

Using AI to predict self-reported problem gambling with account-based player data in an online casino setting

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09.09.2022

Auer, M., Griffiths, M.D. Using artificial intelligence algorithms to predict self-reported problem gambling with account-based player data in an online casino setting. *J Gambl Stud* (2022). <https://doi.org/10.1007/s10899-022-10139-1>



About myself

- Likes cars and guitars
- Statistician and Psychologist
- Published 40+ peer reviewed gambling studies
- Consults operators and regulators on gambling related topics
- Developed a player tracking tool called *mentor*
 - Auer, M., & Griffiths, M. D. (2022). Gambling before and during the COVID-19 pandemic among online casino gamblers: An empirical study using behavioral tracking data. *International Journal of Mental Health and Addiction*, 20(3), 1722-1732.
 - Hopfgartner, N., Auer, M., Griffiths, M. D., & Helic, D. (2022). Predicting self-exclusion among online gamblers: An empirical real-world study. *Journal of Gambling Studies*, 1-19.
 - Auer, M., & Griffiths, M. D. (2022). The relationship between structural characteristics and gambling behaviour: An online gambling player tracking study. *Journal of Gambling Studies*, 1-15.
 - Auer, M., & Griffiths, M. D. (2022). Attitude Towards Deposit Limits and Relationship with Their Account-Based Data Among a Sample of German Online Slots Players. *Journal of Gambling Studies*, 1-18.



Background

- Most recent studies have used voluntary self-exclusion as a proxy measure for Problem Gambling *
 - Self-exclusion is a questionable proxy-measure for Problem Gambling **
 - There are various screens for Problem Gambling ***
 - There are few studies which facilitated problem gambling with player tracking data****
 - Multiple jurisdictions require online operators to identify problem gambling
- There is not a single study which correlated self-reported PG with player tracking data

*Finkenwirth, S., MacDonald, K., Deng, X., Lesch, T., & Clark, L. (2021). Using machine learning to predict self-exclusion status in online gamblers on the PlayNow. com platform in British Columbia.

*Percy, C., França, M., Dragičević, S., & d'Avila Garcez, A. (2016). Predicting online gambling self-exclusion: an analysis of the performance of supervised machine learning models. *International Gambling Studies*, 16(2), 193-210. *ational Gambling Studies*, 21(2), 220-237.

**Auer, M., & Griffiths, M. D. (2016). Should voluntary "self-exclusion" by gamblers be used as a proxy measure for problem gambling?. *MOJ Addiction Medicine & Therapy*, 2(2), 00019.

*** McMillen, J., & Wenzel, M. (2006). Measuring problem gambling: Assessment of three prevalence screens. *International Gambling Studies*, 6(2), 147-174.

**** McAuliffe, W. H., Louderback, E. R., Edson, T. C., LaPlante, D. A., & Nelson, S. E. (2022). Using "markers of harm" to track risky gambling in two cohorts of online sports bettors. *Journal of Gambling Studies*. <https://doi.org/10.1007/s10899-021-10097-0>. Advance online publication

**** Luquiens, A., Tanguy, M. L., Benyamina, A., Lagadec, M., Aubin, H. J., & Reynaud, M. (2016). Tracking online poker problem gamblers with player account-based gambling data only. *International Journal of Methods in Psychiatric Research*, 25(4), 333–342



Experimental Design

- 1,287 players from a European online gambling casino answered questions on the Problem Gambling Severity Index (PGSI) between September 2021 and February 2022
- Age, gender, registration date and each gambling and cash transaction was available

(1) Have you bet more than you could really afford to lose?
(2) Have you needed to gamble with larger amounts of money to get the same excitement?
(3) Have you gone back to try to win to back the money you'd lost?
(4) Have you borrowed money or sold anything to get money to gamble?
(5) Have you felt that you might have a problem with gambling?
(6) Have you felt that gambling has caused you any health problems, including stress or anxiety
(7) Have people criticized your betting, or told you that you have a gambling problem, whether or not you thought it is true?
(8) Have you felt your gambling has caused financial problems for you or your household?
(9) Have you felt guilty about the way you gamble or what happens when you gamble?

