

Leonardo Figueroa

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Employment

2014/3–	Assistant professor, Departamento de Ingeniería Matemática, Facultad de Ciencias Físicas y Matemáticas, Universidad de Concepción
2011/11– 2014/2	Postdoctoral fellow, Centro de Investigación en Ingeniería Matemática, Universidad de Concepción
2007-I	Research assistant in project <i>Matemáticas II</i> , Centro de Modelamiento Matemático, Universidad de Chile
2002-I	Research assistant, Facultad de Ciencias Físicas y Matemáticas, Universidad de Concepción

Education

2007–2011	D.Phil. in Numerical Analysis, University of Oxford Supervisor: Prof. Endre Süli; Thesis: Deterministic Simulation of Multi-Beaded Models of Dilute Polymers
2001–2006	Mathematical Engineering, Universidad de Concepción Supervisor: Prof. Gabriel Gatica; Thesis: An Augmented Mixed Finite Element Method for Incompressible Elasticity and GMRES Iteration of its Compressible Counterpart
2001–2004	B.Sc. in Mathematical Engineering, Universidad de Concepción

Research interests

Orthogonal Polynomials, Approximation Theory, Spectral Methods

Numerical approximation of Boundary Value Problems from Continuum Mechanics, high-dimensional Partial Differential Equations and Partial Differential Equations with singular coefficients

Finite Element methods

Publications

Orthogonal polynomial projection error in Dunkl–Sobolev norms in the ball, with Gonzalo A. Benavides, *J. Approx. Theory* 261 (2021), 105495, doi:10.1016/j.jat.2020.105495

Orthogonal polynomial projection error measured in Sobolev norms in the unit ball, *J. Approx. Theory* 220 (2017), 31–43, doi:10.1016/j.jat.2017.04.003

Orthogonal polynomial projection error measured in Sobolev norms in the unit disk, *Constr. Approx.* 46 (2017), no. 1, 171–197, doi:10.1007/s00365-016-9358-y

Greedy approximation of high-dimensional Ornstein–Uhlenbeck operators, with Endre Süli, *Found. Comput. Math.* 12 (2012), no. 5, 573–623, doi:10.1007/s10208-012-9122-z

A priori and a posteriori error analysis of an augmented mixed finite element method for incompressible fluid flows, with Gabriel N. Gatica and Norbert Heuer, *Comput. Methods Appl. Mech. Engrg.* 198 (2008), no. 2, 280–291, doi:10.1016/j.cma.2008.07.018

Augmented mixed finite element methods for the stationary Stokes equations, with Gabriel N. Gatica and Antonio Márquez, *SIAM J. Sci. Comput.* 31 (2008/09), no. 2, 1082–1119, doi:10.1137/080713069

Scientific presentations and posters

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| 2019/7 | On Dunkl–Sobolev orthogonal polynomials in the ball involving reflection-invariant weights, 15th International Symposium on Orthogonal Polynomials, Special Functions and Applications (OPSFA 2019), Hagenberg-im-Mühlkreis |
| 2019/1 | High-Order Sobolev Orthogonal Polynomials, Approximation Theory and Spectral Methods in the Ball, Sixth Chilean Workshop on Numerical Analysis of Partial Differential Equations, Universidad de Concepción, Concepción |
| 2018/11 | On weighted Sobolev orthogonal polynomials in the ball, Analysis Seminar, Department of Mathematics, University of Oregon, Eugene |
| 2018/6 | On higher-order Sobolev orthogonal polynomials in the ball, Congreso de Matemática Capricornio, Antofagasta |
| 2017/4 | Approximation theory and spectral methods with Sobolev orthogonal polynomials, XXX Jornada de Matemática de la Zona Sur, Universidad Católica de la Santísima Concepción, Concepción |
| 2016/12 | <i>Proyección ortogonal sobre polinomios y espacios de Sobolev ponderados en la bola euclideana</i> , Primer Encuentro Conjunto Sociedad Matemática de Chile y Unión Matemática Argentina, Valparaíso |
| 2016/8 | <i>Bases y espacios de polinomios ortogonales en la bola</i> , Coloquio del Departamento de Ingeniería Matemática, Universidad de Concepción, Concepción |
| 2016/1 | On spectral differentiation on the disk, Fifth Chilean Workshop on Numerical Analysis of Partial Differential Equations, Universidad de Concepción, Concepción |

Scientific presentations and posters (continued)

