

CURRICULUM VITAE

JOACHIM KRIEGER

Address:

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Personal and Education.

- Born on June 3rd 1976, Basel, Switzerland. Citizen of Switzerland.
- Languages: English, German, Swiss German, French
- Mathematisch Naturwissenschaftliches Gymnasium Basel, Switzerland, 1987-1991.
- Humanistisches Gymnasium Basel 1991-1994, graduating with a "Type A (Greek and Latin) Matura".
- Basel University 1994-1995, "Vordiplom der Mathematik und Physik".
- Harvard University 1995-1999. Senior thesis under guidance of Prof. Wilfried Schmid on "Characteristic cycles associated with representations of noncompact Lie groups." BA with Highest Honours in Mathematics.
- Graduate student at Princeton University 1999-2003, advisee of Prof. Sergiu Klainerman. Ph. D. Thesis (2003) on "Global regularity of Wave Maps in 2 and 3 spatial dimensions."

Employment

- 2014-: Full Professor, Ecole Polytechnique Federale de Lausanne
- 2010-2013: Associate Professor(T), Ecole Polytechnique Federale de Lausanne
- 2009-2011: Associate Professor(T), The University of Pennsylvania (on leave 2010-2011)
- 2008-2009: Calabi Assistant Professor (TT) (chaired position)
- 2007-2009: Assistant Professor (TT), The University of Pennsylvania
- Spring 2004-2007 : Benjamin Peirce Assistant Professor of Mathematics, Harvard University.
- Fall 2003: Member at the Institute for Advanced Study, Princeton.

Research Interests

- Partial differential equations, mathematical physics, harmonic analysis, differential geometry.

Prizes, Awards and Fellowships

- First Prize at competition "La jeunesse recherche", Switzerland (1992).
- Harvard: Phi-Beta-Kappa, Senior Thesis awarded Mumford Prize, recipient of Wister Prize for highest grade point average in mathematics.
- Princeton: Recipient of Dodds Fellowship for the academic year 2002/3.

- Harvard: Recipient of NSF Grant DMS-0401177 "Global regularity and development of singularities for geometric wave equations", 2004-2007
- Sloan Fellow 2008-2010.
- NSF Grant DMS-0757278, 2008-2011
- inaugural Calabi Assistant Professorship(Chair), 2008-2009, The University of Pennsylvania
- SNF-grant 2011- 2014, SNF-weave grant, 2025 - 2029.
- SNSF Consolidator Grant (1.367 Mio. Swiss Francs, transitional substitute for ERC Consolidator Grants) 2015 - 2020
- Fellow of the American Mathematical Society(2016)

Editorial work:

- Transactions of the AMS and Memoirs of the AMS, 2019 – .
- Proceedings of the American Mathematical Society 2012 – 2019
- Discrete and Continuous Dynamical Systems A(Associate Editor).
- Analysis in Theory and Applications.
- Differential and Integral Equations.
- Dynamics of PDE (Interntl. Press)

Conference Organization:

- Nonlinear Hamiltonian PDEs, Centro Stefano Francisi (Ascona), July 1 - 6 2012, co-organised with D. Bambusi (Milano), Th. Kappeler (Zurich) and W. Schlag (Chicago).
- Analysis and Computation of dispersive PDE and fluid dynamics, Institut Henri Poincaré(Paris), June 16 - 20 2025, co-organised with T. Buckmaster (NYU) and K. Schratz (Sorbonne).

Administration:

- Director of the Section de Mathématiques, 2019 – 2023
- Member of the commission de recherche, EPFL, 2011 – 2019
- Member of Ecole Doctorale committee, EPFL

Teaching

- Harvard University:** Math 21(Multivariable Calculus), Math 115(Topics in Analysis and Applications), Math121(Honours Linear Algebra), Math 212(Real Analysis), Math112(Real Analysis), Math231(Topics in Nonlinear Hyperbolic PDE)
- Princeton University:** Math 103(Calculus of One Variable)
- The University of Pennsylvania:** Math 240(Analysis), Math 608(Graduate Real Analysis), Math 644/645(PDE), Math114(Calculus), Math104(Calculus)
- Ecole Polytechnique Federale de Lausanne:** Equations Differentielles Ordinaires, Geometrie pour Genie Mecanique, Equations Differentielles Partielles, Elliptic PDE, Analyse II, Analyse III pour physiciens, Analysis I(Deutsch), Harmonic Analysis, Dispersive PDE, Introduction to Dynamical Systems, l^2 -Decoupling(Ph. D. course).

