Dr. Zinovi Krougly

Departments of Statistical & Actuarial Sciences and Applied Mathematics
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1. Education

Diploma of Senior Research Fellow**,** Computer Systems and Networks,
High Assessment and Accreditation Commission, Moscow, 1988

Ph. D. in Mathematics **and** ***Computer Science***
Institute of Control Sciences of Russian Academy of Sciences, Moscow, 1984

Ph. D. Thesis **"**Stochastic Modeling of Computer Systems and Queuing Networks"

B.Sc. and M. Sc. in Mathematics and ***Computer Science***
Belarusian State University of Informatics and Radioelectronics, Minsk, Belarus, 1970

2. Expertise and Research Interests

- Scientific Computing, Numerical Analysis, Optimization
- Stochastic Modeling, Simulation
- Use of Technology in the Teaching of Mathematics, Statistics and Related Disciplines
- High-precision Numerical Computing
- Statistical Quality Control
- Data Analysis and Visualization, Graphic Information Technology
- Operations Research / Queuing Theory and Queuing Networks, Performance Analysis
- Programming Languages for Computational Science and Applications
- C++/ C#, SQL Server, OLE DB, ODBC, XML, Matlab, R, Mathematica.

3. Employment History

The University of Western Ontario, London, ON, Canada

Date	Position	Department
2000 - Current	Assistant Professor / Adjunct Professor Research Associate	Statistical & Actuarial Sciences
2000 - Current	Assistant Professor / Adjunct Professor Research Associate	Applied Mathematics
2003	Research Associate	ESSO Centre for Mathematics Education

Teaching at the University of Western Ontario, London, Canada

- **Applied Mathematics AM4611F / AM 465F / 565A**
  Introduction to Object Oriented Scientific Programming:
  2004-05 (A-Term), 2006-07 (A-Term), 2008-09 (A-Term), 2010-11(A-Term), 2011-12(A-Term)

- **Statistical Science SS1024a/b** *Basic Statistical Methods:*
  2003-04 (B-Term), 2003-04 (B-Term) , 2006 (A-Term), 2011-12(A-Term)

- **Applied Mathematics AM1411b / AM 025b** *Linear Algebra for Engineers:*
  2007-08 (B-Term), 2011-12 (B-Term)

- **Mathematics 050a/b:** *Calculus: 2005-06 (B-Term), 2006-07 (A-Term), 2007-08 (A-Term)*

- **Applied Mathematics AM 026** *Applied Mathematics for Engineers:*
  2005-06 (B-Term), 2006-07 (A-Term, B-Term)

- **Statistical Sciences SS 437b** *Topics in Operations Research:*
  2002-2003 (B-Term), 2002-03 (B-Term), 2005-06 (B-Term), 2006-07 (B-Term)

- **Applied Mathematics AM325b** *Optimization:*
  2003-04 (B-Term), 2004-05 (B-Term)

- **Statistical Science SS222a** *Methods of Statistical Analysis:*
  2004-05 (A-Term)

- **Busines & Management Math 5011** *Management Science Mathematics:*
  2004-05 (B-Term) (Fanshawe College, London, Ontario, Canada)

- **Statistical Science SS257a** *Probability:*
  2003-04 (A-Term)

- **Statistical Science SS 760a grad** *Networks and Queues:*
  2002:03 (A-Term)

- **Statistical Science SS736a grad** *Statistical Computing with Mathematica and C++:*
  2002-03 (A-Term)

- **Statistical Science SS452b / 537b grad** *Stochastic Processes:*
  2001-02 (B-Term)

- **Statistical Science SS301b** *Applied Regression Analysis:*
  2001-02 (B-Term)

Teaching of Graduate Courses at the University of Western Ontario, London, Canada

- **Introduction to Object Oriented Scientific Programming (AM 4611F / 465F / 565A)**
  2004-05 (A-Term), 2006-07 (A-Term), 2008-09 (A-Term), 2010-11 (A-Term),
  2011-12 (A-Term)

- **Statistical Computing with Mathematica and C++ (SS 736a)**
  2002-03 (A-Term)

- **Stochastic Processes (SS 537b)**
  2001-02 (B-Term)

- **Networks and Queues (SS 760a)**
  2002-03 (A-Term)

Research & Duties at the University of Western Ontario, London, Canada

- Stochastic modeling for generating disturbance patterns within landscapes that interfaces with geographic information systems (GIS). Developed in C++ software package "TDsimulator", which used to illustrate the total disturbance impact under different initial conditions and scenarios.

