

Solution of Homework 2

Social Networks

Exercise 4.4 Let A be a square $n \times n$ matrix whose rows are orthonormal. Prove that the columns of A are orthonormal.

Solution: Let A be $\begin{bmatrix} a_{11} & \dots & a_{1n} \\ \dots & \dots & \dots \\ a_{n1} & \dots & a_{nn} \end{bmatrix}$, the rows are orthonormal so $r_i \cdot r_j = 1$ if $i =$

j and 0 otherwise, where r_i is the i -th row of A .

The means $AA^T = A^T A = I$ since A is $n \times n$ matrix.

Therefore we can get $c_i \cdot c_j = 1$ if $i = j$ and 0 otherwise, where c_i is the i -th column of A . Thus the columns are also orthonormal.

Exercise 4.6 Prove that the left singular vectors of A are the right singular vectors of A^T .

Solution: Let $A = UDV^T$ by SVD where U is composed of the left singular values of A and V is composed of the right singular values of A . Then $A^T = (UDV^T)^T = VDU^T$, so the left singular vectors of A are the right singular vectors of A^T .

Exercise 4.31

1. Consider the pairwise distance matrix for twenty US cities given below. Use the algorithm of Exercise 2 to place the cities on a map of the US.
2. Suppose you had airline distances for 50 cities around the world. Could you use these distances to construct a world map?

Solution:

1. In order to put the cities on a map, we would compute the rank 2 approximation of the matrix of distance. This gives us a projection of the rows of the original matrix onto a two-dimensional subspace spanned by the first 2 singular vectors of the original matrix.
2. Yes, map M to a three-dimensional subspace. Do a rank 3 approximation of the distance matrix to get an approximate map of the world in three dimensions.

Networks Homework 2 Solution

Giancarlo de Marchis, Roberto Sabella

A red circular graphic with a gradient, appearing as a semi-circle on the right side of the slide, partially overlapping the authors' names.

Networks Homework 2 Solution:

Networks Benny Bing, 2002 The joint conference ICWLHN 2002 and ICN 2002 covers a wide variety of technical sessions covering all aspects of networking technology It features some of the world's most dynamic presenters including leading experts such as Norman Abramson inventor of the first access protocol OCo the ALOHA protocol and Daniel Awduche pioneer of the MPLambdaS concept now referred to as GMPLS The proceedings for this joint conference is accessible to engineers practitioners scientists as well as industry professionals from manufacturers to service providers

Optical Networks Giancarlo de Marchis, Roberto Sabella, 2013-03-20 Optical network design and modelling is an essential issue for planning and operating networks for the next century The main issues in optical networking are being widely investigated not only for WDM networks but also for optical TDM and optical packet switching This book contributes to further progress in optical network architectures design operation and management and covers the following topics in detail Routing strategies and algorithms for optical networks Network planning and design Wavelength conversion and wavelength assignment in optical networks Technologies for optical networks transport access and local area networks Transmission aspects in wide area optical networks New paradigms for traffic modelling This book contains the selected proceedings of the Second International Working Conference on Optical Network Design and Modelling which was sponsored by the International Federation for Information Processing IFIP and held in February 1998 in Rome Italy This valuable new book will be essential reading for personnel in computer communication industries and for academic and research staff in computer science and electrical engineering

Artificial Intelligence and Quantum Computing for Advanced Wireless Networks Savo G. Glisic, Beatriz Lorenzo, 2022-04-11 ARTIFICIAL INTELLIGENCE AND QUANTUM COMPUTING FOR ADVANCED WIRELESS NETWORKS A comprehensive presentation of the implementation of artificial intelligence and quantum computing technology in large scale communication networks Increasingly dense and flexible wireless networks require the use of artificial intelligence AI for planning network deployment optimization and dynamic control Machine learning algorithms are now often used to predict traffic and network state in order to reserve resources for smooth communication with high reliability and low latency In Artificial Intelligence and Quantum Computing for Advanced Wireless Networks the authors deliver a practical and timely review of AI based learning algorithms with several case studies in both Python and R The book discusses the game theory based learning algorithms used in decision making along with various specific applications in wireless networks like channel network state and traffic prediction Additional chapters include Fundamentals of ML Artificial Neural Networks NN Explainable and Graph NN Learning Equilibria and Games AI Algorithms in Networks Fundamentals of Quantum Communications Quantum Channel Information Theory and Error Correction Quantum Optimization Theory and Quantum Internet to name a few The authors offer readers an intuitive and accessible path from basic topics on machine learning through advanced concepts and techniques in quantum networks Readers will

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Emerging Technologies in Wireless Ad-hoc Networks: Applications and Future Development Aquino-Santos, Raul,2010-11-30 Mobile ad hoc networks have attracted considerable attention and interest from the commercial sector as well as the standards community Many new ad hoc networking applications have been conceived to help enable new commercial and personal communication beyond the domain of tactical networks including personal area networking home networking law enforcement operations search and rescue operations commercial and educational applications and sensor networks Emerging Technologies in Wireless Ad hoc Networks Applications and Future Development provides the rationale state of the art studies and practical applications proof of concepts experimental studies and future development on the use of emerging technologies in wireless ad hoc networks In addition this work explores emerging wireless ad hoc technologies based on communication coverage areas body sensor networks personal area networks local area networks and metropolitan area networks and their applications in critical sectors for example agriculture environment public health and public transportation

