

# Jeffrey Galkowski

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## Research Interests

Scattering and spectral theory, microlocal analysis, quantum chaos, high energy eigenfunctions, high frequency numerical analysis

## Employment

2022-present	Professor	University College London
2019-2022	Associate Professor	University College London
2018-2019	Assistant Professor	Northeastern University
2015-2018	NSF Postdoctoral Fellow	Stanford University
2015-2017	CRM-ISM Postdoctoral Fellow	McGill University

## Fellowships and Grants

ERC Synergy Grant: PSINumScat - 101167139	2025-2031
Leverhulme Research Project Grant: RPG-2023-325	2024-2029
EPSRC Early Career Fellowship: EP/V001760/1	2021-2026
EPSRC Standard Grant: EP/V051636/1	2022-2026
NSF Research Grant DMS-1900434	2019
NSF Mathematical Sciences Postdoctoral Research Fellow	2015-2019
NSF Graduate Fellow	2010-2015

## Awards

2021	Adams Prize	University of Cambridge
2021	Faculty Education Award	University College London

## Education

2010-2015	Ph.D.	Mathematics, University of California, Berkeley Dissertation topic: Distribution of Resonances in Scattering by Thin Barriers Dissertation advisor: Maciej Zworski
2007-2010	BSE	Electrical Engineering, University of Rochester

## Research Papers

- [1] Jeffrey Galkowski, Manas Rachh, and Euan A. Spence. Helmholtz boundary integral methods and the pollution effect. *arXiv:2507.22797*, 2025.
- [2] Martin Averseng, Jeffrey Galkowski, and Euan A. Spence. Non-uniform finite-element meshes defined by ray dynamics for helmholtz problems. *arXiv:2506.15630*, 2025.
- [3] Yan-Long Fang and Jeffrey Galkowski. Surface plasmons in metamaterial cavities: Scattering by obstacles with negative wave speed. *arXiv:2505.22253*, 2025.
- [4] Jeffrey Galkowski and Euan A. Spence. Convergence theory for two-level hybrid Schwarz preconditioners for high-frequency helmholtz problems. *arXiv:2501.11060*, 2025.
- [5] Théophile Chaumont-Frelet, Jeffrey Galkowski, and Euan A. Spence. Sharp error bounds for edge-element discretisations of the high-frequency Maxwell equations. *arXiv:2408.04507*, 2024.
- [6] Jeffrey Galkowski, Shihua Gong, Ivan G. Graham, David Lafontaine, and Euan A. Spence. Convergence of overlapping domain decomposition methods with PML transmission conditions applied to nontrapping Helmholtz problems. *arXiv:2404.02156*, 2024.