- C++ implementation of the EM algorithm for disability insurance model via ODE and system of nonlinear equations. Estimation from sample data and density approximation with Coxian and phase-type distribution.

- High-precision numerical computing and complex analysis, C++ implementation and Matlab integration.

- Stochastic modeling and real-time visualization of fire growth by cellular automata. C++ package examines a variety of probability conditions of fire spread natural phenomena. The model also allows the incorporation of a stochastic spotting mechanism.

- Forecasting and time series analysis: with software packages in C++, Mathematica and R.

- Performance evaluations and optimization of computer-communication systems. C++ package for exact solutions (BCMP, mean value analysis, etc.), priority approximations in multiclass queuing networks, Markov chain routines, global balance solution.

- C++ implementation of the algorithms to Matrix Analytic Methods in Stochastic Modeling.

- Stochastic modeling of flows in communication systems and reliability models. C++ ALM-soft package, hypothesis testing for almost-lack-of memory (ALM) distributions. Simulation distributions both with and without ALM property, computing the corresponding statistics, and plotting their curves.

- Scientific computing, numeric computation, optimization, statistical data analysis, stochastic modeling and simulation in C++, Mathematica and R software.

- High performance computing in stochastic modeling and simulation, Windows and Linux environments, integrating with Mathlink and Mathematica (C++ and Mathematica software). Used LAM/MPI C++ communication standard for parallel and distributed computers (SHARCNET infrastructure).

- Using C++/C#, Matlab, Mathematica, Mathlink, R, Visual Fortran, S-Plus, Minitab, MFC, DLL, Object Oriented Programming, LAM/MPI C++ communication standard for parallel and distributed computers (SHARCNET infrastructure).

Nexus Solutions Inc., London, ON, Canada

Date	Position
June 2010 – April 2011	Software Developer

Research and Duties:

- Statistical computing, statistical quality control and control charts for the continuous emission monitoring systems (CEMS) to demonstrate environmental regulatory compliance of various industrial sources of air pollutants.
- Database management and networking, continuous data collection and statistical analysis.
- European and American statistical control standards to monitor process characteristics in industry, exponentially weighted moving average (EWMA), CUSUM and Shewhart reports and control charts development.
- Used C++/C#, SQL Server, OLE DB, XML, and ODBC.

Elite Technologies Ltd., London, ON, Canada

Date	Position
1999	Programmer / Analyst

Research and Duties:

- Statistical data analysis, software development in the area of continuous emission monitoring and data acquisition systems for controlling the gas composition output of manufacturing and power plants.
- User interface design, database management to provide gas concentration and pollution level information.
- Development of a versatile administrator utility to edit application's configuration repository in order to meet diverse customer needs.
- Used Visual C++, Visual Basic, MFC, Windows API, MS Access, and SQL Server/ODBC.

International DEWA Company, Minsk, Belarus & Leipzig, Germany

Date	Position
1993 – 1998	Director / Project Manager

Research & Duties:

- Mathematical modeling, statistical analysis of clinical data, algorithms for medical diagnostics and cancer prevention
- Expert system for quick diagnostic screening of a population at high risk for developing cancer Algorithms and evaluations in relation to the database of patient information such as laboratory and clinical results, diagnostic classification and treatment method and history
- Configuration design of local area networks, developed software applications for optimizing customers' software and hardware resources

- User interfaces for medical/scientific charting applications and graphical presentation of research results

- Software applications for medical scientific research using Visual C++, Visual Basic, Fortran, SQL Server, MS Access, MFC, Windows API, Active X, and FoxPro

- Teaching of graduate courses, a thesis supervision of graduate students in the area of Mathematical Modeling, Performance Evaluation of Computer Systems and Networks

Central Research Institute for Applied Computer Science, Minsk, Belarus

Date	Position	Department
1985-1993	Head of the Scientific Laboratory, Professor	Mathematical Modeling, Performance
1970-1984	Senior/Junior Scientific Researcher	of Computer Systems and Networks

Research and Duties:

- Teaching of graduate courses, a thesis supervision of graduate students in the area of Mathematical Modeling, Performance Evaluation of Computer Systems and Networks

- Exact and approximation methods for performance evaluation and optimization of computer-communication systems using queuing network models

- Statistical analysis of data and streams in computer systems and networks using performance measure models and tools.

