

Pierre Albin

palbin@illinois.edu

<http://www.math.uiuc.edu/~palbin/>

1409 West Green Street, Office 237 Illini Hall
Urbana, IL 61801

Research Interests

Geometric and microlocal analysis, analytic representation of topological invariants, spectral geometry, heat kernels, Dirac operators

Employment

Professor; Mathematics Department, UIUC, 2020-present.
Associate Professor; Mathematics Department, UIUC, 2016-present.
Assistant Professor; Mathematics Department, UIUC, 2011-2016.
Fondation Sciences Mathématiques de Paris Postdoctoral fellow, Jussieu, 2010-2011.
N.S.F. Joint Institutes' Postdoctoral Fellowship, IAS and Courant, 2009-2010.
N.S.F. Postdoctoral Fellowship; Mathematics Department, M.I.T., 2006-2009.
C.L.E. Moore Instructor; Mathematics Department, M.I.T., 2005-2008.

Education

PhD in Mathematics, Stanford University June 2005; Advisor: Rafe Mazzeo
BS in Applied Mathematics, Instituto Tecnológico Autónomo de México June 2000

Awards

Eisenbud Professor at MSRI, Fall 2019.
NSF Grant DMS-1711325, "Index theory on singular spaces", \$264,120.00, 2017-2020.
Helen Corley Petit Scholar, UIUC 2016-2017.
Visiting Professor at Sapienza University of Rome, summer 2014.
N. Tenney Peck Teaching Award in Mathematics, 2014.
Simons Collaboration Grant #317883, \$35,000.00, 2014-2019.
Institut des Hautes Études Scientifiques Visitor, June 2012.
NSF Grant DMS-1104533, "Index theory on singular spaces" 2011-2014.
NSF Postdoctoral Fellowship DMS-0603547, 2006-2009.
Stanford University Centennial Teaching Award, 2005.

Professional Service

MSRI HR advisory committee, 2019-2022.
Member-at-Large AMS Committee on Meetings and Conferences, 2015-2018.
Conference/Workshop organization:
Analysis on Singular Spaces. BIRS-Oaxaca, May 2021.
Microlocal Analysis. MSRI, Fall semester 2019.
Geometric and Spectral Methods in Partial Differential Equations. BIRS-Oaxaca, Dec. 2016.
Spectral invariants on singular and non-compact spaces. CRM-Montreal, July 2012.
Analyse Géométrique. A conference in honor of Rafe Mazzeo. CIRM-Luminy, January 2011.
Singularities @ MIT. A conference in honor of Richard Melrose. MIT, April 2009.
Elliptic and Hyperbolic Equations on Singular Spaces. MSRI, 2008.

Publications

- 1) *A renormalized index theorem for some complete asymptotically regular metrics: the Gauss-Bonnet theorem.*, Adv. Math. 213 (2007), no. 1, 1–52.
- 2) *Families index for manifolds with hyperbolic cusp singularities.*

