

Probability and Random Processes

ECS 315

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1 Probability and You



Office Hours:

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Monday 14:40-16:00

Friday 14:00-16:00

Life is random

In 2005, this fact

Life is random

showed up all over the world...

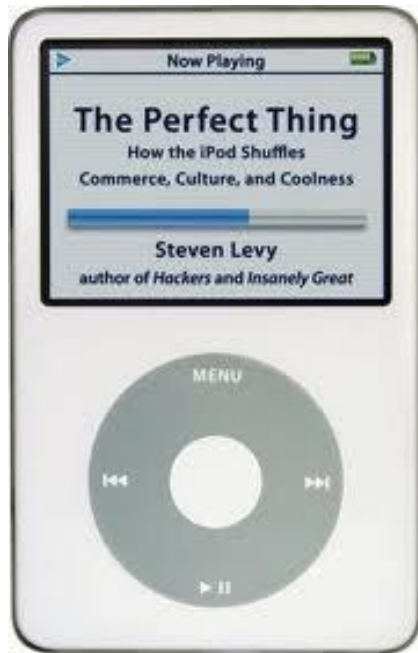
iPod shuffle
Life is random.



Applications of Probability Theory

- The subject of probability can be traced back to the **17th century** when it arose out of the study of **gambling games**.
- The range of applications extends beyond games into business decisions, insurance, law, **medical tests**, and the social sciences.
- The **stock market**, “the largest casino in the world,” cannot do without it.
- The **telephone network**, call centers, and airline companies with their randomly fluctuating loads could not have been economically designed without probability theory.

“The Perfect Thing”



“The Perfect Thing”



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The Perfect Thing: How the iPod Shuffles Commerce, Culture, and Coolness [Hardcover]

[Steven Levy](#) (Author)

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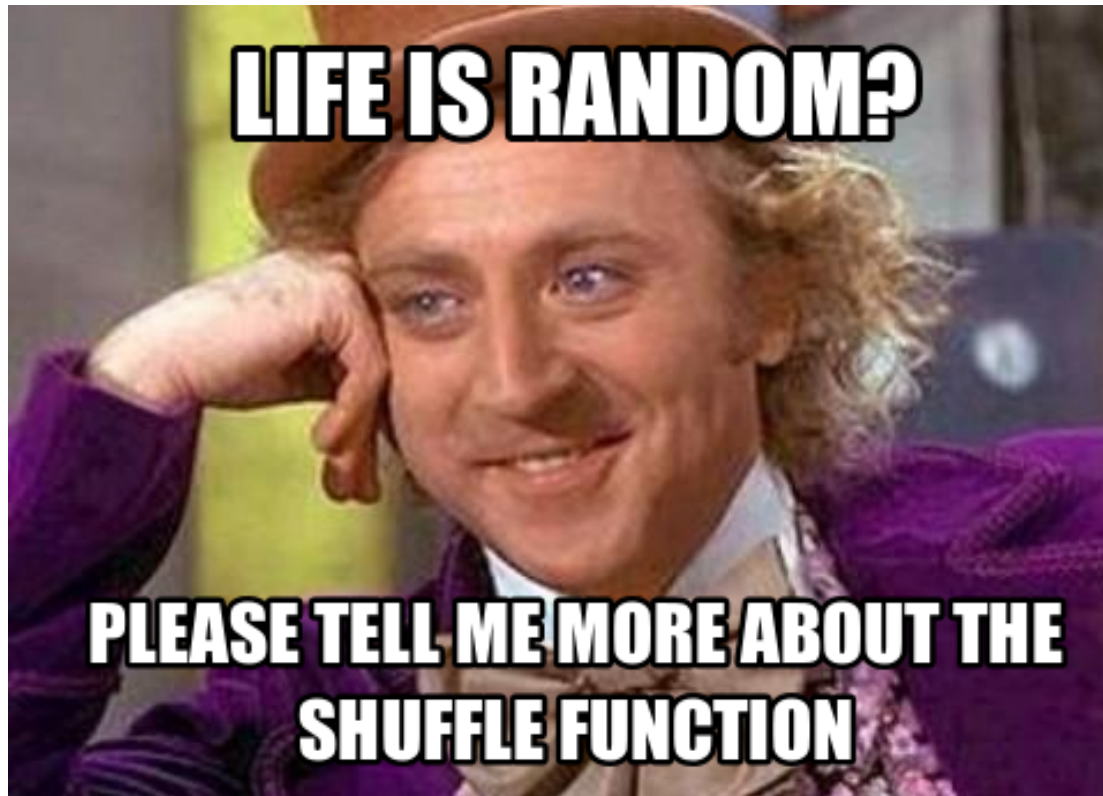
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Perfect?!...