Ph. D. students supervised:

- Sohrab Shahshahani, 2009 - 2012 (UPenn/ EPFL)

- Can Gao, 2011 - 2014 (EPFL)
- Stefano Burzio, 2015 - 2019(EPFL)
- G  rome Graf, 2015 - 2019(EPFL)
- Jonas Luehrmann, 2014 - 2016(ETH), co-advisor.
- Gaspard Ohlmann, 2016 - 2021(EPFL)
- Yang Liu, 2019 – 2023
- Katie Marsden, 2020–2024
- Dylan Samuelian, 2021–2025
- Jaime Gomez, 2023–
- Timon Miehl  ng, 2025 –

Postdocs mentored:

- Joules Nahas, 2010 – 2014
- Roland Donn  nger, 2011 – 2014
- Willie Wai Yeung Wong, 2011 – 2014
- Elisabetta Chiodaroli, 2013 – 2017
- Aparajita Dasgupta, 2013 – 2016
- Hasan Inci, 2015 – 2017
- Derek Smith, 2016 – 2017
- Shuang Miao, 2016 – 2019
- Klaus Widmayer, 2017 – 2022
- Anna Kiesenhofer, 2017 – 2021
- Luigi Forcella, 2018 – 2020
- Shengquan Xiang, 2019 – 2022
- Tobias Schmid, 2021—2025
- David Wallauch, 2024–
- Jose Palacios, 2025 –

Conference Participation upon Invitation

- Participant at 2001 UCLA conference on "Dispersive Equations"
- Participant at 2001 Oberwolfach conference on "Nonlinear Evolution Problems"
- Speaker at the June 2002 joint AMS-UMI conference in Pisa.
- Speaker at the July/August 2002 "Summer School on the Cauchy Problem in General Relativity", Cargese, Korsika.
- Speaker at Oberwolfach May 2003 conference on "Nonlinear Dispersive Equations".
- Speaker at 2004 Special Semester "Phase Space Analysis of Partial Differential Equations" at the Centro Ennio de Giorgi, Pisa, Italy.
- Speaker at 2004 Oberwolfach conference on "Dispersive Differential Equations".
- Speaker at 2005 joint AMS-DMS meeting Mainz
- Speaker at 2005 Oberwolfach conference on "Nonlinear Evolution Problems"
- Speaker at 2005 MSRI workshop on "Nonlinear Dispersive Equations".
- Speaker at 2006 workshop on the Ricci Flow, Harvard University
- Invited Speaker at 2006 workshop at RIMS, Kyoto
- Speaker at 2007 workshop at RIMS, Kyoto
- Invited Speaker at 2008 Oberwolfach conference on geometric flows
- Invited Speaker at 2008 conference "Geometry and Analysis", the Royal Institute of Technology Stockholm.
- Journ  es equations aux d  riv  es partielles Evians-les-bains 2009

