Probabilistic Analysis and Randomized Algorithms

Indicator random variables

A simple yet powerful technique for computing the expected value of a random variable.

Helpful in situations in which there may be dependence.

Given a sample space and an event A, we define the *indicator random variable*

$$I\{A\} = \begin{cases} 1 & \text{if } A \text{ occurs}, \\ 0 & \text{if } A \text{ does not occur}. \end{cases}$$

Lemma

For an event A, let $X_A = I\{A\}$. Then $E[X_A] = \Pr\{A\}$.

Proof Letting $\overline{A}$ be the complement of A, we have

$$\begin{aligned} E[X_A] &= E[I\{A\}] \\ &= 1 \cdot \Pr\{A\} + 0 \cdot \Pr\{\overline{A}\} \quad \text{(definition of expected value)} \\ &= \Pr\{A\}. \end{aligned}$$ ■ (lemma)

Simple example

Determine the expected number of heads when we flip a fair coin one time.

- Sample space is $\{H, T\}$.
- $\Pr\{H\} = \Pr\{T\} = 1/2$.
- Define indicator random variable $X_H = I\{H\}$. X_H counts the number of heads in one flip.
- Since $\Pr\{H\} = 1/2$, lemma says that $E[X_H] = 1/2$.

Probabilistic Analysis Of Algorithms

Mikhail J. Atallah

Probabilistic Analysis Of Algorithms:

Probabilistic Analysis of Algorithms Micha Hofri,2012-12-06 Probabilistic Analysis of Algorithms begins with a presentation of the tools of the trade currently used in probabilistic analyses and continues with an applications section in which these tools are used in the analysis ofr selected algorithms The tools section of the book provides the reader with an arsenal of analytic and numeric computing methods which are then applied to several groups of algorithms to analyze their running time or storage requirements characteristics Topics covered in the applications section include sorting communications network protocols and bin packing While the discussion of the various algorithms is sufficient to motivate their structure the emphasis throughout is on the probabilistic estimation of their operation under distributional assumptions on their input Probabilistic Analysis of Algorithms assumes a working knowledge of engineering mathematics drawing on real and complex analysis combinatorics and probability theory While the book is intended primarily as a text for the upper undergraduate and graduate student levels it contains a wealth of material and should also prove an important reference for researchers As such it is addressed to computer scientists mathematicians operations researchers and electrical and industrial engineers who are interested in evaluating the probable operation of algorithms rather than their worst case behavior **Probability and Computing** Michael Mitzenmacher,Eli Upfal,2005-01-31 Randomization and probabilistic techniques play an important role in modern computer science with applications ranging from combinatorial optimization and machine learning to communication networks and secure protocols This 2005 textbook is designed to accompany a one or two semester course for advanced undergraduates or beginning graduate students in computer science and applied mathematics It gives an excellent introduction to the probabilistic techniques and paradigms used in the development of probabilistic algorithms and analyses It assumes only an elementary background in discrete mathematics and gives a rigorous yet accessible treatment of the material with numerous examples and applications The first half of the book covers core material including random sampling expectations Markov s inequality Chevyshev s inequality Chernoff bounds the probabilistic method and Markov chains The second half covers more advanced topics such as continuous probability applications of limited independence entropy Markov chain Monte Carlo methods and balanced allocations With its comprehensive selection of topics along with many examples and exercises this book is an indispensable teaching tool **Probabilistic Analysis of Algorithms** Micha Hofri,1987-09-01 **Probabilistic Analysis of Algorithms** Alexander Hendrik George Rinnooy Kan,Leendert Stougie,University of Amsterdam. Institute of Actuarial Science & Econometrics,1988 **Probabilistic Analysis of Algorithms** A. H. G. Rinnooy Kan,1985 *Randomized Algorithms* Rajeev Motwani,Prabhakar Raghavan,1995-08-25 This book presents basic tools from probability theory used in algorithmic applications with concrete examples **Worst-case and Probabilistic Analysis of Algorithms for a Location Problem** Gerard Cornuejols,George L. Nemhauser,Laurence A. Wolsey,1978 **Algorithms and Theory of Computation**