- [7] Jeffrey Galkowski and Maciej Zworski. Classical-quantum correspondence in Lindblad evolution. *arXiv:2403.09345*, to appear in *J. Math. Phys.*, 2024.
- [8] Martin. Averseng, Jeffrey Galkowski, and Euan A. Spence. Helmholtz FEM solutions are locally quasi-optimal modulo low frequencies. *Adv. Comput. Math.*, 50(6):Paper No. 112, 48, 2024.
- [9] Yaiza Canzani and Jeffrey Galkowski. Improvements for eigenfunction averages: An application of geodesic beams. *Journal of Differential Geometry*, 124(3):443 – 522, 2023.
- [10] Yaiza Canzani and Jeffrey Galkowski. Weyl remainders: an application of geodesic beams. *Invent. Math.*, 232(3):1195–1272, 2023.
- [11] Kiril Datchev, Jeffrey Galkowski, and Jacob Shapiro. Semiclassical resolvent bounds for compactly supported radial potentials. *J. Funct. Anal.*, 284(7):Paper No. 109835, 28, 2023.
- [12] Jeffrey Galkowski and Euan A. Spence. Sharp preasymptotic error bounds for the Helmholtz  $h$ -FEM. *SIAM J. Numer. Anal.*, 63(1):1–22, 2025.
- [13] Jeffrey Galkowski and Jared Wunsch. Propagation for Schrödinger operators with potentials singular along a hypersurface. *Arch. Ration. Mech. Anal.*, 248(3):Paper No. 37, 28, 2024.
- [14] Jeffrey Galkowski and Maciej Zworski. An abstract formulation of the flat band condition. *arXiv:2307.04896* to appear in *Contemp. Math.*, 2023.
- [15] Yaiza Canzani and Jeffrey Galkowski. Logarithmic improvements in the Weyl law and exponential bounds on the number of closed geodesics are predominant. *arXiv:2204.11921*, 2022.
- [16] Yaiza Canzani, Jeffrey Galkowski, and Blake Keeler. Asymptotics for the spectral function on Zoll manifolds. *arXiv:2211.09644* to appear in *J Spectr. Theory*, 2022.
- [17] Jeffrey Galkowski. Complete asymptotic expansions of the spectral function for symbolic perturbations of almost periodic Schrödinger operators in dimension one. *J. Spectr. Theory*, 12(1):105–142, 2022.
- [18] Jeffrey Galkowski. Lower bounds for piecewise polynomial approximations of oscillatory functions. *Journal of Approximation Theory*, 305:106100, 2025.
- [19] Jeffrey Galkowski, David Lafontaine, Euan A. Spence, and Jared Wunsch. The  $hp$ -FEM applied to the Helmholtz equation with PML truncation does not suffer from the pollution effect. *arXiv:2207.05542* to appear in *Comm. Math. Sci.*, 2022.
- [20] Jeffrey Galkowski, Pierre Marchand, and Euan A. Spence. High-frequency estimates on boundary integral operators for the Helmholtz exterior Neumann problem. *Integral Equations Operator Theory*, 94(4):Paper No. 36, 68, 2022.
- [21] Jeffrey Galkowski, Pierre Marchand, Jian Wang, and Maciej Zworski. The scattering phase: seen at last. *SIAM J. Appl. Math.*, 84(1):246–261, 2024.
- [22] Jeffrey Galkowski, Leonid Parnovski, and Roman Shterenberg. Classical wave methods and modern gauge transforms: spectral asymptotics in the one dimensional case. *Geom. Funct. Anal.*, 33(6):1454–1538, 2023.
- [23] Jeffrey Galkowski and Jacob Shapiro. Semiclassical resolvent bounds for long-range Lipschitz potentials. *Int. Math. Res. Not. IMRN*, (18):14134–14150, 2022.
- [24] Jeffrey Galkowski and Jacob Shapiro. Semiclassical resolvent bounds for weakly decaying potentials. *Math. Res. Lett.*, 29(2):373–397, 2022.
- [25] J. Galkowski and E. A. Spence. Does the Helmholtz boundary element method suffer from the pollution effect? *SIAM Rev.*, 65(3):806–828, 2023.
- [26] Jeffrey Galkowski and Jared Wunsch. On non-diffractive cones. *J. Differential Geom.*, 120(3):505–518, 2022.
- [27] Jeffrey Galkowski and Maciej Zworski. Viscosity limits for zeroth-order pseudodifferential operators. *Comm. Pure Appl. Math.*, 75(8):1798–1869, 2022.

