CURRICULUM VITAE

NAME: Zinovi Krougly

Date: June 6, 2023

Rank:

Assistant Professor, Western University, Department of Mathematics

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EDUCATION

Degree	University	Year
Ph.D.	Institute of Control Sciences, Russian Academy of Sciences, Moscow	1984
Ph.D. Thesis	Mathematical Modeling of Computer Systems and Queuing Networks	

EXPERTISE and RESEARCH INTERESTS

Teaching Mathematics with Technology
Numerical Integration, Optimization
Numerical Laplace and Inverse Laplace Transforms
High - precision Numerical Computation
Operations Research, Stochastic Modeling, Queuing Networks
Multiple Regression and Big Data Analysis for Predictive Emission Monitoring Systems
Applications in C++, C#, Matlab, R and Mathematica with Support of Arbitrary-precision Arithmetic

EMPLOYMENT HISTORY

Western University

Date	Position	Department
2021 - Current	Assistant Professor	Mathematics
2004 - 2021	Assistant Professor	Applied Mathematics
2018 - 2020	Lecturer	Mathematics and Statistics, King's University College
2000 - 2018	Assistant Professor	Statistical & Actuarial Sciences
2016 - 2017	Assistant Professor	Electrical & Computer Engineering
2003	Research Associate	ESSO Centre for Mathematics Education

Nexus Solutions Inc., London, ON, Canada

Date	Position
June 2010 - Apr. 2011	Programmer / Analist

Elite Technologies Ltd., London, ON, Canada

Date	Position
1999	Programmer / Analyst

International DEWA Company, Minsk, Belarus & Leipzig, Germany

Date	Position
1993 - 1998	Director / Project Manager

Central Research Institute for Applied Computer Science, Minsk, Belarus

Date	Position
1985-1993	Head of the Mathematical Modeling Laboratory
1970-1984	Senior/Junior Scientific Researcher

ACADEMIC HONOURS

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

TEACHING at WESTERN UNIVERSITY

List of Courses Taught in Last Ten Years

Calculus: 1000A, 1000B, 1301A, 1301B
Applied Mathematics: 3611F, 1411B, 3817A, 3817B , 4611F, 4999Z
Mathematics: 1230B
Statistical Sciences: 1024A, 2141A, 2143B
Financial Modelling: 3817B
Actuarial Sciences: 9903B
Software Engineering: 2250B

UNDERGRADUATE COURSES Taught in Last Fourteen Years

Date	Course	Name
2022-2023	Calculus 1301B	Calculus II, sec. 004, Western University
2022-2023	Calculus 1301A	Calculus II, summer course, Western University
2021-2022	Calculus 1301A	Calculus II, summer course, Western University
2020-2021	Applied Mathematics 3611F	Object Oriented Scientific Programming, Western University
	Calculus 1000B	Calculus I, sec. 001, Western University
	Calculus 1301A	Calculus II, sec. 270, King's University College
2019-2020	Calculus 1301B	Calculus II, sec. 001, Western University
	Calculus 1301B	Calculus II, sec. 006, Western University
	Mathematics 1230B	Calculus for the Social Sciences, King's University College
2018-2019	Calculus 1000A	Calculus I, sec. 006, Western University
	Calculus 1000A	Calculus I, sec. 570, King's University College
	Calculus 1301B	Calculus II, sec. 001, Western University
	Calculus 1301B	Calculus II, sec. 006, Western University
	Mathematics 1230B	Calculus for the Social Sciences, King's University College
2017-2018	FM 3817B	Optimization Methods for Financial Modelling
	Calculus 1301B	Calculus II

2016-2017	Applied Mathematics 3611F	Introduction to Object Oriented Scientific Programming
	Calculus 1301B	Calculus II
	Software Engineering 2250B	Software Construction
2015-2016	Applied Mathematics 3611F	Introduction to Object Oriented Scientific Programming
	Calculus 1301B	Calculus II
	Applied Mathematics 4999Z	Project
2014-2015	Applied Mathematics 4611F	Object Oriented Scientific Programming
	Calculus 1301B	Calculus II
	Statistical Sciences 2141A	Applied Probability and Statistics for Engineers
	Statistical Sciences 2143B	Applied Statistics and Data Analysis for Engineers
	Financial Modelling 3817B	Optimization Methods for Financial Modelling
	Applied Mathematics 4999Z	Project
2013-2014	Applied Mathematics 4611F	Object Oriented Scientific Programming
	Statistical Sciences 2141A	Applied Probability and Statistics for Engineers
	Applied Mathematics 3817B	Optimization
2012-2013	Applied Mathematics 3817A	Optimization
	Statistical Sciences 2141A	Applied Probability and Statistics for Engineers
	Applied Mathematics 4611F	Object Oriented Scientific Programming
	Calculus 1000B	Calculus I
	Applied Mathematics 3817B	Optimization
2011-2012	Applied Mathematics 4611F	Object Oriented Scientific Programming
	Applied Mathematics 1411B	Linear Algebra for Engineers
	Statistical Sciences 1024A	Basic Statistical Methods
2010-2011	Applied Mathematics 4611F	Object Oriented Scientific Programming
2008-2009	Applied Mathematics 4611F	Object Oriented Scientific Programming
2007-2008	Applied Mathematics 1411B	Linear Algebra for Engineers
	Applied Mathematics 050A	Calculus

