

# ALEJANDRO VÉLEZ-SANTIAGO

*Department of Mathematical Sciences  
University of Puerto Rico at Mayagüez*

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## EDUCATION

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2004 – 2010	University of Puerto Rico, Río Piedras, PR <i>Ph.D. Mathematics</i> PhD Dissertation: <i>The Laplacian with Nonlocal Robin Boundary Conditions</i> Advisor: Mahamadi J. Warma, Ph.D.
2000 – 2004	University of Puerto Rico, Río Piedras, PR <i>B.A. Mathematics</i>
1998 – 2003	Conservatory of Music, San Juan, PR <i>B.A. Music-Violin (not completed)</i>

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## PROFESSIONAL EXPERIENCE

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2020 – present	University of Puerto Rico at Mayagüez <i>Associate Professor of Mathematics</i>
2016 – 2019	University of Puerto Rico at Mayagüez <i>Assistant Professor of Mathematics</i>
2013 – 2016	University of California, Riverside, USA <i>Visiting Assistant Professor of Mathematics</i>
2011 – 2013	University of Puerto Rico, Humacao, PR <i>Adjunct Professor of Mathematics</i>
2010 – 2011	Iowa State University, Iowa, USA <i>Post-doctoral trainee in Mathematics</i>
2004 – 2010	University of Puerto Rico, Río Piedras, PR TA Mathematics & Math Instructor
2006 – 2010	Private classes, Canóvanas, PR <i>Violin Teacher</i>
1999 – 2005	Puerto Rico Symphony Orchestra, San Juan, PR <i>Violin Musician</i>

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## RESEARCH

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My primary research focuses on partial differential equations and analysis, mostly on elliptic and parabolic equations on non-smooth domains, and operator semigroups. Other areas of research and interest are potential theory, analysis on fractals, and operator theory (among others).

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## EXTERNAL FUNDING

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Agency: Puerto Rico Science, Technology & Research Trust

Agreement Number: 2022-00014

Project: *Boundary value problems of nonstandard growth structure over real-world regions*

Amount and Period: \$150,000 / July 16, 2021 - July 31, 2023

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## PUBLICATIONS: RESEARCH PAPERS

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1. M. R. Lancia, A. Vélez-Santiago. A priori estimates for general elliptic and parabolic boundary value problems over irregular domains. *Submitted* (2023).
2. G. Ferrer\*, A. Vélez-Santiago. 3D Koch-type crystals. *Journal of Fractal Geometry* (to appear).
3. C. Carvajal-Ariza\*, J. Henríquez-Amador\*, A. Vélez-Santiago. The generalized anisotropic dynamical Wentzell heat equation with nonstandard growth conditions. *Journal d'Analyse Mathématique* (to appear).
4. V. Díaz-Martínez\*, A. Vélez-Santiago. Generalized anisotropic elliptic Wentzell problems with nonstandard growth conditions. *Nonlinear Analysis: Real World Applications* **68** (2022), 103689.
5. M. M. Boureau, A. Vélez-Santiago. Applied higher-order elliptic problems with nonstandard growth structure. *Applied Mathematics Letters* **123** (2022), 107603.
6. J. Henríquez-Amador\*, A. Vélez-Santiago. Generalized anisotropic Neumann problems of Ambrosetti–Prodi type with nonstandard growth conditions. *Journal of Mathematical Analysis and Applications* **494** (2021), 124668.
7. K. Ríos-Soto, C. Seda-Damiani\*\*, A. Vélez-Santiago. The variable exponent Bernoulli differential equation. *Involve, a Journal of Mathematics* **12** (2019), 1279-1291.
8. M. R. Lancia, A. Vélez-Santiago, P. Vernole. A quasi-linear nonlocal Venttsel' problem of Ambrosetti–Prodi type on fractal domains. *Discrete & Continuous Dynamical Systems – Series A* **39** (2019), 4487-4518.
9. M. M. Boureau, A. Vélez-Santiago. Fine regularity for elliptic and parabolic anisotropic Robin problems with variable exponents. *Journal of Differential Equations* **266** (2019), 8164-8232.
10. S. Creo, M. R. Lancia, A. Vélez-Santiago, P. Vernole. Approximation of a nonlinear fractal energy functional on varying Hilbert spaces. *Communications on Pure and Applied Analysis* **17** (2018), 647-669.
11. A. Vélez-Santiago. A quasi-linear Neumann problem of Ambrosetti–Prodi type on extension domains. *Nonlinear Analysis: Theory, Methods & Applications* **160** (2017), 191-210.
12. M. R. Lancia, A. Vélez-Santiago, P. Vernole. Quasi-linear Venttsel problems with nonlocal boundary conditions on fractal domains. *Nonlinear Analysis: Real World Applications* **35** (2017), 265-291.
13. A. Vélez-Santiago. Embedding and trace results for variable exponent Sobolev and Maz'ya spaces on non-smooth domains. *Glasgow Mathematical Journal* **58** (2016), 471-489.

