BIAS AUDIT OF MORGAN STANLEY'S USE OF EIGHTFOLD MODEL FOR SCORING APPLICANTS

July 5, 2023

Introduction

This report presents the results of a "Bias Audit" by BLDS, LLC, conducted in accordance with New York City's Automated Employment Decision Tools ordinance (Local Law 144, Int. 1894-2020) (herein, "New York City Ordinance"), of Morgan Stanley's use of the algorithmic model made available by Eightfold to screen applicants' resumes, thereby aiding in the user's evaluation of applicants to consider for employment.

Executive Summary

Morgan Stanley retained BLDS to conduct a bias audit of their use of the Eightfold model consistent with the New York City Ordinance. The Eightfold model scores applicants on how well the information on their resume matches the requirements for the job.

To conduct the bias audit, Morgan Stanley supplied BLDS with applicant records for the period 9/1/2022 through 5/31/2023 representing each applicant for a job. In total, BLDS analyzed the records of 263,064 applications.

In conducting the bias audit, BLDS computed the impact ratio for all applicants for each category required by the New York City Ordinance and the New York City Department of Consumer and Worker Protection's Notice of Adoption of Final Rule (Final Rule). BLDS followed the methodology set forth in the Final Rule, calculating the impact ratio based on a comparison of the scoring rates (defined by the law as the percent of applicants in each demographic group scoring above the median) by sex, race/ethnicity, and intersectional categories for all applicants.

The impact ratio for all categories ranges from 1 to .903. These ratios are well above 0.80, the level at which the federal government's Uniform Guidelines on Employee Selection Procedures state that, as a rule of thumb, disparate impact may exist.

BLDS is of the professional opinion that a more accurate bias audit would be conducted at the job level, i.e., considering the job for which the applicant applied. Thus, BLDS also computed the impact ratios following the same methodology required by the Final Rule, but we computed the median for each job rather than an overall median across all applicants for all jobs, and then summed overall by category the counts of those above the median score of the job for which they applied. The results are similar to those ignoring the job for which an applicant applied. The impact ratio for all categories, when the job applied for is considered, ranged from 1 to .911.

Requirements of the New York City Ordinance

The New York City Ordinance specifies that a bias audit is required to be conducted of any automated employment decision tool ("AEDT") used by an employer or employment agency within New York City before using the AEDT, and an employer "may not use or continue to use an AEDT if more than one year has passed since the most recent bias audit of the AEDT." The New York City Ordinance defines an AEDT as "any computational process, derived from machine learning, statistical modeling, data analytics, or artificial intelligence, that issues simplified output, including a score, classification, or recommendation, that is used to substantially assist or replace discretionary decision making for making employment decisions that impact natural persons." The Final Rule further defines the phrase "to substantially assist or replace discretionary decision making" to mean "(i) to rely solely on a simplified output (score, tag, classification, ranking, etc.), with no other factors considered, (ii) to use a simplified output as one of a set of criteria where the simplified output is weighted more than any other criterion in the set, or (iii) to use a simplified output to overrule conclusions derived from other factors including human decision making."

BLDS has no independent opinion and has conducted no analysis to determine if Morgan Stanley's use of the Eightfold model meets the definition of an AEDT under the New York City Ordinance or the Final Rule. Nevertheless, Morgan Stanley has retained BLDS to conduct a bias audit of the Eightfold model consistent with the requirements of the New York City Ordinance and Final Rule.

The Eightfold Model

The Eightfold algorithmic model produces a match score which represents how well a prospective job applicant's resume matches the written job description for which they applied.

The Eightfold model has two inputs: (1) a job description for the relevant position, and (2) each applicant's resume, which is then compared to the job description. Thus, at a high level, the model scores how good of a fit there is between the job description and a given resume. Morgan Stanley considers this objective output as one of the factors a recruiter will consider in deciding who to advance in the hiring process.

The model produces a match score which ranges from .5 to 5, with a higher match score indicating a better match between an applicant's resume and the job requirements stated for the job.

Class Membership Information

The New York City Ordinance relies on the EEOC's seven race/ethnicity groups[1] and requires that separate impact ratios be calculated for: (a) all race/ethnicity groups; (b) two sex groups (male/female); and (c) groups constructed intersectionally between sex[2] and the racial/ethnic groups. This results in fourteen groups. The highest scoring category, however, remains the reference group.

[1] The EEOC's seven race/ethnicity groups are: (1) American Indian or Alaska Native; (2) Asian; (3) Black or African American; (4) Hispanic or Latino; (5) Native Hawaiian or Other Pacific Islander; (6) Two or More Races; and (7) White.

[2] The only available options are Male and Female.

The Final Rule allows "an independent auditor to exclude a category that represents less than 2% of the data being used for the bias audit from the required calculation of the impact ratio." However, the auditor "must include the justification for the exclusion and report the number of applicants and scoring rate or selection rate for the excluded category."

