A. Shadi Tahvildar-Zadeh

Curriculum Vitae

Educational History

Ph.D.	Courant Institute of Mathematical Sciences, 1991
	Thesis Advisor: Prof. Jalal Shatah
	Title: Harmonic Maps of the Minkowski Space
M.S.	Courant Institute of Mathematical Sciences, 1989
B.S.	Sharif University of Technology, Tehran, Iran, 1985

Professional History

2017-present	Professor I, Dept. of Mathematics, Rutgers (New Brunswick)
2014-2017	Undergraduate Vice-Chair, Dept. of Mathematics, Rutgers (New Brunswick)
Spring 2011	Member, Institute for Advanced Study, Princeton NJ
Fall 2007	Guest Professor, Sharif University of Technology, Tehran
2003-2004	Member, Institute for Advanced Study, Princeton NJ
2000-2016	Associate Professor, Dept. of Mathematics, Rutgers (New Brunswick)
1994-2000	Assistant Professor, Dept. of Mathematics, Princeton University
1992-1994	Assistant Professor, Dept. of Mathematics, University of Michigan
1991-1992	Member, Institute for Advanced Study, Princeton NJ

Research Activities

Publications

- In Preparation:

  1. (with M. Kiessling) *Bopp-Lande-Thomas-Podolsky electrodynamics as initial value problem.* currently 52 pages.

  2. (with M. Kiessling and M. Lienert) *Relativistic interacting electron-photon system in one space dimension*, currently 19 pages.

  3. (with S. Beheshti) *The double-Kerr solution via vesture.*

- Submitted for Publication

  1. (with M. Kiessling) *On the quantum mechanics of a single photon*, 29 pages, (2017).

- Appeared in print:

  1. (with Shabnam Beheshti) "Integrability and Vesture for Harmonic Maps into Symmetric Spaces," *Rev. Math. Phys.* **28**:03, (2016) 44 pages. [arXiv: 1209:1383].

2. (with Michael Kiessling) "A novel quantum-mechanical interpretation of the Dirac equation," *Jour. Phys. A* (2016), 54 pages. [arXiv:1411.2296]

3. (with Michael Kiessling) "Dirac's point electron in the zero-gravity Kerr–Newman world," in *Quantum Mathematical Physics,* F. Finster, J. Kleiner, C. Roken, and J. Tolksdorf, eds., Birkhauser Basel, 2016. [arXiv: 1505.05552]

4. "On a zero-gravity limit of the Kerr–Newman spacetimes and their electromagnetic fields" *Jour. Math. Phys.*, **56**, 042501 (2015) [arXiv:1410.0416]

5. (with Michael Kiessling) "The Dirac point electron in zero-gravity Kerr–Newman spacetime" *Jour. Math. Phys.*, **56**; 042303 (2015) [arXiv:1410.0419]

6. (with Shabnam Beheshti) "Dressing with control: Using integrability to generate desired solutions to Einstein's equations." in *The sine-Gordon Model and its Applications*, Springer International Publishing, 2014. 207-231. [arXiv:1312.5253]

7. "On the static spacetime of a single point charge," Reviews in Mathematical Physics, **23** No. 3 (2011) 1-38. [arXiv:1012.1400]

8. (with M. Kiessling) "On the relativistic Vlasov-Poisson system," Indiana University Math Journal, Vol. 57, No. 7 (2008), 3177–3207 [arXiv:0708.1760v3].

9. (with N. Burq, F. Planchon & J. Stalker) "Strichartz estimates for wave and Schrödinger equations with potentials of critical decay," Indiana University Math Journal, Vol. 53, No. 6 (2004), 1667-1682 [arXiv:math.AP/0401019].

10. (with J. Stalker) "Scalar waves on naked singularity backgrounds," Classical and Quantum Gravity, Vol. 21, 2831–2848 (2004) [arXiv:gr-qc/0401011].

11. (with N. Burq, F. Planchon & J. Stalker) "Strichartz estimates for the wave and Schrödinger equations with the inverse-square potential," Journal of Functional Analysis Vol. 203, 519–549, (2003). [arXiv:math/0207152]

12. (with J. Stalker & F. Planchon) "Dispersive Estimate for the Wave Equation with the Inverse-Square Potential," Discrete and Continuous Dynamical Systems, Vol. 9, No. 6, 1387–1400, (2003).

13. (with J. Stalker & F. Planchon) "L^p Estimates for the Wave Equation with the Inverse-Square Potential," Discrete and Continuous Dynamical Systems, Vol. 9, N0. 2, 427–442, (2003).

14. (with F. Majidi) *Hachtroudi*, Encyclopaedia Iranica, Vol. 12, Fascicle 1 (2003).

