

Aleksandar Lazarević

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EDUCATION:

Ph.D. Computer Science, Temple University, Philadelphia, PA, 2000 - 2001
GPA: 3.96 Washington State University, Pullman, WA, 1997 - 2000
Thesis Title: *Integration of Multiple Prediction Models for Centralized and Distributed Knowledge Discovery in Databases*

M.S. Computer Science and Computer Engineering, University of Belgrade, Yugoslavia 1994-1997
GPA: 10.00 (on 10.0 scale)
Thesis Title: *A New Method of Data Dependence Determination for Programming Loops in Parallel Computers*

B.S., Computer Science and Computer Engineering, University of Belgrade, Yugoslavia 1989-1994
GPA: 9.22 (on 10.0 scale)
Thesis Title: *A Simulator of a VLIW Processor*

RESEARCH EXPERIENCE:

Research Associate, Army High Performance Computing Research Center
University of Minnesota, Minneapolis, MN, 2002 – present
Research Assistant, Temple University, Philadelphia, PA, 2000 – 2001
Washington State University, Pullman, WA, 1998 – 2000

Research Interests:

- Data Mining in Intrusion Detection (network intrusion detection, computer security, cyber terrorism, information assurance, database misuse detection, wireless intrusion detection, distributed intrusion detection, alert correlation)
- Anomaly/Outlier Detection
- Data mining for predicting damage in mechanical structures
- Data Mining for rare class analysis
- Web Mining, Privacy-preserving Data Mining, Link Analysis, Social networks
- Data mining for global climate systems
- Machine Learning: combining predictors (ensemble methods, mixture of experts), supervised and unsupervised learning, algorithms for prediction in heterogeneous data
- Brain Image Classification, Microarray Data Analysis
- Distributed and Parallel Data Mining
- Spatial and Spatial-Temporal Data Analysis and Modeling
- Knowledge Discovery in Business Valuation, Web Mining, E-Commerce Applications
- Neural Networks, Radial Basis Functions
- Parallel Processing in Superscalar and VLIW Architectures

Research Projects:

- **Data Mining in Intrusion Detection** – *Research Scientist and Project Leader* (Applying data mining for computer security. Network intrusion detection, anomaly and novel attack detection. Database misuse detection, Information Assurance), project funded by AHPCRC, January 2002 – present.
- **Data Mining for Damage Prediction in Mechanical Structures** – *Research Scientist* (Investigating data mining techniques to predict the existence, location and severity of damage in mechanical structures), project funded by DoD, Lawrence Livermore National Laboratory, June 2002 – present.
- **Data Mining for Rare Classes** - *Research Scientist* (Developing novel techniques based on rule-based techniques, generating artificial examples and integration techniques), June 2002 – present.
- **Mining Earth Science Data** – *Research Scientist* (Applying data mining techniques for discovery interesting patterns in global climate systems), project funded by NASA, September 2003 – present.
- **Bioinformatics, Disordered Proteins and Function** - *Research Assistant* (Discovery of ordered and disordered proteins, as well as the flavors of disorder proteins, Determining the functions carried by proteins and 3-D protein structures), project funded by NIH, August 2001 – December 2001.
- **Data Reduction for Spatial-Temporal Knowledge Discovery** - *Research Assistant* (Reduction of spatial and spatial-temporal attributes through a spatial statistical and spatial-temporal analysis, Data compression through controllable sampling and model sensitivity analysis, Discovery of predictable geospatial subsets), project funded by *INEEL, Department Of Energy*, March 2001 – September 2001.
- **Data Mining in Brain Imaging** – *Research Assistant* (Discovering brain structure-function associations from image and clinical data, Retrieval of similar brain scan images, Developing statistical and neural network models for classification of brain image), January 2001 - present.
- **Knowledge Discovery in Business Valuation** – *Principle Software Engineer* (Intangible assets analysis and identifying enterprise value drivers, time-series data analysis, e-commerce applications), project funded by *ValueMiner Inc.*, May 1999 - November 2000.
- **Spatial Data Mining and Knowledge Discovery** – *Research Assistant and Principle Software Engineer* (development of a system for knowledge discovery and local models integration without exchange of confidential and proprietary information in large spatial databases), project funded by *INEEL, Department Of Energy*, January 1998 - May 1999.

