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Book Announcements

Nicolaos B. Karayiannis and Anastasios N. Venetsanopoulos, *Artificial Neural Networks: Learning Algorithms, Performance Evaluation, and Applications* (Kluwer Academic Publishers, Boston, MA, 1993) 440 pages

Chapter 1: Introduction. Overview. Book organization. *Chapter 2: Neural Network Architectures and Learning Schemes.* Introduction. Feed-forward neural networks. Feed-back neural networks. Self-organizing neural networks. Discussion. *Chapter 3: ELEANNE: Efficient LEarning Algorithms for Neural NEtworks.* Introduction. Recursive least-squares algorithms. Efficient learning algorithms for single-layered neural networks. Efficient learning algorithms for multi-layered neural networks. Computational considerations. Experimental results. Discussion. *Chapter 4: Fast Learning Algorithms for Neural Networks.* Introduction. A generalized training criterion. Fast learning algorithms for single-layered neural networks. Fast learning algorithms for multi-layered neural networks. Experimental results. Discussion. *Chapter 5: ALADIN: Algorithms for Learning and Architecture DetermiNation.* Introduction. Training criteria. Neural networks with one hidden layer. Neural networks with multiple hidden layers. Experimental results. Discussion. *Chapter 6: Performance Evaluation of Single-Layered Neural Networks.* Introduction. Optimal least-squares training of single-layered neural networks. Capacity considerations. Output nonlinearities and network performance. Discussion. *Chapter 7: High-Order Neural Networks and Networks with Composite Key Patterns.* Introduction. High-order neural networks. Neural networks with composite key patterns. Capacity considerations. Discussion. *Chapter 8: Applications of Neural Networks: A Case Study.* Introduction. General methodology for the development of neural network systems. Application of neural networks in environmental protection. Discussion. *Chapter 9: Applications of Neural Networks: A Review.* Introduction. Optimization problems. Image compression. Recognition of handwritten signatures, characters, and digits. Text to speech conversion. Classification applications. Medical diagnosis. Prediction of secondary structures of proteins. Weather forecasting. Financial predictions. Other applications. *Chapter 10: Future Trends and Directions.*

Luciano Lavagno and Alberto Sangiovanni-Vincentelli, *Algorithms for Synthesis and Testing of Asynchronous Circuits* (Kluwer Academic Publishers, Boston, MA, 1993) 339 pages

Preface. Chapter 1: Introduction. Motivation. Organization. *Chapter 2: Overview of the Design Methodology.* Signal transition graphs. Signal transition graph synthesis. The *VMEbus* master interface protocol. A signal transition graph specification for the *VMEbus* interface. The circuit implementation of the *VMEbus* master interface. *Chapter 3: Previous Work.* Circuit model taxonomy. Definitions. The Huffman model for asynchronous circuits. Micropipelines. Speed-independent circuits. Delay-insensitive circuits. Hazard analysis in asynchronous circuits. Conclusion. *Chapter 4: The Signal Transition Graph Model.* A low-level model for asynchronous systems. Modeling asynchronous logic circuits. A high-level behavioral model for asynchronous systems. Classification of models of asynchronous circuits. Signal transition graphs and change diagrams. Conclusion. *Chapter 5: The State Encoding Methodology.* Overview of the state encoding methodology. From signal transition graphs to finite state machines. Constrained finite state machine minimization. State signal insertion. Experimental results. *Chapter 6: The Synthesis Methodology.* Hazard

analysis and signal transition graphs. Circuit implementation of the next state function. Static Hazard detection in the circuit implementation. Hazard elimination by delay padding. Dynamic Hazard analysis. Experimental results. *Chapter 7: The Design for Testability Methodology*. Definitions and notation. A procedure guaranteed to generate an HFRPDFT circuit. Heuristic procedures to improve HFRPDFT testability. A procedure guaranteed to generate an RGDFT circuit. Design for delay testability methodology. Experimental results. *Chapter 8: Conclusions*.

