

## 305 Lecture 40 - The Gambler's Fallacy

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# Plan

- In this lecture we're going to go over one bad way to learn from experience - the Gambler's Fallacy.
- This requires jumping back in the book, back in fact to Chapter 4.

## Associated Reading

Odds and Ends, chapter 4.

## Abstract Setup

A process will be repeated. It just had one kind of outcome, and we want to know whether that made the likelihood of some other outcome on the next run of the process go up.

## Questions

Given that trial  $n$  of the process produced output  $o$ , which processes are such that

- The probability that trial  $n$  will produce output  $o$  just went up?
- The probability that trial  $n$  will produce output  $o$  stayed the same?
- The probability that trial  $n$  will produce output  $o$  just went down?

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- On trial one, it hurts a lot.
- That increases the probability on trial two that it will also hurt a lot.



## Fair Gambling Devices

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- That's what happens in all fair gambling devices.
- But note that not all gambling devices are fair, and sometimes the fact that you get output  $o$  is evidence that it is (intentionally or not) biased towards  $o$ .

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- Sampling without replacement (if you want to call it a single process) is one.
- The fact that the previous bag going onto the luggage carousel is not yours does really raise the probability that the next one will be yours.
- But these cases are rare.

- It's a little odd to lump 'hot hand' reasoning in with gambler's fallacy.
- On the face of it, it looks like simple inductive reasoning.
- I think (though the data are really messy) that hot hand reasoning is often over-stated, but that there really is a phenomenon there.

The trick is squaring the intuitive idea in 1 with the observation in 2.

1. Someone who hits a shot is more likely 'hot' and hence somewhat more likely to hit the next shot.
2. Shooting percentages are roughly the same for shooters who hit and who missed on their previous shots.

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- Defence (assumes everyone knows about effect - which is realistic)
- Shot selection (not obviously rational, but might be)

## For Next Time

- We will look in more detail at how to update on new information, like the information that that player just hit their last four shots.