Dr. Ajmia Younes Orfi,

PhD in Applied Mathematics
Assistant Professor of Mathematics
Department of Mathematics and Computer Science, Alfaisal University

Personal Information

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Education

1. **PhD in Applied Mathematics:** (June 2017) **(with very honorable mention)**
Department of Mathematics, Faculty of Sciences of Tunis, University of Tunis-El Manar, Tunisia; with several trainings and visits to Pierre and Marie Curie University, Paris.
Thesis Title: **A priori and a posteriori error analysis using Finite Element Method: Applications to unsteady Darcy and Darcy-Stokes equations**
Administrative Advisor: Professor M. Dammak
Scientific Advisor: Professor Christine Bernardi, Pierre and Marie Curie University, Paris, France.

2. **Master in Applied Mathematics:**(Feb 2009) **(with an award of excellence)**
University of Moncton, New Brunswick, Canada.
Project title: **A posteriori error estimator for mixed dual finite element methods of linear elasticity problems**
Advisor: Professor Mohamed Farhloul, University of Moncton, New Brunswick, Canada.

3. **Bachelor in Applied Mathematics:** (June 2006)
Faculty of Sciences of Monastir, University of Monastir, Tunisia.

Experience

* **Assistant Professor at Alfaisal University, Riyadh, College of Science and General Studies, Department of Mathematics & Computer Science** (August 2024--present)
Teaching the courses:

***Fall 2025*:** MAT 211 Calculus III (197 students).

***Spring 2025*:** Calculus II for The Saudi Economists Program-Office of Executive Education & Development-College of Business (16 students).
MAT 212 Linear Algebra (52 students). MAT 116 Calculus for Biomedical Sciences II (22 students). MAT 111 Business Calculus (57 students).
***Fall 2024*:** MAT 211 Calculus III (181 students). MAT 112 Calculus II (39 students).

* **Adjunct Professor at Alfaisal University, Riyadh, College of Science and General Studies, Department of Mathematics & Computer Science** (Fall 2019--Spring 2024)
Teaching the courses:

***Spring 2024*:** MAT 212 Linear Algebra (49 students). MAT 116 Calculus for Biomedical Sciences II (22 students). MAT 111 Business Calculus (87 students).
***Fall 2023*:** MAT 211 Calculus III (102 students).
***Summer 2023*:** MAT 211: Calculus III (17 students). MAT 213: Differential equations (62 students).
***Spring 2023*:** MAT 212 Linear Algebra (26 students). MAT 224: Numerical Methods (38 students). MAT 116: Calculus for Biomedical Sciences II (18 students).
***Fall 2022*:** MAT 211 Calculus III (142 students).
***Summer 2022*:** MAT 211 Calculus III (13 students).
***Fall 2021*:** MAT 211 Calculus III (115 students).
***Summer 2021*:** MAT 211 Calculus III (33 students). MAT 212: Linear Algebra (43 students).
***Fall 2020*:** MAT 211 Calculus III (105 students).
***Summer 2020*:** MAT 211 Calculus III (21 students). MAT 213: Differential equations (5 students).
***Spring 2020*:** MAT 211 Calculus III (12 students).
***Fall 2019*:** MAT 211 Calculus III (70 students).

* **Lecturer at King Saud University, Riyadh, College of Business Administration Department of Quantitative Analysis (**Sept 2009 -- Jan 2017)
Teaching the courses**:**
QUA 111: Quantitative Methods (Level 7), 10 times.
QUA 107: Introduction to Statistics in Business, twice.
QUA 204: Linear Algebra in business (Level 6), 13 times.
Laboratory of QUA 204 using **MATLAB** software (2010-2012)
I prepared a:
- Handout on QUA 204 (English) (68 pages)
- Handout on QUA 111 (Arabic) (70 pages)
- Laboratory instruction manual on **MATLAB** (30 pages)

* **Teaching Assistant at University of Moncton, New Brunswick Canada, College of Science, Department of Mathematics and Statistics**
(January 2007-- December 2007)
Teaching the courses:
MATH 1163: Integral calculus.
MATH 3803: Theory of Numbers.
Responsibilities:
Selection and solution of problems, tutorials, marking exams.

Committees and Services:

* Member of the Hiring Committee in the Math Department, Alfaisal University (January 2024--present)

* Member of the thesis review committee for the quality of research projects in the Life Science program at Alfaisal University, Spring 2025.
Thesis title: " Comparing Marine Biodiversity Using Baited Remote Underwater Video Systems (BRUVS) between Seagrass and Coral Reef Ecosystems of the Arabian Gulf ", defended on 13 May 2025.