Ami Arbel, Exploring Interior-Point Linear Programming Algorithms and Software (The MIT Press, Cambridge, MA, 1993) 211 pages

PART I: PREPARATIONS. *Chapter 1: Introduction*. *Chapter 2: Modeling Linear Optimization Problems*. Linear programs in standard form. Modeling issues and nonlinear effects. Graphical solution of linear programs. Problem areas. Additional reading. *Chapter 3: The Simplex Algorithm*. Linear systems of equations. Bases and basic solutions. Replacing vectors in a basis. Fundamental properties of linear programming problems. Pivot operation in solving a system of equations. Starting and stopping the simplex algorithm. Matrix form of the pivot operation. Duality. Additional reading. *Chapter 4: A First Look at an Interior-Point Algorithm*. Geometric explorations. Mathematical requirements. Additional reading. PART II: ALGORITHMS. *Chapter 5: The Primal Algorithm*. Scaling. Taking an interior step. Free variables. How to start. When to stop. A digression. Additional reading. *Chapter 6: The Dual Algorithm*. Scaling. Primal estimates. Additional reading. *Chapter 7: The Primal-Dual Algorithm*. Newton's method. The barrier method. Developing the algorithm. Summary. Additional reading. *Chapter 8: Implementation Issues*. Solving systems of linear equations. Solving symmetric systems of equations. Sparse matrix techniques. Additional reading. PART III: SOLUTIONS. *Chapter 9: The Integrated Environment*. The file command. The edit command. The spec file command. The solve command. The view command. The print command. The run demo command. *Chapter 10: Command-Line Operations*. Solving a model. Editing the specfile. Appendix A: The MPS file format. Appendix B: The netlib test collection. Selected bibliography. Index.

Anil Nerode and Richard A. Shore, Logic for Applications (Springer, New York, 1993) 365 pages

Preface. *Introduction*. *Chapter I: Propositional Logic*. Orders and trees. Propositions, connectives and truth tables. Truth assignments and valuations. Tableau proofs in propositional calculus. Soundness and completeness of tableau proofs. Deductions from premises and compactness. An axiomatic approach. Resolution. Refining resolution. Linear resolution, Horn clauses and PROLOG. *Chapter II: Predicate Logic*. Predicates and quantifiers. The language: Terms and formulas. Formation trees, structures and lists. Semantics: Meaning and truth. Interpretation of PROLOG programs. Proofs: Complete systematic tableaux. Soundness and completeness of tableau proofs. An axiomatic approach. Prenex normal form and skolemization. Herbrand's theorem. Unification. The unification algorithm. Resolution. Refining resolution: Linear resolution. *Chapter III: PROLOG*. SLD-resolution. Implementations: Searching and backtracking. Controlling the implementation: Cut. Termination conditions for PROLOG programs. Equality. Negation as failure. Negation and nonmonotonic logic. Computability and undecidability. *Chapter IV: Modal Logic*. Possibility and necessity; knowledge or belief. Frames and forcing. Modal tableaux. Soundness and completeness. Modal axioms and special accessibility relations. An axiomatic approach. *Chapter V: Intuitionistic Logic*. Intuitionism and constructivism. Frames and forcing. Intuitionistic tableaux. Soundness and completeness. Decidability and undecidability. A comparative guide. *Appendix A: An Historical Overview*. Calculus. Logic. Leibniz's dream. Nineteenth century logic. Nineteenth century foundations of mathematics. Twentieth century foundations of mathematics. Early twentieth century logic. Deduction and computation. Recent automation of logic and PROLOG. The future. *Appendix B: A Genealogical Database*. *Bibliography*. History of mathematics. History of logic. Mathematical logic. Intuitionistic, modal, and temporal logics. Logic and computation. *Index of Symbols*. *Index of Terms*.

