

Curriculum Vitae¹

Name: Hossein Movasati

Date and place of birth: 10.5.1975, Tabriz-Iran

Marital status: Married (31.5.2003)²

Nationality: Iranian, Brazilian

Prizes/Medals won in Math. competitions:

- International Olympiad of Mathematics, Bronze medal, 1993, Turkey.
- Annual Iranian Student Competition in Mathematics, Fourth place, 1995, Kerman University, Iran.
- Annual Iranian Student Competition in Mathematics, Second place, 1996, Sharif University of Technology, Iran.

Educational and professional background:

- Undergraduate studies at the Faculty of Mathematics, Sharif University of Technology, October 1993-October 1997, Tehran.
- Ph.D. in Mathematics at Instituto de Matemática Pura e Aplicada (IMPA), January 1998-December 2000, Rio de Janeiro. Title: On deformation of holomorphic foliations with a center in the projective space. Ph.D. Advisor: Prof. Dr. Alcides Lins Neto.
- Postdoctoral fellow at IMPA, January 2001-June 2001.
- Postdoctoral fellow at Institute for Mathematics and Physics IPM, Tehran, July 2001-September 2001.
- Postdoctoral fellow at Max-Planck Institut für Mathematik MPIM Bonn, October 2001-September 2002.
- Research position at Institut für Theoretische Physik, Technische Universität Clausthal, October 2002-June 2003 and at Mathematisches Institut Georg August Universität Göttingen, July 2003-September 2004.

¹An online and detailed version of this CV can be found in <http://lattes.cnpq.br/4758525199848229>

²My wife, Sara Ochoa, is also a mathematician and works on Partial Differential Equations.

- Research/Teaching position as 'Wissenschaftler Mitarbeiter': Darmstadt University of Technology, Mathematics Department, October 2004-September 2005.
- Japan Society for Promotion of Science (JSPS) fellow at Mathematics Department of Ochanomizu University, Tokyo, September 2005-October 2006.
- Tenure-track position at Instituto de Matemática Pura e Aplicada (IMPA), from October 2006. Full Professor since 2017.
- Sabbatical year at Harvard university, September 2013-August 2014.

Languages: Reading, writing and speaking abilities in Persian, English, Azari, Portuguese, Spanish and German and familiar with French, Arabic and Japanese.

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Students

1. Evilson da Silva Vieira. Ph.D. thesis title: Ciclos Limites Projetivos e Aplicações computacionais à Dinâmica Complexa. 2009.
2. Alan Geraldo Reyes Figueroa, Master thesis title: Monstrous moonshine conjecture: a review of Borcherd's proof. 2010.
3. Younes Nikdelan, Ph.D. Thesis title: Darboux-Halphen-Ramanujan Vector Field on a Moduli of Calabi-Yau Manifolds, 2015.
4. Yadollah Zare, Ph.D. Pull-back of polynomial differential equations, 2018.
5. Roberto Vilaflor, Ph.D, Periods of algebraic cycles, 2019.
6. Jorge Duque, Ph.D, Hodge cycles and Gauss hypergeometric function, 2021.
7. Daniel Lopez Garcia, Ph.D, On the Orbits of Monodromy Action, 2021.

Organizer of conferences (last 4 years)

1. Arithmetic and Geometry of Picard-Fuchs Differential Equations, 20-21 August, IMPA, Rio de Janeiro, 2012.
2. Arithmetic of modular forms and elliptic curves, IMPA, 3-14 January, IMPA, Rio de Janeiro, 2011.
3. International Conference in Number Theory and Physics, IMPA, Rio de Janeiro, 15-26 June, 2015.
4. Mirror symmetry in higher genus, IMPA, Rio de Janeiro, 28 November 03 December 2020.