- 2015/8 Function spaces, orthogonal polynomials and spectral methods on the unit disk, Congreso de Matemática Capricornio, Iquique
- 2015/7 Computational aspects of the elasticity module of a variational model for block caving, Encuentro de elasticidad no lineal, homogeneización y fractura, Pontificia Universidad Católica de Chile, Santiago
- 2015/2 Analytical Aspects of Orthogonal Expansions on the Unit Disk, Sydney Dynamics Group Seminar, University of Sydney, Sydney
- 2014/9 Eigenvalue problems on the unit disk by the hyperspherical method (*sic*), Latest Advances in Numerical Solutions with FEM, Puerto Varas
- 2014/5 *Polinomios ortogonales y métodos espectrales en el círculo*, Coloquio del Departamento de Ingeniería Matemática, Universidad de Concepción, Concepción
- 2014/2 Finite element approximation of a quasi-static model of rock detachment, Computational Mathematics and Applications Seminar, University of Oxford, Oxford
- 2013/12 Greedy-type algorithms based on finite element discretizations approximating elliptic PDE on Cartesian product domains, Séptimo Encuentro de Análisis Numérico de Ecuaciones Diferenciales Parciales, Pontificia Universidad Católica de Valparaíso, Valparaíso
- 2013/11 Zernike-type polynomials and approximation of functions on Cartesian powers of the unit disk, Séminaire de Calcul Scientifique, CERMICS, École des Ponts ParisTech, Paris
- 2013/8 Polynomial approximation and spectral methods on the unit disk, Congreso de Matemática Capricornio, La Serena
- 2013/1 Concrete Greedy Algorithms Approximating High-dimensional PDE, Fourth Chilean Workshop on Numerical Analysis of Partial Differential Equations, Universidad de Concepción, Concepción
- 2012/8 Spectral bases for concrete Greedy Algorithms approximating a high-dimensional PDE, Congreso de Matemática Capricornio, Antofagasta
- 2011/12 Greedy Approximation of a High-Dimensional PDE arising from Kinetic Theory Models of Dilute Polymers, Sexto Encuentro de Análisis Numérico de Ecuaciones Diferenciales Parciales, La Serena
- 2011/11 Greedy approximation of a singular and high-dimensional elliptic PDE using spectral bases, Seminario de Análisis Numérico de EDPs, Departamento de Matemática, Universidad del Bío-Bío, Concepción
- 2010/11 On an abstract method to approximate the solution of a high-dimensional degenerate elliptic PDE, Oxford University Numerical Analysis Group Internal Seminar, Oxford

Scientific presentations and posters (continued)

2010/7	Separated representation approximation of a high-dimensional Fokker–Planck PDE for dilute polymers (poster), LMS-EPSC Durham Symposium on Numerical Analysis of Multiscale Problems, Durham
2010/2	Towards a tensor-decomposition technique for high-dimensional PDE (poster), 3rd Oxford University SIAM Student Chapter Conference, Oxford
2009/7	Tackling a high-dimensional PDE arising from the kinetic theory of polymeric solutions, 23rd Biennial Conference on Numerical Analysis, Glasgow
2006/8	A priori and a posteriori analysis of an augmented mixed finite element method for incompressible elasticity, Congreso de Matemática Capricornio, La Serena
2006/8	<i>Dinámica y control de un brazo robótico flexible</i> , Jornada de Mecánica Computacional, Concepción

Research projects

2020/8–2022/7	Dunkl–Sobolev spaces, orthogonal polynomials and approximation (VRID-Investigación 220.013.047-INV), Universidad de Concepción, main researcher
2018/4–2020/3	Orthogonal polynomials and fast spectral methods in special geometries (FONDECYT 1181957), funded by CONICYT, main researcher
2015/6–2017/5	Fast spectral methods on balls (VRID-Enlace 215.013.040-1.0), Universidad de Concepción, main researcher
2013/3–2015/2	Approximation of high-dimensional partial differential equations arising in continuum mechanics problems using Greedy Algorithms (FONDECYT 1130923), funded by CONICYT, main researcher

Outreach talks

2020/3	<i>Mi aproximación de la aproximación de la aproximación es mejor que tu aproximación de la aproximación de la aproximación</i> , YouTube
2017/8, 2017/11	<i>Mi aproximación de la aproximación de la aproximación es mejor que tu aproximación de la aproximación de la aproximación</i> , Universidad de Concepción
2014/10	<i>En matemáticas el genérico también es más barato</i> , Liceo Domingo Ortiz de Rozas, Coelemu and Instituto San Sebastián, Yumbel