What about the shuffle function?

Electronics >
About.com iPhone / iPod
Part of The New York Times Company

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Is iTunes' Shuffle Mode Truly Random?

By Sam Costello, About.com Guide

<http://ipod.about.com/od/advanceditunesuse/a/itunes-random.htm>



CNET Australia

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MP3 Players > News > iTunes: Just how random is random?

iTunes: Just how random is random?

By David Braue | March 8, 2007 | 127

<http://www.cnet.com.au/itunes-just-how-random-is-random-339274094.htm>

howstuffworks

Adventure Auto Culture Entertainment Home & Garden

Computer Electronics

iPod Shuffle Problems: How Random is the iPod Shuffle?

So just how random is the shuffle capability on an iPod Shuffle? Even before the device debuted in 2005, people have wondered about the shuffle function on iPods. Many complain that what they hear from

<http://electronics.howstuffworks.com/ipod-shuffle2.htm>

How to Interpret a Probability

- Many think that probabilities do not exist in real life.
- Nevertheless, a given or a computed value of the probability of some event A can be used in order to make **conscious decisions**.
- Long-run frequency interpretation.
 - If the probability of an event A in some actual physical experiment is p , then we believe that if the experiment is repeated independently over and over again, then in the long run the event A will happen $100p\%$ of the time.

Frequency Interpretation and LLN

- These assumptions are motivated by the **frequency interpretation of probability**.
 - If we repeat an experiment a large number of times then the fraction of times the event A occurs will be close to $P(A)$.
 - If we let $N(A, n)$ be the number of times A occurs in the first n trials then

$$P(A) = \lim_{n \rightarrow \infty} \frac{N(A, n)}{n}$$

- Later on, this result will be a theorem called **the law of large numbers (LLN)**.

USA Currency Coins

- Penny = 1 cent
(Abraham Lincoln)



- Dime = 10 cents
(Franklin D. Roosevelt)



- Nickel = 5 cents
(Thomas Jefferson)

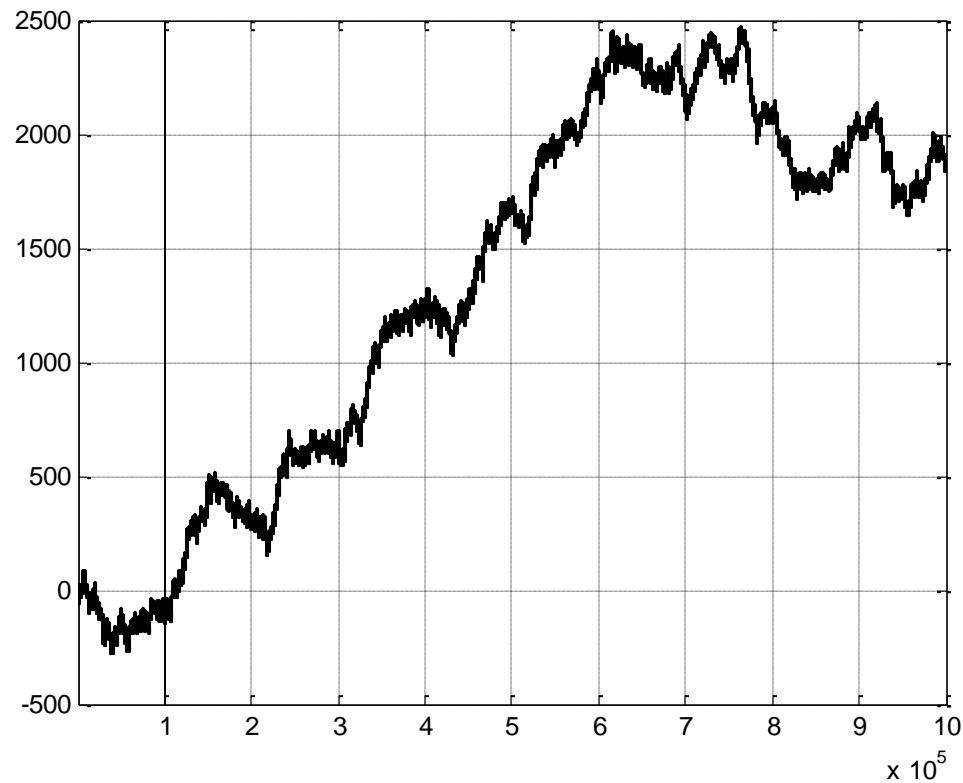


- Quarter = 25 cents
(George Washington)