I am also one of the main organizers of the weekly online seminar

Geometry, Arithmetic and Differential Equations of Periods (GADEPs)
Fridays 10:30 (Rio de Janeiro's time)
<http://w3.impa.br/~hossein/GADEPs/GADEPs.html>

Conferences

Some conferences that I have been invited:

1. Arithmetic and Algebraic Differentiation: Witt vectors, number theory and differential algebra In honor of Alexandru Buium, Berkeley, 2015. Gauss-Manin connection in disguise: a tale of a differentiation.
2. Explicit Methods for Modularity of K3 Surfaces and Other Higher Weight Motives, ICERM, 19-24 October, 2015. Two aspects of the project Gauss-Manin Connection in Disguise
3. Workshop on Hodge Theory in String Theory, November 18-22, 2013, Fields institute, Canada. A common framework for automorphic forms and topological partition functions.
4. Canadian Number Theory Association XII Meeting, Canada, 2012. Modular forms for triangle groups.
5. Frontiers in Mathematical Sciences (a conference in honor of Siyavash Shahshahani's 70th birthday), Iran, 2012. Modular forms: From arithmetic to Physics applications.
6. Workshop on Arithmetic and Geometry of K3 surfaces and Calabi-Yau threefolds, Canada, 2011. Modular-type functions attached to Calabi-Yau varieties.
7. Number Theory and Physics at the Crossroads, Canada, 2011. Mirror quintic Calabi-Yau modular forms.
8. Workshop on Variation of Cohomology: D-Modules, Monodromy and Arithmetic, Germany, 2011. Halphen-type equations attached to Calabi-Yau equations.
9. Summer School and Conference on Hodge Theory and Related Topics, Italy, 2010. Automorphic functions for moduli of polarized Hodge structures.
10. 11-th International Conference on Real and Complex Singularities, Brazil, 2010. Calabi-Yau singularities and q-expansions.

11. Besse Summer School 2010, Quasimodular forms and applications, France, 2010. Geometric interpretation of quasi modular forms.
12. Singularités des champs de vecteurs du plan, bifurcations et applications, France, 2009. Center conditions: the rigidity of pull-back differential equations.
13. 40th Annual Iranian Mathematics Conference, Iran, 2009. Periods and generating functions in Algebraic Geometry.
14. III CLAM Congreso Latino Americano de Matemáticos, Chile, 2009. Periods and generating functions in Algebraic Geometry.
15. Workshop on Algebraic Geometry and Physics, Brazil, 2009. Moduli of polarized Hodge structures arising from mirror Calabi-Yau three folds.

Teaching

Some courses that I have given at IMPA:

1. Differential Topology, Summer 2007.
2. Several complex variables, March-June 2007.
3. Topology of Algebraic varieties, March-June 2007.
4. Topics on analytic varieties, August-November 2007.
5. Arithmetic of elliptic curves and modular forms, March-June 2008.
6. Introduction to number theory, Summer 2009.
7. Topics in Hodge theory, March-June 2009.
8. Introduction to number theory, Summer 2010.
9. Arithmetic of elliptic curves and modular forms, March-June 2010.
10. Introduction to holomorphic foliations, March-June 2010.
11. Geometric theory of foliations, Summer 2011.
12. Several complex variables, March-June 2011.
13. Introduction to number theory , Summer 2012.
14. Complex analysis, March-June 2012.
15. Topics in Hodge theory, March-June 2012.
16. Arithmetic of elliptic curves and modular forms (together with Khosro M. Shokri), July-November, 2012.
17. Topics in complex varieties (together with C. Camacho), Summer 2013.
18. Topology of manifolds, March-June 2013.
19. Introduction to Algebraic Curves and Foliations, January-February 2015.

- 20. Topics in Hodge theory I, March-June 2015.
- 21. Holomorphic foliations I, March-June 2015.
- 22. Topics in Hodge theory II, August-November 2015.
- 23. Holomorphic foliations II, August-November 2015.
- 24. Topics in Hodge theory I, March-June 2016.
- 25. Topics in modular forms, August-November 2016.
- 26. Introduction to Number Theory, January-February 2017.
- 27. Introduction to Complex Geometry, March-June 2017.
- 28. Topics in Hodge Theory, August-November 2017.
- 29. Topics in modular forms and elliptic curves, January-February 2018.

