José C. Garay

Curriculum Vitae

PERSONAL DETAILS

Address	Institute of Mathematics, University of Augsburg. Universitätsstrasse 12a, 86159 Augsburg
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Email	jose.garay.fernandez@uni-a.de
Website	https://tue62222.wixsite.com/jcgaray
Git	https://github.com/jcgarayf/Codes

RESEARCH INTERESTS

Numerical Analysis in general and Numerical Linear Algebra in particular, Domain Decomposition Methods, High-Performance Computing, Asynchronous Algorithms, Multiscale/Multiphysics Problems, and Scientific Machine Learning.

EDUCATION

Ph.D. in Mathematics 2018
Temple University *Philadelphia, PA, USA*

- Dissertation title: Asynchronous Optimized Schwarz Methods for Partial Differential Equations in Rectangular Domains. Advisor: Daniel B. Szyld. Co-Advisor: Frédéric Magoulès.

M.Sc. in Mathematics 2017
Temple University *Philadelphia, PA, USA*

B.Sc. in Electronics Engineering 2011
Universidad Nacional de Asunción *San Lorenzo, Paraguay*

- Thesis title: Simulation of Cyclic Two-Phase Flow in Homogeneous Porous Media.

CERTIFICATIONS

IBM Data Science Professional Certificate 2021
IBM

- Earned certificates on courses "What is data science?" and "Tools for data science."

PUBLICATIONS

[1] José C. Garay, Frédéric Magoulès, and Daniel B. Szyld. *Syncrhonous and Asynchronous Optimized Schwarz Methods for Poisson's Equation in Rectangular Domains.* Electronic Transactions on Numerical Analysis (ETNA), vol. 55 (2022), pp. 744-791.

[2] Susanne C. Brenner, José C. Garay and Li-yeng Sung. *Multiscale Finite Element Methods For An Elliptic Optimal Control Problem With Rough Coefficients.* J. Sci. Comput. 91, 76 (2022). https://doi.org/10.1007/s10915-022-01834-7.

[3] Susanne C. Brenner, José C. Garay and Li-yeng Sung. *Additive Schwarz Preconditioners for a Localized Orthogonal Decomposition Method.* Electronic Transactions on Numerical Analysis, Vol. 54 (2021), pp. 234-255.

[4] Mireille El Haddad, José C. Garay, Frédéric Magoulès and Daniel B. Szyld. *Synchronous and Asynchronous Optimized Schwarz Methods for One-way Subdivision of Bounded Domains.* Numerical Linear Algebra with Applications, vol. 27 (2020) paper e2779 (30 pages).

[5] José C. Garay, Frédéric Magoulès, and Daniel B. Szyld. *Convergence of Asynchronous Optimized Schwarz Methods in the plane.* Proceedings of the 24th International Conference on Domain Decomposition Methods. Peter E. Bjostard, Susanne C. Brenner, Laurence Halpern, Ralf Kornhuber, Hyea Hyun Kim, Talal Rahman, and Olof B. Widlund, eds., Lecture Notes in Computer Science and Engineering, vol. 125, Springer, Berlin and Heidelberg, 2018.

[6] José C. Garay, Frédéric Magoulès, and Daniel B. Szyld. *Optimized Schwarz Method for Poisson's Equation in Rectangular Domains.* Proceedings of the 24th International Conference on Domain Decomposition Methods. Peter E. Bjostard, Susanne C. Brenner, Laurence Halpern, Ralf Kornhuber, Hyea Hyun Kim, Talal Rahman, and Olof B. Widlund, eds., Lecture Notes in Computer Science and Engineering, vol. 125, Springer, Berlin and Heidelberg, 2018.

TALKS

2011 - *Simulation of Cyclic Two-Phase Flow in Homogeneous Porous Media.* Facultad Politécnica of the Universidad Nacional de Asunción. Asunción, Paraguay.

2011 - *Simulation of Cyclic Two-Phase Flow in Homogeneous Porous Media.* Parque tecnológico de ITAIPU (ITAIPU R&D, an electricity generating government agency). Asunción, Paraguay.

2017 - *Asynchronous Optimized Schwarz Methods for Poisson's Equation in Rectangular Domains.* Mid-Atlantic Numerical Analysis Day. Temple University, Philadelphia, PA, USA.

