

Overbooked And Overlooked: Machine Learning and Racial Bias in Medical Appointment Scheduling

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Date: Friday, February 16th

Time: 11:00 AM – 12:00 PM

Location: ENGR 2901

[Zoom Link](#) | Meeting ID: 965 6608 3678 | Passcode: 628786

Synopsis:

Machine learning is often employed in appointment scheduling to identify the patients with the greatest no-show risk, so as to schedule them in a way that is least disruptive to the clinic. Those scheduling decisions maximize the clinic performance, as measured by a weighted sum of all patients' waiting time and the provider's overtime and idle time. However, if a racial group is characterized by a higher no-show risk, then the patients belonging to that racial group will be scheduled more frequently into less desirable slots, and spend more time waiting in the clinic for their appointments. Thus, the challenge becomes minimizing the schedule cost while avoiding racial disparities. Motivated by the real-world case of a large specialty clinic whose black patients have a higher no-show probability than non-black patients, we analytically study racial disparity in this context. Then, we propose new objective functions that minimize both schedule cost and racial disparity and that can be readily adopted by researchers and practitioners. We develop a race-aware objective, which instead of minimizing the waiting times of all patients, minimizes the waiting times of the racial group expected to wait the longest. We also develop race-unaware methodologies that do not consider race explicitly. We validate our findings both on simulated and real-world data. We demonstrate that state-of-the-art scheduling systems cause the black patients in our data set to wait about 30% longer than non-black patients. Our race-aware methodology achieves both goals of eliminating racial disparity and obtaining a similar schedule cost as that obtained by the state-of-the-art scheduling method, whereas the race-unaware methodologies fail to obtain both efficiency and fairness. Our work uncovers that the traditional objective of minimizing schedule cost may lead to unintended racial disparities. Both efficiency and fairness can be achieved by adopting a race-aware objective.

Bio:

Shannon Harris earned a PhD in Business Analytics and Operations from the University of Pittsburgh in 2016. Her research interests include mathematical and empirical modeling with a focus on healthcare applications. Primarily, she analyzes the attendance behavior of patients to outpatient clinic appointments, and how that behavior affects a clinic's scheduling practices. Additionally, she has projects researching racial bias in healthcare scheduling, and how people-centric operations affect patients' transition of care from the hospital to home. Her work has been published in the *European Journal of Operational Research*, *Manufacturing and Service Operations Management*, *Journal of Operations Management*, *Military Medicine*, and the *Journal of Multi-Criteria Decision Analysis*. Shannon worked as a management consultant at Deloitte Consulting and as a cost analyst at Technomics, Inc. She has served as a track chair for several INFORMS and CORS conference sessions, and has served on the board of the INFORMS Minority Issues Forum (MIF), INFORMS Diversity Committee, and the PhD Project student planning committee.