Programming experience

I have written a collection of procedures in the library `foliation.lib` in SINGULAR. It is an implementation of algorithms which I have developed during my career. For further information see

<http://w3.impa.br/~hossein/mod-fol-exa.html>.

It is mainly dedicated to the computation of

1. algebraic de Rham cohomology of hypersurfaces, Gauss-Manin connections of families of hypersurfaces which depend on various parameters, Picard-Fuchs equations, mixed Hodge structure of affine hypersurfaces, etc.
2. the q -expansion of modular forms through their differential equations (Ramanujan, Darboux, Halphen), the q -expansion of Calabi-Yau modular forms, higher genus Gromov-Witten invariants, etc.
3. dimension of the space of Hodge cycles for Fermat variety, their periods and the Zariski tangent space of Hodge and Noether-Lefschetz loci, verification of the reducedness of the Hodge loci.

Almost all the proofs in my book below relies on computer computations:

H. Movasati, Gauss-Manin connection in disguise: Calabi-Yau modular forms, with appendices by Khosro Shokri and Carlos Matheus, Surveys in Modern Mathematics, Vol 13, International Press, Boston.

Publications³

- Papers on holomorphic foliations, Hilbert 16-th problem, limit cycles, center problem and topology of fibrations (2000-2010):
 1. H. Movasati, On the topology of integrable foliations, Bol. Soc. Bras. Mat., Vol. 31, No. 3 (2000), 305-336.
 2. H. Movasati, On deformation of foliations with a center in the projective space, An. Acad. Brasil. Ciênc. 73 (2001), no. 2, 191-196.
 3. H. Movasati, Abelian integrals in holomorphic foliations, Rev. Mat. Iberoamericana, Vol. 20, issue 1 (2004).
 4. H. Movasati, Center conditions: Rigidity of logarithmic differential equations, Journal of Differential Equations, 197 (2004) 197-217.
 5. H. Movasati, Center conditions for polynomial differential equations: discussion of some problems, Kôkyûroku, 1447, Research Institute for Mathematical Sciences (RIMS), Kyoto University.
 6. H. Movasati, Meromorphic connections on $\mathbb{P}^1$ and the multiplicity of Abelian integrals. Journal of Dynamical and Control Systems, Vol 12, No. 2, 217-228, 2006.
 7. H. Movasati, Relative Cohomology with Respect to a Lefschetz Pencil. Journal für Reine und Angewandete Mathematik, 594, 175-199, 2006.
 8. L. Gavrilov, H. Movasati. The infinitesimal 16th Hilbert problem in dimension zero. Bul. Sci. Math., 131, 242-257, 2007.
 9. H. Movasati, I. Nakai, Commuting holonomies and rigidity of holomorphic foliations, Bull. London Math. Soc., 40:473-478, 2008.
 10. L. Gavrilov, H. Movasati, I. Nakai, On the non-persistence of Hamiltonian identity cycles, Journal of Differential Equations, Vol. 246, 2706-2723.
 11. H. Movasati, E. Silva, Projective limit cycles, Moscow Mathematical Journal, Vol. 9, Number 4, p. 855-866.