Trainings

Attending Summer School on the Nonlinear Analysis of Partial Differential Equations (PDEs): Fluid Dynamics, Chemotaxis, and Singularity Formation, that was held at Monastir, Tunisia from July 14 to18, 2025, (Certificate of participation earned)
https://sites.google.com/nyu.edu/summer-schoolpde
* Courses given by prestigious Professors including Prof. Nader Masmoudi (Courant Institute New York University (NYU), NYU Abu Dhabi) and Prof. Hatem Hatem Zaag (Université Sorbonne, Paris Nord).

Participated in the workshop entitled “Writing Instructional Objectives” held October 24, 2024 at Alfaisal University (Certificate of Attendance earned).

Participated in the workshop entitled “From Vague Course Outcomes to Measurable Objectives” held October 16, 2024 at Alfaisal University (Certificate of Attendance earned).

Submitted (or under preparation) Papers

1. Ajmia Younes Orfi, Fully Discretized Time-Dependent for a Dual Mixed Finite Element Method of the Elasticity Problem, submitted http://dx.doi.org/10.2139/ssrn.5102209

2. Ajmia Younes Orfi, A Posteriori Error Estimates of a Dual Mixed Finite Element Method of the unsteady Elasticity Problem, under preparation.

Publications

1. Ajmia Younes Orfi and Driss Yakoubi, A posteriori error estimates of finite element method for the time-dependent Darcy problem in an axisymmetric domain, **Computers & Mathematics with Applications, (2019), Vol. 77, Issue 10, 15 May 2019, Pages 2833-2853**, https://doi.org/10.1016/j.camwa.2019.01.016, *ISI-Impact Factor (IF)= 3.370.*

2. Christine Bernardi and **Ajmia Younes Orfi**, A posteriori error analysis of the fully discretized time-dependent coupled Darcy and Stokes equations, **Computers and Mathematics with Applications (2018), Vol. 76, No. 2, Pages 340-360**, https://doi.org/10.1016/j.camwa.2018.04.021, *ISI-Impact Factor (IF)= 3.370.*

3. Ajmia Younes Orfi and Driss Yakoubi, A priori error analysis of an Euler implicit, Finite Element approximation of the unsteady Darcy problem in an axisymmetric domain**, Advances in Applied Mathematics and Mechanics, Adv. Appl. Math. Mech, (2018) Vol.10, No. 2, Pages 301-321**, DOI 10.4208/aamm.OA-2016-0055, *ISI-IF=1.31.*

4. Christine Bernardi and **Ajmia Younes Orfi**, A priori error analysis of the fully discretized timedependent coupled Darcy and Stokes equations, **SeMA Journal (2016), Vol. 73 No 2, Pages 97-119**, https://doi.org/10.1007/s40324-015-0058-5, *ISI-IF=1.851.*

5. Christine Bernardi and **Ajmia Younes Orfi**, Finite element discretization of the time dependent axisymmetric Darcy problem, **SeMA Journal, (2015), Vol. 68, No. 1, pp 53-80.** doi.org/10.1007/s40324-015-0032-2, *ISI-IF=1.851.*

6. Mohamed Farhloul **and Ajmia Younes Orfi**, A Posteriori Error Estimates for a Dual Mixed Finite Element Method of the Elasticity Problem. **Universal Journal of Applied Mathematics & Computation 3 (2015), pp 70-86**. www.papersciences.com, *ISI-IF=0.25.*

Research Activities

My research interests range from the development of fundamental aspects of Finite Element Methods to the solution of physical and real problems using accurate and reliable numerical methods. I have started by proposing and analyzing new posteriori error estimators for mixed finite element methods of the stationary elasticity problem. I have continued with exploring other advanced techniques of error estimations for time dependent Darcy and coupled Darcy stokes equations. My interests cover also solving complex problems related to other physical and medical problems such as flow with heat in porous media, blood flow in arteries, flow in deformable walls etc.
Specifically, my work is related to:
* Mathematical and numerical analysis of PDEs: Stokes, Darcy, Linear Elasticity and coupled Darcy Stokes, etc.
* Error approximation; Finite Element Methods
* Stabilized finite element method and mesh adaptive
* Dual Mixed finite element method
* Non-stationary problems discretized by Backward Euler scheme for the time variable and finite elements for space variables.

