Camille Carvalho

ccarvalho3@ucmerced.edu | camillecarvalho.org | GitHub: carvalhocamille

CURRENT POSITION

Assistant Professor	University of California Merced, CA, USA
Applied Math Department	*07/2018 – Present*

EDUCATION

PhD in Applied Mathematics   10/2012 – 12/2015

ENSTA Paris, France

- Title: Mathematical and numerical study of plasmonic structures with corners.
- Advisors: Anne-Sophie Bonnet-Ben Dhia, Patrick Ciarlet. Funded by ENSTA Paris and DGA (Direction Générale de l'Armement)

Master's degree in Applied Mathematics   2011 – 2012

Sorbinne Université, France

- Partial Differential Equations and Numerical Analysis. Master with honors.

Engineer diploma   2009 – 2012

ENSTA Paris, France

- Mathematics and Simulation.

RESEARCH EXPERIENCE

Visiting Assistant Professor   07/2016 – 06/2018

Applied Math Department   *University of California Merced, CA, USA*

- Research on close evaluation for layer potentials. Collaboration with Arnold Kim and Shilpa Khatri

Postdoctoral researcher   01/2016 – 06/2016

CMAP - INRIA team Defi   *Ecole Polytechnique, France*

- Contour integrations for the Interior Transmission Eigenvalue Problem.
- Advisors: Lucas Chesnel and Houssem Haddard. Funded by the METAMATH ANR.

TEACHING EXPERIENCE

Lecturer at the University of California Merced   07/2016 – Present

Instructor of record (72h per course)

Math 122: Complex Analysis (upper division, 45 students)	*Fall 2021*
Math 150: Mathematical Modeling (upper division, 30 students)	*Spring 2021*
Math 298: Boundary Integral Equations (graduate, 10 students)	*Fall 2020*
Math 24: Differential Equations and Linear Algebra (lower division, 150 students)	*Fall 2020*
Math 150: Mathematical Modeling (upper division, 30 students)	*Spring 2020*
Math 122: Complex Analysis (upper division, 45 students)	*Fall 2019*
Math 150: Mathematical Modeling (upper division, 30 students)	*Spring 2019*
Math 131: Numerical Methods for Engineers and Scientists (upper division, 150 students)	*Spring 2018*
Math 131: Numerical Methods for Engineers and Scientists (upper division, 75 students)	*Fall 2017*
Math 23: Vector Calculus (lower division, 120 students)	*Fall 2017*
Math 23: Vector Calculus (lower division, 240 students)	*Spring 2017*
Math 23: Vector Calculus (lower division, 120 students)	*Fall 2016*

Teaching Assistant at ENSTA Paris   10/2012– 06/2016

Discussion section leader and grader (15h per course)

Quadratic optimization	*2012 – 2016*
Stability and Control of dynamical systems	*2013 – 2015*
Complex analysis	*2013 – 2015*

Peer-reviewed journals

* indicates corresponding author, $^+$ indicates students and postdocs

1. A.-S. BONNET-BEN DHIA, C. CARVALHO, L. CHESNEL*, AND P. CIARLET JR, *On the use of perfectly matched layers at corners for scattering problems with sign-changing coefficients*, Journal of Computational Physics, 322 (2016), pp. 224–247

2. C. CARVALHO, L. CHESNEL*, AND P. CIARLET JR, *Eigenvalue problems with sign-changing coefficients*, Comptes Rendus Mathematique, 355 (2017), pp. 671–675

3. A.-S. BONNET-BEN DHIA, C. CARVALHO, AND P. CIARLET*, *Mesh requirements for the finite element approximation of problems with sign-changing coefficients*, Numerische Mathematik, 138 (2018), pp. 801–838

4. C. CARVALHO, S. KHATRI*, AND A. D. KIM, *Asymptotic analysis for close evaluation of layer potentials*, J. Comput. Phys., 355 (2018), pp. 327–341

5. P. SAKKAPLANGKUL$^+$, V. A. BOKIL, AND C. CARVALHO*, *A fully fourth order accurate energy stable finite difference method for maxwell's equations in metamaterials*, IEEE Journal on Multiscale and Multiphysics Computational Techniques, 4 (2019), pp. 260–268

6. C. CARVALHO*, S. KHATRI, AND A. D. KIM, *Asymptotic approximations for the close evaluation of double-layer potentials*, SIAM J. Sci. Comput., 42 (2020), pp. A504–A533

7. S. KHATRI*, A. D. KIM, R. CORTEZ, AND C. CARVALHO, *Close evaluation of layer potentials in three dimensions*, Journal of Computational Physics, 423 (2020), p. 109798