³Author's articles are available online at www.impa.br/~hossein/ and arxiv.org

12. H. Movasati, M. Uribe, Limit cycles, Abelian Integrals and Hilbert's 16th Problem (Book), 31 Colóquio Brasileiro de Matemática, 2017.
- Papers on negatively embedded varieties (after H. Grauert 1962):
 1. C. Camacho; H. Movasati; P. Sad, Fibered neighborhoods of curves in surfaces. *J. Geom. Anal.* 13 (2003), no. 1, 55–66.
 2. C. Camacho; H. Movasati, Neighborhoods of analytic varieties (Book). *Monografías del Instituto de Matemática y Ciencias Afines*, 35. Instituto de Matemática y Ciencias Afines, IMCA, Lima; Pontificia Universidad Católica del Perú, Lima, 2003.
 3. C. Camacho, H. Movasati, B. Scardua, The moduli of quasi-homogeneous Stein surface singularities, *Journal of Geometric Analysis* (2009) 19:244-260.
 4. H. Movasati, P. Sad, Embedded curves and foliations, *Publ. Mat.* 55 (2011), 401–411.
 5. C. Camacho, H. Movasati, Foliated neighborhoods of exceptional submanifolds, *Indiana University Mathematical Journal*, Vol 63, No. 5, (2014).
 - My first contact with modular forms
 1. J. Hilgert and D. Mayer, H. Movasati, Transfer operator for $\Gamma_0(n)$ and the Hecke operators for the period functions of $PSL(2, \mathbb{Z})$, *Math. Proceedings of the Cambridge Philosophical Society*, Vol. 139 issue 1, 2005.
 - Papers on Hodge Theory, Picard-Fuchs equations and related topics:
 1. H. Movasati, Calculation of Mixed Hodge structures, Gauss-Manin connections and Picard-Fuchs equations, *Real and Complex Singularities*, Trends in Mathematics, 247-262, 2006, Birkhauser (proceeding of Sao Carlos Conference in Singularities, CIRM, 2004).
 2. H. Movasati, Mixed Hodge structure of affine hypersurfaces. *Ann. Inst. Fourier.*, Tome 57, (2007), fascicule 3, 775-801.
 3. H. Movasati, S. Reiter, Hypergeometric series and Hodge cycles of four dimensional cubic hypersurfaces, *Jou. of Number Theory*, Vol. 2, No. 6, 2006.

4. H. Movasati, Moduli of polarized Hodge structures, (lectures in CIMPA-UNESCO-IPM School on Recent Topics in Geometric Analysis, May 2006), Bull. Soc. Bras. Mat., 39(1), 81-107, 2008.
 5. H. Movasati, On elliptic modular foliations, Indagationes Mathematicae, 19 (2008) No.2 263-286.
 6. H. Movasati, S. Reiter, Painlevé VI equations with algebraic solutions and families of curves, Journal of Experimental Mathematics, Vol. 19, Number 2, 2010, P. 161-173.
 7. H. Movasati, S. Reiter, Heun equations coming from geometry, Bul. Brasil Math. Soc. 43(3), 423-442, 2012.
 8. C. Camacho, H. Movasati, Remarks on a theorem of Perron, J. Diff. Equ. 260, 1465-1471, (2016).
 9. E. Aljovin, H. Movasati, R. Villaflor, Integral Hodge conjecture for Fermat varieties, Journal of Symbolic Computation Volume 95, 2019, Pages 177-184.
 10. H. Movasati, R. Villaflor, Periods of linear algebraic cycles, Pure and Applied Mathematics Quartely, Vol. 14, No. 3-4, 563-577, 2018.
 11. H. Movasati, E. Sertoz, On reconstructing subvarieties from their periods, Rendiconti del Circolo Matematico di Palermo Series 2, 2020.
 12. H. Movasati, Special components of Noether-Lefschetz loci , Rendiconti del Circolo Matematico di Palermo Series 2 volume 70, pages 861-874 (2021).
 13. H. Movasati, S. Reiter, Convolution of Picard-Fuchs equations, To appear in Michigan Mathematical Journal.
 14. H. Movasati, A Course in Hodge Theory: With Emphasis on Multiple Integrals (Book), Somerville, MA: International Press Boston, 2021.
 15. H. Movasati, R. Villaflor, A Course in Hodge Theory: Periods of Algebraic cycles (Book), 33 Colóquio Brasileiro de Matemática, IMPA, Rio de Janeiro, Brazil, 2021.
- Papers related to the project “Gauss-Manin connection in disguise”:

