William A. Stein – Curriculum Vitae – June 2019

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Employment
- · **SageMath, Inc.**: CEO/Founder, 2015–present.
- · **University of Washington**: Prof. of Math. (tenured), 2010–2019.
- · **University of Washington**: Assoc. Prof. of Math. (tenured), 2006–2010.
- · **UC San Diego**: Assoc. Prof. of Math. (tenured), 2005–2006.
- · **Harvard University**: Benjamin Peirce Asst. Prof. of Math., 2001–2005.
- · **Harvard University**: NSF Postdoctoral Fellow, 2000–2004.

Education
- · **University of California at Berkeley**, Ph.D. in Mathematics, 2000, *Explicit Approaches to Modular Abelian Varieties*, under H. W. Lenstra.
- · **Northern Arizona University**, B.S. in Mathematics, 1994.

Prizes
- · **Richard Dimick Jenks Memorial Prize** for Excellence in Software Engineering applied to Computer Algebra, 2013.
- · **Tropheés du Libre**. The SageMath project won first prize in 2007 in Scientific Software (3000 euros, a laptop, books, server space, etc.).

Grants

21. PI on **NSA Grant**, *Sage: Open Source Math Software*, 2014–2017.

20. co-PI on **NSF Grant**, DMS-7098841, *Sage-combinat: Developing and sharing open source software for algebraic combinatorics*, 2012–2015.

19. PI on **NSF Grant**, DMS-7180474, *Explicit Approaches to Elliptic Curves and Modular Abelian Varieties*, 2012–2015.

18. co-PI on **NSF Grant**, DMS-1062253, *REU: Inverse Problems for Electrical Networks*, 2011–2014.

17. co-PI on **NSF Grant**, DMS-1020378, *Collaborative Research: UTMOST: Undergraduate Teaching in Mathematics with Open Software and Textbooks*, undergraduate curriculum development, 2011–2014.

16. PI on **DOD Grant**, four Sage Bug-fixing workshops per year and other development support, 2011–2016.

15. PI on **NSF Grant** DMS-1015114, *Sage: Unifying Mathematical Software for Scientists, Engineers, and Mathematicians*, four Sage Days workshops per year, 2011–2014.

14. UW Royalty Research Fellow (1-quarter teaching buyout), 2009–2010.

13. PI on **NSF Grant** DMS-0821725, SCREMS grant for number theory, geometry, and software research ($100K, purchased high end computers for UW).

12. PI on **Google Grant**, for Sage development, Summer 2008 (amount: $18K).

11. PI on **Microsoft Grant**, port Sage to Windows, 2008–2009 (amount: $32K).

10. PI on **NSF Grant** DMS-0757627, *FRG: Collaborative Research: L-functions and Modular Forms*, 2008–2012 (amount: $1.2 million).

9. co-PI on **NSF Grant** DMS-0754486, *REU Site: Inverse Problems for Electrical Networks*, 2008–2011.

8. PI on **NSF Grant** DMS-0713225, *SAGE: Software for Algebra and Geometry Experimentation*, 2007–2010.

7. PI on **NSF Grant** DMS-0555776, *Explicit Approaches to the Birch and Swinnerton-Dyer Conjecture*, 2007–2010.

6. co-PI on **NSF Grant** DMS-0602287, *Southwest Center for Arithmetic Geometry*, 2006–2009.

5. PI on **NSF Grant,** DMS-0400386, *Explicit Approaches to Modular Forms and Modular Abelian Varieties*, 2004–2007.

4. PI on **Sun Academic Education Grant** ($70K Sun Fire V480 server), 2003.

3. From W. R. Hearst III and Harvard ($20K for 12 Processor Cluster), 2002.

2. Clay Mathematics Institute Liftoff Fellowship, Summer 2000.

1. Berkeley Vice Chancellor Research Grant (6 Processor Cluster), 1999.

Publications   All papers are available at https://wstein.org/papers/.