- Erwin Schrodinger Institute, Vienna, 2010
- Oberwolfach September 2010 conference on dispersive PDE.
- Mini course 2010 Solitary and Dispersive Days, Milano Dec. 13-17
- 2011 Nonlinear Dispersive Equations (ETH),
- 2011 International Congress of industrial and applied Mathematics, Vancouver
- 2012: Workshop on Constructive Quantum Field Theory at Simons Center for Geometry and Physics, Stonybrook.
- 2012: Oberwolfach conference on Nonlinear Evolution Problems
- 2012: Fourteenth International Conference on Hyperbolic Problems, Universita die Padova
- 2012: International Conference on Nonlinear Partial Differential Equations, University of Oxford
- 2013: 22nd Nevanlinna Colloquium, Helsinki (plenary speaker)
- 2013: Workshop on Analytical Aspects of Mathematical Physics, ETH May 27 - 31
- 2013: Nonlinear Wave Equations, Institut Henri Poincare, Paris, May 21 - 24
- 2013: Dispersive PDEs: Models and Dynamics. Pisa, Sep. 18-20
- 2014: Dynamics in Geometric Dispersive Equations, May 4 - 9, Banff Research Station, Canada
- 2014: Harmonic Analysis and Partial Differential Equations, June 2014, Bonn, Germany.
- 2014: Effective Equations in Mathematical Physics, June 30 - July 4, Mittag Lefler Institute Stockholm, Sweden.
- 2014: 6th Euro-Japanese workshop on Blow-up, Sep. 1 - 5, Tokyo Institute of Technology, Tokyo, Japan.
- 2015: Mathematical Problems in General Relativity, Simons Center(Stonybrook), Jan. 19 - 23.
- 2015: Maxwell Minisymposium, ICMS, Univ. of Edinburgh, April 29th.
- 2015: Workshop "Longtime Behaviour of Nonlinear Waves", Univ. of Bielefeld, June 8 - 12.
- 2015: Conference "Nonlinear Waves and their Numerical Study", Fields Institute Toronto, June 22 - 26.
- 2016: Conference in honour of Sergiu Klainerman, Princeton University, Jan. 26 - 29.
- 2016: Oberwolfach workshop on Nonlinear Evolution Problems, May 29th - June 4th.
- 2016: Summer school on nonlinear waves, IHES, Bures-sur-Yvette, France.
- 2017: Analyse asymptotique des équations d'évolution, CIRM, Luminy, France, July 3 - 7.
- 2017: Conference in honour of Demetrios Christodoulou, ETH, July 9 - 14 .
- 2018: La Thuile workshop.
- 2018: Rivière-Fabes symposium(Minneapolis), two lectures.
- 2018: Nonlinear Dirac equations and related problems, Univ. of Bielefeld, May 28 - 30.
- 2018: 10th Mathematical Society of Japan, Seasonal Institute, Hokkaido University, Sapporo.
- 2019: Oxbridge PDE conference, Oxford.
- 2019: Harmonic Analysis and PDE, Hausdorff Institute Bonn.

- 2019: Nonlinear dynamics and long-time asymptotics, conference in memory of Vladimir Buslaev, Steklov Institute St. Petersburg.
- 2019: BIRS workshop on Advances in Dispersive Equations: Challenges and Perspectives, Banff.
- 2019: Conference on Nonlinear Partial Differential Equations and Applications, Univ. of Michigan, Ann Arbor.
- 2019: 4th Swiss-Japanese PDE seminar, Osaka, Japan.
- 2020: Long-time dynamics and singularity formation, NYU Abu Dhabi (online).
- 2021: One World PDE seminar(online).
- 2021: Banff online workshop on singularity formation for PDEs.
- 2022: Mathematics of Wave Phenomena, Karlsruhe, plenary speaker.
- 2022: Recent trends in nonlinear dispersive equations: equilibria, stability, dynamics, Banach Center Bedlewo.
- 2022: Deterministic Dynamics and Randomness in PDE, Oberwolfach
- 2022: Nonlinear waves and dispersive equations, Oberwolfach.
- 2023: Nonlinear wave equations and General Relativity, Tsinghua University, Beijing.
- 2023: 14th Isaacs Congress, Ribeirao Preto, Brasil.
- 2023: ICMAM Latin America Satellite Conference in Analysis and PDE
- 2023: Conference in honour of Wilfried Schmid, TSIMF, Sanya, China
- 2024: Harmonic and Stochastic Analysis of Dispersive PDEs, Bielefeld University
- 2024: Spectral analysis of Schrodinger operators, ICERM Brown University, Rhode Island.
- 2024: 14th AIMS conference, Abu Dhabi.
- 2025: Workshop 'Black holes, naked singularities, shocks and implosions', Singapore National University.
- 2025: Hyperbolic Dispersive Equations on Curved Geometries: Connections to Physics and General Relativity, Simons Center, Stonybrook.
- 2025: Nonlinear Dispersive Equations: Advances and Perspectives, CIRM(Luminy).
- 2026: Recent progress in asymptotic stability of solitons and related problems, Punta Arenas, Chile.
- 2026: Nonlinear Waves and Dispersive Equations, Oberwolfach.