14. A. Vélez-Santiago. Ambrosetti–Prodi-type problems for quasi-linear elliptic equations with nonlocal boundary conditions. *Calculus of Variations and Partial Differential Equations* **54** (2015), 3439-3469.
15. A. Vélez-Santiago. Global regularity for a class of quasi-linear local and nonlocal elliptic equations on extension domains. *Journal of Functional Analysis* **269** (2015), 1-46.
16. A. Vélez-Santiago. On the well-posedness of first order variable exponent Cauchy problems with Robin and Wentzell-Robin boundary conditions on arbitrary domains. *Journal of Abstract Differential Equations and Applications* **6** (2015), 1-20.
17. A. Vélez-Santiago. Quasi-linear variable exponent boundary value problems with Wentzell-Robin and Wentzell boundary conditions. *Journal of Functional Analysis* **266** (2014), 560-615.
18. A. Vélez-Santiago. Solvability of linear local and nonlocal Robin problems over  $C(\Omega)$ . *Journal of Mathematical Analysis and Applications* **386** (2012), 677-698.
19. A. Vélez-Santiago. Quasi-linear boundary value problems with generalized nonlocal boundary conditions. *Nonlinear Analysis: Theory, Methods & Applications* **74** (2011), 4601-4621.
20. A. Vélez-Santiago, M. J. Warma. A class of quasi-linear parabolic and elliptic equations with nonlocal Robin boundary conditions. *Journal of Mathematical Analysis and Applications* **372** (2010), 120-139.

\* = graduate student    \*\* = undergraduate student

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#### PUBLICATIONS: BOOKS

1. L. F. Cáceres, O. Colón, J. Flores, D. Gutiérrez, F. Henao, J. Jiménez, S. López, J. Ortega, A. Portnoy, A. Vélez-Santiago. *OMPR Olimpiadas Matemáticas de Puerto Rico 2021--2022*. OMPR, UPRM, 2023.
2. L. F. Cáceres, O. Colón, D. Gutiérrez, F. Henao, J. Jiménez, S. López, J. Ortega, B. Morales, A. Portnoy, A. Vélez-Santiago. *OMPR Olimpiadas Matemáticas de Puerto Rico 2020--2021*. OMPR, UPRM, 2022.
3. L. F. Cáceres, O. Colón, D. Gutiérrez, B. Morales, A. Portnoy, A. Vélez-Santiago. *OMPR Olimpiadas Matemáticas de Puerto Rico 2019--2020*. OMPR, UPRM, 2021.
4. L. F. Cáceres, O. Colón, B. Morales, A. Portnoy, A. Vélez-Santiago. *OMPR Olimpiadas Matemáticas de Puerto Rico 2018--2019*. OMPR, UPRM, 2019.
5. L. F. Cáceres, O. Colón, B. Morales, A. Portnoy, P. A. Torres, A. Vélez-Santiago. *OMPR Olimpiadas Matemáticas de Puerto Rico 2017--2018*. Publicaciones AFAMaC, 2018.
6. L. F. Cáceres, O. Colón, A. Portnoy, P. A. Torres, A. Vélez-Santiago, M. Zepeda. *OMPR Olimpiadas Matemáticas de Puerto Rico 2016--2017*. Publicaciones AFAMaC, 2017.

