

'Fair' machine learning models for detecting at-risk online gambling detecting at-risk online gamblers

What this research is about

In recent decades, online gambling has become much more common in Canada. Unfortunately, the rise in online gambling has also led to increased concerns over gambling harms. A recent survey suggests that over 30% of people who experience problem gambling identify online gambling as the key concern.

The field of machine learning is an area of artificial intelligence (AI) that examines how computers can develop models to understand relationships between data for the purpose of making good predictions in the future. Machine learning is now being explored by researchers for its potential in promoting safer gambling and reducing harm in online gambling. For instance, recent research studies have explored machine learning for classifying gambling severity based on scores on the Problem Gambling Severity Index (PGSI) and voluntary self-exclusion enrollment.

While machine learning shows promise in promoting safer gambling, a key challenge is whether these systems treat people fairly. That is, will machine learning systems be equally good at detecting people at-risk from different backgrounds? Indeed, concerns have been raised about how machine learning models may magnify inequities or biases based on sociodemographic characteristics. However, no studies have comprehensively examined fairness of machine learning in the gambling field.

The primary goal of the study was to explore fair models for gambling. The researchers developed three machine learning models and compared their performance and degree of fairness. It was predicted that (1) age and sex differences would be found for people with high-risk gambling (a PGSI score of 8 or

What you need to know

Machine learning is an area of artificial intelligence (AI) that focuses on how models can learn through experience with data. These models show promise for promoting safer gambling in online gambling. However, whether these models can treat people fairly remains unclear. The goal of this study was to explore the performance and fairness of three models for identifying harmful gambling.

The data came from surveys of people gambling online as well as account data from a provincial-owned gambling website in Canada. The researchers found that, if the goal was to identify as many people with high-risk gambling as possible, then the 'classification parity model' performed the best. Yet, none of the models could be considered truly fair across all the performance metrics that were measured. The researchers suggest that models tested on-site with large samples could reach a higher degree of fairness.

higher), and (2) overall model performance would differ according to three ways of measuring fairness, namely, 'fairness via unawareness', 'classification parity', and 'outcome calibration'.

What the researchers did

The researchers collected data from 9,145 adults in 2019 (wave 1) and 10,716 adults in 2022 (wave 2). Respondents were recruited from a government-owned gambling website in Québec, Canada. They completed an online survey and also permitted the researchers to obtain some of their online gambling account data from the previous 12 months. Respondents had to be 18 years of age or older, complete a key number of gambling risk questions,

and have gambled on the website with money in the previous 12 months.

Nineteen variables were used as inputs for the models, including financial activities on the website as well as indicators of gambling spending. Age and sex were also included. The outcome variable of interest was whether a person scored 8 or higher on the PGSI.

The researchers trained and validated the three machine learning models using wave 1 data. They then tested the three models using wave 2 data.

What the researchers found

First, it was found that respondents between 18 and 24 years old had the highest proportion of people with a score of 8 or higher on the PGSI. The proportion of people with high-risk gambling decreased with older age. Similarly, men tended to score higher than women on the PGSI. These findings support the prediction that gambling severity would differ by age and sex.

Next, the machine learning models were examined and compared. The researchers addressed which of the three models performed the 'best' and which was the 'fairest'. The best model could be defined as the one that correctly identified the highest number of people who experienced gambling harm. In this case, the researchers found that the 'classification parity' model performed the best. Yet, the performance of each model changed depending on the goal.

In terms of fairness, the 'fairness via unawareness' model was the best classifier, but was undermined by group-level differences in PGSI status.

Both the remaining models could be considered potentially fair, with some metrics favouring each. The 'classification parity' model performed well in detecting people at-risk, but was somewhat worse with people at lower-risk. The 'outcome calibration' model performed well overall, but was noticeably deficient in detecting older people who were at-risk.

Taken together, these results suggest that none of the tested modelling approaches could be considered clearly 'fairest'. However, the researchers

suggest that models tested on-site with large samples could reach a higher degree of fairness.

How you can use this research

Machine learning models are being integrated into online gambling research at a rapid pace. This study suggests that the performance and fairness of models can vary. That said, researchers interested in using machine learning models could consider testing models on-site and using sufficiently large samples.

About the researchers

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