- Maintaining and support of real time and distributed systems

- Network applications in a Novell NetWare environment and provided software/hardware support for distributed systems

- Applications to determine the optimal performance of real-time systems and networks

- Algorithms, analytical models and software applications in C/C++, Fortran, FoxPro, Pascal and PL/1 for improving the production of large manufacturing enterprises

5. Representative Publications

Papers in Refereed Journals

1. A stochastic model for generating disturbance patterns within landscapes (2009), Krougly, Z.L., Creed, I.F., Stanford D.A., Computers & Geosciences 35, 1451-1459.

2. Stochastic forest fire growth models (2009), Boychuk, D., Braun, W.J., Kulperger, R.J., Krougly, Z.L., Stanford, D.A., Environmental and Ecological Statistics 16, 133-151.

3. Algorithms for linear time series analysis: with R package (2007), McLeod, A.I., Yu, H., Krougly, Z.L., Journal of Statistical Software 23(5), 1-26.

4. A stochastic model for forest fire growth (2007), Boychuk, D., Braun, W.J., Kulperger, R.J., Krougly, Z.L., Stanford, D.A., Information Systems and Operational Research (Special Issue on Forestry) 45, 9-16.

5. Iterative algorithms for performance evaluation of closed network models (2005), Krougly, Z.L., Stanford, D.A., Performance Evaluation 61 (2005), 41-64.

6. Periodic Poisson processes and almost-lack-of-memory distributions (2004), Dimitrov, B.D., Rykov, V.V, Krougly, Z.L., Automation and Remote Control 65, 1597-1610.

7. Computational algorithms of optimization of closed queuing networks (1990), Krougly, Z.L., Murshtein, M.S., Automation and Remote Control 49, 926-936.

8. Optimization of closed stochastic networks (1987), Vishnevsky, V.M., Krougly, Z.L., Automation and Remote Control 46, 173-183.

Refereed Conference Proceedings

9. Implementation and application of extended precision in Matlab (2009), Krougly, Z.L., Jeffrey D.J., Proceedings of the Applied Computing Conference ACC '09, Editors: N. Mastorakis et al., WSEAS Press, p. 103—108.

10. Periodic non-stationary arrival processes in queuing networks and their characterization (2003), Dimitrov, B.D., Rykov, V.V, Krougly, Z.L., Distributed Computer and Communication Networks (DCCN-2003): Stochastic Modeling and Optimization, Technosphera, Moscow, 64-72.

11. On properties and statistical estimation of ALM distributions (2003), Dimitrov, B.D., Rykov, V.V, Krougly, Z.L., Ghitany, M., Proceedings of Hawaii International Conference on Statistics and Related Fields, Honolulu: (CD ISSN#1539-7211).

12. A stochastic forest fire spread model (2005), Kulperger, R.J., Krougly, Z.L., Stanford, D.A., Proceedings of the 5th Saint Petersburg Workshop on Simulation, St. Petersburg, 401-406.

13. Nonlinear programming algorithms for performance modeling of computer networks (2003) Krougly, Z.L., Stanford, D.A., Distributed Computer and Communication Networks: Stochastic Modeling and Optimization (DCCN-2003), Technosphera, Moscow, 11-22.

14. Experimental data analysis and software applications for Indicator spectrophotometric method for the determination of acidic and basic properties of solid surfaces (2004), Krougly, Z.L., Glibin, V.P., 87th Canadian Chemistry Conference and Exhibition of the CSC, 934.

Books (Russian)

15. Estimation of Mini Computer Systems Basic Parameters (Reliability, Performance, Cost, etc.) (1988), Krougly, Z.L., Peselev K.V., Moscow, Engineering, pp. 1- 88.