2018 - *Asynchronous Optimized Schwarz Methods for Poisson's Equation in Rectangular Domains.* SIAM Conference on Applied Linear Algebra. Hong Kong.

2018 - *Asynchronous Optimized Schwarz Methods for Poisson's Equation in Rectangular Domains.* 25th International Domain Decomposition Conference, DD XXV. St. John's, Newfoundland, Canada.

2018 - *Asynchronous Optimized Schwarz Methods for Partial Differential Equations in Rectangular Domains.* Computational Mathematics Seminar Series. Louisiana State University, Baton Rouge, LA, USA.

2019 - *Asynchronous Optimized Schwarz Methods for the Screened Poisson Equation in Rectangular Domains.* Scientific Computing around Louisiana Meeting, SCALA 2019. Tulane University, New Orleans, LA, USA.

2019 - *Asynchronous Optimized Schwarz Methods for the Screened Poisson Equation in Rectangular Domains.* International Congress on Industrial and Applied Mathematics, ICIAM 2019. Valencia, Spain.

2019 - *Preconditioning the Localized Orthogonal Decomposition Method for Multiscale Elliptic PDEs.* Fall 2019 Finite Element Circus. Virginia Tech, Blacksburg, Virginia, USA.

2020 - *Preconditioning the Localized Orthogonal Decomposition Method for Multiscale Elliptic PDEs.* Scientific Computing around Louisiana Meeting, SCALA 2020. Louisiana State University, Baton Rouge, LA, USA.

2020 - *Additive Schwarz Preconditioners for a Localized Orthogonal Decomposition Method*. Communications in NLA. Online seminar.

2020 - *Additive Schwarz Preconditioners for a Localized Orthogonal Decomposition Method*. 26th International Domain Decomposition Conference, DD XXVI. Virtual Conference.

2021 - *Additive Schwarz Preconditioners for a Localized Orthogonal Decomposition Method*. Mathematical Congress of the Americas, MCA 2021. Virtual Conference.

2021 - *Multiscale Finite Element Methods For An Elliptic Optimal Control Problem With Rough Coefficients*. The Finite Element Circus Fall 2021. State College, Pennsylvania, USA.

2022 - *Multiscale Finite Element Methods For An Elliptic Optimal Control Problem With Rough Coefficients*. Latest Trends and Insights into Matrix Theory, Iterative Methods, and Preconditioning. Philadelphia, Pennsylvania, USA.

2022 - *Multiscale Finite Element Methods For An Elliptic Optimal Control Problem With Rough Coefficients*. 17th Copper Mountain Conference On Iterative Methods. Virtual Conference.

2022 - *Multiscale Finite Element Methods For An Elliptic Optimal Control Problem With Rough Coefficients*. The Second International Conference on Computational Methods and Applications in Engineering, ICCMAE 2022. Starkville, Mississippi, USA.

2022 - *Multiscale Finite Element Methods For An Elliptic Optimal Control Problem With Rough Coefficients*. 2022 SIAM Annual Meeting (AN22). Pittsburgh, Pennsylvania, USA.

2022 - *Multiscale Finite Element Methods For An Elliptic Optimal Control Problem With Rough Coefficients And Control Constraints*. The Fall 2022 Finite Element Circus. Pittsburgh, Pennsylvania, USA.

2023 - *Multiscale Finite Element Methods For An Elliptic Optimal Control Problem With Rough Coefficients And Control Constraints*. The 29th Biennial Numerical Analysis Conference. Glasgow, Scotland.

2023 - *DD-LOD: A Localized Orthogonal Decomposition Method for Elliptic Problems with Rough Coefficients Based on Domain Decomposition Techniques*. Mathematics of Computation Research Seminar. Universität Bonn, Bonn, Germany.

POSTER PRESENTATIONS

2017 – *Asynchronous Optimized Schwarz Methods for Poisson's Equation in Rectangular Domains* - International Conference on Domain Decomposition Methods DD XXIV - Svalbard, Longyearbyen, Norway.

2017 – *Asynchronous Optimized Schwarz Methods for Poisson's Equation in Rectangular Domains* - SIAM Conference on Computational Science and Engineering – Atlanta, Georgia, USA.