15. (with Yan Guo) "Formation of singularities in relativistic fluid dynamics and in spherically symmetric plasma dynamics," Contemporary Mathematics, Vol. 238, 151–161, (1999). [arXiv:math/9807136]

16. "Relativistic and non-relativistic elastodynamics with small shear strains," Ann. Inst. H. Poincaré Phys. Théor., Vol. 69, No. 3, 275–307, (1998).

17. (with T. Cazenave & J. Shatah) "Harmonic maps of the hyperbolic space and development of singularities for wave maps and Yang-Mills fields," Ann. Inst. H. Poincaré Phys. Théor. , Vol. 68, N0. 3, 315–349, (1998).

18. (with A. Schlatter & M. Struwe) "Global existence of the equivariant Yang-Mills flow in four dimensions," Amer. J. Math. , Vol. 120, 117–128, (1998).

19. (with J. Shatah) "On the stability of stationary wave maps," Comm. Math. Phys., Vol. 185, 231–256, (1997).

20. "Wave maps, or harmonic maps of Lorentzian manifolds," (in Persian), Nashr-e Riyāzi, Vol. 7, No. 1, 6–14, (1995).

21. (with J. Shatah) "On the Cauchy problem for equivariant wave maps," Comm. Pure Appl. Math., Vol. XLVII, 719-754, (1994).

22. (with D. Christodoulou) "On the asymptotic behavior of spherically symmetric wave maps," Duke Math. Jour., Vol. 71, No. 1, 31-69, (1993).

23. (with D. Christodoulou) "On the regularity of spherically symmetric wave maps," Comm. Pure Appl. Math., Vol. XLVI, 1041-1091, (1993).

24. (with J. Shatah) "Regularity of harmonic maps from the Minkowski space into rotationally symmetric manifolds," Comm. Pure Appl. Math., Vol. XLV, 947-971, (1992).

INVITED TALKS

Spring 2018	Analysis Seminar, **Courant Institute, NYU, New York**, February 2018.
	General Relativity Seminar, **Université Pierre et Marie Curie, Paris**, February 2018.
	Field Equations on Lorentzian Space-time, **Universität Hamburg**, March 2018.
	Lectures on Integrability and Vesture, **Universität Köln**, March-April 2018.
	Analysis and Geometry Seminar, **Queen Mary University of London**, March 2018.
	Workshop and Conference on Nonlinear Waves, **Georgia Tech., Atlanta**, May 2018.
Fall 2017	2nd Northeast Analysis Meeting, **SUNY Albany**, October 2017.
	Black Hole Initiative, **Harvard University, Boston**, October 2017
Summer2017	Mathematics, Physics, and their Interaction, **ETH, Zürich**, July 2014
Spring 2017	Faculty Research Talk for Prospective Graduate Students, **Rutgers (New Brunswick)**, March 2017.
Fall 2016	Geometric Analysis Seminar, **Rutgers (New Brunswick)**, September 2016.
Summer 2016	4th Frontiers in Mathematical Sciences Conference, **Sharif Univ. of Tech., Tehran**, July 2016.
	Physics Colloquium, **Institute for Research in Fundamental Sciences, Tehran**, July 2016.
Spring 2016	Berkeley Harmonic Analysis and Differential Equations Student Seminar, **University of California, Berkeley**, March 2016.
	Analysis Seminar, **University of California, Santa Barbara**, March 2016.
Fall 2015	Workshop on Dynamics of Self-Gravitating Matter, **Institut Henri Poincare, Paris, France**, October 2015.
	Graduate Analysis Seminar, **Rutgers (New Brunswick)**, December 2015.
Summer 2015	Short course on General-Relativistic Quantum Mechanics, **Sharif University of Technology, Tehran, Iran**, July 2015.
Spring 2015	Mathematical Problems in General Relativity Workshop, **Simons Center for Geometry and Physics, Stoney Brook NY**, January 2015.
	Mathematics Colloquium, **University of Pittsburgh**, February 2015
	PDE Seminar, Math department, **Brown University, Providence RI**, March 2015.
	Analysis Seminar, Math department, **Johns Hopkins University, Baltimore MD**, April 2015
	Undergraduate Pizza Seminar, **Rutgers (New Brunswick)**, April 2015.