45. *Beyond the black box*, with Jeroen Demeyer and Ursula Whitcher, 2016, Notices of the AMS.

44. *Databases of elliptic curves ordered by height and distributions of Selmer groups and ranks* (22 pages), with Jennifer S. Balakrishnan, Wei Ho, Nathan Kaplan, Simon Spicer and Jamie Weigandt, 2016, in ANTS XII proceedings.

43. *p-adic Heights of Heegner Points and Anticyclotomic Lambda-Adic Regulators* (34 pages), with Jennifer S. Balakrishnan and Mirela Ciperiani, 2013, Math. Comp.

42. *A p-adic analogue of the conjecture of Birch and Swinnerton-Dyer for modular abelian varieties* (33 pages), with Jennifer S. Balakrishnan and J. Steffen Müller, 2013, Math. Comp.

41. *A Database of Elliptic Curves over $\mathbf{Q}(\sqrt{5})$ – First Report* (16 pages), with Jonathan Bober, Alyson Deines, Ariah Klages-Mundt, Benjamin LeVeque, R. Andrew Ohana, Ashwath Rabindranath, Paul Sharaba, 2012, appeared in ANTS proceedings.

40. *Numerical computation of Chow-Heegner points associated to pairs of elliptic curves* (12 pages), 2012, to appear in Math. Comp. (as an appendix).

39. *Sage: Creating a Viable Free Open Source Alternative to Magma, Maple, Mathematica, and MATLAB* (9 pages), in the FoCM 2011 proceedings.

38. *Non-commutative Iwasawa theory for modular forms* (40 pages), with John Coates, Tim Dokchitser, Zhibin Liang, Ramdorai Sujatha, 2013, in Proceedings of the London Math Society.

37. *Heegner Points and the Arithmetic of Elliptic Curves over Ring Class Extensions* (20 pages), with Robert Bradshaw, April 2012, J. Number Theory.

36. *Kolyvagin's Conjecture for Some Specific Higher Rank Elliptic Curves* (40 pages), 2011, submitted.

35. *Computations About Tate-Shafarevich Groups Using Iwasawa Theory* (46 pages), with Christian Wuthrich, 2012, to apear in Mathematics of Computation.

34. *The Sage Project: Unifying Free Mathematical Software to Create a Viable Alternative to Magma, Maple, Mathematica and MATLAB* (16 pages), 2010, in the Proceedings of the International Congress of Mathematical Software, Kobe, Japan.

33. *Toward a Generalization of the Gross-Zagier Conjecture* (17 pages), 2010, Int. Math. Res. Notices.

32. *Fast Computation of Hermite Normal Forms of Random Integer Matrices* (16 pages), with Clement Pernet, Volume 130, Issue 7, July 2010, Pages 1675-1683, Journal of Number Theory.

31. *Verification of the Birch and Swinnerton-Dyer Conjecture for Specific Elliptic Curves*, with G. Grigorov, A. Jorza, S. Patrikis, and C. Patrascu (26 pages), 2009, to appear in Mathematics of Computation.

30. *The Modular Degree, Congruence Primes and Multiplicity One* (16 pages), with Amod Agashe and Ken Ribet, 2012, in a volume in honor of Serge Lang.

29. *Explicit Heegner points: Kolyvagin's conjecture and non-trivial elements in the Shafarevich-Tate group*, with Dimitar Jetchev and Kristin Lauter (18 pages), 2008, Journal of Number Theory.

28. *On the generation of the coefficient field of a newform by a single Hecke eigenvalue, with Koopa Koo and Gabor Wiese* (11 pages), 2008, J. Théor. Nombres Bordeaux.

27. *Open Source Mathematical Software (opinion piece)* (1 page), with David Joyner, Notices of the AMS, November 2007.

26. *Average Ranks of Elliptic Curve*, with Baur Bektemirov, Barry Mazur and Mark Watkins (19 pages), May 2007, Bulletins of the AMS.

