Understanding and Addressing Bias In Predictive Analytics

By Justin Serebro

Goals of Traditional Insurance

Achieve diversification using law of Large Numbers

Charge proportional to risk

Provide societal benefits

Specialization of risks you want to accept

Impact of Predictive Analytics on Insurance

Enhanced risk selection and identification

Identify potential customers

Downside: Potential for bias

How Does Predictive Analytics Impact Bias?

A) Introducing Bias

B) Reinforcing Existing Bias

C) Magnifying Impact of Bias

D) Who cares

Definition of Bias

prejudice in favor of or against

usually in a way considered to be **unfair**

Definition of Prejudice

A liking or dislike without good reason

A feeling of unfair dislike because of some characteristic (i.e. race or religion)

Injury or Damage to a person's rights.

Is Charging Everyone the Same Rate Biased?

A) Yes

B) Yes, in some circumstances

C) No

Key Takeaways for Avoiding Bias

Requires good reason for preference

Preference cannot be due specific protected characteristics

Cannot inhibit a person's rights.

Type of coverage is important when considering bias

Example: Woman buying Car Insurance

- Janice can not find car insurance coverage
- Janice has had 5 major car accidents in the past 3 years
- Janice is a triplet (her brothers are Leo and Frank)
- Leo has a perfect driving record
- Leo is able to get car insurance coverage

Example: Woman buying Car Insurance

- Janice can not find car insurance coverage
- Janice has had 5 major car accidents in the past 3 years
- Janice is a triplet (her brothers are Leo and Frank)
- Frank has had 5 major car accidents in the past 3 years
- Frank is able to get car insurance coverage

Criteria To Avoid Bias

Needs to be possible for any person to achieve highest rating given other factors (regardless of protected characteristics)

Ex: Capable of assigning an African American Muslim female doctor the same risk factor as a Caucasian Jewish male doctor

Bias Embedded in Predictive Analytics

Predictive models are built based on data

Biased training data will result in biased model predictions

Necessary to question how bias may be getting into the data and perform adjustments

Oversampling or Undersampling techniques may be appropriate

Case 1: Criminal Justice

- Algorithm *underestimated* the likelihood that white defendants would re-offend but *overestimated* the likelihood for Black defendants:
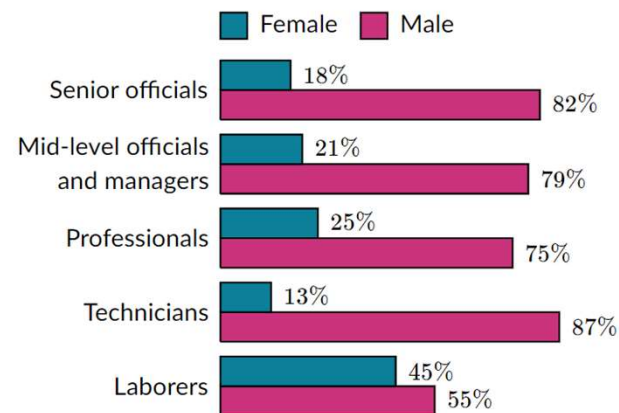
	White	Black
Labeled higher risk, but didn't re-offend	23.5%	44.9%
Labeled lower risk, yet did re-offend	47.7%	28.0%

- This algorithm wasn't trained on data that included the race of defendants
- Model used age of the defendant and the number of previously committed crimes
- Arrest data is biased so model became biased

Case 2: Hiring Decisions

- In 2014, Amazon experimented with using software to screen job applicants.

In 2014, Amazon employees were largely male:

	Female	Male
Senior officials	18%	82%
Mid-level officials and managers	21%	79%
Professionals	25%	75%
Technicians	13%	87%
Laborers	45%	55%

- The screening software was trained on a decade of résumés that had been previously rated by employees as part of the hiring process.

- Bias perpetuates bias

Action Steps To Mitigate Bias

Interpretable models

Understanding potential bias in dataset being used

Back test models to assess embedded bias

Adjust for bias via Oversampling/Undersampling

Questions/Comments

What Have Your Experiences Been With Bias?

What Steps Have You Taken To Mitigate Bias

Should Bias Only Be Concerned with Protected Characteristics?

References

Definition of Bias:
- BIAS | definition in the Cambridge English Dictionary
- Bias Definition & Meaning - Merriam-Webster
- Bias Definition & Meaning | Dictionary.com

Definition of Prejudice:
- Prejudice Definition & Meaning - Merriam-Webster
- Prejudice Definition & Meaning | Dictionary.com
- Prejudice Definition & Meaning | Britannica Dictionary

Case 1 Criminal Justice:
- Predictive policing algorithms are racist. They need to be dismantled. | MIT Technology Review
- A computer program used for bail and sentencing decisions was labeled biased against blacks. It's actually not that clear. - The Washington Post

Case 2 Amazon Hiring Decisions:
- Amazon scraps secret AI recruiting tool that showed bias against women | Reuters
- Amazon Built AI to Hire People, but It Discriminated Against Women (businessinsider.com)