Handbook, Volume 1 Mikhail J. Atallah,Marina Blanton,2009-11-20 Algorithms and Theory of Computation Handbook Second Edition General Concepts and Techniques provides an up to date compendium of fundamental computer science topics and techniques It also illustrates how the topics and techniques come together to deliver efficient solutions to important practical problems Along with updating and revising many *Probabilistic Analysis of Matching and Network Flow Algorithms* Rajeev Motwani,1988 **Algorithms and Theory of Computation Handbook** Mikhail J. Atallah,1998-11-23 Algorithms and Theory of Computation Handbook is a comprehensive collection of algorithms and data structures that also covers many theoretical issues It offers a balanced perspective that reflects the needs of practitioners including emphasis on applications within discussions on theoretical issues Chapters include information on finite precision issues as well as discussion of specific algorithms where algorithmic techniques are of special importance including graph drawing robotics forming a VLSI chip vision and image processing data compression and cryptography The book also presents some advanced topics in combinatorial optimization and parallel distributed computing applications areas where algorithms and data structuring techniques are of special importance graph drawing robot algorithms VLSI layout vision and image processing algorithms scheduling electronic cash data compression dynamic graph algorithms on line algorithms multidimensional data structures cryptography advanced topics in combinatorial optimization and parallel distributed computing **Probabilistic Analysis of Algorithms for NP-Complete Problems** John Franco,CASE WESTERN RESERVE UNIV CLEVELAND OHIO DEPT OF COMPUTER ENGINEERING.,INDIANA UNIV AT BLOOMINGTON DEPT OF COMPUTER SCIENCE.,1984 The goal of this research is to develop and analyze algorithms which can in some practical sense solve certain NP complete problems efficiently By solve we mean determine whether a solution to a given instance of an NP complete problem exists where for the problems we have considered a solution is an assignment of values to a list of variables which cause some predicate to be true We do not consider actually finding solutions when they exist since doing so adds unnecessary complexity to the statement of the algorithms the algorithms we consider can all be modified to find solutions without significantly altering performance NP complete problems are found in Crytology Operations Research Artificial Intelligence Computer System Design and many other areas There is no known algorithm for an NP complete problem which runs in time bounded by a polynomial on the length of the input polynomial time in the worst case nor is one likely to be found We seek algorithms which solve nearly every instance of specific NP complete problems in polynomial time **Algorithms and Theory of Computation Handbook - 2 Volume Set** Mikhail J. Atallah,Marina Blanton,2022-05-29 Algorithms and Theory of Computation Handbook Second Edition in a two volume set provides an up to date compendium of fundamental computer science topics and techniques It also illustrates how the topics and techniques come together to deliver efficient solutions to important practical problems New to the Second Edition Along with updating and revising many of the existing chapters this second edition contains more than 20 new chapters This edition now covers external memory

parameterized self stabilizing and pricing algorithms as well as the theories of algorithmic coding privacy and anonymity databases computational games and communication networks It also discusses computational topology computational number theory natural language processing and grid computing and explores applications in intensity modulated radiation therapy voting DNA research systems biology and financial derivatives This best selling handbook continues to help computer professionals and engineers find significant information on various algorithmic topics The expert contributors clearly define the terminology present basic results and techniques and offer a number of current references to the in depth literature They also provide a glimpse of the major research issues concerning the relevant topics **Probabilistic Methods for Algorithmic Discrete Mathematics** Michel Habib,Colin McDiarmid,Jorge Ramirez-Alfonsin,Bruce Reed,2013-03-14 Leave nothing to chance This cliche embodies the common belief that ran domness has no place in carefully planned methodologies every step should be spelled out each i dotted and each t crossed In discrete mathematics at least nothing could be further from the truth Introducing random choices into algorithms can improve their performance The application of proba bilistic tools has led to the resolution of combinatorial problems which had resisted attack for decades The chapters in this volume explore and celebrate this fact Our intention was to bring together for the first time accessible discus sions of the disparate ways in which probabilistic ideas are enriching discrete mathematics These discussions are aimed at mathematicians with a good combinatorial background but require only a passing acquaintance with the basic definitions in probability e g expected value conditional probability A reader who already has a firm grasp on the area will be interested in the original research novel syntheses and discussions of ongoing developments scattered throughout the book Some of the most convincing demonstrations of the power of these tech niques are randomized algorithms for estimating quantities which are hard to compute exactly One example is the randomized algorithm of Dyer Frieze and Kannan for estimating the volume of a polyhedron To illustrate these techniques we consider a simple related problem Suppose S is some region of the unit square defined by a system of polynomial inequalities Pi x y o **The Simplex Method** Karl Heinz Borgwardt,2012-12-06 For more than 35 years now George B Dantzig s Simplex Method has been the most efficient mathematical tool for solving linear programming problems It is proba bly that mathematical algorithm for which the most computation time on computers is spent This fact explains the great interest of experts and of the public to understand the method and its efficiency But there are linear programming problems which will not be solved by a given variant of the Simplex Method in an acceptable time The discrepancy between this negative theoretical result and the good practical behaviour of the method has caused a great fascination for many years While the worst case analysis of some variants of the method shows that this is not a good algorithm in the usual sense of complexity theory it seems to be useful to apply other criteria for a judgement concerning the quality of the algorithm One of these criteria is the average computation time which amounts to an anal ysis of the average number of elementary arithmetic computations and of the number of pivot steps A rigid analysis of the average behaviour

may be very helpful for the decision which algorithm and which variant shall be used in practical applications The subject and purpose of this book is to explain the great efficiency in prac tice by assuming certain distributions on the real world problems Other stochastic models are realistic as well and so this analysis should be considered as one of many possibilities

