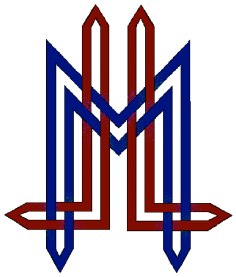

Lorie M. Liebrock

New Mexico Institute of Mining and Technology

Computer Science and Engineering Department

Center for Graduate Studies

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Research Interests

Dr. Liebrock's research interests are in advancing solution processes for complex problems using computer science and mathematics. For example, in digital forensics on terabyte size data sets, parallelization, visualization, and education are all essential for advancing the field. Further, well posedness analyses support improvement of preliminary solutions and demonstrate forensic soundness.

Computer Security

Parallel digital forensics for terabyte size data sets.

Parallel Processing

Use of problem topology for parallelization, algorithm analysis, design, and performance evaluation. Portable parallel programs and environments.

Visualization

Use of visualization and visual analytics for problem understanding, especially for parallel processing and computer security.

Well Posedness

Use of well posedness analysis for problem understanding and improving quality of solutions.

Degrees Earned

Ph.D. Computer Science, Grade Point >4.0/4.0, Rice University, September 1994,
Dissertation Title: Using Problem Topology in Parallelization,
Co-advisors: Dr. Jack Dongarra and Dr. Ken Kennedy

M.S. Computer Science, Grade Point >4.0/4.0, Rice University, May 1992

M.S. Computer Science, Grade Point 4.0/4.0, Michigan Technological University, May 1988

B.S. Computer Science, Honors, Michigan Technological University, May 1985

Assoc. General Studies, Highest Honors, Delta College, December 1981

Professional Positions (1994-present)

- July 1, 2012-present: Dean of Graduate Studies, Professor of Computer Science, Professor of Information Technology, Adjunct Professor of Management, New Mexico Institute of Mining and Technology (NMT)
- March 30, 2012-June 30, 2012: Dean of Graduate Studies, Chair and Professor of Computer Science, Professor of Information Technology, Adjunct Professor of Management, New Mexico Institute of Mining and Technology (NMT)
- August 15, 2011-March 29, 2012: Dean of Graduate Studies, Chair and Associate Professor of Computer Science, Associate Professor of Information Technology, Adjunct Professor of Management, NMT
- July 1, 2009-August 15, 2011: Associate Professor and Chair of Computer Science, Associate Professor of Information Technology, Adjunct Professor of Management, NMT
- July 1, 2007-June 30, 2009: Education Director and Chief Technology Officer, New Mexico Computing Applications Center, State of New Mexico
- 2007-June 30, 2009: Associate Professor and Associate Chair for Undergraduate Affairs, Department of Computer Science, Associate Professor of Information Technology, Adjunct Professor of Management, NMT
- 2007-Present: Associate Editor, Applied Mathematics and Computation
- 2002-2007: Assistant Professor, Department of Computer Science, Assistant Professor of Information Technology, Adjunct Professor of Management, New Mexico Inst. of Mining and Technology
- 2000-2001: Assistant Professor, Department of Mathematical Science, University of Alaska, Fairbanks
- 2000-2001: Researcher, Arctic Region Supercomputing Center, University of Alaska, Fairbanks
- 1994-2002: Researcher, Liebrock-Hicks Research

Recent Grants and Contracts: (2002-present)

- Summary: Principal investigator on funding of more than $4,052,028 and a co-PI on $485,433.
- "NMT-Scientific Leadership And Teaching Endeavor (NMT-SLATE-PhD)", Department of Homeland Security, 2011-2016, $250,000.
- "Cyberinfrastructure Development for the Western Consortium of Idaho, Nevada, and New Mexico", NSF EPSCoR Proposal, 2009-2012, New Mexico Education Portion $666,100, Education Lead for New Mexico.
- Sandia National Lab., Parallel Digital Forensics Infrastructure. $25,000, 4/09-10/09.
- "Coordinated Information Technology and Assurance Development and Education Laboratory, CITADEL", Scholarship for Service Grant, National Science Foundation, DUE-0313885, $2,138,599, Funded May, 2003. Principal Investigator; renewed DUE-0621363, $1,025,329, 7/2006-6/2011.
- "ENSL: Experimental Network of Sensors Lab for advancing research in sensed-data collection, integration, management, and analysis", National Science Foundation, $160,000, Funded November, 2006, 2 years, Co-PI.
- Sandia National Lab., Parallel computing modelling & performance improvement. $5,000, 7/06-7/07.
- "Supercomputing Challenge Internships", New Mexico Computing Applications Center, $45,000, July 08-July 09. There were subcontracts for $15,000 each to NMSU and UNM. This supported two Challenge students and two NMT graduate students on research in modeling and simulation of auto traffic. Principal Investigator
- "AISTEA", Capacity Building Grant, National Science Foundation, $180,985, Funded May, 2003. Co-PI.
- "CITADEL: Capacity Building", National Security Agency, $144,448.36, Funded September, 2003. Co-PI.
- "Research Experience for Undergraduates: Automatic Data Distribution", Research Grant, National Science Foundation's Partnerships for Advanced Computational Infrastructure (PACI), $6,000, Funded May, 2003. . Further funding $6,000 December, 2003. Principal Investigator
- "Automatic Data Distribution Toolkit for Galaxy Quest", Research Grant, National Center for Supercomputing Applications, $85,000, Funded December, 2002. Further funding $50,000 December, 2003. Principal Investigator.

