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# Managing Massive Multiplayer Online Games

SoSe 2018

## Exercise Sheet 8: Game Analytics

Discussion: June 6st, 2017

### Exercise 8-1 *Bot Detection with Bayes* **(Homework)**

In the following regard an abstract game in which players regularly have to make decisions. Examples are:

- In which order to pick up objects
- In which direction the player should go at a crossroad inside of a labyrinth
- In which direction the player sends his exploring units

We assume that there are always four alternatives $\{a_1, ..., a_4\}$ and that a BOT selects each of these with the same probability. With the help of log data it could be estimated empirically that real players select the alternatives with the following probabilities:

| | $a_1$ | $a_2$ | $a_3$ | $a_4$ |
|---|---|---|---|---|
| Probability | $10\%$ | $20\%$ | $30\%$ | $40\%$ |

Player $p_1$ was observed to have the following sequence of decisions:

$$O = [a_3, a_2, a_1, a_4, a_1, a_2, a_2, a_3, a_1]$$

In the following $B$ is the event that player $p_1$ is a BOT and $\overline{B}$ is the event that player $p_1$ is a real player.

(a) Calculate the probability $P(O \mid B)$ that a BOT produces the above sequence.

(b) Calculate the probability $P(O \mid \overline{B})$ that a real player produces the above sequence.

(c) Assume that $1\%$ of all players are BOTs. Calculate the probability $P(B \mid O)$ that player $p_1$ is a BOT.