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An Embedding-based Semantic Analysis Approach for Detecting Redundancy in Psychological Concepts Operationalized through Scales

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To reduce redundancy in psychological concepts and measurement scales is essential for alleviating participant burden, enhancing data quality, and refining theoretical frameworks. This study introduces a novel, computationally-driven approach to detect redundancy, referred as the Embedding-based Semantic Analysis Approach (ESAA). ESAA utilizes natural language processing techniques to generate semantic embeddings of scale items and applies unsupervised hierarchical clustering to uncover latent semantic structures and relationships among them. Then preliminary validation of ESAA's capabilities is conducted by a series of experiments. The results demonstrate that ESAA can successfully converge semantically similar items, discriminate between items with significant differences, and identify patterns of overlap among constructs known to have redundancies. Compared to traditional methods relying on participant data collection, ESAA offers a more objective, efficient, and low-cost approach to detecting overlap in psychological measurement, which shows potential to serve as tool for reducing redundancy and refining psychological theories. Further research is suggested.

Biography:

Zhen Huang is currently the Director of the Academic Division at the Positive Psychology Research Center, School of Social Science, Tsinghua University. She holds a Ph.D. in Economics and previously served as a Postdoctoral Researcher at the Institute of Psychology, Chinese Academy of Sciences. Her primary research areas include positive psychology, educational psychology, and AI psychology. She has published papers in Q1 SCI journals including Nature's sub-journals. Additionally, she served as a guest editor for a special issue on Growth Mindset in the Journal of Pacific Rim Psychology.

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