Computational complexity a modern approach answers

Solutions to homework 1.2 and mid-period are available. List of papers to read. Prior knowledge of the following materials is believed. A brief overview of the basics will be given in the first lecture. Other than this, the course should be independent. Discreet mathematics and probability. Data structures : lists, trees, stacks etc. Algorithms, asymptotic runtime, basic algorithms such as width/depth-first search, sorting etc. Limited automata (deterministic and non-deterministic), common language, context-free language. Turing machines, decidability, NP completeness, reductions. References to this basic material are : M. Sipser : Introduction to the theory of calculation. T. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein : Introduction to Algorithms Professor: Subhash Khot - By 416, 212-998-4859, Office Hours : Just before class or by appointment. Course Curriculum The first part of the course will cover basic aspects of complexity theory. This includes complexity classes P, NP, L, NL, PSPACE, polynomial hierarchy, BPP, P/poly, NC, IP, AM, #P and relationships between them. The second part of the course will cover advanced toipcs, such as PCPs, circuit lower limits, communication complexity, derandomization, property testing and quantum calculation. Emphasis is placed on width instead of covering some of these themes in depth. Homework and exams There will be three homework, a take-home mid-period and a take-home finish. Homework 1 Solutions Homework 2 Solutions Midterm Solutions Homework 3 Solutions Endedrm Towards the end of the course you may be asked to read a research article you choose and present it in class. The list of recommended papers/topics is shown above. References and textbooks We will not follow a specific textbook, but a good reference is: Arora and Barak: Computational Complexity: A Modern Approach. A draft of this book is available on � You can also see : C.H. Papadimitriou : Computational Complexity. D.Z. You and K.I. Ko : Theory of computational complexity. Course notes from similar courses taught at Princeton and UC-Berkeley can be useful. See : Title Computational Complexity: A Modern Approach Author(s) Sanjeev Arora, Boaz Barak Publisher: Cambridge University Press; 1 issue (April 20, 2009) Bound 594 pages eBook Online, HTML and PDF Files Language: English ISBN-10: 0521424267 ISBN-13: 978-0521424264 Share this: Book description This incipory graduate textbook describes both recent achievements and classic results of computational complexity theory, including interactive evidence, PCP, derandomization and quantum calculation. It can be used as a reference, for self-study, or as a textbook. More than 300 exercises are included. About Sanjeev Arora is a professor in the department of computer science at Princeton University. He holds a Doctorate from the University of California, Berkeley and has done basic work in complexity theory, probabilistically controlling evidence, and approach algorithms. Boaz Barak is an assistant professor in the department of computer science at Princeton University. He holds a doctorate from the Weizmann Institute of Science. Reviews, rankings and recommendations: Related book categories: Read and download links: Similar books: Credits 4 Lecturer Ola Svensson Office time Wednesdays 14:00 - 16:00 in INJ 112 Schedule Mondays 10-12 in INM 10. Thursdays 8-10 in INR 113. Computational complexity is the part of computer science that studies the computational resources (time, memory, communication, ...) needed to solve problems that we care about. It also looks at trade-offs and relationships between different types of calculation (e.g. whether randomness helps, accurate vs approximate solutions, average vs worst case guarantees, ...). This course familiarizes students with advanced concepts of computational complexity, and develops an understanding of fundamental questions that under the influence of some of the most important problems with modern computer science. Having started with some basic concepts, potential topics include Boolean circuits and non-uniform calculation Role randomness in calculation Interactive evidence and zero-knowledge evidence Probabilistically controllable evidence and their characterization of the complexity class NP (PCP Theorem) Communication complexity Recommended book: Sanjeev Arora and Boaz Barak: Computational Complexity: A Modern Approach, Cambridge University Press, 2009. A draft of the book is available for free here. Homework First homework available here. Deadline 17:00 Friday 26 October. Other homework available here. Deadline 17:00 Friday 16 November. Third homework available here. Deadline 17:00 Friday 7 December. Schedule and references Lecture 1 (Thursday, September 20): Introduction. Diagonalization. Time hierarchy theorem. Chapter 0-3. Another good reference is here. Introductory slides. Ola's notes. Speech 2 (Monday, September 24): Nondeterministic calculation, P vs NP, and why diagonalization alone will not solve P vs NP. Chapters 2-3. Recall lecture 2 slides. Ola's notes. Exersise session (Thursday September 27) Exercise set 1. Solutions to training kit 1. Speech 3 (Monday, October 1): Complete evidence of why diagnoalization alone will not solve P vs NP. The beginning of Boolean circuits (non-uniform calculation) Chapter 6. Ola's notes. Lecture 4 (Thursday, October 4): Basic boundaries on Boolean circles and an alternative proof of NP completeness. Chapter 6. Ola Notes Training Session (Monday October 8) Exercise Set 2. Solutions to training kit 2. Lecture 5 (Thursday, October 11): Randomised calculation, Adleman's theorem. 