

# Curriculum Vitae

Jiří Lebl

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## Education:

PhD in Mathematics, Spring 2007, University of California, San Diego (UCSD)

Advisor: Prof. Peter Ebenfelt Thesis: *Singularities and Complexity in CR Geometry*

BA (Spring 2001) and MA (Spring 2003) in Mathematics, San Diego State University (SDSU)

## Employment:

2018–present Associate Professor, *Oklahoma State University (OSU)*

2013–2018 Assistant Professor (tenure-track), *Oklahoma State University (OSU)*

2011–2013 Van Vleck Visiting Assistant Professor, *University of Wisconsin–Madison (UW–Madison)*

2010–2011 Teaching Visitor, *University of California, San Diego (UCSD)*

2007–2013 J. L. Doob Research Assistant Professor ('07–'10) / Adjunct Assistant Professor ('10–'13)  
*University of Illinois at Urbana–Champaign (UIUC)*

2004–2007 Teaching Assistant, *University of California, San Diego (UCSD)*

2003 Programmer, *Red Hat, Inc.*, Raleigh, NC

2002 Teaching Assistant in Mathematics, *San Diego State University (SDSU)*

2000–2001 Programmer, *Eazel, Inc.*, Mountain View, CA

1999 Programmer/Consultant, *Spyder, Inc.*, San Diego, CA

1996–1998 Programmer/Consultant, *Trega, Inc.*, San Diego, CA

## Grants:

2014–2018: PI on NSF grant DMS-1362337, *Complexity in CR Geometry* (\$141,000).

2009–2013: PI on NSF grant DMS-0900885, *Singularities and Complexity in CR Geometry* (\$99,898).

Oklahoma State University Fiscal Year 2016 Dean's Incentive Grant (\$3000).

Oklahoma State University Fiscal Year 2015 Dean's Incentive Grant (\$3000).

Oklahoma State University Fiscal Year 2015 Arts and Sciences Summer Research Grant (\$8000).

## Publications and Preprints: (selected publications are marked with ►)

- [38] Bernhard Lamel, Jiří Lebl, *Segre nondegenerate totally real subvarieties*, preprint [arXiv:2001.08598](https://arxiv.org/abs/2001.08598).
- [37] John P. D'Angelo, Dusty Grundmeier, Jiří Lebl, *Rational sphere maps, linear programming, and compressed sensing*, to appear in *Complex Anal. Synerg.*, preprint [arXiv:1911.05559](https://arxiv.org/abs/1911.05559).
- [36] Jiří Lebl, Alan Noell, Sivaguru Ravisankar, *A CR singular analogue of Severi's theorem*, preprint [arXiv:1909.04752](https://arxiv.org/abs/1909.04752).
- [35] Anne-Katrin Gallagher, Jiří Lebl, Koushik Ramachandran, *The closed range property for the  $\bar{\partial}$ -operator on planar domains*, to appear in *J. Geom. Anal.*, preprint [arXiv:1901.04390](https://arxiv.org/abs/1901.04390).
- [34] Jiří Lebl, Alan Noell, Sivaguru Ravisankar, *On the Levi-flat Plateau problem*, to appear in *Complex Anal. Synerg.*, [MR 4052029](https://arxiv.org/abs/1809.01276), preprint [arXiv:1809.01276](https://arxiv.org/abs/1809.01276).
- [33] Adam Coffman, Jiří Lebl, *Removing Isolated Zeroes by Homotopy*, *Topol. Methods Nonlinear Anal.*, **54** (2019), no. 1, 275–296, [MR 4018281](https://arxiv.org/abs/1712.01787), [arXiv:1712.01787](https://arxiv.org/abs/1712.01787).
- [32] Anne-Katrin Gallagher, Jiří Lebl, Koushik Ramachandran, *Convexity of level lines of Martin functions and applications*, *Anal. Math. Phys.*, **9** (2019), no. 1, 443–452, [MR 3933550](https://arxiv.org/abs/1710.00280), [arXiv:1710.00280](https://arxiv.org/abs/1710.00280).
- [31] Jiří Lebl, Alan Noell, Sivaguru Ravisankar, *On Lewy extension for smooth hypersurfaces in  $\mathbb{C}^n \times \mathbb{R}$* , *Trans. Amer. Math. Soc.*, **371** (2019), no. 9, 6581–6603, [MR 3937338](https://arxiv.org/abs/1704.08662), [arXiv:1704.08662](https://arxiv.org/abs/1704.08662).
- [30] Jiří Lebl, Asif Shakeel, Nolan Wallach, *Unentangled Measurements and Frame Functions*, *J. Math. Phys.*, **59** (2018), no. 6, 062107, [MR 3816448](https://arxiv.org/abs/1701.06069), [arXiv:1701.06069](https://arxiv.org/abs/1701.06069).
- [29] Jiří Lebl, Alan Noell, Sivaguru Ravisankar, *Codimension two CR singular submanifolds and extensions of CR functions*, *J. Geom. Anal.*, **27** (2017), no. 3, 2453–2471, [MR 3667437](https://arxiv.org/abs/1604.02073), [arXiv:1604.02073](https://arxiv.org/abs/1604.02073),
- [28] Jiří Lebl, Arturo Fernández Pérez, *Global and local aspects of Levi-flat hypersurfaces*. *Publicações Matemáticas do IMPA. 30º Colóquio Brasileiro de Matemática*. Instituto Nacional de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, 2015. ISBN: 978-85-244-0407-8. [MR 3242789](https://arxiv.org/abs/1604.02073),
- [27] Jiří Lebl, Alan Noell, Sivaguru Ravisankar, *Extension of CR functions from boundaries in  $\mathbb{C}^n \times \mathbb{R}$* , *Indiana Univ. Math. J.*, **66** (2017), no. 3, 901–925, [MR 3663330](https://arxiv.org/abs/1505.05255), [arXiv:1505.05255](https://arxiv.org/abs/1505.05255).