16. Structure Selection and Performance Evaluations of Distributed Computer Systems and Networks (1987), Engineering Manual 25 212-3-86, Vishnevsky, V.M., Krougly, Z.L., Moscow, Ministry of Automation, pp. 1–280.

17. Structure Selection and Performance Evaluation of Interactive Computer System (1987), Engineering Manual 25 212-2-86, Zagarsky, A.N., Kesler, E.Y., Krougly, Z.L., Moscow, Ministry of Automation, pp. 1-127.

18. Structure Selection, Engineering Facility Resources Integration Supporting for the Automated

Control Systems (1987), Engineering Manual 25 212-10-86, Galkin, A.L., Krougly, Z.L., Rivkin, M.L., Moscow, Ministry of Automation, pp. 1- 178.

Papers in Refereed Journals (Russian)

19. New Technology for Precancerous and Cancer Detection (1996), Grigorovich, N.A., Krougly, Z.L., Kudelko, T., *Medical News* 1, 16-18.

20. Screening Method for Malignant Tumors, (1994), Grigorovich, N.A., Krougly, Z.L., Kobytev, E.M., *Official Invention Bulletin of the Republic Belarus* 1, 21.

21. Discrete Optimization of Computer Systems Configurations (1089), Krougly, Z.L., Chesnokova, N.M., *Creation of Multilevel Automated Control Systems* 2, 38-53.

22. Configuration Design of Local Area Networks (1989), Zagarsky, A.N., Kesler, E.Y., Krougly, Z.L., *Creation of Multilevel Automated Control Systems* 2, 7-37.

23. Optimization Algorithms, Synthesis and Structure of Computer Systems and Networks (1987), Zagarsky, A.N., Krougly, Z.L., Murshtein, M.A., *Electronic Modelling* 1, 1 - 23.

24. Algorithms of Approximate Analysis of Computer Systems Structure (1985), Bakanovich, E.A., Krougly, Z.L., *Electronic Modeling* 5, 14 – 21.

25. Development of Configurations of Real Time Systems (1982), Zagarsky, A.N., Krougly, Z.L., Rivkin, M.L., Strocev, U.V., *Devices and Control Systems* 3, 6-8.

26. Modeling of External Memory by Decomposition Method (1981), Krougly, Z.L., *Electronic Modeling* 5, 90-96.

27. Stochastic Network Model of Disk Memory (1979), Krougly, Z.L., *Creation of Multilevel Automated Control Systems* 3, 82-91.

28. Some Program Models of Real Time Systems (1978), Krougly, Z.L., *Creation of Multilevel Automated Control Systems* 3, 65-76.

29. Algorithms of Design of Computer Systems Structures with Multiple Class Tasks Models (1980), Krougly, Z.L., *Control Systems and Computing Machinery* 4, 73-79.

30. Modeling of Real Time Computer Systems (1977), Krougly, Z.L., *Creation of Multilevel Automated Control Systems* 4, 23-25.

31. Idle Times of the Assembly Line by not Ordinary Deliveries and Consumption of Assembly Units (1974), Kamenev, V.V., Krougly, Z.L., *Economics and Mathematical Methods* 1, 110 – 119.

Papers in Refereed Conference Proceedings (Russian)

32. The Information Component of the Computer Laboratory-Clinical Screening System of Malignant Tumors (1994), Krougly, A.Z., Krougly, Grigorovich, N.A., The Science-Practical Conference of Oncologists of the Republic Belarus, Polymya, Minsk, Belarus, pp. 58-61.

33. Discrete Optimization of Computer System Structures (1989), Zagarsky, A.N., Krougly, Z.L., Chesnokova, N.M., Abstracts All-Union Scientific-Technical Conference Computer Facilities Design, Polytechnic Institute, Lithuania, Kaunas,84-85.

34. Interactive Package of Analysis/Synthesis Programs for Queueing Networks (PEGAZ) (1988), Vishnevsky, V.M., Krougly, Z.L., Teleautomatic Systems of Queueing Systems, vol. 3, Timpul, Chisinau, Moldova, pp. 37-40.