Honors and Awards

- Voted Student Association Teacher of the Year, Presented Spring Graduation Ceremony, NMT, 2005.
- Elected to 9th Edition of *Who's Who Among America's Teachers* ®, 2004-2005; July 27th, 2005.
- Selected as a biographical candidate for Strathmore's Who's Who, Who's Who in the Midwest, and Who's Who in Science and Engineering, National Register's Who's Who in Executives and Professionals, Academic Key's Who's Who in Sciences Higher Education, Empire Who's Who Among Executives and Professionals, Marquis Who's Who, and Who's Who Among America's Teachers ®.
- Patent: "Multiprocessor Parallel Computer Architecture Using a Parallel Machine with Topology-Based Mapping of Composite Grid Applications", US Patent Serial No. 5,737,623, 1998
- Outstanding Student Summer Program, Sandia National Laboratory, Albuquerque, 1985

Recent Professional Activities

- Graduate Dean, NMT, 2011-present
- Chair, Computer Science and Engineering, NMT, 2009-present
- Associate Editor, Applied Mathematics and Computation, 2007-Present
- ACM Special Interest Group on Applied Computing, Treasurer, 2007-present
- Editor of the Proceedings of the ACM Symposium on Applied Computing (SAC), 2004-2008
- Track Co-Chair, Computer Forensics Track, ACM SAC, 2009-2011
- Member of Academic Computing Machinery (ACM), Institute of Electrical and Electronics Engineers (IEEE), IEEE Computer Society, Sigma XI
- Reviewer: ACM Symposium on Applied Computing, Applied Mathematics and Computation, Computing Reviews, International Conference on Supercomputing.

Graduate Advising

Ph.D. Advisor (NMT):

In progress: Hakan Akkan, Earl Eiland, Alex Kent, Max Planck

2010: Danny Quist, "Automating Malicious Software Reverse Engineering and Analysis with Covert Executable Monitoring."

2005: Sue Goudy "Development of a Modeling Methodology for Hybrid Parallelism", (co-advisor: Stephen Schaffer).

M.S. Advisor (NMT):

In progress: Victor Tomas Echeverria, Noah Shepard, Joseph Maurer, Kyle McCready, John Franks
2012: Hugh Wimberly
2011: Cynthia Veitch
2010: Nico Marrero, Derek Smith, Jason Mattax
2009: William Baker, James Curry, Curtis Hash, Vincent Urias, Sherry Thomas, Jason Mattax
2008: Paul Ferrell, Ronald Prine, Mayuri Shakamuri, Moses Schwartz, David Burton, Sage LaTorra
2007: Unnati Thakore, Barry Gavrich
2006: Heather Bitsoi, Ashley Dearie (Mgt.), Scott Miller, George Schmaltz (Mgt.), Robert Erbes, Edward Earl Eiland
2005: Kalyan Bondili, Eric Alsheimer, Nathan Campbell, Carlisle House, Steve Sones
2004: Stephen K. Hess, Aishwarya Kalyanasundaram, Harley Kozushko, Ramesh Naidu Ande, Yuan Ye,
2003: Radhadrishna Reddy Mudhiganti, Sailaja Mummidi