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#### TALKS AT MATH CONFERENCES

- *A priori estimates for generalized inhomogeneous local and nonlocal heat equations over irregular regions*  
XV Congress 2022 on Evolution Equations and Functional Analysis Group

- (GAFEVOL)  
Universidad Nacional de Colombia, sede Manizales, Colombia  
November 28 – December 2, 2022
- *Feller diffusion processes over real world regions*  
Boricuas in Applied Mathematics: Fostering Collaborations in Puerto Rico  
2022 SACNAS National Conference  
San Juan, Puerto Rico (USA)  
October 28, 2022
  - *Análisis y Ecuaciones Diferenciales Parciales sobre una clase de cristales 3D de tipo fractal*  
XVIII Encuentro Internacional de Matemáticas (EIMAT)  
Universidad del Atlántico, Barranquilla, Colombia (virtual)  
October 20, 2022
  - *Generalized anisotropic elliptic Wentzell problems with nonstandard growth conditions*  
Special Session on Nonstandard Elliptic and Parabolic Regularity Theory with Applications  
American Mathematical Society (AMS) Sectional Meeting  
Chattanooga, Tennessee (USA)  
October 15-16, 2022
  - *If I am the solution of a Robin problem on a domain, how globally smooth can I be?*  
Latinx in the Mathematical Sciences 2022, Institute of Pure and Applied Mathematics (IPAM), Los Angeles, California (USA)  
July 7-9, 2022
  - *On the Feller property associated to general non-symmetric differential operators over irregular regions*  
Two days of PDEs in heterogeneous and irregular structures, “Sapienza”  
Università degli di Roma, Italy  
June 23-24, 2022
  - *Fine regularity for anisotropic Robin problem with nonstandard growth structure over irregular domains*  
7<sup>th</sup> Cornell Conference on Analysis, Probability and Mathematical Physics on Fractals, Cornell University, New York (USA)  
June 4-8, 2022
  - *The generalized anisotropic dynamical Wentzell heat equation with nonstandard growth conditions*  
SIDIM 2022 Mathematics, University of Puerto Rico, PR (virtual)  
February 26, 2022
  - *The generalized anisotropic Wentzell problem with nonstandard growth conditions*  
International Conference on Applied Mathematics and Numerical Methods, University of Craiova, Romania (Virtual Talk)  
October 29-31, 2020
  - *The Robin problem over irregular domains*  
Analysis Seminar, The University of Alabama, USA (Virtual Talk)  
October 16, 2020
  - *Fine regularity for the elliptic anisotropic Robin problem with nonstandard growth conditions*  
SIDIM XXXX Mathematics, University of Puerto Rico at Cayey, PR