Individuals can answer: Never (0), Sometimes (1), Most of the Time (2), Almost Always (3)



Explanatory Variables

- 23 variables were used to predict future problem gambling

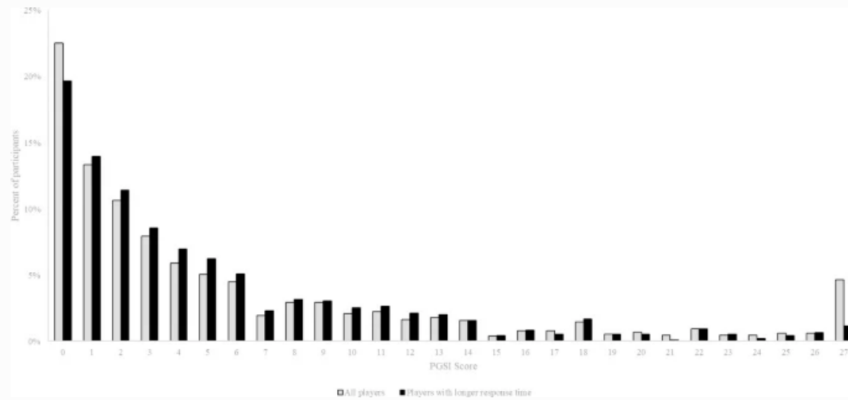
Feature Number	Feature
1	Age (in years)
2	Gender
3	Number of play breaks
4	Number of voluntary limit changes
5	Number of bets
6	Amount of money bet
7	Average bet amount
8	Standard deviation bet
9	Number of deposits
10	Amount of money deposited
11	Standard deviation deposits
12	Amount of money won
13	Amount of money lost (amount won minus amount bet)
14	Number of sessions
15	Total session length (in minutes)
16	Number of different gambling days
17	Average number of deposits per gambling day
18	Average number of deposits per session
19	Average amount of money lost per gambling day
20	Average monetary loss per session
21	Average amount of money deposited per gambling day
22	Average amount of money deposited per session
23	Percent of sessions ending with low account balance



PGSI responses

- 4.66% of players answered all nine questions with “almost always” which results in a score of 27 (
- Players with a very short response time were removed from the data sample (N=945)

Fig. 1



Percentage of players for each PGSI score before and after removing players with short response time

The grey bars indicate a larger than expected number of players who answered each question with „almost always“ or „never“.

After removing players with a very short response time the „tails“ of the distribution shrunk

→ Out of the final 945 players, 248 (26%) scored as problem gamblers (score of 8 or more)

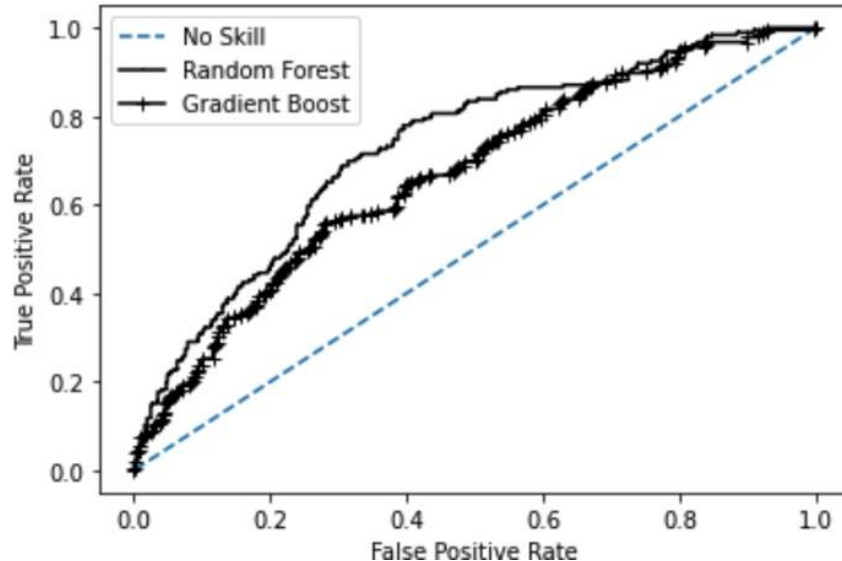
AI models

- A Random forest model displayed the highest model accuracy with an AUC of 72.9%

No Skill: ROC AUC=0.500

Random Forest: ROC AUC=0.729

Gradient Boost: ROC AUC=0.670



The model accuracy is in line with previous academic studies predicting responsible gaming behaviour such as voluntary self-exclusions