GRADUATE COURSES Taught in Last Ten Years

Date	**Course**	**Name**
2016-2017	Applied Mathematics 3611F-GF	Object Oriented Scientific Programming
2014-2015	Applied Mathematics 4611F-GF	Object Oriented Scientific Programming
2013-2014	Applied Mathematics 4611F-GF	Object Oriented Scientific Programming
2012-2013	Actuarial Sciences 9903B	Decision Making and Object Oriented Programming

COURSE DEVELOPMENT

Calculus 1301A 001 2022 (Online Format)

The textbook switched from Stewart's text to Calculus Volume 2 - OpenStax. The lectures, office hours, assignments and exams run via Zoom.

Calculus 1301A 001 2021 (Online Format)

The lectures, office hours, assignments and exams run via Zoom.

AM 3611F 2020 (In - Person with Online Format)

AM 3611F includes a mix of both remote and in-person or Zoom teaching. Lecture material posted via a recorded lectures, C++ programming codes and lecture slides.
List of C++ final projects in AM 3611F follows:

Numerical Integration
Numerical Laplace and Inverse Laplace Transform
Gaver-Stehfest Algorithm and Inverse Laplace Transforms
Multiple Linear Regression
Complex Analysis, Lambert W Function and Extended Precision
Eigensystems, Matrix Exponentials and System of Ordinary Differential Equations
Nonlinear and Quadratic Optimization
Probability Distributions Simulating and Testing.

Calculus 1301A 270 2020 (Blended Format)

This course includes a mix of both remote and in-person or Zoom teaching, synchronous and asynchronous lecture materials, videos and voice recorded lectures.

Calculus 1000B 001 2020 (Online Format)

The lectures, office hours, assignments and exams run via Zoom.

Mathematics 1230B 574 2020 (In-person Format)

This course includes: methods of integration, constrained and unconstrained multivariable optimization with applications; mathematical modelling with differential equations, including applications in management, finance, economics, and social science.

Software Engineering 2250B 2017 (Software Construction)

This course grounded on scientific foundation of object-oriented programming and its various applications in software engineering. Used C# programming language and Unity Game Engine as the graphics platform. Many powerful features and algorithms introduce for data analysis and visualization, simulations, implementation of classes, methods and objects. That makes the language an ideal platform for software construction, deploying high-performance algorithms, and explore game prototyping environment with 3D Unity and C#.

Actuarial Sciences 9903B

This course based on high performance algorithms for supporting general and honors undergraduate and graduate programs, as well as postgraduate research projects in statistical & actuarial sciences,

applied mathematics and related fields. It focuses on data analysis and decision modelling, object-oriented technique in C# and covers optimization, simulations and stochastic modelling, financial and risk models.

Course project, AM 4999Z "Numerical Laplace Transforms and Inverse Laplace Transforms in Arbitrary Precision", 2015-2016

We concentrate on challenging numerical examples, and examines the issues faced when dealing with periodic functions and singularities. C++ and Matlab arbitrary precision class libraries have played a key role in the calculations. We observe the accuracy of the inversions, as we increase the number of the expansion terms in approximation, and increase the precision level, which ultimately leads to stable solutions.

Course project, AM 4999Z "Monte Carlo and Numerical Laplace Transform Inversion Methods with Applications in Financial Modelling", 2014-2015

This project examines three methods applied to pricing Asian options in finance using numerical Laplace transform inversion, and compares it to the price obtained through simulations. The methods used are Gaver-Stehfest, Talbot and Weeks. From the numerical results obtained, the equations often will not provide reliable solutions in double precision. As a result, programs using more precise architecture should be used for this inversion problem. Alternatively, simulation approaches can be used, but are very time consuming.