- ▶ [26] Jiří Lebl, Asif Shakeel, Nolan Wallach, *Local Distinguishability of Generic Unentangled Orthonormal Bases*, Phys. Rev. A. **93** (2016), no. 1, 012330, [arXiv:1502.06639](#).
- [25] Dusty Grundmeier and Jiří Lebl, *Initial monomial invariants of holomorphic maps*, Math. Z. **282** (2016), no. 1, 371–387, [MR 3448385](#), [arXiv:1502.03434](#).
- [24] Jiří Lebl, *An interesting example of a compact non- $\mathbf{C}$ -analytic real subvariety of  $\mathbf{R}^3$* , [arXiv:1412.4838](#).
- ▶ [23] John P. D’Angelo and Jiří Lebl, *Homotopy equivalence for proper holomorphic mappings*, Adv. Math., **286** (2016), 160–180, [MR 3415683](#), [arXiv:1408.1104](#).
- [22] Jiří Lebl, *Singular Levi-flat hypersurfaces in complex projective space induced by curves in the Grassmannian*, Internat. J. Math., **26** (2015), no. 5, 1550036 (17 pages), [MR 3345513](#), [arXiv:1407.5913](#).
- [21] Xianghong Gong and Jiří Lebl, *Normal forms for CR singular codimension two Levi-flat submanifolds*, Pacific J. Math., **275** (2015), no. 1, 115–165. [MR 3336931](#), [arXiv:1403.0558](#).
- [20] Jiří Lebl, *Addendum to Uniqueness of certain polynomials constant on a line*, [arXiv:1302.1441](#).
- [19] Jennifer Halfpap and Jiří Lebl, *Signature pairs of positive polynomials*, Bull. Inst. Math. Acad. Sin. (N.S.), **8** (2013), no. 2, 169–192, [MR 3098535](#), [arXiv:1211.0997](#).
- [18] Jiří Lebl, André Minor, Ravi Shroff, Duong Son, and Yuan Zhang, *CR singular images of generic submanifolds under holomorphic maps*, Ark. Mat., **52** (2014), no. 2, 301–327, [MR 3255142](#), [arXiv:1205.5309](#).
- ▶ [17] Dusty Grundmeier, Jiří Lebl, and Liz Vivas, *Bounding the rank of Hermitian forms and rigidity for CR mappings of hyperquadrics*, Math. Ann., **358** (2014), no. 3–4, 1059–1089, [MR 3175150](#), [arXiv:1110.4082](#).
- [16] Jiří Lebl and Han Peters, *Polynomials constant on a hyperplane and CR maps of spheres*, Illinois J. Math., **56** (2012), no. 1, 155–175, [MR 3117023](#), [arXiv:1105.2343](#).
- ▶ [15] Jiří Lebl, *Singular set of a Levi-flat hypersurface is Levi-flat*, Math. Ann., **355** (2013), no. 3, 1177–1199, [MR 3020158](#), [arXiv:1012.5993](#).
- [14] Orest Bucicovschi and Jiří Lebl, *On the continuity and regularity of convex extensions*, J. Convex Anal., **20** (2013), no. 4, 1113–1126, [MR 3184299](#), [arXiv:1012.5796](#).
