JAMAL SHABANI

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May 26, 2025

Department of Mathematics and Statistics
Acadia University
Wolfville
Nova Scotia, B4P 2R6 Canada

Dear Dr. Richard Karsten,

I am writing to express my interest in applying for the Mathematics Assistant Professor position at Acadia University. With my knowledge and experience in teaching math, I am confident that I am an excellent fit for this role.

I am currently working as a Postdoctoral Research Associate at the University of Wisconsin in Madison. I have a PhD in Mathematics from McMaster University and an additional 5 years of experience teaching math to both high school and undergraduate students. During this time, I have developed an ability to adjust my teaching style to the needs of the students, as well as developed strong communication skills that have allowed me to effectively explain complex concepts in a simple way. My ability to connect with my students have allowed me to make math more accessible and enjoyable for them.

My teaching and recitation experience throughout my graduate studies in United States and in Canada at McMaster University has confirmed my interest and dedication to teaching. By teaching courses and conducting breakout sessions/recitations at University of North Florida in Jacksonville, Florida and later at Louisiana State University in Baton Rouge, Louisiana, and at McMaster University as graduate teaching assistant (please see my resume for a list of courses I taught), I learned a lot about the best practices to make students more engaged in classroom. During my time as graduate teaching assistant, I had the opportunity to teach students as sole instructor instructor. My responsibilities as an instructor included teaching a class, setting the midterm and final exams, quizzes and homework and grading all exams, quizzes and homework.

In addition, I have created a variety of lesson plans and activities to increase student engagement and comprehension. I have also been able to integrate the use of technology in my teaching to further enhance student learning. I have the knowledge and skills to create a supportive and engaging learning environment that will help students reach their potential.

I am eager to bring my knowledge and expertise to Acadia's Mathematics department and make a positive contribution to your department. I am confident that I can help your students excel in math and develop the skills they need to succeed in their academic and professional pursuits. I am attaching my resume for your review.

Thank you for your time and consideration. I look forward to speaking with you further about this opportunity.

Jamal Shabani PhD

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https://github.com/jamalshabani

RESEARCH INTEREST

Topology Optimization, Applied Mathematics, Scientific Computing, Numerical Analysis, Partial Differential Equations, Machine Learning, Artificial Intelligence, Number Theory.

EDUCATION

McMaster University, Hamilton, ON. *September 2021 - September 2024*
PhD in Applied Mathematics. **PhD by Research (100%)**

Louisiana State University, Baton Rouge, LA. *August 2019 - May 2021*
Master of Science in Mathematics. **GPA: 4.00/4.00 (100%)**

University of North Florida, Jacksonville, FL. *August 2017 - May 2019*
Master of Science in Mathematics. **GPA: 4.00/4.00 (100%)**

Middle East Technical University, Ankara, Turkey. *September 2012 - June 2016*
Bachelor of Science in Mathematics. **GPA: 3.65/4.00 (91%)**

PROFESSIONAL SUMMARY

- 5 years' university teaching experience as Assistant Lecturer.
- 3 years' experience using Python to solve Partial Differential Equations with Finite Elements Methods(FEM)
- 3 years' experience in Optimal Control, Optimal Design, and Topology Optimization.
- Strong mathematical background especially in Numerical Analysis, Optimization and Numerical PDEs.
- Strong programming background in Python.
- Strong background in Machine Learning, Deep Neural Networks tools such as PyTorch

WORK EXPERIENCE

Postdoctoral Researcher Fellow September 2024 - Present
University of Wisconsin - Madison *Madison, WI*

- Technical Skills: Python, C++.
- Working on 3D mutlimaterials Advanced Topology Optimization with materials selection.

Graduate Research Assistant September 2021 - September 2024
MEF90 Lab *Hamilton, ON*

- Technical Skills: Python, C++.
- Creating all mathematical frameworks for our Optimization problems including the appropriate adjoint computations necessary for sensitivity analysis.
- Implementing the Optimization problems using Python, PETSs (Portable Extensible Toolkit for Scientific Computations and TAO (Toolkit for Advanced Optimization).

