

Problem 2.1.1 Suppose that all combinations of angles and heights are equally likely to be chosen. What is the probability that the coin lands heads up?

Problem 2.1.2 Now suppose that some combinations of angles and heights are more likely to be chosen than others, with the probabilities shown in Table P2.2. What are the new probabilities that the coin lands heads up?

Problem 2.1.3 We force the coin-thrower to throw the coin at an angle of 45 degrees. What is the probability that the coin lands heads up?

Problem 2.1.4 We force the coin-thrower to throw the coin at a height of 0.2m. What is the probability that the coin lands heads up?

Problem 2.1.5 If we constrained the angle and height to be fixed, what would happen in repetitions of the same experiment?

Problem 2.1.6 In light of the previous question, comment on the Frequentist assumption of exact repetitions of a given experiment.

Problem 2.2 Objections to Bayesianism

The following criticisms of Bayesian statistics are raised in an article by Gelman [4]. Provide a response to each of these.

Problem 2.2.1 'As scientists we should be concerned with objective knowledge rather than subjective belief.'

Problem 2.2.2 'Subjective prior distributions don't transfer well from person to person.'

Table P2.1 The results of a coin throw from a given angle and height above a table.

| Angle (degrees) | Height above table (m) | | | | |
|-----------------|------------------------|-----|-----|-----|---|
| | 0.2 | 0.4 | 0.6 | 0.8 | 1 |
| 0 | T | H | T | T | H |
| 45 | H | T | T | T | T |
| 90 | H | H | T | T | H |
| 135 | H | H | T | H | T |
| 180 | H | H | T | H | H |
| 225 | H | T | H | T | T |
| 270 | H | T | T | T | H |
| 315 | T | H | H | T | T |

Table P2.2 The probability that a given person throws a coin at a particular angle and at a certain height above a table.

| Angle (degrees) | Height above table (m) | | | | |
|-----------------|------------------------|------|------|------|------|
| | 0.2 | 0.4 | 0.6 | 0.8 | 1 |
| 0 | 0.05 | 0.03 | 0.02 | 0.04 | 0.04 |
| 45 | 0.03 | 0.02 | 0.01 | 0.05 | 0.02 |
| 90 | 0.05 | 0.03 | 0.01 | 0.03 | 0.02 |
| 135 | 0.02 | 0.03 | 0.04 | 0.00 | 0.04 |
| 180 | 0.03 | 0.02 | 0.02 | 0.00 | 0.03 |
| 225 | 0.00 | 0.01 | 0.04 | 0.03 | 0.02 |
| 270 | 0.03 | 0.00 | 0.03 | 0.01 | 0.04 |
| 315 | 0.02 | 0.03 | 0.03 | 0.02 | 0.01 |