TEACHING EXPERIENCE:

- **Graduate Teaching Assistant** for Visual Basic, C, Fortran, Algorithmics. Washington State University, August 1997 – December 1998
- Teaching a few lessons in a course on *Machine Learning*, Temple University, Fall 2001.

WORK EXPERIENCE:

- **Research Associate.** Research and development in the field of applying data mining techniques in cyber threat analysis (network intrusion detection, host-based intrusion detection, distributed intrusion detection, database misuse detection). Act as a project leader. Army High Performance Computing Research Center, U. of Minnesota, January 2002 – present
- **System Programmer in Applied Cryptography.** The development of the software system for encryption/decryption algorithms, cryptographic applications and authentication mechanisms in network environment. Institute of Applied Mathematics and Electronics, Belgrade, Yugoslavia, March 1995 – August 1997

TECHNICAL SKILLS:

- **System Administration for Linux and Windows operating systems**
- **Programming Languages:** C/C++ (Visual C++, Borland C++), Visual Basic, Perl, Pascal, Fortran 90, Prolog, ADA, 80xx assembler, PDP-11 assembler, HTML
- **Operating Systems:** Windows NT/98/2000/XP, Linux, Unix, VAX/VMS
- **Software Packages:**
 - o Mathematical and statistical packages: MATLAB, S-PLUS, SAS
 - o Data Mining Software Packages: Clementine
 - o Visual Matcom (MATLAB Compiler)
 - o Database packages: MS Access, Postgress, MS SQL Server
 - o VLSI Packages: N2.ISP, VHDL, MAXPLUS, Orcad, Tanner,
 - o Electrical Engineering packages: Spice
 - o General computer skills: MS Front Page, Latex, CorelDraw!, Visio, MS Office

PROFFESIONAL AFFILIATIONS:

- **Member**
 - o Society for Industrial and Applied Mathematics (SIAM)
 - o Institute of Electrical and Electronics Engineers (IEEE)
 - o Association for Computing Machinery (ACM)
 - Special Interest Group in Knowledge Discovery and Data Mining (SIGKDD)
- **Workshop Chair**, Data Mining for Cyber Threat Analysis, IEEE International Conference on Data Mining, December 2002
- **Publicity Chair**
 - o Fourth SIAM International Conference on Data Mining, Orlando, FL, April 2004
 - o Third SIAM International Conference on Data Mining, San Francisco, CA, May 2003
- **Program Committee Member**
 - o Eight Pacific-Asia Conference on Knowledge Discovery and Data Mining, May 2004
 - o Seventh International Conference on Discovery Science, Padova, Italy, October, 2004
 - o Workshop on Data Mining for Computer Security, IEEE International Conference on Data Mining, November 19, 2003
 - o ICML/KDD Workshop on Learning from Imbalanced Data Sets II, August 2003
 - o Seventh Pacific-Asia Conference on Knowledge Discovery and Data Mining, May 2003
 - o Second IEEE International Conference on Data Mining, December 9-12, 2002
- **Tutorials**
 - o *Data Mining for Computer Security Applications*, Third IEEE International Conference on Data Mining, Melbourne, FL, November 19, 2003.
 - o *Data Mining for Intrusion Detection*, Seventh Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD-03), Seoul, Korea, April 30, 2003
- **Reviewer**
 - o IEEE Transactions on Knowledge and Data Engineering
 - o Knowledge and Information Systems (KAIS), An International Journal
 - o IEEE Transactions on Systems, Man and Cybernetics
 - o IEEE Security & Privacy, IEEE Transactions on Education
 - o Neural Computing and Applications Journal, Journal on Neural Networks
 - o ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 2002, 2003
 - o IEEE International Conference On Data Mining, 2002, 2003
 - o ...

