

## LEONARDO ANDRÉS ZEPEDA-NÚÑEZ

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### POSITIONS

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- Massachusetts Institute of Technology, Cambridge MA, USA** *June 2017 - present*  
Visiting Scholar  
Mentor: Pr. Laurent Demanet.
- University of California, Irvine CA, USA** *July 2015 - July 2017*  
Visiting Assistant Professor in Mathematics  
Mentor: Pr. Hongkai Zhao.
- Massachusetts Institute of Technology, Cambridge MA, USA** *June 2016 - September 2016*  
Visiting Scholar  
Mentor: Pr. Laurent Demanet.
- Massachusetts Institute of Technology, Cambridge MA, USA** *June 2015 - August 2015*  
Postdoctoral Researcher  
Mentor: Pr. Laurent Demanet.

### EDUCATION

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- Massachusetts Institute of Technology, Cambridge MA, USA** *June 2015*  
Ph.D. in Mathematics.  
Dissertation: Fast and Scalable solvers for the Helmholtz equation.  
Advisor: Pr. Laurent Demanet.  
Related Topics: High-Frequency Computational Wave Propagation, Numerical Analysis, High-Performance Computing, Applied Harmonic Analysis, Inverse Problems, Seismic Imaging.
- École Polytechnique, Palaiseau, France** *June 2010*  
M.Sc. in Numerical Analysis and Partial Differential Equations.  
Thesis: Modelling of clogging in steam generators for third generation pressurized water nuclear reactors.  
Advisor: Annalisa Ambrosso.  
Joint program with École Normale Supérieure and Université Pierre et Marie Curie, Paris IV.
- École Polytechnique, Palaiseau, France** *June 2010*  
Diploma, Ingénieur Polytechnicien,  
Thesis: Spectral methods based on Fourier continuation for solving the Navier-Stokes equation.  
Advisor: Pr. Oscar Bruno.  
Specialization in Applied Mathematics, Mechanics and Engineering Sciences.
- Instituto de Matemática Pura e Aplicada, Rio de Janeiro, Brazil** *January-March 2006*  
Summer Program in Mathematics.
- Universidad de Chile, Santiago, Chile** *2004-2006*  
Three years of undergraduate studies in Mathematical Engineering.

### PUBLICATIONS

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**L. Zepeda-Núñez**, and H.-K. Zhao. “A fast multi-directional preconditioner for the 3D Lippmann-Schwinger equation in the high-frequency regime,” *in preparation*.

J. Fang, J. Qian, **L. Zepeda-Núñez**, and H.-K. Zhao. “Adaptive learning and singularity removal for plane wave methods for the high-frequency Helmholtz equation,” submitted to *Journal of Computational Physics*.

M. Taus, **L. Zepeda-Núñez**, and L. Demanet. “Fast and high-order solvers for the 3D high-frequency Helmholtz equation,” *in preparation*.

A. Scheuer, **L. Zepeda-Núñez**, R. J. Hewett and L. Demanet. “A parallel pipelined polarized-trace algorithm for the 3D Helmholtz equation,” *in preparation*.

J. Fang, J. Qian, **L. Zepeda-Núñez**, and H.-K. Zhao. “Learning dominant wave directions for plane wave methods for the high-frequency Helmholtz equation,” *Research in the Mathematical Sciences* 2017.

A. Scheuer, **L. Zepeda-Núñez**, R. Hewett and L. Demanet. “A short note on a pipelined polarized-trace algorithm for 3D Helmholtz”, *Proc. SEG annual meeting, Dallas*, October 2016; **Top 30 best papers price**.

M. Taus, **L. Zepeda-Núñez**, and L. Demanet. “A short note on a fast and high-order Hybridizable Discontinuous Galerkin solver for the 2D high-frequency Helmholtz equation,” *Proc. SEG annual meeting, Dallas*, October 2016.