Fall 2014	Mathematical Physics seminar, Math dept, **Rutgers (New Brunswick)**, December 2014
	3rd Conference on Frontiers in Mathematical Sciences, **Institute for Research in Fundamental Sciences, Tehran, Iran**, December 2014
Summer 2014	Short course on General Relativity and the Dirac Equation, **Institute for Research in Fundamental Sciences, Tehran, Iran**, July 2014
	10th AIMS conference on differential equations and dynamical systems, Madrid, Spain, July 2014.
Fall 2013	2nd Conference on Frontiers in Mathematical Sciences, **Institute for Research in Fundamental Sciences, Tehran, Iran**, December 2013
Spring 2013	Mathematical physics seminar, **Rutgers (New Brunswick)**, February 2013.
Fall 2012	Departmental Colloquium, **Rutgers (New Brunswick)**, September 2012.
	Symposium on recent results in General Relativity **CUNY graduate center,** New York, NY, November 2012.
	Workshop on electromagnetic spacetimes, **Wolfgang Pauli Institute**, Vienna, Austria, November 2012.
Spring 2012	Analysis seminar, **Université Pierre et Marie Curie**, Paris, France, May 2012.
	Member seminar, **Albert Einstein Institute**, Golm, Germany, May 2012.
Summer 2011	Analysis Seminar, **Trinity College**, Dublin, Ireland, June 2011.
	Conference on Nonlinear Dispersive Equations, **ETH Zurich**, Switzerland, June 2011.
	Analysis Seminar, **Université de Nice**, France, June 2011.
Spring 2011	Barrett Memorial Lectures in Mathematical Relativity, **University of Tennessee**, Knoxville, TN, May 2011.
	Analysis Seminar, **University of Michigan**, Ann Arbor, MI, February 2011.
	Analysis Seminar, **Brown University**, Providence, RI, January 2011.

TEACHING AND MENTORING ACTIVITIES

- Postdoctoral mentor (joint with A. Soffer and M. Kiessling) of Ebru Toprak (Fall 2018–)

- Postdoctoral mentor (joint with M. Kiessling) of Annegret Burtscher (Fall 2017-Summer 2018)

- Honors thesis advisor and research mentor of undergraduate senior Michael McNulty (Summer 2016-Spring 2017)

- Co-advising (with Michael Kiessling) of PhD student Erik deAmorim, (Spring 2016-present).

- Member, Thesis defense committee of Jianguo Xiao (April 2016).

- Member, Thesis defense committee of Francis Seuffert (April 2016)

- Member, Oral qualifying exam of Lun Zhang (February 2016)

- Member, Oral qualifying exam of Michael Breeling (February 2016).

- Member, Thesis defense committee of Manuel Larenas (May 2015).

- Chair, Thesis defense committee of Moulik Balasubramanian (April 2015).

- Postdoctoral mentor (joint with M. Kiessling) of Xinliang An, (Fall 2014-Spring 2016).

- Mentor (joint with M. Kiessling) of Rutgers Physics graduate student Parmesh Pasnoori (Summer 2014–Spring 2015).

- Outside member of thesis defense committee for August Kruger (Physics dept., Rutgers NB), (September 2014).

- Thesis advisor of Moulik K. Balasubramanian (Spring 2012–May 2015)

- Thesis defense committee member of Yue Wang (May 2013)

- Aresty program faculty mentor (jointly with M. Kiessling) for Corey St.-John (Summer 2012–Spring 2013)

- Served on the oral qualifying exam committees of Tom Sznigir, Francis Seuffert and Xukai Yan (Spring 2013)

- Supervised reading of R. Penrose's *Road to Reality* by freshman student N. Patel (Fall 2012)

- Taught graduate numerical methods courses (642:573 & 642:574) when faculty members regularly teaching these courses became unavailable, Fall 2012, Spring 2013, and Fall 2013.

- Outside expert member of thesis defense committee for Sohrab Shahshahani (at EPFL, Switzerland) August 2012.

- Chair, oral qualifying exam of M. K. Balasubramanian, February 2012.

- Thesis defense committee member for Brent Young, April 2011.

- Postdoctoral mentor (jointly with M. Kiessling) of Shabnam Beheshti, 2009-2011.

- Supervised readings in Functional Analysis and PDEs by Moulik Balasubramanian, 2010-2011.

- Honors track advisor to J. Sloane, 2009-2010.

- Co-adviser (with M. Kiessling) of PhD student Jared Speck (now a tenure-track assistant professor at MIT) 2005-2008.

- Developed a new graduate course: "Mathematical Foundations of Relativity and Gravitation", given in 2007, 2009, and 2011.

SERVICE ACTIVITIES

A. Service to the Department

1. Undergraduate Vice-Chair (June 2014–July 2017)

   (a) Increasing efficiency and productivity at the undergraduate office
   - Designed and implemented online employment applications
   - Developed and implemented online surveys of faculty's availability and course preferences.
   - Initiated and brought to completion the process of eliminating *all* paper forms that were in use at the undergraduate office.

