
Ralph L. Wojtowicz

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www.adjoint-functors.net/su/web

Select Project Experience:

- Consultant: Financial analysis for Flexible Plan Investments, Ltd. 2013–present
Responsible for analysis of dynamic investment strategies, data collection, management of SQLite and PostgreSQL databases, and estimation and prediction of financial trends. Software development and analysis using R and Java.
- Principal Investigator: Hadoop Cluster for Integrating Big Data Concepts and Methods into the Curriculum and Research at Shepherd University (\$19K grant). 2012–present
Responsible for design of multi-node Hadoop cluster; purchase of servers, workstations and equipment; laboratory setup, networking and maintenance; collection of datasets for research and teaching; academic curriculum development; writing annual technical and financial report.
- Principal Investigator: Applications of Big Data Technologies to Bio-Informatics West Virginia NASA Space Grant Consortium (\$2500 grant). 2014
Conducted basic algorithm research involving machine-learning and string-matching using massive datasets arising in the bio-informatics domain.
- Principal Investigator: Quantum Kan Extensions and Applications. Intelligence Advanced Research Projects Activity (\$105K contract). 2011–2012
Managed all technical and financial aspects of the project. Conducted basic and applied computer science research, developed software applications in Java and Haskell, wrote software documentation and user guide. Responsible for writing monthly technical and financial reports. Created presentation material and delivered presentations to a government client. Responsible for reviewing a government contract and writing a subcontract for an academic research subcontractor.
- Principal Investigator. Categorical Logic as a Foundation for Reasoning Under Uncertainty. Missile Defense Agency (\$100K Phase I and \$500K Phase II SBIR contracts). 2006–2008
Developed and implemented statistical algorithms for integration into defense systems. Managed all technical and financial aspects of the project. Wrote monthly technical and financial reports and annual reports. Prepared and delivered presentations to government program managers.
- Co-Investigator (with faculty from Rensselaer Polytechnic Institute and the University of Illinois at Urbana-Champaign): Great Computational Intelligence. Air Force Office of Scientific Research (\$600K grant). 2011–2014
Conducted basic and applied research in artificial intelligence. Developed novel semantic web technologies to support visualization and analysis of multi-sorted, linked data. Computed examples and gave research presentations at conferences. Wrote research articles and developed presentation material for a government client.

- Principal Investigator: Logic-Based Methods for Assurance of Complex System Performance. West Virginia NASA Space Grant Consortium (\$2500 grant). 2012
Conducted basic research in the IV&V domain. Prepared and delivered technical talk at annual NASA IV&V workshop.
- Technical Lead: Network Analysis and Activity Detection. Office of Naval Research (\$1.4M contract). 2009–2010
Responsible for data collection and integration, development of analysis software in Java, system integration with semantic web tools developed by the government and other contractors, writing monthly technical and financial reports to a government client, creation of presentation materials. Demonstrated software system in a live Marine Corps exercise.
- Principal Investigator. Categorical Logic as a Foundation for Robust Decision Making. Air Force Office of Scientific Research (\$180K grant). 2008–2010
Responsible for all technical and financial aspects of the project. Conducted basic research in automated uncertainty management. Developed and implemented mathematical algorithms. Prepared and delivered presentations to government program officers.
- Analyst. Trade-Net Integration into Global Trader. Office of Naval Intelligence (\$1.9M contract). 2009–2010
Responsible for development of methods, algorithms and Java tools to support analysis and visualization of decades of cargo shipping transaction data stored in a large Oracle database. Wrote software user guides, research articles, technical reports and software requirements documents. Conducted analysis and prepared presentation material for a government client.
- Technical Lead: Anomaly Detection Literature Survey for Adversary Detection Applications. Department of Homeland Security. 2010
Responsible for researching statistical anomaly detection techniques for applications to client systems. Wrote final technical report.
- Principal Investigator. Measures of Effectiveness Sensitivity Calculator. Office of Naval Research (\$100K contract). 2006–2007
Responsible for collecting system performance metrics from multiple government and industry sources, design and development of simulation software in Matlab and Java, conducting numerical experiments, creating presentations and delivering them to clients, and technical report writing. Made recommendations for government investment in future technologies.
- Analyst: Wide Aperture Array Passive Sonar Algorithm and System Development. Office of Naval Research. (\$1.6M contract). 2010
Responsible for developing analysis and simulation software in Matlab and Java, analyzing sensor data, and writing technical reports.