Research stays

2006/1–3	Brunel Institute of Computational Mathematics, London; Fundación Andes project C-14040
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Teaching experience

2017-II	525476 <i>Métodos Espectrales</i> (Spectral Methods), Universidad de Concepción
2016-II	525223 <i>Ecuaciones Diferenciales</i> (Differential Equations), Universidad de Concepción
2016-II	525490 <i>Taller II</i> (Applied Mathematics Workshop II), Universidad de Concepción
2015-II, 2018-II, 2019-II	525501 <i>Ecuaciones Diferenciales Parciales y Aplicaciones I</i> (Partial Differential Equations), Universidad de Concepción
2015-I, 2018-I, 2020-I	4220017 <i>Mecánica del Medio Continuo</i> (Continuum Mechanics; doctoral level course), Universidad de Concepción
2014-II	408634 <i>Teoría de Elementos Finitos</i> (Theory of Finite Element Methods; doctoral level course), Universidad de Concepción
2014-II, 2015-II, 2017-I, 2018-I, 2019-I	521230 <i>Cálculo Numérico</i> (Numerical Analysis), Universidad de Concepción
2014-I, 2015-I, 2016-I, 2017-I, 2020-I	525402 <i>Análisis Funcional II</i> (Functional Analysis), Universidad de Concepción
2013-I, 2014-I	4220032 <i>Métodos Espectrales</i> (Spectral Methods; doctoral level course), Universidad de Concepción
2013-II, 2016-I, 2019-I, 2020-II	4220014 <i>Análisis Funcional</i> (Functional Analysis; doctoral level course), Universidad de Concepción
2010/10–12	Msc Numerical Solution of Differential Equations I (tutor and marker), University of Oxford
2008/1–3, 2009/1–3, 2011/1–3	Part A Numerical Analysis (once as tutor and three times as marker), University of Oxford
2010/4	Recognised as having completed Preparation for Learning and Teaching (Stage 1), University of Oxford
2007-I	512537 <i>Elementos Finitos</i> (Finite Element Method; teaching assistant and problem designer), Universidad de Concepción
2007-I	MAT 1110 <i>Matemáticas I</i> (Mathematics for biologists; part-time lecturer), Universidad Católica de la Santísima Concepción
2004-II	521234 <i>Complemento de Cálculo</i> (Advanced Calculus for engineers; teaching assistant), Universidad de Concepción
2003, 2004-I	521230 <i>Cálculo Numérico</i> (Numerical Analysis; teaching assistant), Universidad de Concepción

Thesis supervision

2020/3 Gonzalo Benavides, Mathematical Civil Engineering, Universidad de Concepción; Thesis: [Orthogonal Polynomials with Reflection-Invariant Weights](#)

Participation in thesis committees

2018/9 Cinthya Rivas, PhD in Applied Sciences with mention in Mathematical Engineering, Universidad de Concepción

2015/1 Ernesto Cáceres, Mathematical Civil Engineering, Universidad de Concepción

2012/8 Walter Rudolph, Mathematical Civil Engineering, Universidad de Concepción

Participation in event organizing committees

2019/10 *Escuela de Primavera de Análisis Numérico*, Universidad de Concepción

2019/1 Sixth Chilean Workshop on Numerical Analysis of Partial Differential Equations (WONAPDE 2019), Universidad de Concepción

2016/1 Fifth Chilean Workshop on Numerical Analysis of Partial Differential Equations (WONAPDE 2016), Universidad de Concepción

2014/9 *Escuela de Primavera de Análisis Numérico*, Universidad de Concepción

Scholarships and prizes

2007–2011 *Presidente de la República* scholarship for overseas postgraduate study

2007 *Universidad de Concepción* prize for the best graduate from the Mathematical Engineering programme

2006 Undergraduate thesis support scholarship of the Centro de Modelamiento Matemático of the Universidad de Chile

2003 Mathematical Engineering scholarship for the best non-freshman student

2002 Mathematical Engineering scholarship for best entrance scores

2001 Universidad de Concepción scholarship for the top ten Academical Aptitude Test scores

2001 Best regional score in Academical Aptitude Test, language part

Skills

Languages: Native Spanish, advanced English

Coding: Expert in \LaTeX and Matlab; proficient in C, Fortran, Python, Julia and Mathematica

Last updated on November 2020