Representative Responsibilities and Professional Experience

While at New Mexico Institute of Mining and Technology

At NMT, she has contributed in research, teaching, and service. In **research**, she has published ten journal articles since coming to NMT, with seven of those published in or since 2007. Recent journal publications include: an invited paper in the Journal of Digital Forensics Practice; two invited papers were in IEEE Distributed Systems Online; two papers in the Journal of Applied Mathematics and Computation; and a paper in each of the Journal of Computer Virology, Concurrency and Computation: Practice and Experience, Multimedia Tools and Applications, Information Visualization, and Lecture Notes in Computer Science. In addition to her journal publications (21 total), she has edited five proceedings and a special issue of a journal and published 32 refereed conference and workshop papers, with 10 of them published in or since 2007. In addition she developed proposals, obtained funding, and has carried out programs totaling $4,052,028 as principal investigator and been a co-PI on $485,433. In **teaching**, she has developed her own version of courses previously offered in Computer Science (Information Protection and Security, Computer Security, Computer Architecture, Compiler Writing, Digital Forensics, and Parallel Processing), in addition to developing new courses (Computer Graphics, Visualization, and Network Forensics). In addition to often teaching an overload, she has had higher than average advisee loads with as many as 95 advisees (undergraduate and graduate combined) at one time. She has graduated two Ph.D. students and 36 Masters students. In **service**, as the Graduate Dean she is modernizing, enhancing, and expanding the Center for Graduate Studies support for the broad graduate community at New Mexico Tech. In this roll she oversees all graduate programs, ensures rules, processes and procedures are followed by and for graduate students, and serves at the lead graduate student advocate. As the Computer Science Department's Chair and the Co-Lead for the Information Technology program she acts as the department's leader and administrator to advance computer science and information technology research and education on campus and beyond. Major endeavors have already included changing the introductory program to improve retention and taking our graduate program to distance delivery for four specific organizations (SNLA, LANL, INL, and NSA). Formerly, as Undergraduate Advisor, she regularly dealt with issues such as plagiarism, course substitutions, supervision of graduate instructors, and transfer evaluations. She served as the Associate Chair of the Computer Science Department for Undergraduate Affairs. This was a high priority service commitment to improve retention of students in our programs (Computer Science and Information Technology) and to improve our students' performance after graduation, in addition to maintaining department policy for the undergraduate programs. Major service to the Computer Science Community has been as the Editor of the Proceedings of the Symposium on Applied Computing (SAC), Associate Editor for Applied Mathematics and Computation (AMC), Student Volunteers Co-Chair for SC08, and a Member of the Board of Directors for New Mexico Supercomputing Challenge. SAC is a well reputed conference that often has papers that are the top downloads from the ACM Digital Library. AMC is a reputable journal for both Computer Science and Mathematics. The SC Conference is the premier international conference for high performance computing (HPC), networking, storage and analysis. The New Mexico Supercomputing Challenge program works to improve student opportunities and abilities related to modeling, simulation, computing, and research. One program spans **research, teaching, and service:** the Scholarship for Service (SFS) Program. In this program, she directs research projects and collaborations for all scholars. She has graduated 35 scholars, all of which have been placed in government service including 5 at LANL, 6 and INL, 7 at SNLA, 2 at DISA, 3 at SPAWAR, and 8 at NSA, as well as individuals at CIA, Railroad Retirement Board, Army Corps of Engineers, and Fort Huachuca. She has developed a continually evolving professional development course for the SFS students,

which she teaches every semester. This professional development program, the program's excellent educational opportunities, and student research has led to an outstanding reputation as evidenced by a quote from the article **Scholarship program targets need for cybersecurity skills** by Richard W. Walker in Government Security News *"Some of [the SFS institutions] are putting out extraordinary, great technical people" he (Allan Paller – director of research at the SANS Institute) said citing the University of Tulsa, New Mexico Tech, and George Washington as examples*, which was published in March of 2009. She supports the students as research and academic advisor and mentor to build their cohort, prepare them for government service, enhance their information assurance education and research, and help them find internships and permanent government positions. This program is contributing significantly in both strengthening research and building NMT's information assurance reputation.

While at New Mexico Computing Applications Center (NMCAC)

As a representative for NMT, beginning in September 2006, she helped develop the proposal that led the legislature to support and fund the development of the New Mexico Computing Applications Center. Initial funding went to purchase New Mexico's supercomputer, Encanto. Encanto was the third fastest machine in the Top 500 list when it was purchased and set up in October 2007. In addition, three 2.1 TFlop exemplars were placed in the three state research universities. Her involvement included proposal and business plan development, meetings around the state to ensure that the entire state will benefit from the Center's opportunities, and discussions with legislators to convey the purpose and importance of the Center. She helped to transform the purpose of the Center from Economic Development focused Research and Development, with a minor educational component to balanced Economic Development and Education. This balance is essential as economic development in technology industries is not possible without a qualified workforce and students are seldom motivated without the promise of economic opportunities. In addition, the Center supports community development and decision making.