Probability and Algorithms National Research Council,Division on Engineering and Physical Sciences,Commission on Physical Sciences, Mathematics, and Applications,Panel on Probability and Algorithms,1992-02-01 Some of the hardest computational problems have been successfully attacked through the use of probabilistic algorithms which have an element of randomness to them Concepts from the field of probability are also increasingly useful in analyzing the performance of algorithms broadening our understanding beyond that provided by the worst case or average case analyses This book surveys both of these emerging areas on the interface of the mathematical sciences and computer science It is designed to attract new researchers to this area and provide them with enough background to begin explorations of their own **Probability and Computing** Michael Mitzenmacher,Eli Upfal,2017-07-03 Greatly expanded this new edition requires only an elementary background in discrete mathematics and offers a comprehensive introduction to the role of randomization and probabilistic techniques in modern computer science Newly added chapters and sections cover topics including normal distributions sample complexity VC dimension Rademacher complexity power laws and related distributions cuckoo hashing and the Lovasz Local Lemma Material relevant to machine learning and big data analysis enables students to learn modern techniques and applications Among the many new exercises and examples are programming related exercises that provide students with excellent training in solving relevant problems This book provides an indispensable teaching tool to accompany a one or two semester course for advanced undergraduate students in computer science and applied mathematics

Probabilistic Analysis of Packing and Partitioning Algorithms Edward Grady Coffman,George S. Lueker,1991 This volume examines two important classes that are characteristic of combinatorial optimization problems sequencing and scheduling in which a set of objects has to be ordered subject to a number of conditions and packing and partitioning in which a set of objects has to be split into subsets in order to meet a certain objective These classes of problems encompass a wide range of practical applications from production planning and flexible manufacturing to computer scheduling and

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dieta w insulinooporności pobierz przykładowy jadłospis - Jun 24 2022
web may 21 2018   dieta w insulinooporności to podstawa dieta dla insulinoopornych to tak naprawdę dieta zdrowego człowieka oparta o zasady racjonalnego żywienia powinna
dieta w insulinoopornoŚci dolnośląska izba aptekarska - Apr 03 2023
web jul 16 2021   dieta w insulinooporności najważniejsze zalecenia staraj się jeść 3 5 regularnych posiłków na dobę i nie podjadaj pomiędzy nimi wybieraj pełnoziarniste
dieta w insulinooporności artykuły medycyna praktyczna - Mar 22 2022

jaka dieta w insulinooporności sprawdź 10 - Jun 05 2023
web may 4 2023   jaka dieta jest zalecana w insulinooporności właściwa odpowiedź powinna brzmieć prawidłowo zbilansowana jest kilka diet które są dobrze
insulinooporość dieta zalecenia zasady postępowania - May 04 2023
web apr 27 2023   wiesz już że dieta niski indeks glikemiczny to nie musi być jedyna i najlepsza droga gdy konieczna jest

dieta w insulinooporności jeśli masz

dieta w przebiegu insulinooporności i zespołu - Mar 02 2023

web nov 8 2020   od viola urban spis treści co to jest insulinooporność jakie objawy towarzyszą insulinooporności jak i dlaczego powstaje insulinooporność czy

dieta w insulinooporności zasady co jeść czego unikać - Jul 26 2022

web nasza dieta w insulinooporności układana jest przez doświadczone dietetyczki dzięki czemu masz pewność że zadbamy o prawidłowe jej zbilansowanie oraz dobór do

dieta w insulinooporności dietetyk powszechny - Sep 27 2022

web oct 9 2019   dieta w chorobie alzheimera sugeruje się że wprowadzenie do diety pewnych składników pokarmowych czy odżywianie się zgodnie z danym modelem

dieta w insulinooporności zasady postępowania i jadłospis - Aug 07 2023

web dieta w insulinooporności opiekun specjalizacji mgr farm monika makiela buczek wrocław 2020 wprowadzenie insulinooporność jest stanem obniżonej wrażliwości

co to jest insulinooporność leczenie dieta grupa lux med - May 24 2022

dieta insulinowa catering dietetyczny medidieta - Feb 18 2022