EDWARD L. ROBERTSON

Computer Science Department
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Born: July 16, 1944
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Education

Ph.D.	1970	University of Wisconsin (Computer Sciences)
M.S.	1968	University of Wisconsin (Computer Sciences)
B.S.	1966	California Institute of Technology (Mathematics)

Experience

2000–2008	Associate Dean, School of Informatics, Indiana University
1984–date	Professor, Computer Science Department, Indiana University
1997–1998	Visiting Professor, Computer Sciences Department, University of Wisconsin (on sabbatical leave)
1990–1992	Director, Indiana Center for Database Systems
1987–88	Fulbright Scholar, Institute of Computer Science, University of Nairobi, Kenya (on leave)
1982–88	Chairman, Computer Science Department, Indiana University
1978–84	Associate Professor, Computer Science Department, Indiana University
1974–78	Assistant Professor, Computer Science Department, Pennsylvania State University, University Park, Pennsylvania
1972–74	Assistant Professor, Department of Applied Analysis and Computer Science, University of Waterloo, Waterloo, Ontario
1971–72	Research Fellow, Inst. of Statistical, Social, and Economic Research, University of Ghana, Legon (Accra), Ghana
1970–71	Visiting Assistant Professor, Computer Science Department, University of Wisconsin
1966–70	Instructor, Research Assistant, Teaching Assistant and NSF Trainee, Computer Science Department, University of Wisconsin
1966	G.E. Center for Advanced Studies, Santa Barbara, California

Awards and Honors

Teaching Excellence Award, Computer Science Dept., Indiana University: 1999, 2000, 2007

Trustee Teaching Award for Faculty, Computer Science Dept., Indiana University: 2004

Fulbright Scholar, Institute of Computer Science, University of Nairobi, Nairobi, Kenya, 1987–88

Grant Funding

National Science Foundation, "Information Dependencies," 2001, $420,000, with Mehmet Dalkilic and Dirk Van Gucht

US Dept. of Education, "Graduate Assistance in Areas of National Need (GAANN): Focusing on Computer Visualization," 1995, $496,503

IU/UCS New Computing Initiatives, "A Media Services Kiosk," with K. Brancolini, M. Gandhi, and D. Van Gucht, 1994, $37,062

Indiana Corp. for Science and Technology, "Indiana Center for Database Systems," with D. Van Gucht and A. Elmagarmid, Nov. 1991 - June 1992, $300,843

Indiana Corp. for Science and Technology, "Indiana Center for Database Systems," with D. Van Gucht and A. Elmagarmid, Nov. 1990 – Nov. 1991, $429,985

National Science Foundation, "Coordinated Experimental Computer Research," Indiana University, departmental grant, 1986–1991, $2,853,313

National Science Foundation, "Equipment for Computer Research," Indiana University, 1986–87, $150,000

Westinghouse Education Foundation, "Upgrading the C421–C422 Digital Hardware Laboratory," 1985, $30,000

Xerox Corp., "A Proposal for XDE Laboratories," Indiana University, 1985, $540,686

National Science Foundation, "Computer Science Research Equipment," with S. Kwasny and R. Port, Indiana University, 1985–86, $99,337

Unico Inc., "Realtime Semantics," Indiana University, 1984, $32,622

Hewlett-Packard Corp., "Computing Equipment Grant," Indiana University, 1984, $220,329

Hewlett-Packard Corp., "Computing Equipment Grant," Indiana University, 1983, $165,000

National Science Foundation, "Computer Science Research Equipment," Indiana University, 1983–84, $200,000

Digital Equipment Corp., "Computing Equipment Grant," Indiana University, 1982, $25,000

Hewlett-Packard Corp., "Computing Equipment Grant," with F. Prosser, Indiana University, 1981, $208,000

Digital Equipment Corp., "Computing Equipment Grant," with F. Prosser, Indiana University, 1981, $52,000

National Science Foundation, "Studies Related to NP-complete Problems: Structure, Approximation and Backtracking," Indiana University, 1980–1982, $66,237

National Science Foundation, "Computer Science Research Equipment," Indiana University, 1980–1981, $175,000