Description of my PhD and MSc projects

1. PhD project:
In my PhD project, we are interested in the analysis of a priori and a posteriori error by finite element method. We consider in particular **the time dependent axisymmetric Darcy equations and the unsteady Darcy-Stokes equations**.
In the first part of the thesis, the fluid is modeled using Darcy's equations in an axisymmetric three-dimensional domain where the boundary conditions and the external forces are axisymmetric. Thus, the solution satisfies a system of equations in the meridian domain.
We proposed a discretization of this problem in the case of an axisymmetric solution.
Finally, we presented some numerical experiments which are in good agreement with the analysis.

In the second part of the thesis, we studied the time-dependent Darcy and Stokes equations, that model laminar fluid flow over a porous medium, in two- or three-dimensional connected open domains which are coupled via appropriate matching conditions on the interface.
The discretization of these two problems relies on a backward Euler's scheme for the time variable and the finite elements for the space variables. We proved a priori error estimates which justify the good convergence properties of the discretization and a posteriori error estimates that lead to an efficient adaptation strategy both for the time steps and the meshes.

2. MS project:

In my MSc project, we introduced and analyzed **two new a posteriori error estimators for two new dual mixed finite element methods of the elasticity problem**. Such a posteriori estimators are useful for adapting mesh in order to improve the approximation of the solution to the studied problem. In the first method, the tensor of the constraints is approximated by the field of Brezzi-Douglas-Marini increased by the rotational of the conforming bubble. In the second method, the tensor of the displacement is approximated by the field of Raviart-Thomas. It is shown that these error estimators are reliable and efficient. Moreover, these estimators justify an adaptive finite element scheme which refines a given grid only in regions where the error is relatively large.

Other Information

1. I was invited by Professor **Christine Bernardi**, Pierre and Marie Curie University, Paris, France to work under her supervision on the solution of steady and unsteady behaviors of Darcy and Stokes-Darcy problems. These trainings were during the following periods:

1. From 19 January 2013 until 26 January 2013.
2. From18 June 2013 until 1 July 2013.
3. From 16 January 2014 until 25 January 2014.
4. From 24 June 2014 until 1 July 2014.
5. From 28 September 2014 until 9 October 2014.
6. From 19 June 2015 until 3 July 2015.
7. From 7 January 2016 until 16 January 2016.

2. I also had the opportunity during these visits to learn how to use the **software FreeFem++** (www.freefem.org - developed by Prof. **F. Hecht**, Pierre and Marie Curie University, Paris). This software was used to obtain the numerical solution of **Darcy** and the coupled **Darcy-Stokes** Problems.

Awards

- June 2008; Award of Merit (2000$), Department of Math. and Statistics; University of Moncton, New Brunswick, Canada.
- June 2007; Award of Merit (2000$), Department of Math. and Statistics; University of Moncton, New Brunswick, Canada.
- December 2007; Award of excellence (5000$), University of Moncton, New Brunswick, Canada.

Software and Hardware skills

- Programming with C++
- **Software:**
  FreeFEM++ (Used to solve Partial Differential Equations with Finite Element Method).
  Matlab, **Latex**, **Power Point**, **MS Word**.

Names of references:

- **Professor Lakhdhar Remaki,** Department of Mathematics and Computer Science Alfaisal University, P.O. Box 50927, Riyadh 11533, Saudi Arabia.
  Tel: +966-1- 215-8906
  Email: lremaki@alfaisal.edu
- **Professor Driss Yakoubi,** Department of Mathematics, Pole Universitaire Léonard de Vinci, France.
  Tel: (+33) 749877227
  Email: driss.yakoubi@devinci.fr
- **Professor Sami Baraket,** Department of Mathematics, Faculty of Sciences of Tunis, University of Tunis El Manar, Tunisia.
  Tel: + 216 70 734 109 ; Fax : 00 216 71 885 350 ; Mobile : + 216 98 468 885
  Email: smbaraket@yahoo.fr
- **Professor Mohamed Farhloul**, Department of Mathematics and Statistics, University of Moncton, New Brunswick, E1A 3E9, Canada.
  Tel: (506)858-3769
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  Email: mohamed.farhloul@umoncton.ca
- **Professor Najwan H. Alsadat,** Department of Quantitative Analysis, College of Business Administration, King Saud University, P.O. Box 71115, Riyadh 11587, Saudi Arabia.
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  Email: nalsadat@ksu.edu.sa
- ***Professor Christine Bernardi (****Passed away in March 2018)*

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