8. C. CARVALHO*, A. D. KIM, L. LEWIS$^+$, AND Z. MOITIER$^+$, *Quadrature by Parity Asymptotic eXpansions (QPAX) for scattering by high aspect ration particles*, SIAM Multiscale Modeling and Simulation, (in press, 2021)

9. C. CARVALHO*, P. CIARLET, AND C. SCHEID, *Limiting amplitude principle and resonances in plasmonic structures with corners: numerical investigation*, Computer Methods in Applied Mechanics and Engineering, (in press, 2021)

10. C. CARVALHO*, *Modified representations for the close evaluation problem*, Mathematical and Computational Applications, (in press, 2021)

Preprints (submitted or in preparation)

11. C. CARVALHO* AND Z. MOITIER$^+$, *Asymptotics for metamaterial cavities and their effect on scattering*, (en revision)

Peer-reviewed Conference Proceedings

12. A.-S. BONNET-BEN DHIA, C. CARVALHO*, L. CHESENL, L. CHESNEL, P. CIARLET JR, AND X. CLAEYS, *Plasmonic cavity modes with sign-changing permittivity*, WAVES Tunis, (2013)

13. A.-S. BONNET-BEN DHIA, C. CARVALHO*, L. CHESNEL, AND P. CIARLET JR, *Plasmonic cavity modes: Black-hole phenomena captured by perfectly matched layers.*, PIERS Proceedings, (2013)

14. A.-S. BONNET-BEN DHIA*, C. CARVALHO, C. CHAMBEYRON, L. CHESNEL, P. CIARLET JR, A. NICOLLET, AND F. ZOLLA, *Curious energy losses at corners of metallic inclusions*, WAVES Karlsruhe, (2015)

15. A.-S. BONNET-BEN DHIA, C. CARVALHO*, AND P. CIARLET JR, *Plasmonic waveguides: Tcoercivity approach for maxwell's equations*, WAVES Karlsruhe, (2015)

16. C. CARVALHO*, S. KHATRI, AND A. D. KIM, *Local analysis of near fields in acoustic scattering*, WAVES Minneapolis, (2017)

Thesis

17. C. CARVALHO, *Mathematical and numerical study of plasmonic structures with corners*, Ph.D, (2015)

Software

18. C. CARVALHO*, *Subtraction_techniques* doi:10.5281/zenodo.3934284, 2020

19. Z. MOITIER* AND C. CARVALHO, *Asymptotic_metacavity* doi:10.5281/zenodo.4716362, 2021

20. ――――, *Scattering_BIE_QPAX,* doi:10.5281/zenodo.4692601, 2021

TALKS

International Conferences

- Subtraction techniques for the close evaluation of layer potentials, SIAM CSE, Spring 2021
- The Singular Complement Method for dielectric-metamaterial transmission problems, MAFELAP, London, 2019
- Asymptotic approximations for transmission boundary-value problems in plasmonic structures, EMTS, San Diego, 2019
- The Singular Complement Method for scattering problems in plasmonic structures, PIERS, Toyama, 2018
- Multiscale modeling to capture near-fields in plasmonic structures, SIAM AN18, Portland, 2018
- Mesh requirements for transmission problems with sign-changing coefficients, SIAM PD17, Baltimore, 2017
- Local analysis of near fields in acoustic scattering, WAVES, Minneapolis, 2017
- Plasmonic waveguides: T-coercivity approach for Maxwell's equations, WAVES, Karlsruhe, 2015
- Leaky modes in a closed plasmonic waveguide, Leaky Days, Palaiseau, France, 2015
- Leaky modes in a non dissipative plasmonic waveguide with a bounded cross section, OWTNM, Nice, France, 2014
- Revealing guides modes in a plasmonic waveguide using Perfectly Matched Layers at the corners, KOZWaves, Newcastle, Australia, 2014
- Plasmonic cavity modes: black-hole phenomena captured by Perfectly Matched Layers, PIERS, Stockholm, Sueden, 2013
- Plasmonic cavity modes with sign changing permittivity, WAVES, Tunis, Tunisia, 2013