- March 7, 2020
- *Anisotropic boundary value problems of nonstandard growth over non-smooth and fractal domains*  
Symposium of Research and Creative Work, University of Puerto Rico at Mayagüez, PR  
January 31, 2020
  - *Approximation of quasi-linear Koch-type fractal energy functionals on varying Hilbert spaces*  
Special Session on Fractal Geometry, Dynamical Systems and Applications, 2020 Joint Mathematics Meeting, Denver, Colorado (USA)  
January 18, 2020
  - *Global regularity for the Robin problem over irregular domains*  
Congress GAFEVOL: Functional Analysis and Evolution Equations, Barranquilla, Colombia  
November 26-29, 2019
  - *Fine regularity for the Robin problem over irregular domains*  
Math Colloquium, University of Puerto Rico at Mayagüez, PR  
October 10, 2019
  - *Global regularity for anisotropic Robin problems with nonstandard growth conditions*  
Joint Analysis/PDE seminar, Ohio State University, Ohio (USA)  
October 3, 2019
  - *New trends on boundary value problems of nonstandard growth over general domains*  
Symposium of Research and Creative Work, University of Puerto Rico at Mayagüez, PR  
September 13, 2019
  - *Solvability and global regularity for a class of anisotropic Robin problems with nonstandard growth conditions*  
Barcelona Analysis Conference, University of Barcelona, Barcelona, Spain  
July 27, 2019
  - *Solvability over  $C(\Omega)$  of the parabolic anisotropic Robin problem with variable exponents.*  
SIDIM XXXIX Mathematics, University of Puerto Rico at Humacao, PR  
March 2, 2019
  - *Approximation of Koch-type fractal energy functionals on varying Hilbert spaces*  
SIDIM XXXIII Mathematics, University of Puerto Rico at Río Piedras, PR  
March 24, 2018
  - *A class of nonlinear boundary value problems on general domains*  
Symposium of Research and Creative Work, University of Puerto Rico at Mayagüez, PR  
February 23, 2018
  - *A quasi-linear Neumann problem of Ambrosetti–Prodi type in extension domains.*  
Special Session: Analysis and Geometry of Fractals, American Mathematics Society (AMS) Fall 2017 Western Sectional Meeting, University of California, Riverside  
November 4-5, 2017

- *A quasi-linear Neumann problem of Ambrosetti–Prodi type in non-smooth domains*  
Advances in Analysis, PDE's and Related Applications.  
Mathematical Congress of the Americas, Montreal, Canada.  
July 24-28, 2017
- *Solvability of the variable exponent heat equation with Wentzell-Robin boundary conditions on arbitrary domains.*  
Current Trends in Function Spaces and Nonlinear Analysis.  
AMS Eastern Sectional Meeting, Hunter College, New York.  
May 6-7, 2017
- *The quasi-linear Venttsel' problem on the Koch snowflake domain*  
SIDIM XXXII Mathematics, University of Puerto Rico at Ponce, PR.  
March 3-4, 2017
- *Variable exponent differential equations with dynamical boundary conditions*  
Math Colloquium, University of Puerto Rico at Mayagüez, PR  
October 27, 2016
- *Global regularity for solutions of nonlocal Robin problems in a class of "bad" domains*  
SIDIM XXXI Mathematics, University of Puerto Rico at Humacao, PR  
March 4-5, 2016
- *Global regularity for Robin problems in a class of "bad" domains*  
Mathematics Colloquium, Department of Mathematics, University of Connecticut  
January 22, 2016
- *Global regularity for Robin problems in a class of "bad" domains*  
AMS Special Session on Fractal Geometry and Dynamical Systems  
2016 Joint Mathematics Meeting, Seattle, Washington, USA  
January 7, 2016
- *Ambrosetti–Prodi type problems for quasi-linear elliptic equations with nonlocal boundary conditions*  
Prairie Analysis Seminar, Department of Mathematics, Kansas State University  
September 25-26, 2015
- *Variable exponent dynamical boundary value problems on "bad" domains*  
Recent Developments in Continuum Mechanics and Partial Differential Equations  
University of Nebraska, Lincoln  
April 18-19, 2015
- *Variable exponent dynamical boundary value problems on "bad" domains*  
Mathematics Colloquia, Department of Mathematics, University of Arkansas,  
March 3, 2015
- *Parabolic variable exponent Wentzell-Robin problems on general domains*  
Analysis Seminar, Dipartimento di Matematica, "Sapienza" Università di Roma, Italy  
September 17, 2014
- *Ambrosetti–Prodi type problems for quasi-linear elliptic equations with nonlocal boundary conditions on non-smooth domains*  
The 10<sup>th</sup> AIMS International Conference on Dynamical Systems, Differential Equations, and Applications, Madrid, Spain  
July 7-11, 2014