- Designed a teaching assignment algorithm based on neural-network optimization and wrote the code in MATLAB that takes the teaching availability and course preferences of all faculty and graduate students into account and schedules them for courses based on their teaching load, avoids time conflicts, and accounts for Rutgers's staggered periods.

- Designed, tested and gradually implemented the computer-assisted scheduling of teaching assignments based on the above algorithm. In Fall 2015 around 200 units of teaching were assigned using this system to around 100 instructors. The process took just a few hours, most of which was taken up by the task of formatting and entering the survey results into the system.

- Oversaw the recruitment and hiring of a tech-savvy data manager, who was tasked with modernizing all aspects of the undergraduate operations through the creation and maintenance of a departmental database (Solutions), and related online advising tools to process pre-requisite overrides, honors special permissions, course transfer evaluations, transfer pre-approval requests, requests from non-matriculating students, etc.

- Initiated the overhaul of the department's Special Permission system. I put a committee of faculty in charge of the process, thereby eliminating the waiting time before students would receive the results.

- Partnered with SAS-IT to design and successfully implement a new online system for special permissions.

(b) Raising the quality of undergraduate math instruction

- Oversaw hiring of full-time and part-time instructors: reviewed 160 applications in 2014, implemented a standardized interview process and conducted 40 live interviews that led to the hiring of 20 part-time and 2 full-time instructors.

- Hired 16 part-time and 6 full-time instructors in 2015 via a rigorous interview process that featured presentations designed to gauge the teaching effectiveness and mathematical knowledge of candidates.

- Hired 6 more full-time instructors in 2016 using the same process.

- Initiated a regime of annual observations of the teaching of all faculty below the rank of associate professor, engaging the entire tenured faculty in the process to observe, provide feedback, and generate reports on teaching effectiveness that are now used to make reappointment and promotion decisions.

- Initiated a rigorous regime of observation of and feedback provided to every teaching assistant and recitation instructor in every course by the lecturer in that course, who would then file an online report subsequently used in writing of the teaching letter for PhD students who go on the job market after graduation.

- Instituted a system of checks and balances for monitoring the performance of the non-tenure track faculty, which led to the departure of two under-performing lecturers and two instructors who were found out to have practiced grade inflation.

(c) Planning for the future of undergraduate math education at Rutgers

- Analyzed a six-year enrollment trend in undergraduate courses and identified the "internal shift" phenomenon: student enrollment nearly doubled in mid- to upper- level courses while dramatically decreasing in lower level courses. Proposed new staffing model that would ensure best qualified instructors and most gifted teachers were matched with the courses in high demand.

- Addressed the chronic staffing shortage and excessive reliance on part-time lecturers in mid-to upper-level courses by increasing class size, hiring of more qualified full-time instructors, and providing additional support for students in these courses through the creation of at-large teaching assistants and the implementation of online office hours conducted by them.
- Tripled the capacity in honors calculus courses in order to meet the unprecedented demand caused by the opening of the Rutgers Honors College and the simultaneous increase in admissions to the SAS Honors Program and the Engineering Honors Academy.
- Established a productive partnership with the Engineering School, the Honors College, the SAS Honors Program, and the IT team in charge of the online platform eGyan at the Chemistry department.
- Oversaw the conversion to hybrid format of the Precalculus course Math 115 by moving recitations online.

2. Math department Ombudsman (Fall 2012–June 2014)

3. Summer math advisor (Summers of 2011-2013)

4. Member, undergraduate honors committee (2012 – 2013)

5. Chair, ad-hoc subcommittee for selecting a textbook for Math 252 (Spring 2013)

6. Member, graduate admissions committee for the MSMF program, 2010.

7. Member, graduate admissions committee for the math PhD program, 2006-2009.

B. Service to the University

1. Member, University Task Force on Academic Integrity Policy, 2017-2018.

2. Member, SAS Strategic Plan's Task Force on Undergraduate Education, 2015.

3. Member, nominations committee, Rutgers School of Arts and Sciences (2012-2014)

C. Service to the Community

1. Refereed papers for *Communications in Mathematical Physics*, *Annals of Mathematics*, *Evolution Equations and Control Theory*, *Journal of Hyperbolic Differential Equations*, *Discrete and Continuous Dynamical Systems A*, *Analysis and PDEs*, *Proceedings of AMS*, *International Math Research Notices*, *Journal of Functional Analysis*.

2. Co-organizer (with M. Kiessling) of the special session on "Mathematical Problems of Relativistic Physics: Classical and Quantum," at the AMS regional meeting, Northeastern U., Boston MA, April 2018.

3. Co-organizer (with M. Kiessling) of the special session on N-body Problems in Relativity at the AMS regional meeting at Penn-State, PA, October 2009.