- [13] John P. D’Angelo and Jiří Lebl, *Pfister’s theorem fails in the Hermitian case*, Proc. Amer. Math. Soc., **140** (2012), 1151–1157, [MR 2869101](#), [arXiv:1010.3215](#).
- [12] John P. D’Angelo and Jiří Lebl, *Hermitian symmetric polynomials and CR complexity*, J. Geom. Anal., **21** (2011), no. 3, 599–619, [MR 2810845](#), [arXiv:1003.0126](#).
- ▶ [11] Jiří Lebl and Han Peters, *Polynomials constant on a hyperplane and CR maps of hyperquadrics*, Mosc. Math. J., **11** (2011), no. 2, 287–317, [MR 2859238](#), [arXiv:0910.2673](#).
- ▶ [10] Jiří Lebl, *Normal forms, Hermitian operators, and CR maps of spheres and hyperquadrics*, Michigan Math. J., **60** (2011), no. 3, 603–628, [MR 2861091](#), [arXiv:0906.0325](#).
- [9] Jiří Lebl, *Pullback of varieties by finite maps*, preprint [arXiv:0812.2498](#).
- [8] Jiří Lebl and Daniel Lichtblau, *Uniqueness of certain polynomials constant on a line*, Linear Algebra Appl., **433** (2010), no. 4, 824–837, [MR 2654111](#), [arXiv:0808.0284](#).
- [7] Jiří Lebl, *Algebraic Levi-flat hypervarieties in complex projective space*, J. Geom. Anal., **22** (2012), no. 2, 410–432, [MR 2891732](#), [arXiv:0805.1763](#).
- [6] John P. D’Angelo and Jiří Lebl, *On the complexity of proper holomorphic mappings between balls*, Complex Var. Elliptic Equ., **54** (2009), nos. 3–4, 187–204, [MR 2513534](#), [arXiv:0802.1739](#).
- [5] Jiří Lebl, *Levi-flat hypersurfaces with real analytic boundary*, Trans. Amer. Math. Soc., **362** (2010), no. 12, 6367–6380, [MR 2678978](#), [arXiv:0710.3801](#).
- ▶ [4] John P. D’Angelo and Jiří Lebl, *Complexity results for CR mappings between spheres*, Internat. J. Math., **20** (2009), no. 2, 149–166, [MR 2493357](#), [arXiv:0708.3232](#).
- ▶ [3] Jiří Lebl, *Extension of Levi-flat hypersurfaces past CR boundaries*, Indiana Univ. Math. J., **57** (2008), no. 2, 699–716, [MR 2414332](#), [arXiv:math.CV/0612071](#).
- [2] John P. D’Angelo, Jiří Lebl, and Han Peters, *Degree Estimates for Polynomials Constant on a Hyperplane*, Michigan Math. J., **55** (2007), no. 3, 693–713, [MR 2372622](#), [arXiv:math.CV/0609713](#).
- [1] Jiří Lebl, *Nowhere minimal CR submanifolds and Levi-flat hypersurfaces*, J. Geom. Anal., **17** (2007), no. 2, 321–341, [MR 2320166](#), [arXiv:math.CV/0606141](#).