National Science Foundation, "Instructional Scientific Equipment Program," with F. Prosser, 1980, $20,000

Western Electric Equipment Grant, "Computer Systems Laboratory," Penn. State University, 1977, $1,200

National Science Foundation, "Properties of Petri Nets and Related Models," with L. H. Landweber, University of Wisconsin, 1976–1978, $37,200

National Research Council of Canada, "Structure, Non-determinism, and Parallelism in Computational Models," 1974–1975, $4,500

National Research Council of Canada, "Parallelism in Computational Models," 1973–1974, $4,000

University of Waterloo Research Grant, "Quantitative Measurement of Non-determinism in Computations Models," 1972–1974, $1,120

National Science Foundation Trainee, Computer Science Department, University of Wisconsin, 1968–1970

Refereed Publications

"Provenance Information Model of Karma Version 3", with Bin Cao, Beth Plale, Girish Subramanian, and Yogesh Simmhan submitted.

"On the Existence of the View-Constraint Duality in Database Systems, Software Engineering, and Systems Engineering Domains", *Enterprise Integration, Interoperability and Networking*, November 2008, with John Springer.

"HLS: Tunable Mining of Approximate Functional Dependencies", *Sharing Data, Information and Knowledge*, Alex Gray, Keith Jeffery and Jianhua Shao (eds), Springer 2008 (*BNCOD 25*), pp. 28-39, with Jeremy T. Engle.

" 'Meta' Matters", *Information Resoruces Management*, 2008, with Richard Martin.

"Structural Recursion as a Query Language on Lists and Ordered Trees", *Theory of Computing Systems*, to appear, with Lawrence V. Saxton, Dirk Van Gucht, and Stijn Vansummeren.

"Preliminary Explorations in Specifying and Validating Entity-Relationship Models in PVS", *Automated Formal Methods*, John Rushby and Natarajan Shankar (eds), ACM Press, 2007, pp 1-10, with Venkatesh Choppella, Arijit Sengupta, and Steve Johnson.

" Structural Recursion on Ordered Trees and List-Based Complex Objects: Expressiveness and PTIME Restrictions ", *Lecture Notes in Computer Science*, Vol 4353, pp 344-358, with Lawrence V. Saxton, Dirk Van Gucht, and Stijn Vansummeren.

"A Calculus for Data Mapping", *Proc. Int'l Conf. on Database Interoperability*, Elsevier Notes in Theoretical Computer Science, *150*,2, 2006, p 37-54, with George H. L. Fletcher, Catharine M. Wyss, and Dirk Van Gucht.

"A Formal Characterization of PIVOT/UNPIVOT", *Proc. ACM Conf. on Information and Knowledge Management*, with Catharine Wyss.

"Relational Languages for Metadata Integration", *ACM Trans. on Database Systems*, *29*, 2, pp. 624-660, with Catherine Wyss.

"Triadic Relations: an Algebra for the Semantic Web", *Semantic Web and Databases*, C. Bussler, V. Tannen, and I. Fundulaki (eds), LNCS 3372, Springer Verlag, pp 91 – 108. An expanded version as Computer Science Technical Report No. 606.

"Architectural Principles for Enterprise Frameworks: Guidance for Interoperability", *Interoperable Strategies for the Enterprise Architect*, Peter Bernus and Mark Fox (eds), Springer/Kluwer, 2005, pp 79–92, with Richard Martin and John Springer similar to Computer Science Technical Report No. 594, Indiana University, 2004.

"On an Information Theoretic Approximation Measure for Functional Dependencies", *Information Systems*, *29*, 6, pp. 483-507 (Sept 2004), with Chris Giannella.

"A Comparison of Frameworks for Enterprise Architecture Modeling", *ER2003 - International Conference on Conceptual Modeling*, with Richard Martin.

"A Note on Approximation Measures for Multi-valued Dependencies in Relational Database", *Information Processsing Letters*, p. 153, vol. 85, (2003), with Chris M. Giannella.

"An Integrated System for Database Visualization", *Sixth International Conference on Database Visualization*, July 2002, 462-467, with Dennis Groth.