25. *Visibility of Mordell-Weil Groups* (20 pages), 2008, Documenta Mathematica.

24. *Visualizing Elements of Shafarevich-Tate Groups at Higher Level*, with D. Jetchev (28 pages), 2008, Documenta Mathematica.

23. *The Manin Constant*, with A. Agashe and K. Ribet (22 pages), 2006, in the World Scientific Coates Memorial Volume.

22. *Computation of p-Adic Heights and Log Convergence*, with B. Mazur and J. Tate (36 pages), 2006, in the Documenta Mathematica Coates Memorial Volume.

21. *SAGE: System for Algebra and Geometry Experimentation* with D. Joyner, (3 pages), in the SIGSAM Bulletin, 2005.

20. *Modular Parametrizations of Neumann-Setzer Elliptic Curves*, with M. Watkins, in IMRN 2004, no. 27, 1395–1405.

19. *Studying the Birch and Swinnerton-Dyer Conjecture for Modular Abelian Varieties Using* MAGMA (23 pages), 2006, chapter in Springer-Verlag book edited by J. Cannon and W. Bosma.

18. *Conjectures about Discriminants of Hecke Algebras of Prime Level* (16 pages), with F. Calegari, in ANTS VI, Vermont, 2004.

17. *Constructing Elements in Shafarevich-Tate Groups of Modular Motives*, with N. Dummigan and M. Watkins, in "Number theory and algebraic geometry—to Peter Swinnerton-Dyer on his 75th birthday", Ed. M. Reid and A. Skorobogatov, pages 91–118.

16. *Approximation of eigenforms of infinite slope by eigenforms of finite slope*, with R. Coleman, Geometric aspects of Dwork theory. Vol. I, II, Walter de Gruyter GmbH & Co. KG, Berlin, 2004, pp. 437–449.

15. $J_1(p)$ *has connected fibers*, with B. Conrad and B. Edixhoven, Documenta Mathematica, **8** (2003), 331–408.

14. *Shafarevich-Tate Groups of Nonsquare Order*, in Progress in Math., **224** (2004), 277–289, Birkhauser.

13. *Visible Evidence for the Birch and Swinnerton-Dyer Conjecture for Rank 0 Modular Abelian Varieties* (30 pages), with A. Agashe, appeared in Mathematics of Computation.

12. *A Database of Elliptic Curves–First Report* (10 pages) with M. Watkins, in ANTS V proceedings, Sydney, Australia, 2002.

11. *Visibility of Shafarevich-Tate Groups of Abelian Varieties*, with A. Agashe, J. Number Theory, **97** (2002), no. 1, 171–185.

10. *Cuspidal Modular Symbols are Transportable*, with H. Verrill, LMS J. Comput. Math., **4** (2001), 170–181.

9. Appendix to Lario and Schoof's *Some computations with Hecke rings and deformation rings*, with A. Agashe, Experiment. Math. **11** (2002), no. 2, 303–311.

8. *There are genus one curves over* $\mathbf{Q}$ *of every odd index*, J. Reine Angew. Math. **547** (2002), 139–147.

7. *Component groups of purely toric quotients of semistable Jacobians*, with B. Conrad, Math. Res. Lett., **8** (2001), no. 5–6, 745–766.

6. *The field generated by the points of small prime order on an elliptic curve*, with L. Merel, Int. Math. Res. Notices, 2001, no. 20, 1075–1082.

5. *An introduction to computing modular forms using modular symbols* (12 pages), in MSRI Publications (Volume 44), Algorithmic Number Theory: Lattices, Number Fields, Curves and Cryptography, Cambridge University Press, 2008.

4. *A mod five approach to modularity of icosahedral Galois representations*, with K. Buzzard, Pac. J. Math., **203** (2002), no. 2, 265–282.

3. *Lectures on Serre's conjectures*, with K. A. Ribet, in Arithmetic Algebraic Geometry, IAS/Park City Math. Inst. Series, Vol. 9, 143–232.