- (with Frédéric Rochon), *Int. Math. Res. Not. IMRN* 2009, no. 4, 625–697.
- 3) *Fredholm realizations of elliptic symbols on manifolds with boundary.*
(with Richard Melrose), *J. Reine Angew. Math.* 627 (2009), 155–181.
- 4) *Renormalizing Curvature Integrals on Poincare-Einstein Manifolds.*,
Adv. Math. 221 (2009), no. 1, 140–169.
- 5) *A local families index formula for $\bar{\partial}$ -operators on punctured Riemann surfaces.*
(with Frédéric Rochon), *Comm. Math. Phys.* 289 (2009), no. 2, 483–527.
- 6) *Relative Chern character, boundaries and index formulæ.*
(with Richard Melrose), *Journal of Topology and Analysis* 1 (2009), no.3, 207–250.
- 7) *Fredholm realizations of elliptic symbols on manifolds with boundary II: fibered boundary.*
(with Richard Melrose),
Motives, QFT, and pseudodifferential operators, 99–117, *Clay Math. Proc.*, 12, AMS, 2010.
- 8) *Resolution of smooth group actions.* (with Richard Melrose),
Spectral theory and geometric analysis, 1–26, *Contemp. Math.*, 535, AMS, 2011.
- 9) *Nonlinear quasimodes near elliptic periodic geodesics.*
(with Hans Christianson, Jeremy L. Marzuola, and Laurent Thomann),
Phys. D 241 (2012), no. 4, 409425.
- 10) *The signature package on Witt spaces.*
(with Eric Leichtnam, Rafe Mazzeo, and Paolo Piazza), *Ann. ENS* 45, 2 (2012).
- 11) *Ricci flow and the determinant of the Laplacian on non-compact surfaces.*
(with Clara Aldana and Frédéric Rochon), *Comm. PDE* 38 (2013), no. 4, 711–749.
- 12) *Inverse Boundary Problems for Systems in Two Dimensions.*
(with Colin Guillarmou, Leo Tzou, Gunther Uhlmann), *Annales IHP* (2013): 1–21.
- 13) *Some index formulae on the moduli space of stable parabolic vector bundles.*
(with Frédéric Rochon), *J. Aust. Math. Soc.* 94 (2013), no. 1, 137.
- 14) *Compactness of relatively isospectral sets of surfaces via conformal surgeries.*
(with Clara Aldana and Frédéric Rochon), *J. of Geometric Analysis*, Nov 2013.
- 15) *Refined intersection homology on non-Witt spaces.*
(with Markus Banagl, Eric Leichtnam, Rafe Mazzeo, and Paolo Piazza),
J. Topology and Analysis 07, 105 (2015).
- 16) *The index of Dirac operators on incomplete edge spaces.*
(with Jesse Gell-Redman), *SIGMA* 12 (2016), Paper No. 089, 45 pp.
- 17) *The Novikov conjecture on Cheeger spaces.* (with Eric Leichtnam, Rafe Mazzeo, and Paolo Piazza), *J. Noncom. Geom.* 11 (2017), no. 2, 451–506.
- 18) *On the Hodge theory of stratified spaces.* *Hodge theory and L2-analysis*, 1–78,
Adv. Lect. Math. (ALM), 39, Int. Press, Somerville, MA, 2017.
- 19) *Hodge theory on Cheeger spaces.*
(with Eric Leichtnam, Rafe Mazzeo, and Paolo Piazza),
J. Reine Angew. Math. 744 (2018), 29–102.
- 20) *Resolvent, heat kernel and torsion under degeneration to fibered cusps.*
(with Frédéric Rochon and David Sher), *Mem. Amer. Math. Soc.* 269 (2021), no. 1314.
- 21) *Analytic torsion and R-torsion of Witt representations on manifolds with cusps.*
(with Frédéric Rochon and David Sher), *Duke Math. J.* 167, no. 10 (2018), 1883–1950.
- 22) *Stratified surgery and K-theory invariants of the signature operator.*
(with Paolo Piazza), arXiv:1710.00934, to appear in *Annales of ENS*.
- 23) *A Cheeger-Muller theorem for manifolds with wedge singularities.*
(with Frédéric Rochon and David Sher), arXiv:1807.02178, to appear in *Analysis & PDE*.
- 24) *Poincare-Lovelock metrics on conformally compact manifolds.*
Adv. Math. 367 (2020), 107108, 43 pp.
- 25) *Sub-Riemannian limit of the differential form heat kernels of contact manifolds.*

(with Hadrian Quan), arXiv:1912.02326, to appear in IMRN.

Preprints:

26) *The index formula for families of Dirac type operators on pseudomanifolds.*

(with Jesse Gell-Redman), arXiv:1712.08513, submitted.

27) *Compactification of $SL(2)$.*

(with Panagiotis Dimakis and Richard Melrose), arXiv:1812.03883, submitted.

28) *Compactification of semi-simple Lie groups.*

(with Panagiotis Dimakis, Richard Melrose, and David Vogan), arXiv:1910.02811, submitted.

Directed Research

Current graduate students: Gayana Jayasinghe, Karthik Vasu

Former graduate students: Melinda Lanius (PhD 2018), Hadrian Quan (PhD 2021)

Selected Academic Talks

Seminars and Colloquia at:

Northwestern, Stanford, Bonn, Roma ‘La Sapienza’, MIT, Puerto Rico Mayagüez, Brown, UCSD, UNC Chapel Hill, Toronto, Oldenburg, Edinburgh, ETHZ, Copenhagen-Lund Öresund seminar, Paris 6, Nantes, Cambridge, Dartmouth, Kentucky, Princeton, Purdue, Temple, UT Austin, Michigan Ann Arbor, Case Western, Nebraska Lincoln, Maryland, Auckland, Courant, Montana State, Michigan State, Stony Brook, Boston Univ, Iowa, Regensburg

Conferences at:

Tokyo University of Science, Japan; Cortona, Italy; Berlin, Germany; Temple; Hopkins; PCMI, Park City, Utah; UC Boulder; Rochester, New York; BIRS Banff, Canada; UNC Chapel Hill; Oberwolfach, Germany; Boston; Northwestern; Tübingen, Germany; Dartmouth; ANU Canberra, Australia; MIT; C.I.R.M., Luminy, France; Boston University; Nice, France; Stanford; Newton Institute, UK

Private Sector Work Experience

Bancomer SA de CV, Mexico, Financial Risk Management; 1994 - 2000.

Miscellaneous

Native languages: English and Spanish,

Citizenship: American