PUBLICATIONS:

Books:

Kumar, V., Srivastava, J., **Lazarevic, A.** (Editors): "Managing Cyber Threats: Issues, Approaches and Challenges", to be published by Kluwer Academic Publishers in spring 2004.

Book chapters:

Lazarevic, A., Kanapady, R., Kamath, C., Tamma, K., Kumar, V.: "Damage Detection Employing Novel Data Mining Techniques" book "New Generation of Data Mining Applications", to be published in January 2004.

Ertoz, L., Eilertson, E., **Lazarevic, A.**, Tan, P., Srivastava, J., Kumar, V., Dokas, P.: The MINDS – Minnesota Intrusion Detection System, book "Next Generation Data Mining", to be published in January 2004.

Lazarevic, A., Srivastava, J., Kumar, V.: "A Survey of Intrusion Detection techniques", book "Managing Cyber Threats: Issues, Approaches and Challenges", to be published by Kluwer in spring 2004.

Journal papers:

Lazarevic, A., Srivastava, J., Kumar, V.: "Data Mining for Intrusion Detection: A Survey", in review.

Lazarevic, A., Kanapady, R., Kamath, C., Tamma, K., Kumar, V.: "Localized Prediction of Multiple Target Variables Using Hierarchical Clustering", in review.

Pokrajac, D., Megalooikonomou, V., **Lazarevic, A.**, Kontos, D., Obradovic, Z., "Classification of 3D Medical Images based on Spatial Distribution Estimation", submitted to *Artificial Intelligence in Medicine*.

Lazarevic, A. and Obradovic, Z.: "Boosting Algorithms for Parallel and Distributed Learning", *Distributed and Parallel Databases Journal, Special Issue on Parallel and Distributed Data Mining*, Vol. 11, No. 2, pp. 203-229, 2002.

Lazarevic, A. and Obradovic, Z.: "Knowledge Discovery in Multiple Spatial Databases," *Journal of Neural Computing and Applications*, Vol. 10, pp. 339-350, 2002.

Lazarevic, A. and Obradovic, Z.: "Adaptive Boosting Techniques in Heterogeneous and Spatial Databases", *Intelligent Data Analysis*, No. 5, pp. 1-24, 2001.

Pokrajac, D., **Lazarevic, A.** and Obradovic, Z.: "Exploration-Exploitation Trade-off in Machine Learning," *Facta Universitatis, Series: Electronics and Energetics*, Vol. 14, No. 1, pp. 67-90, April 2001.

Conference papers:

Lazarevic, A., Kanapady, R., Kamath, C., Tamma, K., Kumar, V.: "Localized Prediction of Multiple Target Variables Using Hierarchical Clustering", Proc. IEEE International Conference on Data Mining, Melbourne, FL, November 2003.

Ertöz, L., Eilertson, E., **Lazarevic, A.**, Tan, P., Dokas, P., Kumar, V., Srivastava, J., "Detection of Novel Network Attacks Using Data Mining", Workshop on Data Mining for Computer Security, to be held in conjunction with IEEE International Conference on Data Mining, Melbourne, FL, November 19, 2003.

Chawla, N., **Lazarevic, A.**, Hall, L., Bowyer, K., SMOTEBoost: Improving the Prediction of Minority Class in Boosting, Proc. Principles of Knowledge Discovery in Databases (PKDD), Cavtat, Croatia, September 2003.

Lazarevic, A., Ertoz, L., Ozgur, A., Srivastava, J., Kumar, V.: "Evaluation of Outlier Detection Schemes for Detecting Network Intrusions", Proc. Third SIAM International Conference on Data Mining, San Francisco, CA, May 2003.

Lazarevic, A., Ertoz, L., Eilertson, E., Srivastava, J., Kumar, V.: "Protecting Against Cyber Threats in Network Centric Systems", Proc. SPIE 17th Annual Symposium on AeroSense, Orlando, FL, April 2003.

