



RICE SOCIAL SCIENCES
Department of Psychological Sciences



Psychometric AI for Organizational Sciences

Enhancing Validity, Interpretability, and Usability in AI-Powered Assessments

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Why Psychometric AI/NLP

Beyond off-the-shelf AI apps and numerical ML models...

AI adoption in personnel selection and assessments is growing, but it raises concerns about construct validity, fairness/bias, and usability.

Many AI/NLP methods applied in organizational sciences lack transparency and legal defensibility, necessitating rigorous examination.

Psychometric AI/NLP integrates traditional psychometrics with advanced AI/NLP to improve assessments.

- Enhancing construct validity with psychometric models
- Addressing psychometric bias in NLP models
- Improving interpretability at all stages with psychometric principles
- Usability growth from traditional assessments with modernized psychometrics

Validity enhancement: Psychometric models on top of language models

Key Points

Latent variable modeling w/ embeddings

Estimating psychometric properties from embedding representations of constructs and measures

Embedding Psychometrics Example

Pseudo-discrimination parameters & pseudo-factor analysis

Estimating item parameters and conducting factor analysis without response data

Empirical Results

LLM-based vs. Human-based

In a study using BFAS-100 and HEXACO-240, pseudo-factors were recovered well and loadings showed strong correlations with empirical data

Bias Examination: Measuring and Reducing Bias in LLM-based Predictions

Key Points

Example

Results

Differential Embedding Dimension Functioning (DEDF)

Analyzing subgroup differences using embedding dimensions as "items" in a measurement framework

Gender Differences in Embedding Representations

In chatbot interviews assessing Big Five traits, DEDF analysis showed subgroup differences in embedding dimensional representations between men and women.

DEDF-adjusted Predictions

DEDF identified potential biases in top-predicting dimensions.

Including DEDF adjustments in model predictions may improve fairness.

Thank you!!

Try this psychometric AI chatbot to get your *interactive, personalized* personality assessment experience! 🤖

Key takeaways:

Integrating psychometric techniques with AI contributes to both valid and fair assessments.

Responsible further enhancements can facilitate bias reduction, *adaptive* assessments, and *real-time* feedback systems.



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