"Using Horizontal-Vertical Decomposition to Improve Query Evaluation," *British National Conference on Databases*, July 2002, 26-41, with Chris Giannella, Mehmet Dalkilic, and Dennis Groth.

"An Entropy-Based Approach to Visualizing Database Structure", *Sixth IFIP Workshop on Visual Database Systems*, May 2002, 157-170, with Dennis Groth.

"FastFD's: A Heuristic-Driven Depth-First Algorithm for Mining Functional Dependencies from Relation Instances" *Lecture Notes in Computer Science 2112*, Springer-Verlag (September 2001), also appeared in *Proceedings of the 3rd International Conference on Data Warehousing and Knowledge Discovery*, with Catharine Wyss and Chris Giannella.

"Discovering Frequent Itemsets in the Presence of Highly Frequent Items," *Workshop on Rule Based Data Mining*, October 2001, 237-245, with Dennis P. Groth.

"Information Dependencies," *Proc. of ACM Principles of Database Systems*, Dallas, May 2000, 245-253, also Computer Science Technical Report No. 531, Nov 1999. with Mehmet M. Dalkilic.

"It's All About Process: Project-Oriented Teaching of Software Engineering," *Software Engineering Education and Training*, IEEE, 2001, also Computer Science Technical Report No. 532, Indiana University Nov 1999. with Dennis P. Groth.

"CE: the classifier–estimator framework for data mining," *Data Mining and Reverse Engineering: Searching for Semantics*, Spaccapietra and Maryanski (eds), Chapam & Hall, 1998, 89-104, with M. Dalkilic and D. Van Gucht.

"Nonlinear Magnification Fields," *IEEE Information Visualization '97*, with T. A. Keahey.

"Techniques for Non-Linear Magnification Transformations," *IEEE Information Visualization '96*, with T. A. Keahey.

"A data model for audio-video data," *Advances in Data Management '94*, P. Sadanandan and S. Chakravarthy (eds), Tata McGraw-Hill, 1994, 135-150. with Munish Gandhi (also Computer Science Technical Report No. 415, Indiana University (1994)).

"Leveled entity relationship model," *The Entity-Relationship Approach: Business Modeling and Re-Engineering*, Springer-Verlag (1994), 420-436, with M. Gandhi and D. Van Gucht.

"A query language for list-based complex objects," *Proc. of ACM Principles of Database Systems*, Minneapolis, May 1994, 179-189, with Latha S. Colby, Lawrence V. Saxton, and Dirk Van Gucht

"The TSQL benchmark," *Proc. of the International Workshop on an Infrastructure for Temporal Databases,* QQ1–QQ28, Arlington, TX, June 1993, with Patrick P. Kalua, Christian Jensen, and Richard Snodgrass.

"SBDM as a framework for hardware/software co-design." A. Rozenblit and K. Buchenrieder (eds), *CoDesign: Computer Aided Software/Hardware Engineering*, IEEE Press (1995), 338-355, with M. Gandhi.

"A specification-based data model," G. Pernul and A. M. Toja (eds), *Entity-Relationship Approach*, Springer-Verlag (1992), 194-209, with M. Gandhi.

"Two complementary course sequences on design and implementation of software products," *IEEE Trans. on Software Engineering,* (November 1987), 1170–1175, with J. E. Burns.

"The nearest neighbor problem on bounded domains," *Automata, Languages, and Programming,* ed. W. Brauer, Lecture Notes in Computer Science, Springer-Verlag (1985) 318–327, with R. Karlson and I. Munro.

"On the complexity of partitioning sparse matrix representations," *BIT 24* (1984), 60–68, with Johann P. Malmquist.

"Backtracking with multi-level dynamic search rearrangement," *Acta Informatica 15* (1981), 99–113, with P. W. Purdom Jr. and C. A. Brown.

"On the structure of sets in NP and other complexity classes," *Theoretical Computer Science 15* (1981), 181–200, with L. H. Landweber and R. J. Lipton.

"Continual pattern replication," *Information and Control 48,* 3 (March 1981), 211–220, with J. Ian Munro.