The Arithmetic Teacher ,1993 **Resource Allocation in Next Generation Wireless Networks** Wayne Li,Yi Pan,2006 Next generation wireless and mobile communication systems are rapidly evolving to satisfy the demands of various network users Due to the great success and enormous impact of IP networks high speed transmission is now possible for both indoor and outdoor wireless systems internet access and web browsing have become the ruling paradigm for next generation system It is envisioned that new generation wireless networks and hand held terminals will support a wide variety of multimedia services such as multimedia web browsing video and news on demand mobile office system stock market information and so on to mobile users anywhere anytime in an uninterrupted and seamless way with low powered handsets The characteristics of wireless links as well as the desire to maintain connectivity while on the move offer significant challenges to provisioning quality of service and the related performance is of central interest Since the resources such as time frequency and code in the wireless segments of such networks are very limited over dimensioning the network resource is equivalent to poor capital investment while congestion at busy hours could mean lost calls and lost revenues It is therefore critical for wireless network designers to

utilise these resources efficiently and effectively In response to the above demand for next generation wireless and mobile communication systems this book aims at providing a timely and concise reference of the current activities and findings in the relevant technical fields The primary goal is to address the key technical issues pertaining to the integrated new systems and present novel technical contributions The book contains 14 invited chapters from prominent researchers working in this area around the world

DWDM Network Designs and Engineering Solutions Ashwin Gumaste, Tony Antony, 2003 A comprehensive book on DWDM network design and implementation solutions Design Software Included Study various optical communication principles as well as communication methodologies in an optical fiber Design and evaluate optical components in a DWDM network Learn about the effects of noise in signal propagation especially from OSNR and BER perspectives Design optical amplifier based links Learn how to design optical links based on power budget Design optical links based on OSNR Design a real DWDM network with impairment due to OSNR dispersion and gain tilt Classify and design DWDM networks based on size and performance Understand and design nodal architectures for different classification of DWDM networks Comprehend different protocols for transport of data over the DWDM layer Learn how to test and measure different parameters in DWDM networks and optical systems The demand for Internet bandwidth grows as new applications new technologies and increased reliance on the Internet continue to rise Dense wavelength division multiplexing DWDM is one technology that allows networks to gain significant amounts of bandwidth to handle this growing need DWDM Network Designs and Engineering Solutions shows you how to take advantage of the new technology to satisfy your network s bandwidth needs It begins by providing an understanding of DWDM technology and then goes on to teach the design implementation and maintenance of DWDM in a network You will gain an understanding of how to analyze designs prior to installation to measure the impact that the technology will have on your bandwidth and network efficiency This book bridges the gap between physical layer and network layer technologies and helps create solutions that build higher capacity and more resilient networks Companion CD ROM The companion CD ROM contains a complimentary 30 day demo from VPIphotonics trade for VPItransmissionMaker trade the leading design and simulation tool for photonic components subsystems and DWDM transmission systems VPItransmissionMaker contains 200 standard demos including demos from Chapter 10 that show how to simulate and characterize devices amplifiers and systems

IJCAI-93 International Joint Conferences on Artificial Intelligence, 1993

Staff Scheduling and Rostering ,2004 *Conference Record* ,1993

Proceedings of the IASTED International Conference, Artificial Intelligence and Soft Computing, May 27-30, 1998, Cancun, Mexico International Association of Science and Technology for Development, 1998

Optical Network Design and Management Xiaomin Ren, Tomonori Aoyama, 2001

Managing the Implementation of Development Projects World Bank, 2006 This 12 module CD ROM library of print based learning materials is designed for classroom training of developing country project managers responsible for overseeing the implementation of development and other

projects Each module includes performance based instructional objectives module and session outlines with a timetable of activities scripted lectures with corresponding visuals case studies exercises and solution sets with teaching notes self assessment questions and answers and selected readings The resource kit provides enough information and practice to instill a solid understanding of the principles of project implementation and an awareness of good practices

Transportation Science ,2003 *Travel Demand Forecasting, Travel Behavior Analysis, Time-sensitive Transportation, and Traffic Assignment Methods* ,1995 The papers in this volume focus on mode choice models traffic assignment hazard models and various modeling systems to improve urban transportation planning a model of origin destination route choice and trip generation for shopping travel *Journal of Communications and Networks* ,2006 *Multipath Traffic Assignment: a Review of Literature. Interim Report* C. Y. Wang,1990 **Optimum Project Addition in Urban Transportation Networks Via Descriptive Traffic Assignment Models** Felipe Ochoa-Rosso,Angel Silva,1968 *Trends and Applications* 1976 IEEE Computer Society. Technical Committee on Computer Communications,1976 **A Collection of Technical Papers** ,1992

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