- *Quasi-linear variable exponent elliptic and parabolic problems with Wentzell boundary conditions*  
2<sup>nd</sup> Joint International Meeting of the Israel Mathematical Union and the American Mathematical Society, Tel Aviv, Israel  
June 16-19, 2014
- *On the well-posedness of first order variable exponent Cauchy problems with Wentzell-Robin boundary conditions on arbitrary domains*  
2014 Joint Mathematics Meetings  
Baltimore Convention Center, Maryland  
January 15-18, 2014
- *Global regularity for a class of quasi-linear nonlocal elliptic equations*  
SIAM Conference in Analysis and Partial Differential Equations  
Orlando, Florida  
December 7-10, 2013
- *Quasi-linear variable exponent parabolic problems with Wentzell-Robin boundary conditions on non-smooth domains*  
Special Session: Fractal Geometry, Dynamical Systems and Mathematical Physics, American Mathematics Society (AMS) Fall 2013 Western Sectional Meeting, University of California, Riverside  
November 2-3, 2013
- *Ambrosetti–Prodi-type problems for quasi-linear elliptic equations with nonlocal boundary conditions*  
Special Session: From Harmonic Analysis to Partial Differential Equations: in Memory of Victor Shapiro, American Mathematics Society (AMS) Fall 2013 Western Sectional Meeting, University of California, Riverside  
November 2-3, 2013
- *Solvability of linear local and nonlocal Robin problems over  $C(\Omega)$*   
Special Session: Partial Differential Equations, American Mathematics Society (AMS) Spring 2013 Central Sectional Meeting, Iowa State University,  
April 27-28, 2013
- *On the well-posedness of first order variable exponent Cauchy problems with Robin boundary conditions on arbitrary domains*  
SIDIM XXVIII Mathematics, Metropolitan University of San Juan, PR  
March 1-2, 2013
- *Recent results for variable exponent Sobolev and Maz'ya spaces on non-smooth domains*  
SIDIM XXVII Mathematics, University of Puerto Rico, Mayagüez, PR  
March 2-3, 2012
- *Ecuaciones de valor en fronteras locales y no locales en dominios de dimensión alta*  
Seminar, Department of Mathematics, University of Puerto Rico, Humacao  
November 3, 2011
- *Quasi-linear elliptic equations with generalized nonlocal boundary conditions on non-smooth domains*  
Mathematical Physics and Dynamical Systems Seminar, University of California at Riverside  
May 12, 2011
- *On a quasi-linear elliptic equation with generalized boundary conditions and data*  
Partial Differential Equations Seminar, University of Iowa

- March 23, 2011
- *Quasi-linear parabolic equations with nonlocal Robin boundary conditions*  
Special Session: Recent Developments in Nonlinear Evolution Equations,  
American Mathematics Society (AMS) Spring 2011 Central Sectional Meeting,  
University of Iowa  
March 18-20, 2011
  - *Solvability of linear local and nonlocal Robin problems over  $C(\Omega)$*   
SIDIM XXVI Mathematics, University of Puerto Rico, Humacao, PR  
February 25-26, 2011
  - *On a quasi-linear elliptic equation with generalized boundary conditions and data*  
ISU Computational and Applied Mathematics Seminar, Iowa State University  
February 21, 2011
  - *On a quasi-linear equation with nonlocal Robin boundary conditions on non-smooth domains*  
66<sup>th</sup> Midwest Partial Differential Equations Seminar, University of Illinois,  
Chicago  
November 13-14, 2010
  - *Linear local and nonlocal Robin problems on extension domains*  
ISU Computational and Applied Mathematics Seminar, Iowa State University  
October 5, 2010
  - *The Laplacian with nonlocal Robin boundary conditions*  
Mathematics Colloquia, Iowa State University  
April 28, 2010
  - *The nonlocal Robin Laplacian on extension domains*  
SIDIM XXV Mathematics, University of Puerto Rico, Mayagüez, PR  
April 21-22, 2010

