



Scoring a Job Application

» Using technology to improve hiring practices

Millions of hiring decisions are made each year, and companies with the ability to sift through numerous candidates to find the best employee have a strategic advantage.

Michael A. Campion < <https://business.purdue.edu/directory/bio.php?username=campion> >, Purdue's Herman C. Krannert Distinguished Professor of Management, says the resumes and achievement records of most job seekers are part of an overflowing pool of big data that creates a daunting amount of work for employers and their HR staff, especially for companies with highly selective hiring practices.

“Enhanced computing power and increased use of technology in organizations has afforded employers and researchers access to an exponentially greater amount of information on candidates,” Campion says. “At the same time, technological innovations have emerged enabling us to develop more sophisticated methods of analyzing such massive amounts of data, especially text-based data.”

Campion, who is listed as the second most cited author in HR management textbooks in the Academy of Management journal *Learning and Education*, was among the first in his field to address the issue in a study titled “Initial Investigation into Computer Scoring of Candidate Essays for Personnel Selection” for the *Journal of Applied Psychology*. It was co-authored by Michael C. Campion at the University of South Carolina, Emily D. Campion at the University of Buffalo SUNY, and Mathew H. Reider of Reider Research.

Starting 10 years before the field in 2012 and drawing on literature on natural language processing (NLP) — a form of artificial intelligence (AI) — the researchers looked at the possibility of leveraging advances in text mining and predictive modeling software programs as a surrogate for human raters in the context of job selection. Using applications of nearly 46,000 job candidates in a large organization, they examine the validity of the scores to predict the ratings of trained assessors, demonstrate that the practice does not disadvantage minority groups and illustrate the positive financial impact of adopting it in an organization.

Campion says the study's purpose was to alert scholars and practitioners to the potential advantages and disadvantages associated with using text mining and predictive computer modeling as an alternative to human raters in a selection context. In doing so, it also produced a bottom-line finding that offers additional appeal to companies using or considering the process.

“It appears possible that computer scoring can result in substantial cost savings when used to augment other information on job applicants,” he says. “It may also identify applicants that would otherwise not have been recognized as qualified due to how they describe their skills.”

The study also indicates that computer scoring is fairer. “Unlike humans, it does not have any bias because it consistently applies criteria across candidates,” Champion says. “As such, society should embrace AI rather than fear it.”

Reducing Differences

Campion, who won the 2023 Distinguished Professional Contributions Award given by the Society for Industrial and Organizational (I-O) Psychology for his lifetime contributions to the improvement of practices in one’s profession, recently returned to the topic of natural language processing in a study commissioned by the U.S. Air Force. Entitled “Using natural language processing to increase prediction and reduce subgroup differences in personnel selection decisions,” the study appeared in *Journal of Applied Psychology*. It was co-authored by Emily D. Campion from University of Iowa and several U.S. Air Force researchers.

The research shows how using NLP on narrative application data can improve prediction of decisions and reduce racial subgroup differences in selection decisions in Officer Training School. NLP scores predict board scores beyond mental ability tests and numeric application information (e.g., years of experience, number of past jobs, GPA, etc.). They also predict job performance better than human hiring decisions from applicant text data, such as past job duties, achievements, interests and statements of objectives.

The research also shows promise in predicting job performance beyond mental ability test scores, as well as reducing subgroup differences between racial minorities and non-racial minorities compared to mental ability tests and numeric application information. This is due to being able to score other information better, such as work experience and past accomplishments.

“An enduring challenge to scholars and practitioners is not only to increase prediction, but to do so in a manner that reduces adverse impact in selection,” Campion says. “Adverse impact in hiring is where racial minorities have lower passing rates compared to non-racial-minorities, presenting initial evidence of discrimination. While there have been significant advancements in research aimed at resolving this problem, it still remains one of the most fundamental issues in the field of hiring.”

Usually, increasing prediction validity increases adverse impact. In other words, the better your hiring procedure, the more it will also show differences between subgroups because it is measuring better. And if there are any differences between subgroups on what the hiring procedure measures (like skills), then it will show greater adverse impact. So, the methods of reducing impact usually reduce validity because they don’t measure as well, which is why it is called the “adverse impact-validity dilemma,” meaning you can increase validity or reduce impact, but often not at the same time. Campion’s study was the first to show you may be able to get both using artificial intelligence in the form of NLP.

Campion says the research has several practical implications. First, HR professionals should incorporate NLP into their selection systems. This could also save cost and increase the speed of hiring decisions. Additionally, NLP models can be used to produce practice applications that provide feedback to candidates in the form of an estimated score.

“This would improve the description of candidates’ credentials to reduce deficiencies and other sources of systematic error,” Campion says. “NLP could enhance transparency of the evaluation of application information and would also allow for continuous improvement of the application review process by standardizing procedures and making them more measurable, transparent and fairer.”

Advancing the Field

Campion is now turning his attention to other AI applications in personnel selection in a special issue of *Personnel Psychology*. “A major recent advancement in the study and practice of personnel selection is other forms of artificial intelligence, specifically machine learning (ML) and related methods, in addition to NLP,” he says. “Practitioners of personnel selection, being one of the largest areas in I-O psychology, have begun to adopt these techniques to improve assessments and other hiring procedures.”

The summary article, “Machine learning applications to personnel selection: Current illustrations, lessons learned and future research,” was co-authored with Emily D. Campion at the University of Iowa. It offers a brief tutorial on some ML concepts and illustrates the potential applications in selection, along with their strengths and weaknesses. In summarizing the findings of 11 articles on the topic, it also identifies some of the less-obvious lessons learned and other insights that researchers new to ML might not clearly recognize, as well as best practices and proposed recommendations for future research.

“Machine learning may be the biggest innovative force in hiring since the invention of employment tests,” Campion says. “There could not be a more pivotal and exciting time in the current state of the science of personnel selection, and we hope our findings will help promote rapid scientific development on this new frontier.”