Important metrics:

age, amount of money deposited, amount of money bet, number of gambling days, average monetary loss per gambling day, average monetary loss per session, average number of monetary deposits per session, account depletion, and number of play breaks

Greater harm problem gamblers

- The three items „Have you felt that you might have a problem with gambling?“, “Has gambling caused you any health problems, including stress or anxiety?” and “Has your gambling caused any financial problems for you or your household?” were used to identify a subgroup of gamblers who experienced greater harm
- Out of the 248 PGs, 79 answered at least one of the three questions with “almost always”



Problem gamblers' profile

- PGs average spent was higher and total spent was lower
- PGs deposited more frequently in sessions and more frequently depleted their accounts
- PGs had more play breaks and a larger standard deviation of the amount bet

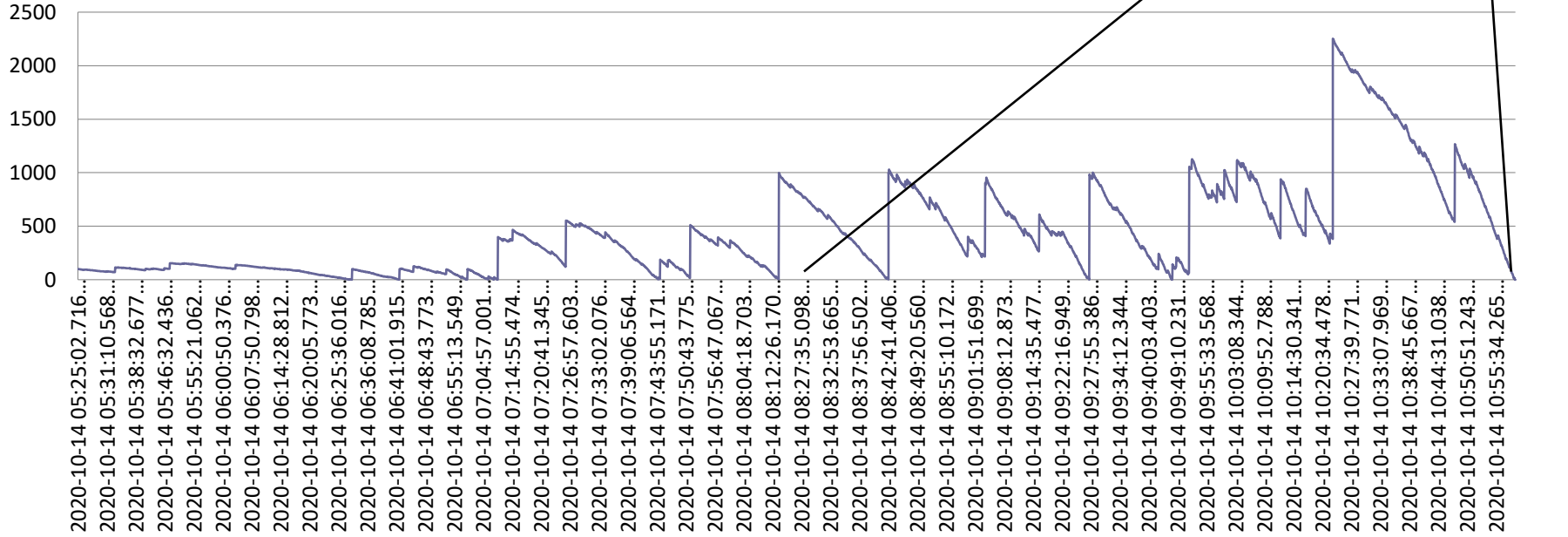
	PGs	GHPGs	NPGs
N	248 (26%)	79 (8.4%)	697 (64%)
Age	37	36	43
Female	40%	32%	49%
Amount deposited	432	478	631
Amount of money bet (€)	3253	2705	7032
Number of gambling days	5.79	4.76	8.30
Average monetary loss per gambling day (€)	-68.24	-122.15	4.22
Average number of deposits per session	1.41	1.53	1.04
Average amount of money deposited per session (€)	63.00	96.08	49.35
Average money loss per session (€)	-42.73	-71.87	-0.06
Percentage of sessions ending with low account balance	78%	79%	65%
Play break (yes/no)	46%	59%	12%
Average bet per game (€)	3.30	5.73	3.21
Standard deviation bet (€)	3.79	6.79	3.54