Lazarevic, A., Kanapady, R., Tamma, K., Kamath, C., Kumar, V.: "Damage Prediction in Structural Mechanics using Hierarchical Localized Clustering-based Approach", Data Mining and Knowledge Discovery: Theory, Tools, and Technology, Proc. SPIE 17th Annual Symposium on AeroSense, Orlando, April 2003.

Lazarevic, A., Srivastava, J., Kumar, V.: "Cyber Threat Analysis - A Key Enabling Technology for the Objective Force (A Case Study in Network Intrusion Detection)", 23rd Army Science Conference, Orlando, FL, December, 2002.

Dokas, P., Ertoz, L., Kumar, V., **Lazarevic, A.**, Srivastava, J., Tan, P.: "Data Mining for Network Intrusion Detection", Proc. NSF Workshop on Next Generation Data Mining, Baltimore, MD, November 2002.

Pokrajac, D., **Lazarevic, A.**, Megalooikonomou, V., Obradovic, Z.: "Effective Classification of 3-D Image Data Using Partitioning Methods", Proc. SPIE Conference on Visualization and Data Analysis, San Jose, CA, January 2002.

Hoskinson, R., Pokrajac, D., Obradovic, Z., **Lazarevic, A.**: "The Unpredictability of Soil Fertility across Space and Time", Proc. 6th International Conference on Precision Agriculture and other Precision Resources Management, Minneapolis, MN, 2002.

Pokrajac, D., Hoskinson, R., **Lazarevic, A.**, Obradovic, Z.: "Spatial-Temporal Techniques for Prediction and Compression of Soil Fertility Data", Proc. 6th International Conference on Precision Agriculture and other Precision Resources Management, Minneapolis, MN, 2002.

Lazarevic, A., Obradovic, Z.: "Data Reduction using Multiple Models Integration," Proc. 5th European Conference on Principles and Practice of Knowledge Discovery in Databases, pp. 301-313, Freiburg, Germany, September 2001.

Lazarevic, A., Obradovic, Z.: "The Distributed Boosting Algorithm," Proc. ACM-SIGKDD International Conference on Knowledge Discovery and Data Mining, pp. 311-316, San Francisco, August, 2001.

Lazarevic, A., Obradovic, Z.: "The Effective Pruning of Neural Network Ensembles," Proc. IEEE International Joint Conference on Neural Networks, pp. 796-801, Washington D.C., July 2001.

Lazarevic, A., Pokrajac, D., Megalooikonomou, V., Obradovic, Z.: "Distinguishing Among 3-D Distributions for Brain Image Data Classification," Proc. 4th International Conference on Neural Networks and Expert Systems in Medicine & Healthcare, Milos Island, Greece, June 2001.

Pokrajac, D., **Lazarevic, A.**, Megalooikonomou, V., Obradovic, Z.: "Classification of Brain Image Data Using Measures of Distributional Distance," Proc. 7th Annual Meeting of the Organization for Human Brain Mapping, London, June 2001.

Obradovic, Z., Megalooikonomou, V., **Lazarevic, A.**, Pokrajac, D.: "Data Mining in Brain Imaging", *invited talk*, 7th Inter University Scientific Meeting Academy of Studenica, TELEMEDICINE, May 2001.

Lazarevic, A., Obradovic, Z.: "Boosting Localized Classifiers in Heterogeneous Databases," Proc. First SIAM International Conference on Data Mining, Chicago, April 2001.

Lazarevic, A., Pokrajac, D., Obradovic, Z.: "An E-commerce System for Mining Distributed Spatial Databases," Proc. IEEE International Conference on Advances in Infrastructure for Electronic Business, Science, and Education on the Internet, l'Aquila, Italy, August 2000.

Lazarevic, A., Pokrajac, D., and Obradovic, Z.: "Distributed Clustering and Local Regression for Knowledge Discovery in Multiple Spatial Databases," Proc. 8th European Symposium on Artificial Neural Networks, pp. 129-134, Bruges, Belgium, April 2000.