"Code generation and storage allocation for machines with span-dependent instructions," *ACM Trans. Programming Languages and Systems 1,* 1 (July 1979), 71–83.

"Microcode bit optimization is NP-complete," *IEEE. Trans. on Computers,* April 1979, 316–319.

"Storage allocation for access path minimization in network structured data bases," in *Data Bases: Improving Usability and Responsiveness,* B. Shneiderman (ed.), Academic Press, New York (August 1978), 319–349, with J. P. Malmquist and E. Gudes.

"NP-completeness, puzzles, and games," *Utilitas Mathematica, 3* (1978), 99–116, with Ian Munro.

"Properties of persistent and conflict–free Petri nets," *J. Assoc. for Computing Machinery, 25,* 3 (July 1978), 352–364.

"On the sequential nature of functions," *J. of Computer and System Science 11,* 1 (August 1976), 51–68, with P. C. Fischer and L. V. Saxton.

"Structure of complexity in the weak monadic theories of the natural numbers," Research Report CS-73-31, Department of Applied Analysis and Computer Science, University of Waterloo (December 1973), 49 pp; *Sixth ACM Symposium on the Theory of Computing* (May 1974), 161–171.

"Complexity classes of partial recursive functions," *J. Computer and System Science 9,* 1 (August 1974), 69–87.

"Recursive properties of abstract complexity classes," *J. Assoc. for Computing Machinery 19,* 3 (April 1972), 296–308, with L. H. Landweber.

Selected Other Publications

"ISO Enterprise Architectures for Intelligent Enterprises", *INCOSE 07*, invited tutorial, with Richard Martin and L. Mark Walker.

"The Integration of Standards for Knowledge Organization in the Domain of Manufacturing Enterprises", *ISKO 2006 - Knowledge Organization for a Global Learning Society*, with Richard Martin and Aaron Loehrlein.

"Constructing and Validating Entity-Relationship Data Models in the PVS Specification Language: A case study using a text-book example", Computer Science Technical ReportNo 632, 2006, Indiana University, with Venkatesh Choppella, Arijit Sengupta, and Steven D Johnson.

"Views in the Enterprise Domain", *Views, Aspects, and Roles 05*, Stephan Herrmann (ed), with Richard Martin.

"Architectural Principles for Enterprise Frameworks", *EMMSAD 2004*, Riga, Lativa, June 2004, with Richard Martin and John Springer.

"An Integrated Approach for Database Visualization", *Advanced Visual Interfaces*, May 2002, 365-366, with Dennis Groth.

"Model curricula for IT schools: report of a curriculum committee", *Proceedings 32nd SIGCSE technical symposium on Computer Science Education*, 2001, 431-432, with Peter J. Denning, Wayne Dyksen, and Richard LeBlanc.

"A Formal Enterprise Architecture Framework to Support Multi-model Analysis", *Advanced Information System Engineering/EMMSAD 2000*, Stockholm, June 2000, with Richard Martin.

"Formalization of multi-level Zachman frameworks," *1999 Enterprise Architecture Forum*, August 1999, also Computer Science Technical Report No. 522, Indiana University (1999), with Richard Martin.

"Architectural support for database visualization," *New Paradigms in Information Visualization and Manipulation*, Dec. 1998, with Dennis Groth.

"CE: the classifier–estimator framework for data mining," Computer Science Technical Report No. 480, Indiana University (1997), with M. Dalkilic and D. Van Gucht.

"Modeling and querying primitives for digital media," MMDBS '95. with M. Gandhi and D. Van Gucht.

"A Consensus Test Suite of Temporal Database Queries," Technical Report R 93-2034, Dept. of Mathematics and Computer Science, Aalborg University, Denmark (1993) with C. S. Jensen *et al.*

"Benchmark queries for temporal databases," Computer Science Technical Report No. 379, Indiana University (1993), with Patrick Kalua

"The role of time in information systems," *Computing in Southern Africa – 91*, with P. Kalua.

"A tutorial on data modeling," *Computing in Southern Africa – 91*, with P. Kalua.

"Pitfalls for Kenya's computerization," *Computers in Africa*, July/August 1988, 34-35.