**L. Zepeda-Núñez**, and H.-K. Zhao. “Fast alternating bi-directional preconditioner for the 2D high-frequency Lippmann-Schwinger equation,” *SIAM Journal of Scientific Computing*, 2016.

**L. Zepeda-Núñez** and L. Demanet. “Nested domain decomposition with polarized traces for the 2D Helmholtz equation,” submitted to *SIAM Journal of Scientific Computing*.

**L. Zepeda-Núñez** and L. Demanet. “A short note on the nested-sweep polarized traces method for the 2D Helmholtz equation,” in *Proc. SEG annual meeting, New Orleans*, October 2015.

**L. Zepeda-Núñez** and L. Demanet. “The method of polarized traces for the 2D Helmholtz equation,” *Journal of Computational Physics*, 2016.

A. Schiemenz, W. Lewis, **L. Zepeda-Núñez**, A. El-Sabaa, S. Powell, M. Yu, and A. Imamshah. “Improved imaging resolution using a hybrid l-BFGS - truncated Newton method in FWI: application to the Bruce 3D field data,” in *Proc. SEG annual meeting, Denver*, October 2014.

**L. Zepeda-Núñez**, R. J. Hewett, L. Demanet. “Preconditioning the 2D Helmholtz equation with polarized traces,” in *Proc. SEG annual meeting, Denver*, October 2014.

**L. Zepeda-Núñez**, R. J. Hewett, M. Rao, L. Demanet. “Time-stepping beyond CFL: a locally one-dimensional scheme for acoustic wave propagation,” in *Proc. SEG annual meeting, Houston*, September 2013.

## TEACHING EXPERIENCE

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**University of California Irvine**  
*Instructor*

Spring 2017  
*Irvine, CA*

- Instructor for a class in single-variable integral Calculus; MATH 2B.

**University of California Irvine**  
*Instructor*

Winter 2017  
*Irvine, CA*

- Instructor for a class in multi-variable differential Calculus; MATH 2D.

**University of California Irvine**  
*Instructor*

Fall 2016  
*Irvine, CA*

- Instructor for a class in single-variable differential Calculus; MATH 2A.

**University of California Irvine**

*Instructor*

Spring 2016

*Irvine, CA*

- Instructor for an introductory class in linear algebra; MATH 3A.

**University of California Irvine**

*Instructor*

Winter 2016

*Irvine, CA*

- Instructor for an introductory class in linear algebra; MATH 3A.

**University of California Irvine**

*Instructor*

Fall 2015

*Irvine, CA*

- Instructor for an introductory class to numerical analysis MATH 105 LA.

**Massachusetts Institute of Technology**

*Recitation Leader*

Spring 2014

*Cambridge, MA*

- Recitation leader for an undergraduate class in complex variables and applications 18.04.

**École Polytechnique**

*Tuteur*

2009-2010

*Palaiseau, France*

- Served as a tutor for students in Applied Mathematics and Mechanics.

**Universidad de Chile**

*Recitation Leader*

Fall 2006

*Santiago, Chile*

- Conducted recitations, prepared problems sets, homeworks and exams; and graded exams for an undergraduate class in Applied Mathematics MA-26B.

## PROFESSIONAL EXPERIENCE

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**Schlumberger - Western Geco**

*Research Intern*

May 2013 - August 2013

*Houston, TX*

- Developed, implemented and tested second order optimization methods, based on the truncated Newton's method, for the Full Waveform Inversion module of Omega2.
- Developed, implemented and tested randomized methods for the optimization routines within the Full Waveform Inversion module of Omega2.

**Areva NP**

*Research Intern*

May 2010 - August 2010

*Colombes, France*

- Developed the first simplified model for the clogging in the steam generator of a third generation pressurized water nuclear reactor.
- Tested and benchmarked the model with experimental data.

**California Institute of Technology**

*Research Intern*

April 2009 - August 2009

*Pasadena, CA*

- Developed unconditionally stable spectral solvers for the incompressible Navier-Stokes equations.