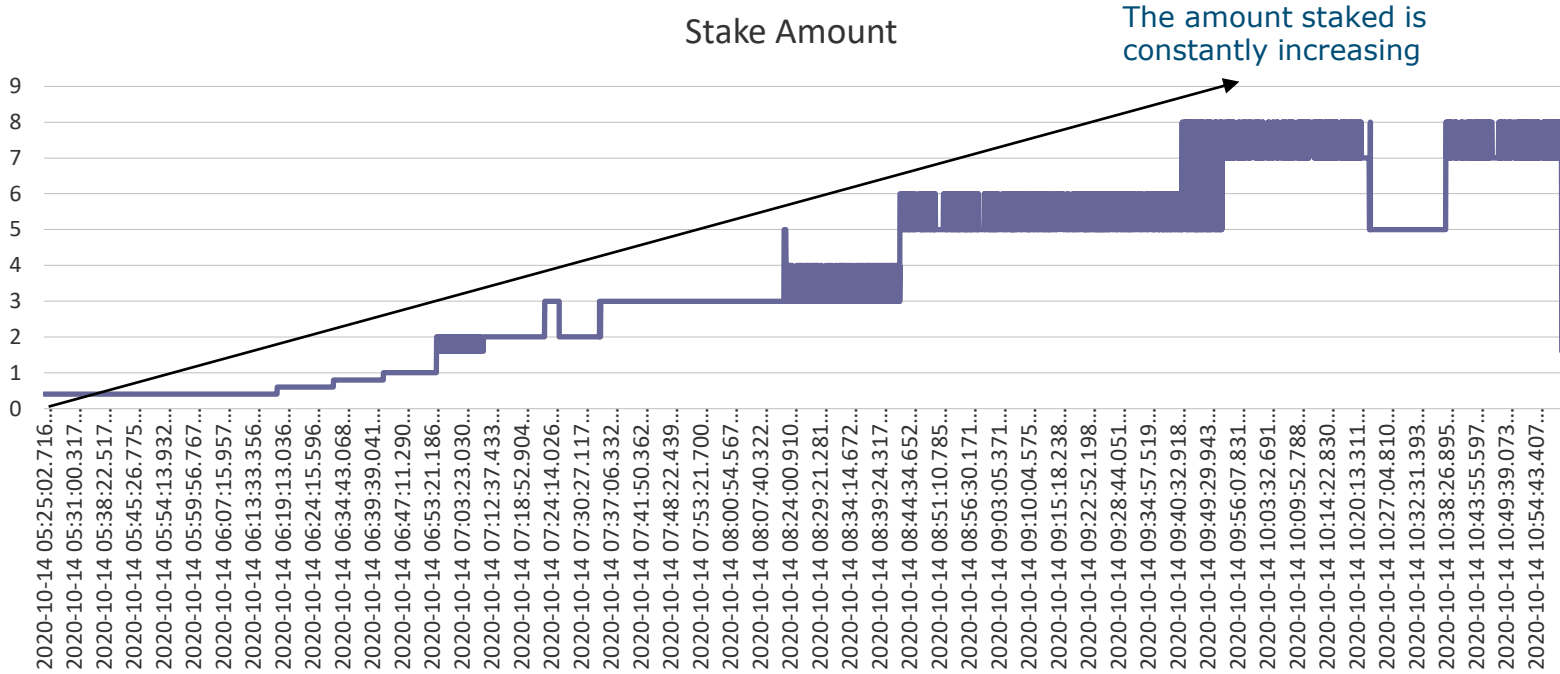
- 6,000 games
- € 4,200 deposited
- € 4,300 loss

Chasing Losses Example

Player Balance for one session



Stake amount per spin for one session



Summary

- Self-reported problem gambling was cleansed for very short response times
- 248 (26%) of players reported to be problem gamblers
- 79 (8.4%) answered three times indicating greater harm with „almost always“
- Model accuracy predicting self-reported problem gambling was high
- Self-reported problem gamblers deposited more frequently per session and more frequently depleted their gambling accounts
- The model was based mostly on behavioural metrics
- Research needs to be repeated with other operators and in other countries



Thank you

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