#### Textbooks:

- *Notes on Diffy Qs: Differential Equations for Engineers*, 466 pages. Introductory differential equations textbook. ISBN: 978-1706230236. Available for download at <https://www.jirka.org/diffyqs/>.

- *Basic Analysis I: Introduction to Real Analysis, Volume I*, 282 pages. Introductory real analysis textbook. ISBN: 978-1718862401. Available for download at <https://www.jirka.org/ra/>.
- *Basic Analysis II: Introduction to Real Analysis, Volume II*, 195 pages. Additional topics in undergraduate analysis. ISBN: 978-1718865488. Available for download at <https://www.jirka.org/ra/>.
- *Tasty Bits of Several Complex Variables*, 182 pages. Introductory course in several complex variables for beginning graduate students. ISBN: 978-0-359-64225-0. Available for download at <https://www.jirka.org/scv/>.
- *Hermitian Forms Meet Several Complex Variables: Minicourse on CR Geometry Using Hermitian Forms*, 62 pages. Notes for a half-semester graduate mini-course on Hermitian forms and CR geometry given at UIUC in Spring 2010. Available for download at <https://www.jirka.org/scv-mini/>.

The two undergraduate books above have been or are being currently used in hundreds of university classes. Apart from my own usage at UIUC, UCSD, UW–Madison, and OSU, they have been used at Dartmouth College, University of California at Berkeley, University of Tennessee, University of Pittsburgh, Iowa State University, University of British Columbia, University of California at Irvine, Texas A&M, University of Hawaii, and many others.

The real analysis book is the standard book for the class at University of Pittsburgh, Iowa State University, and St. John’s University of Tanzania. The differential equations book is the standard book at University of California at Irvine, Santa Barbara City College, and de-facto standard book at the University of British Columbia. The Saylor Foundation (<http://www.saylor.org>) is using both of the undergraduate textbooks as part of their online coursework. Both books are approved textbooks in the American Institute of Mathematics Open Textbook Initiative.

The graduate textbook has been used as a textbook for a topics course on several complex variables at several universities.

#### Book Chapters:

- “Ordinary Differential Equations” in *Computational Toxicology*, Ed. Brad Reisfeld, Arthur Mayeno, volume 2, Series: Methods in Molecular Biology, Humana Press, 2012.
- “Appendix E: Balls and Springs” in *Beginning GTK+/GNOME Programming* by Peter Wright, Wrox Press, 2000.

#### Research Interests:

My primary interests lie in *complex analysis* in general and CR geometry in particular. My research in CR geometry also led me to study problems in real and complex algebraic geometry, discrete geometry, combinatorics, number theory, and experimental mathematics using computers. My research philosophy is not simply to solve problems within the confines of a particular area, but to look for connections and applications to other areas of mathematics and even other disciplines.

My work on CR geometry includes two particular problems: proper holomorphic mappings between balls and hyperquadrics and the singularity structure of a singular Levi-flat hypersurfaces. See my research statement for further information.

Favorite AMS MSC numbers: 32 (several complex variables), 14 (algebraic geometry), 30 (one complex variable).