## INVITED PRESENTATIONS

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SIAM CSE, Atlanta, GA	<i>February 2017</i>
Mathematics seminar, Trinity College Dublin, Ireland	<i>January 2017</i>
SEG Annual Meeting, Dallas, TX	<i>October 2016</i>
Computational Mathematics seminar, Purdue University, IN	<i>October 2016</i>
SIAM Annual Meeting, Boston, MA	<i>July 2016</i>
SIAM SOCAMS, Claremont, CA	<i>June 2016</i>
Applied and Computational Math Seminar, PUC, Santiago, Chile	<i>May 2016</i>
Inverse Problems Seminar, Seattle, WA	<i>March 2016</i>
SIAM PDE, Scottsdale, AZ	<i>December 2015</i>
Special Seminar in Applied Mathematics, Pasadena, CA	<i>November 2015</i>
SEG Annual Meeting, New Orleans, LA	<i>October 2015</i>
ICIAM, Beijing, China	<i>August 2015</i>
WAVES, Karlsruhe, Germany	<i>July 2015</i>
SIAM CSE, Salt Lake City, UT	<i>March 2015</i>
Applied and Computational Mathematics Seminar, UC Irvine, Irvine, CA	<i>February 2015</i>
Applied Mathematics Colloquium, Columbia University, New York, NY	<i>January 2015</i>
SEG Annual Meeting, Denver, CO	<i>September 2014</i>
CMBS-NSF Workshop in Fast Direct Methods, Hannover, NH	<i>June 2014</i>
SIAM CCE Seminar, Cambridge, MA	<i>February 2014</i>
SEG Annual Meeting, Houston, TX	<i>September 2013</i>
Single Person Applied Math Seminar, Cambridge MA	<i>July 2012</i>

## AWARDS AND GRANTS

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MIT International Science and Technology Initiatives grant co-pi.	2017
MIT Presidential Fellowship, Cambridge, MA, USA.	2010
Egide Fellowship from French government for Masters studies, Paris, France.	2009
Summer Undergraduate Research Fellowship (SURF) Caltech Pasadena, CA, USA.	2009
Foundation of Ecole Polytechnique Fellowship, Paris, France.	2007
IMPA summer program fellowship, Rio de Janeiro, Brazil.	2006
Excellence Fellowship, Universidad de Chile, Santiago de Chile, Chile.	2005
Entrance Excellence Fellowship, Universidad de Chile, Santiago de Chile, Chile.	2004
Silver Medal, Ibero-American Physics Olympiads, Havana, Cuba.	2003
Third Place, Chilean Physics Olympiads, Concepción, Chile	2002

## LANGUAGES

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<b>English</b>	Full professional proficiency
<b>French</b>	Fluent
<b>Spanish</b>	Native

## PROFESSIONAL SOCIETIES

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Society for Industrial and Applied Mathematics (SIAM)	member
Society of Exploration Geophysicists (SEG)	member

## MINI-SYMPOSIUM ORGANIZATION

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Co-organizer mini-symposium in waves for SIAM SCE	March 2017
Co-organizer mini-symposium in high-frequency waves for SIAM annual meeting	June 2016

## LEADERSHIP ACTIVITIES

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Co-organizer of the Computational and Applied Mathematics seminar at UCI	2015-2016
President of the SIAM-MIT student chapter	2014-2015
Organizer of the SIAM-CCE Seminar	2014-2015
Organizer of the Simple Person Applied Math Student (SPAMS) Seminar	2010-2011

## TECHNICAL STRENGTHS

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**Computer Languages :** Matlab, Julia, C++, Python, Java.  
**Software:** Linux, Mac OS X, Windows 7, Omega2, Mathematica.

## JOURNALS REFEREED

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Journal of Computational Physics  
Computers & Geosciences  
SIAM Journal on Multiscale Modeling and Simulation  
SIAM Journal on Scientific Computing  
Journal of Engineering Mathematics