Use of Technology in the Teaching of Mathematics and Related Disciplines On-Line Resources and Software

My work involves a combination of mathematics with object oriented scientific programming. Courses that I've taught at Mathematics, Applied Mathematics, Statistical & Actuarial Sciences, Electrical & Computer Engineering Departments and King's University College, follows:

Calculus I and Calculus II, Calculus for the Social Sciences, Applied Mathematics for Engineers, Methods of Statistical Analysis, Probability, Optimization, Optimization Methods for Financial Modelling, Object Oriented Scientific Programming, Software Construction, Probability and Statistics for Engineers, Linear Algebra for Engineers, , Stochastic Processes, Operations Research, Applied Regression Analysis, Statistical Computing, Networks and Queues.

During my work at Western University I also had more than twenty research associate contract positions in the Applied Mathematics, Statistical & Actuarial Sciences and Biology departments. My intensive programming industrial experience and research in C++, C#, Matlab, R and Mathematica also useful for the purpose of enhancing mathematics and programming teaching and learning with technology.

Various materials are available for students on my course web sites:

Lecture notes for mathematical, statistical and actuarial sciences courses, a set of C++, C# and Matlab topics and source codes for object oriented scientific and engineering programming courses (AM 3611F, SE 2250B, AM 4611F, AS 9903B) and optimization courses (AM 3817B, FM 3817B).
The core material is performing scientific computing, statistical data analysis, Monte Carlo simulation, vector-matrix class library, linear and nonlinear optimization, numerical integration and solutions to ordinary differential equations, eigensystems, and advance techniques in variety of programming environments.

These are some workspaces (directories), that was specially developed for assignments and projects using C++, C# and Matlab. That allows to gather various source code files and resources and work with them as a cohesive unit.
This software provides students with working environment including practical examples that can be customized and implemented to solve complex scientific and engineering problems.

RECORD of PERFORMANCE in RESEARCH(last sixteen years)

REPRESENTATIVE PUBLICATIONS

Refereed Journal Publications

[1] Krougly, Z., Krougly, V., Bays, S., Multiple regression and big data analysis for predictive emission monitoring systems, Applied Mathematics, 14(5) (2023), 386-410.

[2 Krougly, Z., Accuracy and precision requirements in probability models, Reliability: Theory & Applications, 16(1) (2021), 133-151.

[3 Krougly, Z., Davison, M., Aiyar, S., The role of high precision arithmetic in calculating numerical Laplace and inverse Laplace transforms, Applied Mathematics, 8 (2017), 562-589.

[4 Boychuk, D., Braun, W.J., Kulperger, R.J., Krougly, Z.L., Stanford, D.A., A stochastic model for forest fire growth, Information Systems and Operational Research (Special Issue on Forestry) 45 (2009), 9-16.

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

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

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

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

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

Papers in Refereed Conference Proceedings

[10 Krougly, Z., Jeffrey, D., Tsarapkina, D., Software implementation of numerical algorithms in arbitrary precision, 15th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC 2013), Editors: N. Bjorner et al., IEEE Computer Society, (2014), 132-138.

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

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

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

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

[15 Dimitrov, B.D., Rykov, V.V., Krougly, Z.L., Ghitany, M., On properties and statistical estimation of ALM distributions, Proceedings of Hawaii International Conference on Statistics and Related Fields, Honolulu (2003): (CD ISSN#1539-7211), 16 - 22.

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

SOFTWARE PACKAGES in C++ and C#

List of C++ and C# software packages developed for and used in research and in the aforementioned papers follows.

[1] Multiple regression and big data analysis for predictive emission monitoring systems (2021-2023)

[2], [3], [10], [11] Numerical Laplace and Inverse Laplace Transforms in Arbitrary Precision (2015 - 2022)

[10], [11] Multiple precision numerical computing library (MPREC package) (2009-2015)

[11] Matlab double-double precision numerical computing library (DDPREC package) (2009)

[4], [5], [12] Stochastic forest fire simulator (FFSimulator package) (2009).

[6] Terrain disturbance simulator (TDSimulator package) (2009).

[7] Linear time series analysis (ltsa package). R computer code can be download from the following programming resources:
- R source package ltsa, version 1.4.2 (2012), http://CRAN.R-project.org/package=ltsa.
- R source package FGN:Fractional gaussian noise, estimation and simulation, version 1.4 (2011), http://www.jstatsoft.org/v23/i05.

[8], [16] Stochastic modeling of networks and queues (ZEDNED package) (2005).

[9], [14], [15] Almost-lack-of-memory distributions (ALM package) (2004), Revised November 2012.