

BIOGRAPHY

Ph.D. Candidate

Naghmeh Shahverdizadeh Shargh

Graduate Academic Unit

Mathematics & Statistics

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**March 8, 2021**

**3:30 p.m. (Atlantic)**

**Virtual Defence**

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Examining Board:

Dr. Branimir Ćaćić (Math & Stats)
Dr. Nicholas Touikan (Math & Stats)
Dr. Donglei Du (Faculty of Management)
Dr. David Bremner (Computer Science) Supervisor
Dr. Barry Monson (Math & Stats) Supervisor

External Examiner: Dr. Tamon Stephen
Dept. of Mathematics
Simon Fraser University

The Oral Examination will be chaired by:

Dr. Kevin Englehart, Associate Dean of Graduate Studies

Universities attended (with dates & degrees obtained):

2016 – present Ph.D. candidate, University of New Brunswick
2012 – 2014 M.S., Mathematics of Geometry, Shahid Beheshti University
2008 – 2012 B.S., Applied Mathematics, Shahid Beheshti University
Independent Study in data analysis and data science.
Independent Study in mathematical optimization in finance.

Publication - Under Review Article

Outer approximations of core points for integer programming

Workshops:

1. AARMS Industrial Problem-Solving Workshop (University of New Brunswick 2019)
Developed machine learning algorithm to automatically detect medical billing for the New Brunswick Department of Health.
2. AARMS Industrial Problem-Solving Workshop (Dalhousie University 2018):
Developed algorithm for a robust, accurate, and readable street map for the city of Sackville, NB by using advanced graph theory models and linear programming.
3. Industrial Problem-Solving Workshop (University of Calgary Jul 2018) Project description Sample size calculation in homogeneity assessment of certified reference materials
4. Graduate Math Modeling in Industry Workshop (Manitoba University 2017)
Project description Modelling the organization of the cytoskeleton

Licenses Certifications:

1. Foundation in Data science and Applications (AARMS summer school university of Prince Edward Island)
2. Functional Analysis for big data (AARMS summer school university of Prince Edward Island)
3. Machine Learning and Data Mining (AARMS summer school university of Prince Edward Island)

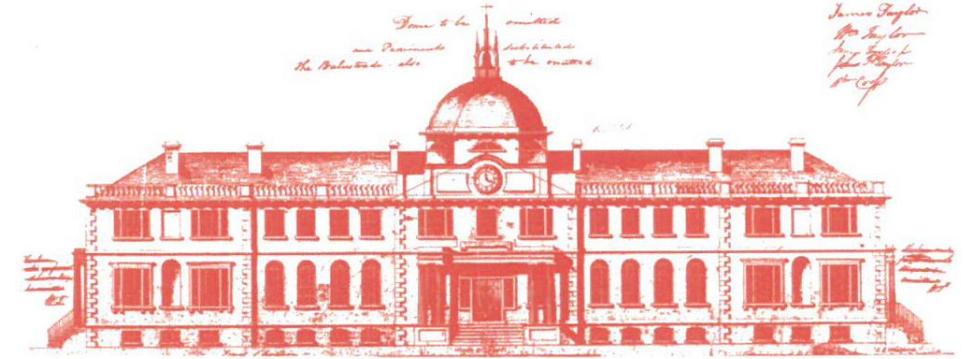
Awards:

Winner of the National Mathematics competition in high school, full scholarship through Ph.D.

Outer Approximations of Core Points for Integer Programming

Abstract

The main objective of this thesis is to develop some new algorithms for solving some hard symmetric integer linear programs (ILP). The idea comes from the concept of core points that are defined by the symmetry group of the polyhedron. The set of core points of a polyhedron is a subset of its integral points. It has been proved that if a symmetric integer linear program is integer feasible, either there is an optimal solution that is a core point or there is a core point in the core set of the polyhedron with the same objective value. Furthermore, for finding an optimal solution of a symmetric ILP, we can search among core points rather than integral points. The set of core points under a symmetry group can be finite or infinite. Recently, some techniques have been developed for solving symmetric ILPs with a finite number of core points. We discuss some of them in Chapter 3. But when the core set is infinite, these techniques are not practical anymore. In this thesis we develop some algorithms for the case where the set of core points has infinitely many elements. Then we use these algorithms to solve some hard symmetric ILPs.



Home of the School of Graduate Studies, Sir Howard Douglas Hall was designed by J.E. Woolford in 1825 and is the oldest university building in Canada still in use.

The University of New Brunswick recognizes that the university sits on traditional Wolastoqey territory. The river that runs right by our university – the St. John River – is also known as Wolastoq, along which live the Wolastoqiyik -- the people of the beautiful and bountiful river.

UNIVERSITY OF NEW BRUNSWICK SCHOOL OF GRADUATE STUDIES

ORAL EXAMINATION

Naghme Shahverdizadeh Shargh

**IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF**

DOCTOR OF PHILOSOPHY