2017 – *Asynchronous Optimized Schwarz Methods for Poisson's Equation in Rectangular Domains* - Householder Symposium XX on Numerical Linear Algebra – Blacksburg, Virginia, USA.

2018 – *Asynchronous Optimized Schwarz Methods for the Screened Poisson Equation in Rectangular Domains* - Celebrating 75 Years of Mathematics of Computation Symposium – Providence, Rhode Island, USA.

2019 – *Asynchronous Optimized Schwarz Methods for the Screened Poisson Equation in Rectangular Domains* - Parallel Solution Methods for Systems Arising from PDEs Workshop - Marseille, France.

PROFESSIONAL MEETINGS

2015 Gene Golub SIAM Summer School on RandNLA June 2015
Delphi, Greece
School on Randomized Numerical Linear Algebra

2015 AARMS Workshop on Domain Decomposition Methods for PDEs August 2015
Halifax, Nova Scotia, Canada

SIAM Conference on Applied Linear Algebra October 2015
Atlanta, GA, United States

14th Copper Mountain Conference on Iterative Methods March 2016
Copper Mountain, Colorado, United States

International Conference on Domain Decomposition Methods, DD XXIV Feb. 2017
Svalbard, Longyearbyen, Norway

SIAM Conference on Computational Science and Engineering February - March 2017
Atlanta, Georgia, USA

Householder Symposium XX on Numerical Linear Algebra June 2017
Blacksburg, Virginia, USA

15th Copper Mountain Conference on Iterative Methods March 2018
Copper Mountain, Colorado, United States

SIAM Conference on Applied Linear Algebra May 2018
Hong Kong

25th International Domain Decomposition Conference, DD XXV July 2018
St. John's, Newfoundland, Canada

Celebrating 75 Years of Mathematics of Computation Symposium Nov. 2018
Providence, Rhode Island, USA

The Fall 2018 Finite Element Circus Nov. 2018
Newark, Delaware, USA

Scientific Computing around Louisiana Meeting, SCALA 2019 Feb. 2019
New Orleans, Louisiana, USA

Oberwolfach Seminar: Beyond Numerical Homogenization June 2019
Oberwolfach, Germany

International Congress on Industrial and Applied Mathematics, ICIAM 2019 July 2019
Valencia, Spain

Parallel Solution Methods for Systems Arising from PDEs Workshop Sept. 2019
Marseille, France

The Fall 2019 Finite Element Circus Nov. 2019
Blacksburg, Virginia, USA

Scientific Computing around Louisiana Meeting, SCALA 2020 Feb. 2020
Baton Rouge, Louisiana, USA

The Second Joint SIAM/CAIMS Annual Meeting (AN20) July 2020
Virtual Conference

50th Anniversary Finite Element Circus Meeting Nov. 2020
Virtual Conference

Broadening Participation: 2020 MPS Workshop for New Investigators Nov. 2020
Virtual Workshop

26th International Domain Decomposition Conference, DD XXVI Dec. 2020
Virtual Conference

SIAM Conference on Computational Science and Engineering (CSE21) March 2021
Virtual Conference
East Coast Optimization Meeting 2021 April 2021
Virtual Conference
Spring 2021 Finite Element Circus Meeting April 2021
Virtual Conference
Mathematical Congress of the Americas, MCA 2021 July 2021
Virtual Conference
Argonne Training Program on Extreme-Scale Computing, ATPESC 2021 August 2021
Virtual Workshop
The Finite Element Circus Fall 2021 Nov. 2021
State College, Pennsylvania, USA
Summer School on Advanced Domain Decomposition Methods Nov. 2021
Milan, Italy (virtual attendance)
Latest Trends and Insights into Matrix Theory, Iterative Methods, and Preconditioning March 2022
Philadelphia, Pennsylvania, USA
East Coast Optimization Meeting 2022 March - April 2022
Virtual Conference
17th Copper Mountain Conference On Iterative Methods April 2022
Virtual Conference
The Spring 2022 Finite Element Circus April 2022
Gainesville, Florida, USA
The Second International Conference on Computational Methods and Applications in Engineering, ICCMAE 2022 May 2022
Starkville, Mississippi, USA
2022 SIAM Annual Meeting (AN22) July 2022
Pittsburgh, Pennsylvania, USA
The Fall 2022 Finite Element Circus October 2022
Pittsburgh, Pennsylvania, USA
East Coast Optimization Meeting 2023 April 2023
Virtual Conference hosted by George Mason University
Jena-Augsburg-Meeting (JAM) on Numerical Analysis June 2023
Augsburg, Germany
Workshop on Numerical Analysis of Nonlinear Schrödinger Equations June 2023
Ausgburg, Germany
The 29th Biennial Numerical Analysis Conference June 2023
Glasgow, Scotland