- [28] Pierre Marchand, Jeffrey Galkowski, Euan A. Spence, and A. Spence. Applying GMRES to the Helmholtz equation with strong trapping: how does the number of iterations depend on the frequency? *Adv. Comput. Math.*, 48(4):Paper No. 37, 63, 2022.
- [29] Yaiza Canzani and Jeffrey Galkowski. Eigenfunction concentration via geodesic beams. *J. Reine Angew. Math.*, 775:197–257, 2021.
- [30] Yaiza Canzani and Jeffrey Galkowski. Sectional sampler: Eigenfunction concentration via geodesic beams. *Notices Amer. Math. Soc.*, 68(3):417, 2021.
- [31] Jeffrey Galkowski, David Lafontaine, and Euan A. Spence. Local absorbing boundary conditions on fixed domains give order-one errors for high-frequency waves. *IMA J. Numer. Anal.*, 44(4):1946–2069, 2024.
- [32] Jeffrey Galkowski, David Lafontaine, and Euan Spence. Perfectly-matched-layer truncation is exponentially accurate at high frequency. *SIAM J. Math. Anal.*, 55(4):3344–3394, 2023.
- [33] Jeffrey Galkowski, David Lafontaine, Euan A. Spence, and Jared Wunsch. Decompositions of high-frequency Helmholtz solutions via functional calculus, and application to the finite element method. *SIAM J. Math. Anal.*, 55(4):3903–3958, 2023.
- [34] Jeffrey Galkowski, Pierre Marchand, and Euan A. Spence. Eigenvalues of the truncated Helmholtz solution operator under strong trapping. *SIAM J. Math. Anal.*, 53(6):6724–6770, 2021.
- [35] Jeffrey Galkowski and John A. Toth. Lower bounds for Steklov eigenfunctions. *Pure Appl. Math. Q.*, 19(4):1873–1898, 2023.
- [36] Jeffrey Galkowski and Steve Zelditch. Lower bounds for Cauchy data on curves in a negatively curved surface. *Israel J. Math.*, 244(2):971–1000, 2021.
- [37] Jeffrey Galkowski and Maciej Zworski. Analytic hypoellipticity of Keldysh operators. *Proc. Lond. Math. Soc. (3)*, 123(5):498–516, 2021.
- [38] Jeffrey Galkowski and Maciej Zworski. Outgoing solutions via Gevrey-2 properties. *Ann. PDE*, 7(1):Paper No. 5, 13, 2021.
- [39] Oscar P. Bruno and Jeffrey Galkowski. Domains without dense Steklov nodal sets. *J. Fourier Anal. Appl.*, 26(3):45, 2020.
- [40] Yaiza Canzani and Jeffrey Galkowski. Growth of high  $L^p$  norms for eigenfunctions: an application of geodesic beams. *Anal. PDE*, 16(10):2267–2325, 2023.
- [41] Jeffrey Galkowski and Matthieu Léautaud. Control from an interior hypersurface. *Trans. Amer. Math. Soc.*, 373(5):3177–3233, 2020.
- [42] Jeffrey Galkowski, Euan A. Spence, and Jared Wunsch. Optimal constants in nontrapping resolvent estimates and applications in numerical analysis. *Pure Appl. Anal.*, 2(1):157–202, 2020.
- [43] Jeffrey Galkowski and John A. Toth. Pointwise bounds for joint eigenfunctions of quantum completely integrable systems. *Comm. Math. Phys.*, 375(2):915–947, 2020.
- [44] Yaiza Canzani and Jeffrey Galkowski. On the growth of eigenfunction averages: Microlocalization and geometry. *Duke Math. J.*, 168(16):2991–3055, 2019.
- [45] Jeffrey Galkowski. Defect measures of eigenfunctions with maximal  $L^\infty$  growth. *Ann. Inst. Fourier (Grenoble)*, 69(4):1757–1798, 2019.
- [46] Jeffrey Galkowski. Distribution of resonances in scattering by thin barriers. *Mem. Amer. Math. Soc.*, 259(1248):ix+152, 2019.
- [47] Jeffrey Galkowski. The quantum Sabine law for resonances in transmission problems. *Pure Appl. Anal.*, 1(1):27–100, 2019.

- [48] Jeffrey Galkowski, Eike H. Müller, and Euan A. Spence. Wavenumber-explicit analysis for the Helmholtz  $h$ -BEM: error estimates and iteration counts for the Dirichlet problem. *Numer. Math.*, 142(2):329–357, 2019.
- [49] Jeffrey Galkowski and Euan A. Spence. Wavenumber-explicit regularity estimates on the acoustic single- and double-layer operators. *Integral Equations Operator Theory*, 91(1):Art. 6, 35, 2019.
- [50] Jeffrey Galkowski and John A. Toth. Pointwise bounds for Steklov eigenfunctions. *J. Geom. Anal.*, 29(1):142–193, 2019.
- [51] Jeffrey Galkowski and Maciej Zworski. An introduction to complex microlocal deformations. *arXiv:1912.09845*, 2019.
- [52] Yaiza Canzani, Jeffrey Galkowski, and John A. Toth. Averages of eigenfunctions over hypersurfaces. *Comm. Math. Phys.*, 360(2):619–637, 2018.
- [53] Sourav Chatterjee and Jeffrey Galkowski. Arbitrarily small perturbations of Dirichlet Laplacians are quantum unique ergodic. *J. Spectr. Theory*, 8(3):909–947, 2018.
- [54] Jeffrey Galkowski. A microlocal approach to eigenfunction concentration. *Journées équations aux dérivées partielles*, pages 1–14, 2018.
- [55] Jeffrey Galkowski and John A. Toth. Eigenfunction scarring and improvements in  $L^\infty$  bounds. *Anal. PDE*, 11(3):801–812, 2018.
- [56] Semyon Dyatlov and Jeffrey Galkowski. Fractal Weyl laws and wave decay for general trapping. *Nonlinearity*, 30(12):4301–4343, 2017.
- [57] Jeffrey Galkowski. A quantitative Vainberg method for black box scattering. *Comm. Math. Phys.*, 349(2):527–549, 2017.
- [58] Jeffrey Galkowski. The  $L^2$  behavior of eigenfunctions near the glancing set. *Comm. Partial Differential Equations*, 41(10):1619–1648, 2016.
- [59] Jeffrey Galkowski. Resonances for thin barriers on the circle. *J. Phys. A*, 49(12):125205, 22, 2016.
- [60] Jeffrey Galkowski. Pseudospectra of semiclassical boundary value problems. *Journal of the Institute of Mathematics of Jussieu*, 14(2):405–449, August 2015.
- [61] Jeffrey Galkowski and Hart F. Smith. Restriction bounds for the free resolvent and resonances in lossy scattering. *Int. Math. Res. Not. IMRN*, (16):7473–7509, 2015.
- [62] Xiaolong Han and Melissa Tacy. Semiclassical single and double layer potentials: boundedness and sharpness with an appendix by Jeffrey Galkowski. *J. Funct. Anal.*, 269:2890–2926, 2015.
- [63] Jeffrey Galkowski. Quantum ergodicity for a class of mixed systems. *J. Spectr. Theory*, 4(1):65–85, 2014.
- [64] Jeffrey Galkowski. Nonlinear instability in a semiclassical problem. *Comm. Math. Phys.*, 316(3):705–722, 2012.
- [65] D. Mott, J. Galkowski, L. Wang, J. Luo, and C. J. Zhong. Synthesis of size-controlled and shaped copper nanoparticles. *Langmuir*, 23:5740–5745, 2007.