7th Ola's Ola's Lecture 6 (Monday, October 15): Polynomin hierarchy. Karp-Lipton theorem. Chapters 5 and 6. Ola Notes Training Session (Thursday October 18) Training set 3. Solutions to training kits 3. Lecture 7 (Monday, October 22): Natural evidence. Interactive evidence. Chapters 8 and 23. Ola's Notes Lecture 8 (Thursday, October 25): Interactive evidence. Graf isomorphism. Chapter 8. Ola Notes Training Session (Monday October 29) Training set 4. Solutions to training kits 4. Lecture 9 (Thursday, November 1): Interactive evidence. IP=PSPACE. Chapter 8. Ola Notes Lecture 10 (Monday, November 5): Last step of evidence of IP = PSPACE and Zero-knowledge evidence Chapter 8. Slides to remember the last lecture. Good lecture notes on zero knowledge certificates here (sections 1-2) and here. Training session (Thursday, November 8) Practice set 5. Solutions to training kits 5. Lecture 11 (Monday, November 12): Probabilistic controllable evidence. Local testability and decodability of Walsh-Hadamard Code Chapter 11. Ola Notes Lecture 12 (Thursday, November 15): Probabilistic Checkable Proofs. NP is a subset of PCP (poly(n), 1). Chapter 11. Ola Notes Training Session (Monday, November 19) Exercise set 6. Solutions to training kits 6. Lecture 13 (Thursday, November 22): Probabilistic controllable evidence. Hardness of approach. Chapter 11. Ola's notes Lecture 14 (Monday, November 26): Cryptography: one-way functions and pseudo-random generators. Chapter 9. Ola Notes Training Session (Thursday, November 29) Exercise set 7. Solutions to training kits 7. Lecture 15 (Monday, December 3): Cryptography: evidence one-way permutations involves PRGs. Chapter 9. Ola's notes Lecture 16 (Thursday 6 December):D by Quantum computing. Chapter 10. Ola's notes Lecture 17 (Monday, December 10):Continuation of quantum computing: Grover's search algorithm. Chapter 10. Ola Notes Training Session (Thursday, December 13) Training set 8. Solutions to training kits 8. Lecture 18 (Monday, December 17):Repetition for examination. Final exam in similar courses given 2016. Solutions to that exam. Exam (Thursday, December 20) This incipient textbook describes both recent achievements and classic results of computational complexity theory. The book essentially requires no background apart from mathematical maturity, and can be used as a reference for self-study for anyone interested in complexity, including physicists, mathematicians and other scientists, as well as a textbook for a variety of courses and seminars. More than 300 exercises are included in a selected hint set. The book starts with a broad introduction to the field and moves on to advanced results. The content includes: definition of Turing machines and basic time and room complexity classes, probabilistic algorithms, interactive evidence, cryptography, quantum calculation, lower limits for specific computational models (decision trees, communication complexity, constant algebraic and monotonous circuits, evidence complexity), average-case complexity and hardness reinforcement, derandomization and pseudorandom constructions, and the PCP theorem. Contains modern take on computational complexity as well as the classic Covers the basic plus advanced topics displayed for the first time in a graduate textbook More than 300 exercises are includedRead moreThis book by two leading theoretical computer scientists provides a comprehensive, insightful and mathematically precise overview of computational complexity theory, ranging from early basic work to new areas such as quantum calculation and hardness of approach. It will serve the needs of a wide audience, ranging from experienced researchers to graduate students and ambitious students seeking an introduction to the mathematical basis of computer science. I'll keep it by my side as a useful reference for my own teaching and research.' Richard M. Karp, University of California at Berkeley's This text is a great achievement that brings together all the important developments in complexity theory. Both students and researchers will find it an incredibly useful resource. Michael Sipser, author of Introduction to the Theory of Computation'Computational complexity theory is in the core of theoretical computer science research. This book contains essentially all the (many) exciting developments over the past two decades, with high-level intuition and detailed technical evidence. It is a must for anyone interested in this field. Avi Wigderson, Professor, Institute for Advanced Study, PrincetonSee more reviews Customer reviews Be the first to review Log in on review Date Published: June 2009format: Hardbackisbn: 9780521424264length: 594 pages dimensions: 259 x 185 x 38 mmweight: 2.78kgcontains: 73 b / w illus. 6 tables 307 exercises availability: Available part I. Basic complexity classes:1. The calculation model - and why it does not matter 2. NP and NP completeness 3. Diagonalization 4. Space complexity 5. The polynomial hierarchy and exchanges 6. Boolean circuits 7. Randomised calculation 8. Interactive evidence 9. Cryptography 10. Quantum calculation 11. PCP theorem and hardness of approach: an introduction Part II. lower limits for concrete calculation models: 12. Decision trees 13. Communication complexity 14. Circuit lower limit 15. Proof complexity 16. Algebraic calculation models Part III. Advanced topics:17. The complexity of counting 18. Average case complexity: Levin's theory 19. Hardness amplification and bug fixing of codes 20. Derandomization 21. Pseudorandom structures: expanders and extractors 22. Proof of PCP theorems and Fourier transform technique 23. Why is the circuit lower boundaries so difficult? Appendix A: mathematical background. Look InsideInstructors has used or reviewed this title for the following ComplexityComputer Complexity TheoryCryptographyHigh Performance Computing in Operations ResearchLimits of ComputationTheory of Computation - HonorsTheory of ComputingSanjeev Arora, Princeton University, New JerseySanjeev Arora is professor in the department of computer science at Princeton University. He holds a Doctorate from the University of California, Berkeley and has done basic work in complexity theory, probabilistically controlling evidence, and approach algorithms. Boaz Barak, Princeton University, New JerseyBoaz Barak is an assistant professor in the department of computer science at Princeton University. He holds a doctorate from the Weizmann Institute of Science. Science.