UNIVERSITY OF ALBERTA

CPA Speaker Series - Business Analytics

Radha Mookerjee,
The University of Texas at Dallas

Friday, September 29, 2023
10:00 AM - 11:30 AM
Location: BUS 4-04

Will Machines Take Over? Algorithms for Human -Machine Collaborative Decision Making in Healthcare

ABSTRACT

Artificial intelligence (AI) has become an increasingly popular alternative for performing tasks that are typically performed by humans. Mammography imaging is one context in which the role of AI is growing. Some experts claim that, with recent advancements in image processing algorithms and the increasing availability of data, AI will replace radiologists. Others argue that the rise of AI will change how diagnostic tasks are allocated, eventually paving the way for human-machine collaborative decision-making. In this research, we study a healthcare system's problem of when, if, and how to use human-machine collaborative decision-making in the context of mammography imaging. To that end, we propose an optimization model for the healthcare system that minimizes costs related to mammography screening and determines whether and when a complete automation (AI alone) strategy or a delegation (collaboration between humans and machines) strategy is preferable to an expert-alone strategy. We find that the disease incidence relative to the ratio of follow-up costs against litigation costs is an important determinant of whether the delegation strategy is preferable to the automation strategy. Reductions in the cost of the algorithm could either result in delegation (sharing of work between humans and machines) or full automation depending on the algorithm's performance. In contrast, a higher litigation cost for machine decisions could alter healthcare systems' preferences away from automation to delegation or expert-only solutions. We also evaluate the use of two or more algorithms from different sources to produce an ensemble (i.e., aggregation of algorithms and their predictions) and characterize when using an ensemble is superior to using any of the algorithms alone. We use data from an AI contest to empirically validate our results and back test its performance in real life. The contest's goal was the crowdsourcing AI algorithms to meet or exceed radiologists' performance in assessing mammograms obtained from actual clinical practice. The empirical analysis suggests that using the delegation strategy is optimal, with a potential of 17.5-30.1% cost savings as compared with the expert-only strategy. Our work has significant implications beyond radiology imaging for the design of work in the AI era and the human-machine collaboration contexts

Department of Accounting & Business Analytics
Alberta School of Business
College of Social Science & Humanities
Business Building, University of Alberta, Edmonton, AB, Canada T6G 2R6.