Invited Talks at Seminars

- 2003: University of Miami, UCLA, Berkeley, IAS,
- 2004: Harvard, Cornell, Courant(NY University),
- 2005: Princeton, UChicago, ETH(Zurich), MIT, UMass Amherst
- 2006: UChicago, Northwestern, UMichigan, ETH, University of Pennsylvania, UC Irvine
- 2007: University of Minnesota, ETH, Cambridge(UK), UCLA
- 2008: University of Rochester, Princeton University, John Hopkins University, University of Pennsylvania, Cornell
- 2009: John Hopkins, EPFL, IHP (Paris), Universite d'Orsay (Paris),
- 2010: Princeton University (mini course), ETH
- 2011: Institut Henri Poincare (Paris), Johns Hopkins, Warwick(UK), Univ. of Zurich
- 2012: Princeton University
- 2014: EPFL

- 2015: University of Zurich, Politecnico di Torino.
- 2016: Imperial College, London.
- 2017: University of Toronto, Johns Hopkins, UMichigan, UMass Amherst, MIT.
- 2018: Universita di Pisa.
- 2020: Princeton University(online)
- 2020: PDE seminar via zoom, organised by Shanghai Tech University
- 2021: Univ. of Trieste, several lectures.
- 2022: EPFL
- 2024: Peking University, Wuhan University
- 2026: ENS Lyon, Basel University

Colloquia

- 2007: UCSD, University of Toronto,
- 2009: Johns Hopkins, Princeton University
- 2011: Cornell, Univ. de Fribourg
- 2019: University of Vienna
- 2024: University of Vienna

Publications

- ”Global regularity of Wave Maps in 2 and 3 spatial dimensions”, Ph. D. Thesis, Princeton University, 2003
- ”Global Regularity of Wave Maps from $\mathbf{R}^{3+1}$ to surfaces”, CMP 238 (2003), no. 1-2, 333–366
- ”Null-form estimates and nonlinear waves”, Advances in Diff. Equations 8 (2003), no. 10, 1193–1231
- ”Global Regularity of Wave Maps from $\mathbf{R}^{2+1}$ to $\mathbf{H}^2$ ”, CMP 250(2004), 507–580
- ”Stability of spherically symmetric Wave Maps”, Memoirs of the AMS, no. 853(2006), Vol. 181, 80p.
- ”Stable manifolds for all monic supercritical NLS in one dimension”(joint with W. Schlag), J. of the Amer. Math. Soc. 19(2006), no.4, 815–920
- ”Non-generic blow-up solutions for the critical focusing NLS in 1-d”(joint with W. Schlag), Journal of the European Math. Soc. Vol. 11(1), 2009, 1–125
- ”On the focusing critical semi-linear wave equation”(joint with W. Schlag), Amer. J. Math. 129 (2007), no. 3, 843–913.
- ”Global regularity for the Yang-Mills equations on high dimensional Minkowski space.” (joint with J. Sterbenz), 100p., Memoirs of the AMS 223(2013), 99 pp. ISBN: 978-0-8218-4489-2

- ”Renormalization and blow up for charge one equivariant critical wave maps”, (joint with W. Schlag and D. Tataru), *Invent. Math.* 171 (2008), no. 3, 543–615.
- ”Slow blow up solutions for the H^1 -critical focusing semi-linear wave equation on $\mathbf{R}^3$, joint w. W. Schlag and D. Tataru), *Duke Math Journal* 147(2009), no. 1, 1–53.
- ”Global well-posedness for the Maxwell-Klein-Gordon equation in 4+1 dimensions. Small energy”(joint with J. Sterbenz and D. Tataru), to appear *Duke Math. J.*
- ”Global Regularity and Singularity Development for Wave Maps”, *Surveys in Diff. Geometry* 12(2008), 167–202
- ”Slow Blow up solutions for certain critical wave equations. RIMS Kokyuroku Bessatsu B22(2010), p. 93 – 102.
- ”Large time decay and scattering for wave maps”, (joint w. K. Nakanishi), *Dyn. Partial Differ. Equ.* 5 (2008), no. 1, 1–37.
- ”On structural stability of pseudo-conformal blowup for L^2 -critical Hartree NLS”(joint with E. Lenzmann and P. Raphael), *Ann. Henri Poincaré* 10 (2009), no. 6, 1159 – 1205.
- ”Renormalization and Blow Up for the critical Yang-Mills problem”(joint w. W. Schlag and D. Tataru), *Adv. Math.* 221 (2009), no. 5, 1445–1521.
- ”Two soliton solutions to the three dimensional gravitational Hartree equation”(joint w. Y. Martel and P. Raphael), *Comm. Pure Appl. Math.* 62 (2009), no. 11, 1501–1550.
- ”Concentration Compactness for Wave Maps”(joint w. W. Schlag), *Research Monographs of the European Mathematical Society*¹(2012), 490p. Preprint appeared 2009.
- ”Global dynamics away from the ground state for the energy-critical nonlinear wave equation”(joint w. K. Nakanishi and W. Schlag), *Amer. J. of Math.* 135(2013), no. 4, 935 – 965.
- ”A codimension two stable manifold of near soliton equivariant wave maps”(joint w. I. Bejenaru and D. Tataru), *Analysis PDE* 6(2013), no. 4, 829 – 857
- ”Global solutions to a non-local diffusion equation with quadratic non-linearity.”(joint w. R. M. Strain), *Comm. PDE* 37(2012), 647 – 689.