WORK EXPERIENCE

Postdoctoral Researcher 2023-Present
University of Augsburg (Supervisor: Daniel Peterseim) *Augsburg, Germany*
Postdoctoral Researcher 2018-2022
Louisiana State University (Supervisor: Susanne Brenner) *Baton Rouge, LA, USA*

- Developed and implemented in MATLAB a numerical solver for the solution of an elliptic PDE with rough coefficients based on a Localized Orthogonal Decomposition method.

- Developed and implemented a high-performance computing parallel solver for the solution of a multiscale elliptic optimal control problem with a Localized Orthogonal Decomposition method, writing a parallel code in C language which integrates the PETSc library and using a supercomputer.
- Reduced the complexity of the parallel code development project by breaking it down into smaller parts to facilitate the management and completion of the whole project.

Research Assistant 2016-2017
Temple University (Supervisor: Daniel Szyld) *Philadelphia, PA, USA*

- Conducted an analysis of an asynchronous domain decomposition iterative method to understand its convergence behavior using techniques from functional analysis, linear algebra and PDE theory. Designed and implemented a MATLAB program to compute the convergence rate of the method and the optimal parameter that minimizes this convergence rate.
- Explored ways to mathematically model the behavior of a non-newtonian fluid observed in lab experiments by reviewing the literature on non-newtonian fluids and evaluating ways of coupling empirical data with first principle equations.

Teaching Assistant for Numerical Analysis I 2015
Temple University *Philadelphia, PA, USA*

- Graded homework and exams, led recitation sessions on the implementation of numerical methods with MATLAB for 17 students, and helped students better grasp course material during office hours.

Teaching Assistant for Math Patterns 2012-2013
Temple University *Philadelphia, PA, USA*

- Graded homework and exams, led recitation sessions, and helped students better grasp course material during office hours.

HONORS AND AWARDS

2013-2015 - Scholarship for Graduate Studies from ITAIPU (ITAIPU R&D, an electricity generating government agency).

2015 - SIAM student travel award. Travel support to attend the SIAM Conference on Applied Linear Algebra 2015.

2018 - Doctoral Dissertation Completion Fellowship from Temple University.

2018 - SIAM student travel award. Travel support to attend the SIAM Conference on Applied Linear Algebra 2018.

2018 - Recipient of Chateaubriand Fellowship from the Embassy of France in the United States (declined).

2018 - NSF Travel Award to attend the 25th International Domain Decomposition Conference, DD XXV.

2018 - Travel award to attend the Celebrating 75 Years of Mathematics of Computation Symposium at ICERM.

2019 - SIAM Travel Award to attend the 9th International Congress on Industrial and Applied Mathematics (ICIAM 2019).

2021 - 2021 Mathematical Congress of the Americas (MCA) Travel Grant from AMS.

2022 - NSF Travel Award to attend The Second International Conference on Computational Methods and Applications in Engineering, ICCMAE 2022.

OUTREACH AND SERVICE

Workshop on Numerical Analysis of Nonlinear Schrödinger Equations 2023
Local Organizer

MATLAB tutorial sessions 2017
Instructor

- Workshop organized by Temple University SIAM Student Chapter.

Temple University SIAM Student Chapter 2016-2018
Officer

Mathematical Contest in Modeling 2015-2017
Graduate student advisor at Temple University

MEMBERSHIPS

Society for Industrial and Applied Mathematics (SIAM) - Since 2015.

SKILLS

Languages	Spanish (mother tongue), English (fluent).
Programming Languages	MATLAB, C/C++, Python, R.
Software	MATLAB, LaTeX, Mathematica, Maple, PETSc (math library), Jupyter (notebook), Git, IBM Watson Studio, RStudio, Scikit-learn.