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EINLADUNG ZUM KOLLOQUIUM

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Human and Machine Approaches that Boost Scientific and Technological Impact

Innovation involves recombining past knowledge. The increasing rate at which scientific knowledge is expanding should bode well for innovation. Nevertheless, new problems related to the appraisal and valuation of new ideas and inventions are inhibiting innovation. One problem is that more scientific studies fail than pass replication tests, which has led to a deep skepticism of science, billions in economic losses, funding cuts, and a weakened job market in psychology. A second problem is that patent review has slowed while patent examiner disagreement and wrongful rejections of meritorious patent applications have risen. In this exploratory study, we investigate the potential of AI and machine learning to enhance the innovation evaluation process.

In study 1, we trained an artificial intelligence model to estimate a paper's replicability using ground truth data on studies that had passed or failed manual replication tests, and then tested the model's generalizability on an extensive set of out-of-sample studies. The model predicts replicability better than the base rate of reviewers and on par with prediction markets, the best present-day method for predicting replicability. We then used the model to conduct a discipline-wide census of replicability in Psychology. We find replicability varies by subfield, research design methods, but not institutional prestige. Further, researchers' past research records and social media strongly predict replicability; in particular, media attention predicts non-replication.

In study 2, we use new data on almost 4,000,000 U.S. patent applications, 2,000,000 EU patents, and 250,000 Canadian patents to test AI's ability to identify patentable inventions and their future citation impact. We report three key findings. First, AI accurately predicts human experts' decisions in spotting meritorious innovation at agreement levels of up to 95%, which is remarkable given the degree of variation and potential disagreement among individual patent examiners. Second, we find that AI accurately predicts an invention's future influence from application data, providing a new view of technological trajectories at the earliest time possible. Third, AI can reduce review process biases and misevaluations.

Brian Uzzi is the Richard L. Thomas Professor of Leadership at the Kellogg School of Management, Northwestern University. He also co-directs the Northwestern Institute on Complex Systems (NICO), and holds professorships in Sociology and the McCormick School of Engineering. He has been on or visited the faculties of INSEAD, Chicago, Harvard, and Berkeley. His work has received 15 teaching prizes and 14 scientific research prizes worldwide in the social, physical, and computer sciences. His research uses social network science and computational methods to explain outstanding human achievement.

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