35. Synthesis of Closed Queueing Networks by the Response Time, Performance and Cost Criteria, (1988), Vishnevsky, V.M., Krougly, Z.L., Murshtein, M.S., Teleautomatic Systems of Queueing Systems, vol.3, Timpul, Chisinau, Moldova, pp. 34-37.

36. Structure Selection and Performance Evaluation of Interactive Computer Systems (1988), Zagarsky, A.N., Krougly, Z.L., Teleautomatic Systems of Queueing Systems, vol. 3, Timpul, Chisinau, Moldova, pp. 41-42.
37. Synthesis of Closed Queueing Networks by the Response, Performance and Cost Criteria (1986), Vishnevsky, V.M., Krougly, Z.L., Murshtein, M.S., The Distributed Automatic Queueing Systems, Institute of Control Sciences, Moscow, pp. 75 – 86.

38. Hybrid Research Methods for Queueing Network Systems and Development of Distributed Systems (1982), Bakanovich, E.A., Volorova, N., Krougly, Z.L., Pottosina, S., Optimization in the Automated Control Systems, Institute of Control Sciences, Moscow, pp. 72-73.

39. Iterative Algorithms of Design of Computer System Configurations (1981), Krougly, Z.L., Development Problems and Maintenance of the Automated Control Systems, vol. 2., Mogilev State University, Mogilev, Belarus, pp. 29-30.

40. Models of Analysis and Synthesis for Structures of Real Time Systems (1981), Zagarsky, A.N., Krougly, Z.L., Optimization of the Automated Control Systems, Institute of Control Sciences, Moscow, pp. 43-44.

Solution Manuals and Software Packages (Russian)

41. Manual "Forecasting. Computer Laboratory-Clinical System for Malignant Tumors Screening" (1994), Grigorovich, N.A., Krougly, A.Z., Krougly, Z.L., Kobytev, E.M., Ministry of Health, Minsk, pp. 1- 47.

42. User Guide. Software Package "Forecasting. Computer Laboratory-Clinical Screening System of Malignant Tumors" (1994), Grigorovich, N.A., Krougly, A.Z., Krougly, Z.L., Kobytev, E.M., Ministry of Health, Minsk, pp. 1 - 37.

43. Computer Systems, Complexes and Networks (1987), Moroz, S.M., Krougly, Z.L., Muraviev, G., Trubicin, L., Research in Real Time Computer Systems, Belarussian State University of Informatics and Radioelectronics, Minsk, pp. 1-53.

44. Software Package "MARS-Engineering", Catalogue of Software and Methodical Manuals of the Centralized Fund of Algorithms and Programs, № 281 (1981), Zagarsky, A.N., Kesler, E.Y., Krougly, Z.L., Petrochenko, M.P., Ministry of Automation Software Centre, Kalinin, pp. 63-64.

45. Methodical Manual "Design of Real Time Systems", Zagarsky, A.N., Krougly, Z.L., Ministry of Automation Software Centre, Kalinin, 1981, pp. 1-200.

Preprints and Work in Progress

- Precision with Applications to Numerical Analysis and Stochastic Modeling, Krougly, Z.L., Jeffrey D.J., Stanford, D.A.

- Spot Fires and Firebrand Distribution, Krougly, Z.L., Kulperger D.J., Stanford, D.A.

Software Packages

1. Journal of Statistical Software 23, 1-26 (with I. McLeod and H. Yu)
   JSS Article http://www.stats.uwo.ca/faculty/aim/2007/ltsa/default.htm

   Linear time series analysis (package ltsa)
   http://cran.r-project.org/web/packages/ltsa/ltsa.pdf
   http://cran.us.r-project.org/web/packages/ltsa/index.html

2. Stochastic Modeling of Networks and Queues (package ZEDNED) with D. Stanford

   Iterative algorithms for performance evaluation of closed network models (2005), Krougly, Z.L., Stanford, D.A., Performance Evaluation 61 (2005), 41-64.
   http://www.stats.uwo.ca/faculty/krougly/home/papers/peva61_2005_41_64.pdf