1. H. Movasati, Modular and Automorphic Forms & Beyond, Monographs in Number Theory, World Scientific, To be published November 2021.
2. H. Movasati, On elliptic modular foliations II , To appear in Moscow Mathematical Journal.
3. J. Cao, H. Movasati, S.-T. Yau, Gauss-Manin connection in disguise: genus two curves, Advances in Mathematics Volume 383, 2021.
4. H. Movasati, Y. Nikdelan, Product formulas for weight two new forms, Cadernos de IME, No. 14, pages 1-7, 2020
5. H. Movasati, Y. Nikdelan, Gauss-Manin connection in disguise: Dwork family, Journal of Differential Geometry, 119 (2021) 73-98.
6. B. Haghighat, H. Movasati, and S.-T. Yau, Calabi-Yau modular forms in limit: Elliptic fibrations, , Communications in Number Theory and Physics, Vol. 11, Number 4, 879-912, 2017.
7. J. A. C. Morales, H. Movasati, Y. Nikdelan, R. Roychowdhury, M. A. C. Torres, Manifolds ways to Darboux-Halphen system, SIGMA, 14, (2018), 003.
8. H. Movasati, Gauss-Manin connection in disguise: Calabi-Yau modular forms (Book), with appendices by Khosro Shokri and Carlos Matheus, Surveys in Modern Mathematics, Vol 13, International Press, Boston.
9. Murad Alim, H. Movasati, Emanuel Scheidegger, Shing-Tung Yau, Gauss-Manin connection in disguise: Calabi-Yau threefolds, Comm. Math. Phys. 344, (2016), no. 3, 889-914.
10. H. Movasati, Gauss-Manin connection in disguise: Noether-Lefschetz and Hodge loci, Asian Journal of Mathematics, Vol.21, No. 3, pp. 463-482, 2017.
11. Ch. Doran, H. Movasati, U. Whitcher and A. Harder, Humbert surfaces and the moduli of lattice polarized K3 surfaces. String-Math 2014, Proceedings of Symposia in Pure Mathematics, Vol. 93, 124-153, (2016).
12. H. Movasati, Quasi-modular forms attached to elliptic curves: Hecke operators. Journal of Number Theory, Volume 157, December 2015, Pages 424-441.

13. H. Movasati, Modular-type functions attached to mirror quintic Calabi-Yau varieties , *Mathematische Zeitschrift*, Vol 281, Issue 3, 2015, pp. 907-929.
14. H. Movasati, Kh. M. Shokri, Automorphic forms for triangular groups: Integrality properties, *Journal of Number Theory*, 145:67–78, 2014.
15. Ch. Doran, T. Gannon, H. Movasati, Kh. M. Shokri. Automorphic forms for triangular groups. *Communications in Number Theory and Physics*, Vol 7, No. 4, 689-737, 2013.
16. H. Movasati, Quasi-modular forms attached to Hodge structures I , *Fields Communication Series*, 67, 2013.
17. H. Movasati, On Ramanujan relations between Eisenstein series , *Manuscripta Mathematicae*, Vol. 139, Numbers 3-4 (2012), 495-514.
18. H. Movasati, Quasi-modular forms attached to elliptic curves, I, *Annales Mathématique Blaise Pascal*, v. 19, p. 307-377, 2012.
19. H. Movasati, Differential modular forms and some analytic relations between Eisenstein series, *Ramanujan Journal*, 17:53-76, 2008.
20. H. Movasati, Multiple Integrals and Modular Differential Equations, 28 *Colóquio Brasileiro de Matemática*, p. 168, 2011.
21. H. Movasati, Eisenstein type series for Calabi-Yau varieties , *Nuclear Physics B*, 847, (2011).