¹This work has been reviewed in an 8 p. article for the Bulletin of the American Mathematical Society by Terence Tao (to appear, available on Bull. AMS webpage)

- "Global dynamics above the ground state energy for the one-dimensional NLKG equation" (joint w. K. Nakanishi and W. Schlag), *Math. Zeitschrift* 272(2012), no. 1-2, 297 – 316.
- "Nonscattering solutions and blowup at infinity for the critical wave equation in $3 - d$ " (joint w. R. Donn timer), *Mathematische Annalen* 357(2013), no. 1, 89 – 163.
- "On stability of the Catenoid under vanishing mean curvature flow on Minkowski space" (joint w. H. Lindblad), *Dyn. Partial Diff. Eqns.* 9(2012), no. 2, 89 – 119.
- "A non-local inequality and global existence" (joint w. P. Gressman and R. Strain), *Adv. in Math.* 230(2012), 642 – 648
- "Nondispersive solutions to the L^2 -critical half-wave equation" (joint w. E. Lenzmann and P. Raphael), *Arch. Rat. Mech. Anal.* 209(2013), no. 1, 61 – 129.
- "Global dynamics of the nonradial energy-critical wave equation above the ground state energy" (joint w. K. Nakanishi and W. Schlag), *Discr. Cont. Dyn. Sys. A* 33(2013), no. 6, 2423 – 2450.
- "Threshold phenomenon for the quintic wave equation in three dimensions" (joint w. K. Nakanishi and W. Schlag), *Comm. Math. Phys.* 327(2014), no. 1, 309 – 332.
- "Full range of blow up exponents for the quintic wave equation in three dimensions" (joint w. W. Schlag), *Jour. Math. Pure. Appl.* (9) 101(2014), no. 6, 873 – 900.
- "Instability of type II blow up for the quintic nonlinear wave equation on $\mathbf{R}^{3+1}$ " (joint w. J. Nahas), *Bull. Soc. Math. France* 143 (2015), no. 2, 339-355.
- "Exotic blow up solutions for the u^5 -focussing wave equation in $\mathbf{R}^3$ " (joint w. R. Donn timer, M. Huang and W. Schlag), *Michigan J. Math.* 63(2014), no. 3, 451 – 501.
- "On type I blow up formation for the critical NLW" (joint w. W. Wong), *Comm. PDE.* 39(2014), no. 9, 1718 – 1728.
- "A vector field method on the distorted Fourier side and decay for wave equations with potentials" (joint w. R. Donn timer), *Mem. Amer. Math. Soc.* 241 (2016), no. 1142, v+80 pp. ISBN: 978-1-4704-1873-1; 978-1-4704-2877-8
- "Codimension one stability of the catenoid under the vanishing mean curvature flow in Minkowski space" (joint w. R. Donn timer, J. Szeftel and W. Wong), *Duke Math. J.* 165 (2016), no. 4, 723–791.