As the Interim Education Director for the NMCAC, since the beginning of November 2007 (as part of her service to NMT), she developed a collaboration between IDEAL-NM, GUTS, Supercomputing Challenge, NM Project 2012, other state programs, and the Center to facilitate improving STEM education in our mid and high schools. This effort will use the GUTS (Growing Up Thinking Scientifically) program, which introduces mid school students to modeling and simulation, as a feeder to the SC Challenge program, which promotes computational thinking in science and engineering. These programs tie with the goal of NM Project 2012 to raise our student's math and science achievement to be national leaders by 2012. IDEAL-NM provides the state's portal to eLearning services for K-12 education. These and other programs were studied, evaluated, and integrated with Center activities to advance New Mexico's education for high technology employment. In summer 2008, at the request of New Mexico's Governor Richardson and with the concurrence of NMT's President López, she started a half time appointment as the Education Director for NMCAC. The Center installed systems to enhance the state-wide delivery system for distance programs and collaboration by putting gateways in the state's institutions of higher education. Gateways include 3D stereo visualization and collaboration resources. The gateways facilitate faculty and student collaboration, distance education, economic development, and community development. She had primary responsibility for: development of the Request for Proposals for the gateway facilities, which included determining the requirements for collaboration and visualization in education and research; technical oversight of the use of Encanto, the Center's user support, and system administration; selection of technical and educational personnel; development of a talents database for relevant personnel from affiliated institutions (for joint appointments), and development of an education program to enhance opportunities for students in high technology.

As the acting Chief Technology Officer for the NMCAC, from April 2008 through June 2009, she led the technology development for this state computing resource. Her duties included oversight of all research and technology based issues including Encanto (New Mexico's supercomputer) operations, user support, visualization and computing equipment selection, policy development, et cetera. Most importantly, as the CTO she was the lead on development of statewide research and collaboration opportunities to leverage the supercomputing infrastructure.

While at University of Alaska, Fairbanks

As a researcher in the Arctic Region Supercomputing Center, she co-developed and ran the "Mathematical Modelling, Computational Science, and Supercomputing" colloquium series focusing on cutting edge research including high performance computing and visualization. Her collaborations primarily focused on understanding applications and obtaining superior performance on the Center's supercomputers. As a visiting Assistant Professor in the Department of Mathematics, Statistics, and Computer Science, she taught core

courses: Operating Systems and Computer Architecture and contributed to improvements in Computer Architecture: A Quantitative Approach by J.L. Hennessy and D.A. Patterson. In addition, she co-taught a graduate course in Optimization. She made substantial contributions to the department's self-study for accreditation and the Masters in Software Engineering proposal.

While at Liebrock-Hicks Research

As a researcher, in 1995, she developed the US-Patent: "Multiprocessor Parallel Computer Architecture Using a Parallel Machine with Topology-Based Mapping of Composite Grid Applications", US Patent No. 5,737,623, April, 1998. She also developed research plans and proposals for the Small Business Innovative Research Program and the U.S. Nuclear Regulatory Commission. She served as principal investigator on two contracts with the U.S. Nuclear Regulatory Commission (NRC): "Data Distribution Algorithm Extensions for Reactor Simulations" and "Technical Assistance for the New Thermal-Hydraulic Code Planning". She served as principal investigator on a DARPA contract for the U.S. Army Aviation and Missile Command: "Parallelization Support for Composite Grid Applications Targeting High Performance Systems".

In Summary

Her work appears in journals and proceedings (Concurrency and Computation: Practice and Experience, Applied Mathematics and Computation, Communications in Applied Analysis, Computers and Mathematics with Applications, Parallel Processing using the Heterogeneous Element Processor, 1986 Frontiers of Massively Parallel Scientific Computation, Transactions of the American Nuclear Society, Proceedings of the Fifth International Topical Meeting on Reactor Thermal Hydraulics, Proceeding of the International Parallel Processing Symposium) and research reports (KMSF, INL). She is a reviewer for Computing Reviews. She served on the technical program committee for SC98 and SC99. She also organized the Coupled Multi-physics panel for SC98. She was the Student Volunteers Co-Chair for SC08. She was editor for the Proceedings of the Symposium on Applied Computing from 2004 through 2008 and now serves as the Treasurer for the ACM Special Interest Group on Applied Computing (SIGAPP). Since 2007 she has been an Associate Editor for Applied Mathematics and Computation. She has worked on research projects supported by various funding agencies and national laboratories including: AFOSR, DARPA, INL, KMSF, NRC, LANL, and SNLA. She has delivered invited lectures at various national laboratories(INL, KMSF, SNLA). She served as Co-Chair of the Computational and Mathematical Modelling Session of NURETH-5(September 21-24, 1992). She is a member of the Association for Computing Machinery(ACM), the Institute of Electrical and Electronics Engineers(IEEE), the IEEE Computer Society, and Sigma XI. She has been selected as a biographical candidate for Who's Who in the Midwest, Who's Who in Science and Engineering, Academic Key's Who's Who in Sciences Higher Education, Who's Who in Executives and Businesses, Lexington Who's Who, Strathmore' Who's Who, Who's Who Among America's Teachers in 2004-2005 and 2006-2007.