

Calculation of Basketball Scoring Probabilities

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Description of the dataset

- The dataset used in this project analyzes the scoring patterns from the 2023 NBA season, spotlighting three legendary players: LeBron James, James Harden, and Stephen Curry. It examines their shooting trends, performance metrics, and on-court precision, revealing the strategic elements behind their success.
- For this project, we will only be analyzing the data for Stephen Curry.

Agenda

Results of basketball scoring calculations

- Overall Shooting Statistics
- Probabilities
- Conditional Probabilities - Future
- Conditional Probabilities - Retrospective

Overall Shooting Statistics

- Overall probability of a make (result = TRUE)
 - $703/1434 = 0.49$
- Overall probability of a miss (result = FALSE)
 - $731/1434 = 0.51$
- Overall proportion of three-pointers (shot_type = 3)
 - $786/1434 = 0.55$
- Overall proportion of two-pointers (shot_type = 2)
 - $648/1434 = 0.45$

Probabilities

- Given the results you found on the previous slide:
 - What is the probability of Steph making 3 of the next 4 shots?
 - $n!/(k!(n-k)!) = 4!/(3!*1!) = 4$ outcomes
 - Probability = $((0.49)^3 * 0.51) * 4 = 0.240$
 - What is the probability that 4 of the next 5 shots are three-pointers?
 - $n!/(k!(n-k)!) = 5!/(4!*1!) = 5$ outcomes
 - Probability = $((0.55)^4 * 0.45) * 4 = 0.165$

Conditional Probabilities - Future

Python analysis of the data revealed the following findings:

Shot Type	Make	Result	Probability
2	True	374	$P(2 \text{Make}) = 0.532$
3	True	329	$P(3 \text{Make}) = 0.468$
2	False	274	$P(2 \text{Miss}) = 0.375$
3	False	457	$P(3 \text{Miss}) = 0.625$

Shot Type	Lead	Result	Probability
2	True	334	$P(2 \text{Lead}) = 0.463$
3	True	388	$P(3 \text{Lead}) = 0.537$
2	False	314	$P(2 \text{Lag}) = 0.441$
3	False	398	$P(3 \text{Lag}) = 0.559$

- If the next shot Steph shoots is a three-pointer...
 - What is the probability he makes it?
 - $P(\text{Make} | 3) = P(\text{Make}) * P(3 | \text{Make}) = 0.49 * 0.468 = 0.229$
 - What is the probability it was taken while his team had the lead (lead = True)?
 - $P(\text{Lead} | 3) = P(\text{Lead}) * P(3 | \text{Lead}) = ((334 + 388)/(1434)) * 0.537 = 0.503$

Conditional Probabilities - Future

- If the next shot Steph shoots is a two-pointer...
 - What is the probability he makes it?
 - $P(\text{Make} | 2) = P(\text{Make}) * P(2 | \text{Make}) = 0.49 * 0.532 = 0.261$
 - What is the probability it was taken while his team had the lead (lead = True)?
 - $P(\text{Lead} | 2) = P(\text{Lead}) * P(2 | \text{Lead}) = 0.503 * 0.463 = 0.233$

Conditional Probabilities - Retrospective

- What is the probability that it was a three-pointer?
 - $P(3) = P(\text{Make} | 3) + P(\text{Miss} | 3) = P(\text{Make}) * P(3 | \text{Make}) + P(\text{Miss}) * P(3 | \text{Miss})$
 - $P(3) = (0.49 * 0.468) + (0.51 * 0.625) = 0.548$
- What is the probability that it was a two-pointer?
 - $P(2) = P(\text{Make} | 2) + P(\text{Miss} | 2) = P(\text{Make}) * P(2 | \text{Make}) + P(\text{Miss}) * P(2 | \text{Miss})$
 - $P(2) = (0.49 * 0.532) + (0.51 * 0.375) = 0.452$