Seminars and invited talks

- Accurate evaluation of near-fields in plasmonic structures, University of Nice, February 2021
- Accurate evaluation of near-fields in plasmonic structures, Fresnel Institute, 2020
- Limiting amplitude principle for plasmonic structures, UC Merced, 2020
- Close evaluation of layer potentials in three dimensions, FSU, 2020
- Subtraction techniques for the close evaluation of layer potentials, UC Merced, 2020
- Boundary integral methods for optical cloaking, UC Merced, 2019
- How to accurately compute near-fields in plasmonic structures, Portland State University, 2019
- Accurate evaluation of near-fields in plasmonic structures, Caltech, 2019
- Capturing near-fields in plasmonic structures with corners, BASCD, Livermore, 2018
- Asymptotic approximations of near fields in scattering problems, Tulane University, New Orleans, 2018
- The Singular Complement Method in plasmonics, INRIA Sophia-Antipolis, Nice, 2018
- Multiscale modeling to capture near-fields in plasmonic structures, ICERM, Brown, 2018.
- Close evaluation of layer potentials, Université de Rennes, France, 2018
- Multi-scale modeling to compute near-fields in plasmonic structures with corners, UC Merced, CA, 2017
- Mathematical and numerical study of plasmonic structures with corners, Oregon State University, OR, 2017
- Mathematical and numerical study of plasmonic structures with corners, UC Merced, CA, 2016
- Mesh requirements for transmission problems with sign-changing coefficients, University of Reims, 2015
- Leaky modes in a closed plasmonic waveguide, Leaky Days, Palaiseau, France, 2015
- Fredholm theory and T-coercivity, ENSTA, Palaiseau, 2014

MENTORING

Postdoctoral researchers	2018 – Present
Zoïs Moitier (Asymptotics for metamaterial cavities)	*11/2019 – 10/2020*
Graduate students	2018 – Present
(PhD students and M.S. students)	
Benjmain Latham (PhD, Finite element methods for plasmonic particles in 3D)	*08/2019 – Present*
Cory McCullough (PhD, co-advised, Boundary integral methods for acoustic radiation forces)	*05/2020 – Present*
Elsie Cortes (PhD, co-advised, Boundary integral equations for optical cloaking)	*08/2020 – Present*
Lori Lewis (M.S., co-advised, Asymptotic for boundary integrals in regions of high curvature)	*08/2018 – 05/2020*
Undergraduate students	2017 – Present
(Summer internships and semester independent research studies)	
Elsie Cortes (Boundary integral methods for scattering)	*08/2018– 12/2019*
Bianca Garibay (Nyström methods for Laplace's equation)	*08/2018 – 12/2018*
Barbara Gomez-Aldrete (UROC, co-advised, Trapezoïd rule for Poisson problems)	*05/2018 – 08/2018*
Jacob Stehle (co-advised)	*05/2017 – 08/2017*
Tutoring at ENSTA ParisTech	2012 – 2015
Mentor for 15 students each year	

SERVICES

NSF panel review	2021
Participated in a review panel for the NSF DMS Applied Math program.	*NSF*
Lecturer supervisor	2020 – Present
Observing and evaluating lecturers.	*UC Merced*
On-campus WSTEM faculty advisor	2019 – Present
Advising the student organization for Women in Science Technology Engineering and Math	*UC Merced*
Chair of the WSTEM faculty affairs committee	2019 – Present
Organize monthly panel discussions about WSTEM issues	*UC Merced*
Co-founder and co-organizer of the Waves seminar	2018 – Present
Bi-weekly seminars about wave propagation phenomena	*UC Merced*
Co-organizer of mini-symposia at international conferences	2019 – Present
Conferences ICIAM 19, SIAM CSE 19, SIAM CSE 21	
Reviewer for peer-reviewed journals	2018 – Present
J. Comp. Phys., SIAM J. Appl. Math., ESAIM M2AN, SIAM J. Imag. Sci.	
Member of doctoral committees	2018 – Present
Member of six doctoral committees	*UC Merced*
Chair of the Applied Math social events	2018 – Present
Applied Math Weekly, Mid-semester receptions, Coffe Hour	*UC Merced*
Member of a hiring committee for a teaching faculty	2018 – 2020
Member for two searches	*UC Merced*
Co-founder and co- organizer of the Boundary integral equation research seminar	2018 – 2020
Bi-weekly seminars about integral methods	*UC Merced*
Chair of a postdoctoral hiring search	2019
	UC Merced
Member of the graduate recruitment and admissions committee	2017 – 2019
Member for two recruitment sessions	*UC Merced*
Applied Math seminar	2018
Co-organizer of the department's seminar	*UC Merced*

CURRENT AND PENDING FUNDING

PI, NSF Applied Math DMS-2009366($295k)   08/2020 – 07/2023
A novel Finite Element Toolbox for Interface Phenomena in Plasmonics   *Single PI*

PI, NSF Computational Mathematics DMS-1819052($200k)   08/2018 – 07/2021
Close evaluation of layer potentials   *Co-PIs: S. Khatri, A. D. Kim*

PI, UC Merced Senate Research Grant ($5,000)   08/2020 – 07/2021
Asymptotic methods for plasmonic problems   *Co-PI: Z. Moitier*

PI, AWM-NSF Travel Award ($1,930)   2017
Travel award to attend the 13th International WAVES conference in Minneapolis