"Pitfalls for Kenya's computerization: Part II", *Computers in Africa*, September/October 1988, 26.

"The Mshuffle as an interconnection network for SIMD machines," *Proc. Twentieth Ann. Allerton Conference on Communication, Control, and Computing,* (1982) 264–271, with K. Keutzer.

"On the density and structure of NP-complete and NP-sets" Technical Report 342, Computer Science Department, University of Wisconsin, also preliminary version in *Proc. Seventeenth Ann. Allerton Conference on Communication, Control, and Computing,* (1979) 661–669, with L. Landweber and R. Lipton.

"Parallel algorithms and serial data structures," *Proc. Seventeenth Ann. Allerton Conference on Communication, Control, and Computing,* (1979) 515–524, with I. Munro.

"Continual pattern replication," *Proc. Seventeenth Ann. Allerton Conference on Communication, Control and Computing,* (1979) 21–26, with I. Munro.

"Code generation for short/long address machines," Technical Summary Report No. 1779, Mathematics Research Center, University of Wisconsin, (1977).

"Computers in developing nations," *Computers & Society, 7* , 2 (1976), 7–9.

"Polynomial completeness and instant insanity," *Symposium on Information Science and Systems* (Johns Hopkins University, April 1975), 263–268, with Ian Munro.

"The problems facing computer science education in developing nations," *Fifth ACM Symposium on Computer Science Education* (February 1975), 56–60.

Properties of Complexity Classes and Sets in Abstract Computational Complexity, Thesis, Computer Science Department, University of Wisconsin (August 1970).

Professional Activities

International Standards Organization TC 184/SC 5/WG 1 *Modelling and Architecture* & ISO/IEC JTC 1/SC 7 *Software and Systems Engineering*: Invited Expert 2008 – .

Computer Science Accreditation Board: Chair, Accreditation Visitation Team, 1986 and 1987.

Editorial Board, *Information Technology for Development,* 1985 - 1992.

State Delegate and Regional Group Leader, Indiana Economic Development Congress, Indiana Economic Development Council, 1986

Indiana Corporation for Science and Technology, Software Technology Committee: Member, 1985 - date; Chair, 1990 - 1991

Session Chairman, "Computer Science Education in Developing Nations," Special Interest Group in Computer Science Education 1978 Symposium

Panel Chairman, "Computers in Developing Nations," 1978 Association for Computing Machinery Annual Conference.

Invited Panelist, "Computers in Developing Nations," Special Interest Group in Computer Science Education 1978 and 1979 Symposia

Invited Panelist, 1979 National Computer Conference, New York, 1979

Tutorial on NP-Complete Problems, 1981 Association for Computing Machinery Annual Conference.

Invited Panelist, "Motivation of computer professionals," 1982 Association for Computing Machinery Annual Conference.

Invited Panelist, "The Role of M.S. Programs in Ph.D. Granting Departments of Computer Science," 1984 Snowbird Conference.

Invited Panelist, "Dealing with the Myriad of Interdisciplinary Demands on Computer Science in the University," Chairs' Session, 1986 Computer Science Conference.

Invited Speaker, "Information Engineering Programs: Indiana University's School of Informatics", *National Electrical Engineering Department Heads Association*, San Diego, March 16-20, 2001.

International Federation for Information Processing: Vice-Chairman, Informatics for Development (ICID), 1985–1989.

Center for International Exchange of Scholars: Fulbright Advisory Committee (computer science), 1989 - 1992, Chair: 1991 - 1992.

Association for Computing Machinery
Vice-Chairman, Special Interest Group on Computers and Society, 1977–1979;
Vice-Chairman, Education Board, 1980–1982.

American Federation of Information Processing Societies: Member, International Relations Committee, 1985–1989.

Professional Society Memberships:
Association for Computing Machinery
Computer Society, Institute of Electrical and Electronics Engineers
Computer Professionals for Social Responsibility
International Council on Systems Engineering

Referee for:
Computer Reviews
Mathematical Reviews
Journal of Computer and System Science
Information and Control
IEEE Transactions of Computers
Theoretical Computer Science
SIAM Journal on Computing
National Science Foundation