Education:

- Doctor of Philosophy in Mathematics. University of Illinois at Urbana-Champaign.
- Master of Science in Aeronautical Engineering. University of Illinois.
- Bachelor of Science in Aeronautical Engineering. Rensselaer Polytechnic Institute.
- Bachelor of Science in Mathematics. Rensselaer Polytechnic Institute.

Employment:

- President, Senior Scientist. Baker Mountain Research Corporation. Yellow Spring, West Virginia. 2011–present
- Assistant Professor. Shepherd University. Department of Computer Sciences, Mathematics and Engineering. 2011–present
- Analyst. Metron, Inc. Reston, Virginia. 2004–2011
- Assistant Professor. University of Dallas. Department of Mathematics and Computer Science. 2001–2004
- Visiting Assistant Professor. Rose-Hulman Institute of Technology. Department of Mathematics. 1999–2001

Software Development Experience:

- Primary programming languages: Python, Java, R, Hadoop/MapReduce and Haskell
- Experience with: C, Android, Processing, OpenGL, MatLab, Lisp, ML, Maple, PostScript, SQL (Oracle and PostgreSQL), Mathematica and Maxima
- Data analysis tools: Hadoop cluster implementation and management, MapReduce algorithm development and implementation, database management (Oracle, MySQL, PostgreSQL)
- Knowledge of XML, RDF, OWL, Jenna, Protégé and semantic web technologies
- Operating environments: Linux, Unix, MacOSX, and Windows
- Other tools include: Version control (Subversion and CVS), emacs, vi and Eclipse

Select Presentations:

- NASA IV&V Workshop. Morgantown, WV. September 2014
- Office of Naval Research Focus Area Forum: Data Science for Decision-Making in Support of Naval Tactical Missions. Poster Session
- Rensselaer Polytechnic Institute Cognitive Sciences Colloquium. May 2014
- Facets of Data-Driven Science. Plenary talk. West Virginia Academy of Science Annual Meeting. May 2014
- 8th International Conference on Semantic Technologies for Intelligence, Defense and Security. George Mason University. November 2013
- NASA IV&V Workshop. Morgantown, WV. September 2012
- IARPA Quantum Computer Science PI Meeting. Princeton, NJ. July 2012
- Turing Centenary Conference. Cambridge University. Cambridge, UK. June 2012
- IEEE 12th International Conference on Information Fusion. Seattle, WA. July 2009
- Air Force Institute of Technology Mathematics Colloquium. Dayton, OH December 2009
- Rose-Hulman Institute of Technology Mathematics Colloquium. October 2009
- Sixth International Conference on Computing Anticipatory Systems. Liège, Belgium. 2003
- Central Texas Algebra Conference. Baylor University. 2003
- AMS Special Session on Discrete Dynamics and Difference Equations. Joint Mathematics Meetings. Baltimore, MD. 2003

Select Awards:

- Outstanding Faculty Award. Shepherd University. Nominated 2014
- Entrepreneur Award. CreateWV “Pitch Your Idea” contest. Charleston, WV. 2012
- Merit Award in recognition of exceptional professional development achievement. Shepherd University. 2012–2014
- Best Paper Award. International Conference on Computing Anticipatory Systems. Liège, Belgium. 2003
- University of Illinois College of Liberal Arts and Sciences Luckman Award for Excellence in Undergraduate Education. Nominated 1996
- University of Illinois Department of Mathematics Graduate Teaching Award. 1996
- National Science Foundation Graduate Fellowship. 1988–1992
- Outstanding Senior Award. Presented annually to the six outstanding students in the United States for exceptional academic achievement and participation in extracurricular activities by Sigma Gamma Tau, the national honor society for aerospace engineering. 1988
- Ricketts Prize. Presented by Rensselaer Polytechnic Institute in recognition of outstanding achievement. 1988

Business Conferences and Workshops Attended:

- Applications of R in Finance. University of Illinois at Chicago. May 2014
- Appalachian Regional Commission Workshop. Entrepreneurship Transforming Appalachia’s Economy. Charleston, WV. November 2013
- Telework West Virginia Conference. Charleston, WV. May 2013
- Biometrics Identification Intelligence Strategic Planning Workshop. Bridgeport, WV. May 2013
- I-79 Technology Corridor Biometrics Workshop. Fairmont, WV. January 2013
- Create WV Conference. Charleston, WV. October 2012
- RESA 8 STEM Workshop. Martinsburg, WV. October 2012
- Appalachian Regional Commission Workshop. Charleston, WV. October 2011
- West Virginia Teaming to Win. 2011–2012, 2014
- Shepherd University Grant Workshop. January 2011
- NDIA Business Development Workshop. 2007
- Small Business Administration: Beyond Phase II Business Development Workshop. 2006

Select Publications:

- R. L. Wojtowicz. Three Approaches to Knowledge Alignment. *in preparation*
- R. L. Wojtowicz. *Investigations of Portfolio Models and Financial Data*. Baker Mountain Research Corporation. Technical Report. 2013
- R. L. Wojtowicz. Sketches, Views and Pattern-Based Reasoning. Proceedings of the 8th International Conference on Semantic Technologies for Intelligence, Defense and Security (STIDS 2013). George Mason University, November 2013.

- R. L. Wojtowicz and N. Yanofsky. *Quantum Kan Extensions and Their Applications*. IARPA contract D11PC20232 Final Report. 2013.
- R. L. Wojtowicz, S. Bringsjord and J. Hummel. Dynamic Semantics of τN -Theories. 2012.
- S. Bringsjord, J. Taylor, B. van Heuveln, K. Arkoudas, M. Clark and R. L. Wojtowicz. Piagetian roboethics via category theory: moving beyond mere formal operations to engineer robots whose decisions are guaranteed to be ethically correct. *Machine Ethics*. M. Anderson and S. L. Anderson Eds. Cambridge University Press. 2011.
- R. L. Wojtowicz. Non-Classical Markov Logic and Network Analysis. IEEE 12th International Conference on Information Fusion. Seattle, WA. July, 2009.
- R. L. Streit and R. L. Wojtowicz. A General Likelihood Function Decomposition that is Linear in Target State. in IEEE Aerospace Conference Proceedings. 2009.
- R. L. Wojtowicz. On Transformations Between Belief States. In Soft Methods for Handling Variability and Imprecision. D. Dubois, H. Prade, et al. editors. Volume 48 of Advances in Soft Computing. Springer-Verlag. pp. 313–320. 2008. <http://www.adjoint-functors.net/belief.pdf>
- R. L. Wojtowicz. *Categorical Logic as a Foundation for Reasoning Under Uncertainty and as a Guide to Machine Learning Algorithm Development*. SBIR Phase I Final Report. 2005.
- R. L. Wojtowicz. Symbolic Dynamics and Chaos Defined by Right Adjointness. CASYS'03-Sixth International Conference on Computing Anticipatory Systems (Liege, Belgium). D. Dubois, Editor. American Institute of Physics Conference Proceedings. (718):268-281. 2004. <http://www.adjoint-functors.net/aipcasy2.pdf>
- R. L. Wojtowicz. *On Categories of Cohesive, Active Sets and Other Dynamic Systems*. Ph.D. Thesis. Department of Mathematics, University of Illinois at Urbana-Champaign. 2002.
- R. L. Wojtowicz. *A Numerical Method for Computing Values of Maxwell's Collisions Integral on a Discretized Velocity Space*. M.S. Thesis. Department of Aeronautical and Astronautical Engineering, University of Illinois at Urbana-Champaign. 1992.

Other Experience:

- Contract and grant management
- Non-profit 501(c)3 management
- Shepherd University Department of Computer Sciences, Mathematics and Engineering hiring committee. 2012–2014
- Shepherd University Department of Psychology hiring committee. 2012–2013
- Proposal Reviewer for Air Force Office of Scientific Research. 2012–present
- Reviewer: CogSci 2011, CogSci 2012 and CogSci 2013 conferences
- Extensive proposal writing and marketing experience with diverse clients
- Recruiting at American Mathematical Society Joint Mathematics Meetings 2006, 2008–2009
- Technical report writing in \LaTeX

Online Coursework:

- R Programming. Completion with Distinction. Coursera. 2014
- Introduction to Data Science. Completion with Distinction. Coursera. 2013

Citizenship: USA