When conducting a bias audit, it is necessary to have demographic information (e.g., sex and race) for each observation. Consistent with legal requirements, applicants may choose whether or not to self-report race/ethnicity and sex information; some applicants choose to provide that information, and some do not. Our studies use the self-reported race and sex identifications. We excluded from our analysis any data for applicants for whom we do not have self-reported race/ethnicity or sex, but we report the number of such cases deleted from each analysis as required by the New York City Ordinance in the summary of results reported below.

The Impact Ratio and Scoring Rate

Morgan Stanley supplied BLDS with applicant records from the period 9/1/2022 through 05/31/2023 for all individuals who applied for any job opening. Based on the available applicant records, we analyzed a total of 263,064.

The Final Rule defines the impact ratio of an AEDT that an employer or employment agency does not use as a pass/fail selection device or assign the applicant to a classification as follows:

$$impact\ ratio = \frac{scoring\ rate\ for\ each\ category}{scoring\ rate\ of\ the\ highest\ scoring\ category}$$

The Final Rule defines the "scoring rate" as "the rate at which individuals in a category receive a score above the sample median score, where the score has been calculated by an AEDT."

The New York City Ordinance and Final Rule suggest that a bias audit should report the overall results for all applicants scored by the AEDT.

Bias Audit Results for Morgan Stanley's Use of the Eightfold Model

The impact ratio for the combined overall jobs for the various categories are presented in the following tables.

Sex Categories

Female	92,324	45.0%	0.958
Male	160,311	46.9%	1.000
Unknown Sex	10,429		

Race/Ethnicity Categories

	Number of Candidates	Scoring Rate	Impact Ratio
Hispanic or Latino	27,346	48.2%	1.000
White (Not Hispanic or Latino)	84,150	47.4%	0.984
Black or African American (Not Hispanic or Latino)	27,264	44.4%	0.921
Native Hawaiian or Pacific Islander (Not Hispanic or Latino)	645	44.2%	0.917
Asian (Not Hispanic or Latino)	92,620	45.2%	0.938
Native American or Alaska Native (Not Hispanic or Latino)	596	45.3%	0.940
Two or More Races (Not Hispanic or Latino)	8,998	46.8%	0.971
Unknown Race/Ethnicity	21,445		

Intersectional Categories

		Number of Candidates	Scoring Rate	Impact Ratio
Hispanic or Latino	**Male**	18,277	48.9%	1.000
	Female	8,972	46.9%	0.959
White (Not Hispanic or Latino)		59,468	48.2%	0.986
Black or African American (Not Hispanic or Latino)		15,201	44.1%	0.903
Native Hawaiian or Pacific Islander (Not Hispanic or Latino)	**Male**	499	43.9%	0.898
Asian (Not Hispanic or Latino)		53,278	45.9%	0.939
Native American or Alaska Native (Not Hispanic or Latino)		408	45.1%	0.923
Two or More Races (Not Hispanic or Latino)		5,781	47.2%	0.965
White (Not Hispanic or Latino)		24,567	45.5%	0.930
Black or African American (Not Hispanic or Latino)		12,008	44.7%	0.914
Native Hawaiian or Pacific Islander (Not Hispanic or Latino)	**Female**	139	45.3%	0.927
Asian (Not Hispanic or Latino)		39,152	44.2%	0.904
Native American or Alaska Native (Not Hispanic or Latino)		180	45.0%	0.921
Two or More Races (Not Hispanic or Latino)		3,107	46.0%	0.941
Unknown Intersectional		21,445		

The above charts report the impact ratio for each sex category, race/ethnicity category, and the intersection of the sex and race/ethnicity categories based on the median being determined for overall applicants, regardless of for which job they applied.

BLDS is of the professional opinion that a more accurate bias audit would be conducted at the job level, i.e., by counting the number in each category who applied for a certain job who scored above the median score of all applicants who applied for that job. Thus, BLDS also computed the impact ratios following the same methodology required by the Final Rule but computed the median for each job rather than an overall median across all applicants for all jobs and summed by category the counts of those above the median score of the job for which they applied. The results are similar to those ignoring

the job applicants applied for. The impact ratio for all categories when jobs are considered ranged from 1 to .911.

Conclusion

In evaluating the impact ratios for the sex categories, the race/ethnicity categories, and the intersectional categories by combining the data over all jobs, as indicated by the New York City Ordinance and Final Rule, we do not find any instances in which the impact ratios fall below 0.80 (or 80%).

Appendix A – Background on BLDS, LLC

BLDS provides statistical and economic expert testifying and consulting services, primarily in the areas of compliance with anti-discrimination laws and regulations, with a major focus in labor and employment and consumer lending. BLDS has worked with numerous regulatory agencies, many Fortune-500 (and smaller) companies, and several state and local governments including New York City to apply statistical methods to identify and mitigate discrimination and bias in decision-making processes. BLDS's lead partner, Bernard Siskin Ph.D. was appointed by the U.S. Third Circuit as their statistical expert in assessing racial and gender fairness in the Court System. In our regulatory compliance work, BLDS assists clients in developing and implementing best practices for compliance with anti-discrimination laws, particularly as they relate to the use of statistical methods to make employment, credit, marketing, and insurance underwriting decisions. We have been retained by numerous agencies and regulators, including the EEOC, OFCCP, DOJ, and CFPB.