- "Large global solutions for energy supercritical nonlinear wave equations on $\mathbf{R}^{3+1}$ " (joint w. W. Schlag), submitted 2014, J. Anal. Math. 133 (2017), 91–131.
- "Center-stable manifold of the ground state in the energy space for the critical wave equation" (joint w. K. Nakanishi and W. Schlag), in Mathematische Annalen, vol. 361, num. 1-2, p. 1–50, 2015.
- "Optimal polynomial blow up range for critical Wave Maps" (joint w. Can Gao), Comm. Pure Appl. Anal. 14(2015), no. 5, 1705 – 1741.
- "On global regularity for systems of nonlinear wave equations with the null condition" (joint w. C. Gao, A. Dasgupta), Dyn. Partial Differ. Equ. 12 (2015), no. 2, 115 – 125.
- "Concentration Compactness for the critical Maxwell-Klein-Gordon equation" (joint w. J. Luehrmann), submitted (2015), Ann. PDE 1 (2015), no. 1, Art. 5, 208 pp.
- "A class of large global solutions for the Wave Maps equation" (joint w. El. Chiodaroli), Trans. Amer. Math. Soc. 369 (2017), no. 4, 2747–2773.
- "Global well-posedness for the Yang-Mills equation in $4 + 1$ -dimensions. Small energy." (joint w. D. Tataru), submitted (2015), Ann. of Math. (2) 185 (2017), no. 3, 831–893.
- "Small data global regularity for half-wave maps" (joint w. Y. Sire), submitted(2016), Anal. PDE 11 (2018), no. 3, 661–682.
- "Concentration Compactness for critical radial wave maps" (joint w. E. Chiodaroli and J. Luehrmann), submitted(2016), to appear Annals of PDE.
- "On stability of type II blow up for the critical NLW on $\mathbf{R}^{3+1}$ ", submitted(2017), to appear Memoirs of the AMS.
- "Type II blow up solutions with optimal stability properties for the critical focussing nonlinear wave equation on $\mathbf{R}^{3+1}$ " (joint w. S. Burzio), submitted(2017), to appear Memoirs of the AMS.
- "On stability of blow up solutions for the critical co-rotational Wave Maps problem" (joint w. S. Miao), submitted(2018), to appear Duke Math. J.
- "Randomization improved Strichartz estimates and global well-posedness for supercritical data" (joint w. N. Burq), submitted(2019), to appear Annales de l'institut Fourier.

- ”Small data global regularity for half-wave maps in $n = 4$ dimensions”(joint w. A. Kiesenhofer), *Comm. PDE* 46(2021), no. 12, 2305 – 2324.
- ”Cost for a controlled linear KdV equation”(joint w. Shengquan Xiang), *ESAIM: Control, Optimisation and Calculus of Variations*(2021).
- ”Boundary Stabilization of Focusing NLKG near Unstable Equilibria: Radial Case”(joint w. Shengquan Xiang), to appear *Pure and Applied Analysis*.
- ”A stability theory beyond the co-rotational setting for critical wave maps blow up”(joint w. S. Miao and W. Schlag), preprint(2020),
- ”Probabilistic small data global Well-Posedness of the energy-critical Maxwell-Klein-Gordon equation”(joint w. J. Luhrmann and G. Staffilani), to appear *ARMA*.
- ”Semi-global controllability of a geometric wave equation”(joint with S. Xiang), to appear *Pure Appl. Math. Q.*
- ”Global controllability and stabilization of the wave maps equation from a circle to a sphere”(joint w. J.-M. Coron and S. Xiang), to appear *Calc. of Var. and PDE*.
- ”Finite time blow up for the energy critical Zakharov system I: approximate solutions”(joint w. T. Schmid), submitted(2024)
- ”Finite time blow up for the energy critical Zakharov system II: exact solutions”(joint w. T. Schmid), submitted(2024)
- ”Concentric bubbles concentrating in finite time for the energy critical wave maps equation”(joint w. J. Jendrej), submitted(2025).
- ”The cubic NLS on the line with an inverse square potential”(joint w. W. Schlag and K. Widmayer), submitted(2025).
- ”Wave maps from circle to Riemannian manifold: global controllability is equivalent to homotopy”(joint w. J.-M. Coron and S. Xiang), submitted.
- ”Long finite time bubble trees for two co-rotational wave maps”(joint w. Jose Palacios), submitted.

Refereeing

J. Math. Phys., Amer. J. Math., Annales Henri Poincare, Int. Math. Res. Notices, Annals of Math., JFA, CMP, Comm. PDE, Cambridge J. of Mathematics, Duke Math. J., JAMS, Acta Mathematica, Inventiones, etc

Professional Memberships:

- American Mathematical Society
- Swiss Mathematical Society