- Running the simulations and analyzing results using PARAVIEW.

Web Developer June 2017 - Present
Freelancer *Hamilton, ON*

- Technical Skills: HTML5, CSS3, JavaScript, PHP, MySQL.
- Using HTML5, CSS3 and JavaScript to create responsive front-end design of the web apps.
- Utilizing MySQL and PHP to create databases and back-end design of the web apps.

Argonne National Laboratory Summer 2021
MCS Given Associate Intern *Lemont, Illinois*

- Technical Skills: Fortran 90, C++.
- Developed Fortran programs for generating profiles comparisons of different constrained and unconstrained TAO (Toolkit for Advanced Optimization) solvers.
- Ran simulations for different TAO solvers to compare their efficient runtime and CPU usage.

TEACHING EXPERIENCE

McMaster University September 2021 - September 2024
Hamilton, ON *Canada*

(1) Instructor for **MATH 1MP3** - Introduction to Mathematical Scientific Computation in Spring 2023.

(2) Instructor for **MATH 1MP3** - Introduction to Mathematical Scientific Computation in Spring 2022.

(3) Teaching Assistant for **MATH 1LS3** - Calculus for the Life Sciences I

(4) Teaching Assistant for **MATH 1ZC3** - Engineering Mathematics II

(5) Teaching Assistant for **MATH 2C03** - Differential Equations

(6) Teaching Assistant for **MATH 2ZZ3** - Engineering Mathematics IV

(7) Teaching Assistant for **MATH 3MB3** - Introduction to Modelling

Louisiana State University September 2019 - August 2021
Baton Rouge, LA *United States*

(8) Instructor for **MATH 7210** - Abstract Algebra I in Summer 2021.

(9) Instructor for **MATH 1550** - Differential and Integral Calculus in Fall 2020.

(10) Instructor for **MATH 1022** - Plane Trigonometry in Fall 2020.

(11) Instructor for **MATH 1500** - Calculus in Spring 2020.

(12) Instructor for **MATH 2070** - Mathematical Methods in Engineering in Fall 2019.

University of North Florida September 2017 - May 2019
Jacksonville, FL *United States*

(13) Instructor for **MGF 1106** - Finite Mathematics in Spring 2019.

(14) Instructor for **MAC 1105** College Algebras in Fall 2018.

(15) Teaching Assistant for **MAA 4211** - Advanced Calculus I

(16) Teaching Assistant for **MAA 4402** - Complex Analysis

Feza Boys High School July 2016 - July 2017
Dar Es Salaam *Tanzania*

(17) High school math teacher.

(18) High school physics teacher.

RELEVANT COURSEWORK

MAS 6145 - Advanced Linear Algebra Fall 2017
Grade A *University of North Florida*

MAP 6385 - Scientific Computing Spring 2018
Grade A *University of North Florida*

MAA 6417 - Complex Analysis Spring 2019
Grade A *University of North Florida*

MAD 6405 - Numerical Analysis Spring 2019
Grade A *University of North Florida*

MATH 7210 - Algebra I Fall 2019
Grade A *Louisiana State University*

MATH 7311 - Real Analysis I Fall 2019
Grade A *Louisiana State University*

MATH 7320 - Ordinary Differential Equations Spring 2020
Grade A+ *Louisiana State University*

MATH 7330 - Functional Analysis Spring 2020
Grade A- *Louisiana State University*

MATH 7710 - Advanced Numerical Linear Algebra I Spring 2020
Grade A *Louisiana State University*

MATH 7386 - Theory of PDE Fall 2021
Grade A *Louisiana State University*

MATH 7384 - Topics in Material Science Fall 2021
Grade A *Louisiana State University*