David Gries and Fred B. Schneider, A Logical Approach to Discrete Math (Springer, New York, 1993) 497 pages

Preface. Chapter 0: Using Mathematics. Chapter 1: Textual Substitution, Equality, and Assignment. Preliminaries. Textual substitution. Textual substitution and equality. Leibniz's rule and function evaluation. Reasoning using Leibniz's rule. The assignment statement. *Chapter 2: Boolean Expressions.* Syntax and evaluation of boolean expressions. Equality versus equivalence. Satisfiability, validity, and duality. Modeling English propositions. *Chapter 3: Propositional Calculus.* Preliminaries. Equivalence and true. Negation, inequivalence, and false. Disjunction. Conjunction. Implication. *Chapter 4: Relaxing the Proof Style.* An abbreviation for proving implications. Additional proof techniques. *Chapter 5: Applications of Propositional Calculus.* Solving word problems. Combinational digital circuits. *Chapter 6: Hilbert-style Proofs.* Hilbert-style proofs. Natural deduction. Additional proof formats. Styles of reasoning. *Chapter 7: Formal Logic.* Formal logical systems. Constructive logics. *Chapter 8: Quantification.* On types. Syntax and interpretation of quantification. Rules about quantification. Manipulating ranges. *Chapter 9: Predicate Calculus.* Universal quantification. Existential quantification. English to predicate logic. *Chapter 10: Predicates and Programming.* Specification of programs. Reasoning about the assignment statement. Calculating parts of assignments. Conditional statements and expressions. *Chapter 11: A Theory of Sets.* Set comprehension and membership. Operations on sets. Theorems concerning set operations. Union and intersection of families of sets. The axiom of choice. Ill-defined sets and paradoxes. Bags. *Chapter 12: Mathematical Induction.* Induction over the natural numbers. Inductive definitions. Peano arithmetic. Induction and well-founded sets. Induction for inductive definitions. The correctness of loops. *Chapter 13: A Theory of Sequences.* The basic theory of sequences. Extending the theory with new operations. Extending the theory to use integers. *Chapter 14: Relations and Functions.* Tuples and cross products. Relations. Functions. Order relations. Relational Databases. *Chapter 15: A Theory of Integers.* Integral domains. Exploring minimum and maximum. Exploring absolutes. Divisibility, common divisors, and primes. Common representations of natural numbers. *Chapter 16: Combinatorial Analysis.* Rules of counting. Properties of n choose r . Examples of counting. The pigeonhole principle. *Chapter 17: Recurrence Relations.* Homogeneous difference equations. Nonhomogeneous difference equations. Generating functions. *Chapter 18: Modern Algebra.* The structure of algebras. Group theory. Boolean algebras. *Chapter 19: A Theory of Graphs.* Graphs and multigraphs. Three applications of graph theory. Classes of graphs. Subgraphs and morphisms. Hamilton circuits. Planar graphs. Shortest paths and spanning trees. *Chapter 20: Infinite Sets.* Finite versus infinite sets. The cardinality of an infinite set. Countable and uncountable sets.

Richard G. Rice and Duong D. Do, Applied Mathematics and Modeling for Chemical Engineers (Wiley, New York, 1995) 706 pages

Chapter 1: Formulation of Physicochemical Problems. Chapter 2: Solution Techniques for Models Yielding Ordinary Differential Equations (ODE). Chapter 3: Series Solution Methods and Special Functions. Chapter 4: Integral Functions. Chapter 5: Staged-Process Models: The Calculus of Finite Differences. Chapter 6: Approximate Solution Methods for ODE: Perturbation Methods. Chapter 7: Numerical Solutions (Initial Value Problems). Chapter 8: Approximate Methods for Boundary Value Problems: Weighted Residuals. Chapter 9: Introduction to Complex Variables and Laplace Transforms. Chapter 10: Solution Techniques for Models Producing PDEs. Chapter 11: Transform Methods for Linear PDEs. Chapter 12: Approximate and Numerical Solution Methods for PDEs. Index.