#### Conference Presentations:

- *Extending CR functions from codimension 2 CR singular manifolds in any dimension*, AMS special session, September 2019, Madison, Wisconsin.
- *Severi’s theorem for codimension 2 CR singular manifolds  $\mathbb{C}^3$* , 10th Workshop on Geometric Analysis of PDE and Several Complex Variables, August 2019, Serra Negra, Brazil.
- *Averaging Functions over Segre Varieties*, AMS special session, March 2019, Honolulu, Hawaii.
- *Levi-flat Plateau problem*, Analysis and CR Geometry Workshop, December 2018, Erwin Schroedinger Institute, Vienna, Austria.
- *Levi-flat Plateau problem*, AMS special session, November 2018, Fayetteville, Arkansas.
- *Complex analysis with a real parameter and the Levi-flat Plateau problem*, Midwestern Workshop on Asymptotic Analysis, October 2018, Bloomington, Indiana.
- *On Lewy extension for smooth hypersurfaces in  $\mathbb{C}^n \times \mathbb{R}$* , Complex Geometry and PDEs, May 2017, Beirut, Lebanon.
- *On Lewy extension for smooth hypersurfaces in  $\mathbb{C}^n \times \mathbb{R}$* , AMS special session, April 2017, Pullman, WA.
- *Codimension two CR singular submanifolds and extensions of CR functions*, Midwest SCV, May 2016, Toledo, OH.
- *Extensions of CR functions in  $\mathbb{C}^n \times \mathbb{R}$* , AMS special session, April 2016, Salt Lake City, UT.
- *Local and Global Aspects of Singular Levi-flat Hypersurfaces*, Advanced course at 30<sup>o</sup> Colóquio Brasileiro de Matemática, 26–31 of July 2015, IMPA, Rio de Janeiro, Brazil.
- *Homotopy equivalence for proper holomorphic mappings*, AMS special session, March 2015, Mich. State Univ., MI.

- *Normal forms for CR singular codimension two Levi-flat submanifolds*, Workshop on Complex Analysis and Geometry in Wuhan University, May 2014, Wuhan, China.
- *Signature pairs of positive polynomials*, Joint Math. Meetings, AMS special session, Jan. 2013, San Diego, CA.
- *Bounding the rank of Hermitian forms and rigidity for CR mappings of hyperquadrics*, International Workshop on Several Complex Variables and Complex Geometry, July 2012, Taipei, Taiwan.
- *Polynomials constant on a hyperplane and CR maps of spheres*, RTG Workshop on Complex Analysis, October 2011, Ann Arbor, MI.
- Poster *Singular set of a Levi-flat hypersurface is Levi-flat*, VI Workshop on Geometric Analysis of PDE and Several Complex Variables, August 2011, Serra Negra, Brazil.
- *Hermitian forms and rational maps of hyperquadrics*, CIRM - CR-Geometry and PDE's - IV, June 2010, Levico Terme, Italy.
- *Polynomials constant on a hyperplane and CR maps of spheres*, AMS special session, March 2010, Lexington, KY.
- *Hermitian forms and rational maps of hyperquadrics*, RTG Workshop on Holomorphic Maps and Iterations, March 2010, Ann Arbor, MI.
- *Uniqueness of certain polynomials constant on a hyperplane*, Applications of Computer Algebra 2009, Montréal, Canada.
- *Singular Levi-flat hypersurfaces in complex projective space*, Conference on Complex and CR Geometry, Partial Differential Equations and Invariant Theory in honor of Joseph J. Kohn, July 2008, Prague, Czech Rep.
- *Singular Levi-flat hypersurfaces in complex projective space*, CIRM - CR-Geometry and PDE's - III, June 2008, Levico Terme, Italy.
- *Levi-flat hypersurfaces with real analytic boundary*, Special session CMS meeting, December 2007, London, Canada.
- *Extensions of Levi-flat hypersurfaces past CR boundaries*, AMS special session, October 2007, Chicago, IL.
- *Singularities of Levi-Flat Hypersurfaces*, International Conference in PDE, Complex Analysis, and Differential Geometry, June 2006, Notre Dame, IN.

I gave seminar/colloquium talks at UCSD, UIUC, UW–Madison, OSU, SUNY–Stony Brook, Cal State San Marcos, City College of New York, University of Vienna, Georgia State University, Australian National University, University of Adelaide, San Diego State University, Western Illinois University, University of Hawaii, Rutgers University, University of Arkansas, University of Ljubljana, University of Vienna, and Texas A&M University.

#### **Awards (other than grants):**

- Appeared in *List of Teachers Ranked as Excellent by Their Students* for spring 2010 for UIUC Math 595.
- The Honor Society of Phi Kappa Phi, spring 2003.