PUBLICATIONS

1. **J. Shabani,** K. Bhattacharya and B. Bourdin, *"Systematic Design of Compliant Morphing Structures: A Phase-Field Approach."* **Applied Mathematics and Optimization** 91, 41(2025)**https://doi.org/10.1007/s00245-025-10237-7**
2. **J. Shabani**, *"Systematic design of compliant morphing structures with stimulus as design and state variable."* (**Thesis**) **LINK TO ACCESS THESIS**

WORKS IN PROGRESS

1. **J. Shabani** and B. Bourdin, *"Optimal design of a responsive trajectory path."*(**In preparation. Manuscript available upon request**)
2. S. Sridhara, **J. Shabani** and K. Suresh, *Topology optimization with material selection*
3. **J. Shabani**, *FireTop: 150 lines python code for 2D and 3D multi materials topology optimization with Firedrake and phase-field approach.*
4. **J. Shabani**, *On systematic design of time-dependent compliant morphing structures.*
5. **J. Shabani**, *Multi-phase fields topology optimization in 2D and 3D with material selection.*

TALKS GIVEN

1. **Applied and Industrial Mathematical Sciences (AIMS)**, *"Optimal design for Linear Elasticity problems."* - June 2023
2. **Applied and Industrial Mathematical Sciences (AIMS)**, *"Optimal design of responsive structures."* - January 2024
3. **The Mathematics of Modern Sciences webinar**, *"Topology Optimization with Variational Auto Encoders (VAE)."* - April 2025

COMPUTER SKILLS

Programming Languages	Python, SQL, C/C++, MATLAB, Java, C#
Python Packages	Pandas, Matplotlib, Numpy, BeautifulSoup, Jupyter
Software & Tools	FEniCS, Firedrake, LaTeX, Github, PETSc/TAO
Frontend Web Development	HTML5, CSS3, Javascript, VueJS, JQuery, Django
Backend Web Development	PHP, MVC (Model View Controller) Frameworks (Laravel)
Machine Learning Tools	Pytorch

REFERENCES

1. Prof. Blaise Bourdin - McMaster University - bourdin@mcmaster.c - 905-525-9140 ext 27243
2. Prof. Nicholas Kevlahan - McMaster University - kevlahan@mcmaster.ca - 905-525-9140 ext 23412
3. Prof. Aynur Bulut - Louisiana State University - aynurbulut@lsu.edu

McMaster University

Hamilton Canada

By the Authority of the Senate
the Chancellor has conferred upon

Jamal Juma Shabani

the Degree of

Doctor of Philosophy

Mathematics

with all the Rights and Privileges pertaining thereto
in Witness whereof and by the Authority vested in Us,
We have hereunto set our hand and seal.

Dated this 21st day of November, 2024 at Hamilton, Ontario.

Chancellor

President and Vice-Chancellor

University Registrar

Louisiana State University

and

Agricultural and Mechanical College

On the nomination of the Faculty of the

Graduate School

has conferred upon

Jamal Juma Shabani

the degree of

Master of Science

with all the Honors, Rights and Privileges to that degree appertaining.

In Testimony Whereof, the seal of the University and the signatures as authorized by the Board of Supervisors are hereunto affixed. Given at Baton Rouge, Louisiana, on the seventh day of May in the year two thousand and twenty-one.

Chairman of the Board of Supervisors

Executive Vice President and Provost

Interim President

Vice Provost and Dean

University of North Florida

has conferred on

Jamal Juma Shabani

the degree

Master of Science

Mathematical Science

and all the rights and privileges thereunto appertaining.
In Witness Whereof, this diploma, duly signed, has
been issued and the seal of the University affixed.

Issued by the Board of Trustees upon recommendation of the Faculty of the
College of Arts and Sciences at Jacksonville, Florida, This Twenty-Sixth Day of April, A.D., 2019.