Lazarevic, A., Fiez, T. and Obradovic, Z.: "Adaptive Boosting for Spatial Functions with Unstable Driving Attributes," Proc. Pacific-Asia Conference on Knowledge Discovery and Data Mining, pp. 329-341, Kyoto, Japan, April 2000.

Lazarevic, A., Fiez, T. and Obradovic, Z.: "A Software Tool for Spatial Data Analysis and Modeling," Proc. Data Mining Minitrack at the IEEE Hawaii International Conference on System Sciences, IEEE Computer Society Press, January 2000.

Pokrajac, D., **Lazarevic, A.**, Vucetic, S., Fiez T. and Obradovic Z.: "Image Processing in Precision Agriculture," Proc. IEEE International Conference On Telecommunications in Modern Satellite, Cable and Broadcasting Services, Nis, Yugoslavia, October 1999.

Lazarevic, A., Xu, X., Fiez, T. and Obradovic, Z.: "Clustering-Regression-Ordering Steps for Knowledge Discovery in Spatial Databases," Proc. IEEE/INNS International Conference on Neural Networks, No. 345, Session 8.1B, Washington, D.C., July 1999.

Fiez, T., Obradovic, Z., Drossu, R., **Lazarevic, A.**, Pokrajac, D., Vucetic, S., "Use of terrain analysis in yield map interpretation," Proc., First International Conference on Geospatial Information in Agriculture and Forestry", poster presentation, pp. 111-114, Lake Buena Vista, FL, 1998.

SOFTWARE:

- **A Software Package For Intangible Assets Analysis And Identifying Enterprise Value Drivers.** The software system supports flexible data mining in business valuation domain. The software offers an easy-to-use data mining system for experts in business valuation with little knowledge of data analysis and intelligent data mining techniques. The software was developed for *ValueMiner Inc.*
- **A Software Tool for Spatial Data Analysis and Modeling in Centralized and Distributed Environment.** The software tool provides various machine learning techniques for an interactive knowledge discovery in large centralized spatial databases, and allows conducting data analysis and modeling operations at distributed sites by exchanging control and knowledge information.
- **A Software System For Data Reduction For Spatial-Temporal Knowledge Discovery.** The main purpose of the developed software is to reduce the size of spatial-temporal database without losing much information. The used techniques include spatial statistical analysis, spatial-temporal modeling and sensitivity analysis as well as identification of data subsets that can be reduced.

PATENTS:

- Zoran Obradovic, Tim Fiez, **Aleksandar Lazarevic**, Slobodan Vucetic, Dragoljub Pokrajac: **B-094**, "Systems and methods for knowledge discovery in spatial data", Patent disclosure filed January 2001, Reference: S/N 09/753,363

HONORS & ACTIVITIES:

- **Minnesota Supercomputing Institute Award**, Grant for research scholarship and supercomputing research, 2003-2004.
- **Co-Pi** on two research projects funded by ARDA and NSF (National Science Foundation)
- **ACM SIGKDD 2001 Student Travel Award**, Seventh International Conference on Data Mining and Knowledge Discovery, August 2001
- **Graduate Student Award for Outstanding Research**, College of Science and Technology, Temple University, May 2001
- **SIAM Student Travel Award**, First SIAM Conference on Data Mining, April 2001
- Fellowship from Serbian Department for Science and Technology, 1993 - 1994
- Scholarship from Serbian Academy of Science Fund, 1994 – 1996,
- Scholarship from Serbian Academy of Science and Arts, 1994 - 1995
- A fourth prize at Serbian High School Student's competition in Mathematics, 1986
- Vice-president of the church board, "Holy Trinity" Serbian Orthodox Church, St. Paul, MN
- Member of City Brass Orchestra (clarinet), Yugoslavia, 1982 – 1989
- Fluent in Serbian, Croatian, Bosnian, Macedonian. Have knowledge of German.