UNIVERSITÀ DEGLI STUDI DI MILANO

TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO ID CODE 4585

I the undersigned asks to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di Matematica Federigo Enriques**

Scientist- in – charge: **Simone Scacchi**

Nicolas Alejandro Barnafi

CURRICULUM VITAE

PERSONAL INFORMATION

Surname	Barnafi
Name	Nicolas Alejandro
Date of birth	02/07/1991

PRESENT OCCUPATION

Appointment	Structure
Ph.D. student	Politecnico di Milano

EDUCATION AND TRAINING

Degree	Course of studies	University	Year of achievement of the degree
Degree	Bachelor in the Engineering Sciences	Pontificia Universidad Católica de Chile	2015
Specialization	Industrial Engineering, diploma in Mathematics	Pontificia Universidad Católica de Chile	2017
PhD	Mathematical Models and Methods in Engineering	Politecnico di Milano	Expected: 10/2020
Master	Master in the Engineering Sciences	Pontificia Universidad Católica de Chile	2017
Degree of medical specialization			
Degree of European specialization			
Other			

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REGISTRATION IN PROFESSIONAL ASSOCIATIONS

Date of registration	Association	City

FOREIGN LANGUAGES

Languages	level of knowledge
Spanish	Native
Italian	Advanced (non certified)
English	C2 (IELTS certification)

AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award
2017	Best Master's thesis in Mathematical Engineering
2017	Winner of Big Data Marathon

TRAINING OR RESEARCH ACTIVITY

My formation has been focused mainly on the theory and practice of the finite elements method in biological applications. During my Master studies, I worked on the development of a mixed formulation for deformable image registration, argument on which I have continued working afterwards. So far, together with my colleagues, we have developed a rigurous a-posteriori refinement strategy for both primal and mixed formulations, and also a novel formulation which allows for registration with more physically relevant boundary conditions. This work was entirely implemented in the FEniCS library.

During my PhD studies I have been part of the iHeart project, which consists in the development of a mathematical model of the human heart. My role in this project has been the study of cardiac poromechanics models and the development of efficient numerical strategies for their solution. I have worked mainly on four aspects:

(i) The numerical analysis of a linearized poromechanics model, where we proved a novel inf-sup condition for a generalized Stokes problem

(ii) The mathematical modeling of nonlinear cardiac poromechanics, involving also the constitutive modeling and its coupling with the other physics, in particular electromechanics and coronary blood circulation

(iii) The development of splitting schemes for linear poromechanics and their extension to the nonlinear framework

(iv) The implementation of the poromechanics models in lifex, which is a C++ library and is the main tool used in the iHeart project for numerical simulations. In addition, smaller conceptual tests have been developed in FEniCS

PROJECT ACTIVITY

Year	Project
2017-2020	iHeart: An integrated Heart Model for the Simulation of the Cardiac Function

PATENTS

None

CONGRESSES AND SEMINARS

Date	Title	Place
2020	Structure, Regularity and Robustness in the Approximation of PDEs	Milan, Italy
2019	HPC for Industry 4.0	Milan, Italy
2019	RISM iHeart: Modelling the Cardiac Function	Varsese, Italy
2019	Mathematical and Computational Aspects of Machine Learning	Pisa, Italy
2019	Intelligent Machines and Mathematics	Bologna, Italy
2018	Mathematical and Numerical Modeling of the Cardiovascular System	Rome, Italy
2016	WONAPDE ‘16	Concepción, Chile
2016	Annual Meeting ‘16	Boston, USA
2016	Computational Methods in Biology and Biomedicine	Santiago, Chile

PUBLICATIONS

Books
Barnafi N, Gatica GN, Hurtado DE. Primal and mixed finite element methods for deformable image registration problems. SIAM Journal on Imaging Sciences. 2018;11(4):2529-67

Articles in reviews
Barnafi N, Zunino P, Dede’ L, Quarteroni A. Mathematical analysis and numerical approximation of a general linearized poro-hyperelastic model. Computers and Mathematics with Application.

Congress proceedings
None

OTHER INFORMATION

(To be submitted) Barnafi N, Gatica GN, Hurtado DE, Miranda W, Ruiz-Baier R. A posteriori error estimates for primal and mixed finite element approximations of the deformable image registration problem.

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(To be submitted) Barnafi N, Gatica GN, Hurtado DE, Miranda W, Ruiz-Baier R. New primal and dual-mixed finite element methods for stable image registration with singular regularization.
I have worked in the industry with two companies in the development of classification models using machine learning techniques: LATAM and FORIS. In the former, the context was user navigation in the company website, whereas in the latter the contexts were natural language processing and university dropout.
I was president and founder of the SIAM-PUC student chapter, where I worked in the organization of numerous seminars and a national meeting of mathematical engineers called ENIM.

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

Place and date: Milan, Italy, 10/06/2020

SIGNATURE

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