3. High-precision numerical computing and complex analysis (package MPREC) with D. Jeffrey

   Implementation and applications of extended precision in Matlab (2009), Krougly, Z.L., Jeffrey, D.J., Proc. Applied Computing Conference ACC '09, Editors: Mastorakis et al., WSEAS Press 2009, pp. 103--108.
   http://www.stats.uwo.ca/faculty/krougly/home/papers/ACCMM1-09.pdf

4. Terrain Disturbance Simulator (package TDSimulator) with I. Creed and D. Stanford

   A stochastic model for generating disturbance patterns within landscapes (2009), Krougly, Z.L., Creed, I.F., Stanford D.A., Computers & Geosciences 35, 1451-1459.
   http://www.sciencedirect.com/science/article/pii/S0098300408002719

5. Stochastic Forest Fire Modeling package (with D. Stanford and R. Kulperger)

   Stochastic forest fire growth models (2009), Boychuk, D., Braun, W.J., Kulperger, R.J., Krougly, Z.L., Stanford, D.A., Environmental and Ecological Statistics, v. 16, # 1, 133-151
   http://www.springerlink.com/content/8474l2h282031255/

   A stochastic model for forest fire growth (2007), Boychuk, D., Braun, W.J., Kulperger, R.J., Krougly, Z.L., Stanford, D.A., Information Systems and Operational Research (Special Issue on Forestry) 45, 9-16.
   http://www.springerlink.com/content/8474l2h282031255/

   A stochastic forest fire spread model (2005), Kulperger, R.J., Krougly, Z.L., Stanford, D.A., *Proc. of the 5th Saint Petersburg Workshop on Simulation*, St. Petersburg, pp. 401-406.

6. Almost-lack-of-memory distributions (package ALM) with B. Dimitrov and V. Rykov

   Periodic Poisson processes and almost-lack-of-memory distributions (2004), Dimitrov, B.D., Rykov, V.V, Krougly, Z.L., Automation and Remote Control 65, 1597-1610
   http://www.stats.uwo.ca/faculty/krougly/home/papers/04092509075116227.pdf

   On Properties and Statistical Estimation of ALM Distributions
   http://www.stats.uwo.ca/faculty/krougly/home/papers/hawaii2003.pdf

6. Presentations (last eight years)

1. What distribution do spotting distances follow? (April 24, 2009), Field's Institute Workshop on Forest Fire Spotting, Faculty of Forestry, University of Toronto, Ontario, Canada.

2. Integration by inverse substitution (June 5, 2007), Faculty of Mathematics, University of Waterloo, Waterloo, Ontario, Canada.

3. Forest Fire Modelling. An Application of Statistics, Open House Presentation (March 11, 2006), Faculty of Science, University of Western Ontario, London, Ontario, Canada. http://www.stats.uwo.ca/faculty/krougly/ffSimulation/ForestFireSimulation_v2.htm

4. A stochastic forest fire spread model, 5th St. Petersburg Workshop on Simulation (June 30, 2005), St. Petersburg, Russia.

5. Iterative algorithms for performance evaluation of closed networks models (March 16, 2005), Department of Science and Mathematics, Kettering University, Flint, Michigan, USA.

6. Topic in regression analysis (March 10, 2005), Department of Economics, Business and Mathematics, Kings University College, London, Ontario, Canada.

7. Experimental data analysis and software applications for indicator spectrophotometric method for the determination of acidic and basic properties of solid surfaces (May 30, 2004), 87th Canadian Chemistry Conference and Exhibition of the CSC, London, Ontario, Canada.

8. Topic in regression analysis, Department of Statistical and Actuarial Sciences (January 20, 2004), University of Western Ontario, London, Ontario, Canada.

9. Periodic non-stationary arrival processes in queueing networks and their characterization (June 30, 2003), Distributed Computer and Communication Networks: Stochastic Modelling and Optimization (DCCN-2003), Moscow, Russia.

10. Nonlinear programming algorithms for performance modelling of computer networks (June 30, 2003), Distributed Computer and Communication Networks: Stochastic Modelling and Optimization (DCCN-2003), Moscow, Russia.

11. Non-stationary arrival processes in queueing networks and their characterization (June 6, 2003), Hawaii International Conference on Statistics and Related Fields, Honolulu, Hawaii, USA.