grading of free English speech. This problem acquires considerable significance given the evidence that better English leads to better employment outcomes, wages and promotions. To address the assessment task, we post the task of speech transcription, a hard computer science problem, to the crowd. Additionally, we also get direct grades from the crowd. We are able to derive accurate speech/prosody features by force aligning the speech sample on the crowd-sourced text and derive surface level and semantic features from the text. We experiment with our technique on expert-graded speech samples of adult non-native speakers. Using these features in a regression model, we are able to predict expert grades with much higher accuracy than pure machine learning approaches. These features also predict better than crowd grades and combining these two outperforms all other approaches. Our approach shows an accuracy that rivals that of expert agreement and automated essay grading. This work is timely given the huge requirement of spoken English training and assessment. The technique also shows promise to be applied to other constructed response problems.