### Expository Work

- [1] Yaiza Canzani and Jeffrey Galkowski, *Geodesics Beams in Eigenfunction Analysis*, Synthesis Lectures on Mathematics and Statistics, Springer Nature, 2023.

### Editorial and Committee Work

Associate Editor, <i>Mathematika</i>	2021-present
Associate Editor, <i>Pure and Applied Analysis</i>	2023-present
Member, AMS-Simons Travel Grants Committee	2024-present

## Professional Activities

Member	EPSRC College	2022- present
Organizer	LMS Bath Meeting: Advances in Spectral Theory	2024
Scientific Committee	Weyl Laws Across Mathematics	2025
Associate Member	EPSRC College	2021
Organizer	UCL Departmental Colloquium	09/2020-present
Organizer	London Analysis Seminar	12/2019-present
Presenter	STEM for Britain	03/2020
Organizer	Summer School on Semiclassical Analysis at Northwestern University	08/2019
Organizer	Research in Teams Program at Banff International Research Station	10/2017
Officer	Mathematics Graduate Student Association UC Berkeley	1/2011–1/2014

## Research Talks

### *Additional Upcoming talks*

December 2024	Spectral Geometry in the Clouds
January 2025	UCL-Imperial Numerics Seminar
February 2025	University of Cambridge Applied Mathematics Seminar

### *Spectral asymptotics for the Schrödinger equation with bounded, unstructured potentials*

May 2024	Paris-Saclay conference in Analysis and PDE
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### *The finite element method in high frequency scattering: non-uniform meshes defined by ray-dynamics*

December 2023	Paris–London Analysis Seminar
April 2024	LMS-Midlands Conference
June 2024	Conference on microlocal analysis and quantum dynamics in honor of Steve Zelditch

### *The pollution effect in boundary integral methods*

August 2022	Harmonic analysis and waves, University of Washington
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### *Classical wave methods and modern gauge transforms*

April 2022	Banff International Research Station - Almost-Periodic Spectral Problems
July 2022	University College London - Workshop on Microlocal Analysis and PDEs
November 2022	Scattering and Inverse Scattering workshop RICAM
November 2023	Spectral and Resonance Problems for Imaging, Seismology and Materials Science

### *Weyl laws and closed geodesics on typical manifolds*

February 2022	Leeds Geometry Seminar
February 2022	Stanford Analysis and PDE Seminar
March 2022	Harmonic Analysis and Differential Equations Seminar, Berkeley
September 2022	Global Harmonic Analysis a conference in honor of Steve Zelditch
November 2022	London Analysis and Probability Seminar- University College London
January 2023	Analysis Seminar, University of Warwick
April 2023	British Mathematics Colloquium
May 2023	Loughborough Analysis Seminar
February 2024	Pseudodifferential Operators and Related Topics