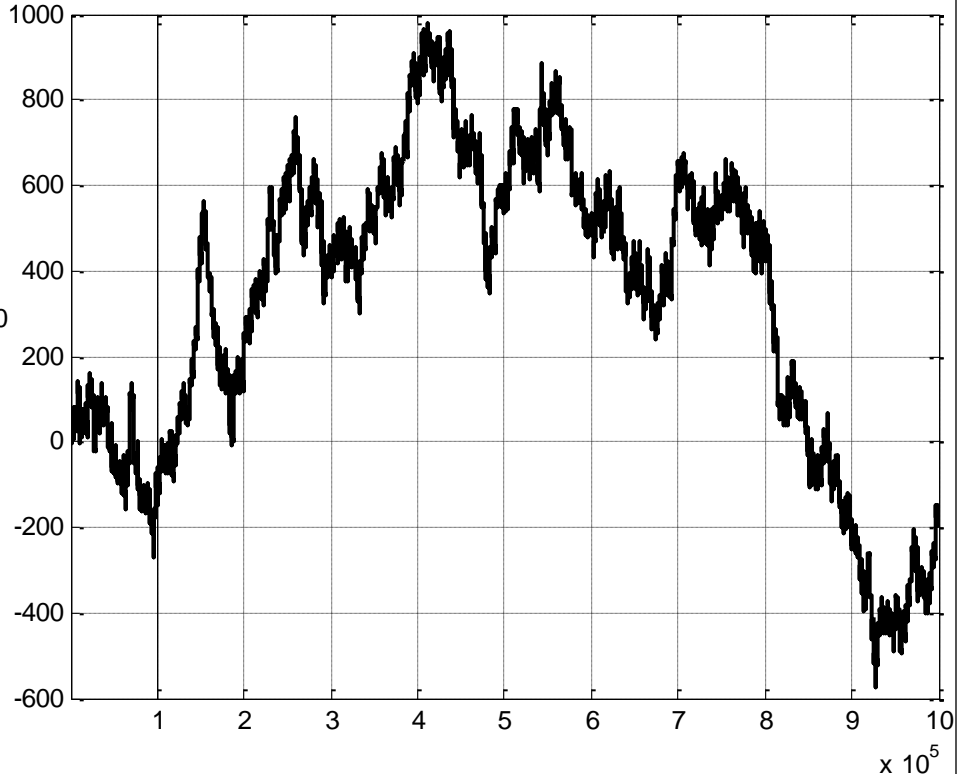
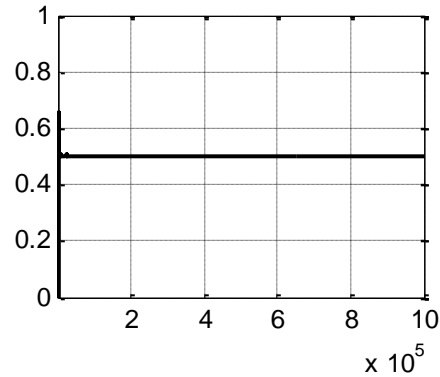
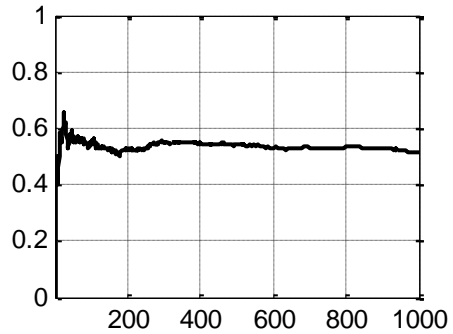
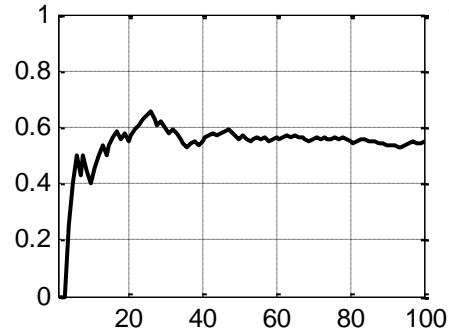
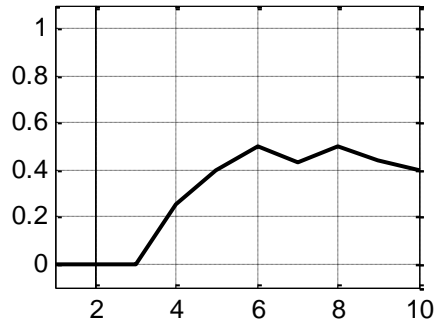


Intersting behavior

- The difference between #H and #T will not be close to 0.



Another trial



Another trial