Governor

Chairman, University Board of Trustees

UNIVERSITY OF NORTH FLORIDA • JACKSONVILLE •

President

Dean

TÜRKİYE CUMHURİYETİ
ORTA DOĞU TEKNİK ÜNİVERSİTESİ
ANKARA

REPUBLIC OF TURKEY
MIDDLE EAST TECHNICAL UNIVERSITY
ANKARA

Şeref Öğrencisi *Honor Student*

Jamal Juma Shabani

Fen Edebiyat Fakültesi *having satisfactorily completed all requirements of the Department of*

Matematik *Mathematics*

Bölümünde gerekli çalışmaları başarı ile tamamlayarak *in the Faculty of Arts and Sciences has been awarded the degree of*

Lisans *Bachelor of Science*

derecesini tanınan bütün yetkileriyle birlikte almaya hak kazanmıştır. *with all the rights and privileges thereto pertaining.*

20 Haziran 2016 *June 20, 2016*

REKTÖR
PRESIDENT

DEKAN
DEAN

BÖLÜM BAŞKANI
DEPARTMENT CHAIR

DİPLOMA NO / NUMBER: 123596 TC. KİMLİK NO / ID NUMBER: 99115361724

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To whom it may concern:

I am writing in support of Jamal Shabani's application for a position in your department.

I am Blaise Bourdin, Professor of Mathematics and Tier 1 Canada Research Chair in Mathematical and Computational Aspects of Solid Mechanics at McMaster University. I was previously the A.K. & Shirley Professor of Mathematics, an adjunct of the Center for Computation & Technology, and an adjunct professor of Mechanical Engineering at Louisiana State University. My areas of expertise include modeling analysis and simulations of problems arising in defect mechanics of solids, optimal design, and high-performance computing.

I met Jamal in the Spring of 2020 while I was still at Louisiana State University. He had passed all his qualifiers after a single semester (a very unusual feat at LSU) and was looking for a research project. As the Covid crisis was developing and classes were switching to an online format, I was reluctant to start a project with a new student and suggested that we wait until the summer. When he got back to me in May, I had received a new NSF award on optimal design of responsive structures with support for a graduate student. I setup a summer reading course to assess his skills and teach him some of the fundamental tools of applied analysis and scientific computing that our students typically lack. I picked Brezis' *Functional Analysis, Sobolev Spaces and Partial Differential Equations* graduate text, which I had read with a few other students. From the beginning, Jamal impressed me by his ability ingest complex material and extract the essential concepts instead of getting stuck on the technical details. Throughout the summer, he was driven (usually waiting on me to feed him material), and independent (taking the initiative to look for alternate presentations of the material).
Jamal mentioned a strong interest for applications and computational work, following which we refocussed our efforts on the finite element method. I gave Jamal two references (Brenner-Scott and Ern-Guermond), asking him to pick one. A week later, he had not only skimmed both books, but had basically captured the essence of the method.
By the end of the semester, we agreed that I would direct his doctoral work, and that he would take his general exam in the early days of the Spring of 2021, an aggressive timeline.
In the summer of 2021, I moved to McMaster University and Jamal followed me shortly after finishing a Givens associate summer appointment in the PETSc group at Argonne National Laboratories.

Jamal's doctoral work deals with optimal design with responsive materials which can deform when subjected to some stimulus such a thermos-elastic materials, shape memory alloys and led to a research article which was recently accepted for publication in *Applied Mathematics and Optimization*. The numerical methods that he developed are based on the phase-field approach to optimal design. On the theoretical side, the main tools of his PhD. are PDE-constrained optimization and adjoint methods, Gamma-convergence, homogenization, and basic functional analysis and PDE. A large part of his work is numerical, and he implemented multiple variants of

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optimal design problems using the open-source finite element packages firedrake and FEniCS. He has very good coding skills. His code is well-structured and properly documented, and he is comfortable with revision system and other modern tools.

To summarize, I warmly recommend Jamal Shabani for a position in your department.

Blaise Bourdin
Professor of Mathematics
Canada Research Chair in Mathematical and Computational Aspects of Solid Mechanics (tier 1)

REFERENCES

1. Prof. Blaise Bourdin - McMaster University - bourdin@mcmaster.c - 905-525-9140 ext 27243

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