### *Exponential accuracy for the method of perfectly matched layers*

May 2021	UC Berkeley Analysis Seminar
July 2021	Mini Conference in Loughborough
February 2022	Conference on Mathematics of Wave Phenomena (Karlsruhe, German)

### *Geodesic beams and Weyl remainders*

December 2020 Spectral geometry session - Canadian Mathematical Society Sectional Meeting  
March 2021 Spectral Theory and Mathematical Physics Seminar - Euler Institute  
May 2021 UCLA Analysis Seminar  
May 2021 Munich-Aarhus-Santiago Mathematical Physics Seminar  
July 2021 Spectral geometry session -Mathematical Congress of the Americas  
February 2022 Analysis Seminar - Yale University

*Viscosity limits for 0<sup>th</sup> order operators*

August 2022 Tallinn University of Technology Department of Cybernetics Colloquium  
June 2020 IHP mathematical physics seminar  
May 2020 Montreal Analysis Seminar - McGill University

*L<sup>p</sup> norms via geodesic beams*

May 2020 Spectral Theory and Dynamical Systems Seminar - Insitut Mathématique de Jussieu

*On non-diffractive cones*

June 2020 Analysis Seminar - Cardiff University  
May 2020 Monza seminar - MIT

*Interior Behavior of Steklov Eigenfunctions*

November 2020 Spectral Geometry in the Clouds  
September 2020 Differential Geometry and Geometric Analysis Seminar - Princeton University  
April 2020 London Analysis and Probability Seminar- Kings College London  
November 2019 Analysis and Geometry Seminar - University of Bristol

*Concentration and growth of eigenfunctions*

December 2019 London Analysis Seminar  
November 2019 Analysis Seminar - University of Leeds  
October 2019 Recent Developments in Microlocal Analysis - MSRI  
October 2019 Analysis Seminar - University of Wisconsin, Madison  
January 2019 Analysis Seminar - Northwestern University  
January 2019 Analysis Seminar - UC San Diego  
February 2019 PDE Analysis Seminar - University of Massachusetts Amherst  
April 2019 Colloquium - University of New Mexico  
April 2019 Analysis and PDE Seminar - Brown University  
May 2019 Microlocal Methods in Analysis and Geometry - CIRM Luminy  
June 2019 Fudan Conference on Microlocal Analysis - Shanghai

*Optimal Constants in Non-trapping Resolvent Estimates*

December 2018 PDE Minischool - University of North Carolina Chapel Hill  
July 2019 PDE/Analysis seminar - Tsinghua University - Beijing

*A Novel Approach to Quantitative Improvements for Eigenfunction Averages*

July 2018 Around Quantum Chaos, Banff Research Station  
September 2018 Analysis and Geometry Seminar, Northeastern University  
November 2018 PDE Analysis Seminar, Massachusetts Institute of Technology

*Steklov Eigenfunctions and Nodal Geometry: a Semiclassical Approach*

May 2018 Workshop on Steklov Eigenproblems, American Institute of Mathematics

*Concentration of Eigenfunctions: Sup-norms and Averages*

January 2018 Analysis and PDE Seminar, UC Berkeley  
January 2018 Special Seminar, Northeastern University  
February 2018 Special Seminar, University of Cambridge  
February 2018 Analysis Seminar, McGill University  
March 2018 Workshop on Microlocal Analysis, Australian National University  
April 2018 Analysis and PDE Seminar, Stanford University  
May 2018 Mathematical Physics Seminar, UC Irvine  
June 2018 Journées Équations aux Dérivées Partielles, Obernai, France

*Fractal Weyl laws for general trapping*

July 2017 Third Symposium on Scattering and Spectral Theory, UFSC, Florianópolis, Brazil  
December 2017 Spectral Geometry, Graphs, and Semiclassical Analysis, Aussois, France  
February 2018 Spectral Geometry Seminar, Université de Montreal

*Defect Measures for Eigenfunctions with Maximal  $L^\infty$  Growth*

March 2017 PDE/Analysis Seminar, Massachusetts Institute of Technology  
March 2017 Mathematical Physics and Harmonic Analysis Seminar, Texas A&M University  
April 2017 Analysis Seminar, Northwestern University