#### **Teaching Experience:**

I wrote five textbooks for my classes, freely available online, and used at dozens of universities. See above.

Teaching experience — At OSU: calculus (Math 2144 and 2163), several complex variables (Math 6283), vector calculus (Math 4013), geometry (Math 4403), complex variables (Math 4283, 5283), differential equations (Math 4263, 4233), undergraduate analysis (Math 4143/4153/5043/5053), graduate manifolds (5193), applied mathematics (5593), UW–Madison: analysis (Math 521/522/621), PDE (Math 322), discrete mathematics (Math/CS 240), and calculus (Math 213 and Math 222). UCSD: differential equations (20D), multivariable calculus (10C and 20C), integral calculus (20B), and real analysis (140A/B). UIUC: advanced calculus (Math 380), finite mathematics (Math 124), differential equations (Math 286 and 285), matrix analysis (Math 225), real analysis (Math 444), and CR geometry (Math 595). SDSU: mathematics for elementary school teachers (Math 210). UCSD: problem sections and grading for calculus (Math 20B), real and complex analysis (Math 140A, 142A, 240A/B/C, and 220A/C), real analysis qualification exam prep sessions for graduate students.

#### **Programming/Computer Experience:**

I have extensive programming experience, mostly in C and C++, but also in Tcl, Perl, Python, PHP, BASIC, Pascal, GEL, Lisp, Matlab/Octave, Maple, and others. I was a major contributor to the GNOME project for several years (<http://www.gnome.org>), and was employed as a programmer several times. I was a member of the GNOME steering committee and later a member of the GNOME Foundation board of directors. I published several programming tutorials in Linux and GNOME related publications, and gave several talks on GNOME, programming, and security at GNOME and Linux conferences. I am the author and maintainer of the free software mathematics package Genius (<https://www.jirka.org/genius.html>), which includes its own programming language, GEL. I have extensive knowledge of L<sup>A</sup>T<sub>E</sub>X, for example I wrote the thesis style for San Diego State University mathematics department.

I have used WeBWorK for several classes (I also maintain the OSU WeBWorK server), and I have authored many new problems, most of which have been contributed to the Open Problem Library.

**Service:**

I was on the organizing committee of *Conference on Complex Analysis and Geometry on the occasion of Sidney Webster's 70th birthday* March 27–29, 2015, University of Wisconsin-Madison. I helped organize *Southern California Analysis and PDE Conference (SCAPDE)* at UCSD on May 28–29, 2011. I co-organized (with John D'Angelo and Alex Tumanov) a special session at the AMS regional meeting at Urbana–Champaign on March 27–29 2009 titled *Holomorphic and CR Mappings*.

I refereed papers for Canadian Journal of Mathematics, Illinois Journal of Mathematics, Journal of Geometric Analysis, Proceedings of the London Mathematical Society, Journal of the London Mathematical Society, Journal of the Indian Mathematical Society, Mathematische Annalen, Mathematika, Pacific Journal of Mathematics, Proceedings of American Mathematical Society, Pure and Applied Mathematics Quarterly, Transactions of American Mathematical Society, and Trends in Math (Birkhäuser–Verlag), Advancase in Mathematics, Contemporary Mathematics, Journal of Mathematical Analysis and Applications, International Journal of Mathematics, Izvestiya RAN. Seriya Matematicheskaya. I submitted many reviews for AMS Mathematical Reviews and Zentralblatt MATH.

The five textbooks mentioned above are all freely available online and modification is explicitly allowed. The mathematics software package Genius is also freely available for download and modification. I contributed over 150 mathematics entries to the Planetmath and Wikipedia encyclopedias. I contributed over a hundred WeBWorK problems to the WeBWorK Open Problem Library.

**Citizenship:** *USA and Czech Republic.*

**References:**

Prof. Peter Ebenfelt, University of California, San Diego, [pebenfel@ucsd.edu](mailto:pebenfel@ucsd.edu)  
Prof. John P. D'Angelo, University of Illinois at Urbana–Champaign, [jpda@math.uiuc.edu](mailto:jpda@math.uiuc.edu)  
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