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## TEACHING

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I enjoy teaching. I love to lecture math courses and to get involve with students. A list of these courses is as follows:

- University of Puerto Rico at Mayagüez  
Pre-calculus II, Calculus I & II & III, Ordinary Differential Equations, Partial Differential Equations and Fourier Series, Advanced Calculus I & II, Undergraduate Seminar, Undergraduate Research, Real Analysis I & II (graduate), Complex Analysis (graduate), Introduction to Partial Differential Equations (graduate), Mathematics for the Modern Sciences, Introduction to Functional Analysis, Graduate Seminar I & II (graduate); Topics in Analysis I: Potential Theory (graduate); Topics in Analysis II: Fractal Geometry and Analysis; Special Topics: Advanced Functional Analysis (graduate), Topics in Pure Mathematics: The Laplacian over Arbitrary Domains (doctoral course at the UPR Río Piedras); Graduate Master's Thesis (graduate).
- Graduate Students who have completed their master's thesis under my mentorship:
  1. Javier Henríquez-Amador (May 2020)
  2. Victor Díaz-Martínez (December 2019)
  3. Carlos Carvajal-Ariza (June 2019)
- University of California Riverside  
Calculus I, II & III, Multivariable Calculus I & II, Ordinary Differential Equations.



In spring 2015, I was in charge of the following graduate research seminars:

- Fractal Research Group
- Mathematical Physics and Dynamical Systems
- University of Puerto Rico at Humacao  
College Algebra, Pre-calculus I & II, Calculus for Business Administration,  
Calculus for Physics Major, Linear Algebra
- Iowa State University  
Calculus I, Ordinary Differential Equations, Introduction to Partial  
Differential Equations
- University of Puerto Rico at Río Piedras  
College Algebra, Pre-calculus I & II, Calculus I & II, Modern Abstract  
Algebra

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#### COMMITTEE WORK / SERVICES

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- Faculty for Math Olympics in Puerto Rico (OMPR)
- Referee for the Journal of Mathematical Analysis and Applications
- Referee for the Journal of Mathematical Methods in the Applied Sciences
- Referee for Discrete and Continuous Dynamical Systems
- Referee for Mathematics in Engineering
- Referee for Rendiconti del Circolo Matematico di Parlamento
- Referee for Advances in Operator Theory
- Referee for the Journal of Fractal Geometry
- Referee for Rocky Mountain Journal of Mathematics
- Referee for Zeitschrift fuer Angewandte Mathematik und Physik
- Reviewer for Math Reviews
- Member of the Graduate Committee at the Department of Mathematical Sciences, UPRM
- Member of the Committees of Pure and Applied Mathematics at the Department of Mathematical Sciences, UPRM
- Member of the Academic Orientation and Enrollment Committee of the Department of Mathematical Sciences, UPRM
- Member of the SIDIM Mathematics Committee

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#### MEMBERSHIPS / ORGANIZATIONS

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- American Mathematical Society (AMS)
- Mathematical Association of the Americas (MAA)
- Association of Christians in the Mathematical Sciences (ACMS)
- Society for Advancement of Hispanic / Chicano and Native American in Science (SACNAS) [lifetime member]

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#### OTHER SKILLS AND KNOWLEDGE

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- Officially Certified as Online Teacher
- Basic computer software: MS Windows, Latex, Internet

Alejandro Vélez-Santiago

- Bilingual: English / Spanish

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#### ADDITIONAL COMMENTS

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- Excellent interrelation with people and promoter of good and organized office environment
- Ability to work independently, according to priorities, as per business needs
- Great passion for education and research, and strong results oriented

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#### REFERENCES

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Available upon request

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