*Pointwise Bounds for Steklov eigenfunctions*

December 2016 Spectral and Scattering Theory Seminar, Purdue University  
January 2017 Analysis Seminar, University of North Carolina, Chapel Hill  
February 2017 Bay Area Microlocal Analysis Seminar, UC Berkeley  
March 2017 Spectral Geometry Seminar, Université de Montreal  
April 2017 Analysis Seminar, Université Laval

*The  $L^2$  Behavior of Eigenfunctions Near the Glancing Set*

October 2016 Analysis Seminar, University of Rochester

*Arbitrarily Small Perturbations of the Laplacian are QUE*

April 2016 Student Harmonic Analysis and Differential Equations Seminar, UC Berkeley  
August 2016 Probabilistic Methods in Spectral Geometry and PDE, CRM Montreal

*Resonance Free Regions and Average Smoothing Times*

December 2015 Partial Differential Equations/Analysis Seminar, UC Berkeley  
September 2016 Analysis/Spectral Theory Seminar, McGill University

*A Quantum Sabine Law for Transmission Problems*

October 2015 Spectral and Scattering Theory Seminar, Purdue University  
February 2016 Bay Area Microlocal Analysis Seminar, Stanford University  
April 2016 Evolution Equations on Singular Spaces, CIRM  
June 2016 Dirichlet-to-Neumann Maps, Oaxaca Research Station

*Distribution of Resonances in Scattering by Thin Barriers*

July 2015 Mathematics Colloquium, University of Reading  
November 2014 Geometric Scattering Theory and Applications, Banff International Research Station  
October 2014 Analysis and PDE Seminar, University of California Los Angeles  
October 2014 PDE Seminar, Brown University  
October 2014 PDE/Analysis Seminar, Massachusetts Institute of Technology  
June 2014 Séminaire Géométrie et Analyse, Université de Nice  
May 2014 Bay Area Microlocal Analysis Seminar, Stanford University  
April 2014 Partial Differential Equations Mini School, University of North Carolina, Chapel Hill  
October 2013 Student Harmonic Analysis and Differential Equations Seminar, UC Berkeley.

*Pseudospectra for Semiclassical Boundary Value Problems*

February 2013 Student Harmonic Analysis and Differential Equations Seminar, UC Berkeley

*Quantum Ergodicity for a Class of Mixed Systems*

October 2012 Student Harmonic Analysis and Differential Equations Seminar, UC Berkeley  
February 2013 Analysis, Dynamics, and Applications Seminar, University of Arizona

*Nonlinear Instability in a Semiclassical Problem*

February 2012 Analysis, Dynamics, and Applications Seminar, University of Arizona  
August 2012 Partial Differential Equations/ Analysis Seminar, UC Berkeley  
November 2011 Student Harmonic Analysis and Differential Equations Seminar, UC Berkeley

### Teaching

2024	High frequency numerical analysis of the Helmholtz equation	instructor
2020,2023	Introduction to Mathematical Scattering Theory, London Taught Course Center	instructor
2021	Introduction to Semiclassical Analysis, London Taught Course Center	instructor
2020-21, 2024	Mathematical Analysis for Economists and Statisticians, University College London	instructor
Summer 2019	Eigenfunctions course at Summer School on Semiclassical Analysis, Northwestern University	instructor
Spring 2019	Math 7350: Pseudodifferential Equations, Northeastern University	instructor
Spring 2019	Math 5102: Analysis II, Northeastern University	instructor
Fall 2018	Math 1342: Calculus II for Scientists and Engineers, Northeastern University	instructor
March 2018	Minicourse on Microlocal Analysis, Australian National University	instructor
Fall 2017	Microlocal Analysis of Boundary Value Problems, Stanford University	instructor
Fall 2017	Elementary Functional Analysis, Stanford University	instructor
Winter 2017	Minicourse on Vasy's method, McGill University	instructor
Fall 2016	Advanced Real Analysis, McGill University	instructor
Winter 2016	Minicourse on Vasy's method, Stanford	instructor
Spring 2014	Math 1B (Calculus II), UC Berkeley	TA
Fall 2013	Math 16A (Calculus I), UC Berkeley	TA
Spring 2013	Math 16B (Calculus II), UC Berkeley	TA
Fall 2012	Math 55 (Discrete Math), UC Berkeley	TA
Spring 2011	Math 53 (Multivariable Calculus), UC Berkeley	TA
Fall 2010	Math 1A (Calculus I), UC Berkeley	TA