2. *Component groups of quotients of* $J_0(N)$, with D. Kohel, Proceedings of the 4th International Symposium (ANTS-IV), 2000, 405–412.

1. *Empirical evidence for the Birch and Swinnerton-Dyer conjectures for modular Jacobians of genus 2 curves*, with E. V. Flynn, F. Leprévost, E. F. Schaefer, M. Stoll, J. L. Wetherell, Math. of Comp. **70** (2001), no. 236, 1675–1697.

Books

5. *Prime Numbers and the Riemann Hypothesis* (154 pages), with B. Mazur (see https://wstein.org/rh/); published by Cambridge University Press.

4. *Algebraic Number Theory, a Computational Approach* (215 pages), (see https://wstein.org/books/ant/); under contract with the AMS.

3. *Modular Forms, a Computational Approach*, (268 pages), published as AMS Graduate Studies in Mathematics, Volume **79**, 2007, and available at https://wstein.org/books/modform/.

2. *Elementary Number Theory* (185 pages), published in the Springer-Verlag UTM series, 2008, https://wstein.org/ent/.

1. *Lectures on Modular Forms and Galois Representations* (200 pages), with K. A. Ribet (on hold).

Computation

· Founder and lead developer of CoCalc (https://cocalc.com).
· Founder of SageMath (https://www.sagemath.org).
· Fluent in Python, Cython, Javascript, C/C++, LaTeX, Magma and React.
· Wrote the modular forms, modular symbols, and modular abelian varieties components of Magma (over 25,000 lines of code).

Selected Teaching

University of Washington

40. *Math 480: Sage – Open Source Mathematical Software*, Spring 2016.

39. *Math 582: Computational number theory*, Winter 2016.

38. *Math 480: Sage – Free Open Source Math. Software*, Spring 2014.

37. *Math 480: Undergraduate Number Theory*, Winter 2014.

36. *Math 581f: Topics in Computational Number Theory*, Fall 2013.

35. *Math 480a/582: Sage – Free Open Source Math. Software*, Spring 2013.

34. *Math 308: Linear Algebra*, Spring 2013.

33. *Math 581e: Algebraic Number Theory*, Fall 2012.

32. *Math 480a/582: Sage – Free Open Source Math. Software*, Winter 2012.

31. *Math 581g: Lectures on Modular Forms and Hecke Operators*, Fall 2011.

30. *Math 480a: Sage – Free Open Source Mathematical Software*, Spring 2011.

29. *Math 581b: Algebraic number theory graduate course*, Fall 2010.

28. *Math 581d: Computer Programming for Mathematicians*, Fall 2010.

27. *Math 480: Computer Programming for Mathematicians*, Spring 2010.

26. *Math 582e: Galois Cohomomogy*, Winter 2010.

25. *Math 414: Elementary Number Theory*, Winter 2010.

24. *Math 583e: Graduate Computational Number Theory, part 2*, Spring 2009.

23. *Math 480: Open Source Mathematical Software*, Spring 2009.

22. *Math 582e: Graduate Computational Number Theory*, Winter 2009.

21. *SIMUW: Mathematical Finance*, Summer 2008.

20. *Math 480: Open Source Mathematical Software*, Spring 2008.

19. *Math 581f: Graduate Algebraic Number Theory*, Fall 2007.

18. *SIMUW: The Riemann Hypothesis*, Summer 2007.

17. *Math 583: The Birch and Swinnerton-Dyer Conjecture*, Spring 2007.

16. *Math 480: Elementary Number Theory*, Spring 2007.

15. *SIMUW: The Congruent Number Problem*, Summer 2006.

14. *Math 583: Computing with Modular Forms*, Spring 2006.

UC San Diego

13. *Elliptic Curves and Modular Forms*, Fall 2005.

12. *Calculus For Scientists and Engineers*, Winter 2006.

Harvard University

11. *Freshman Seminar on Fermat's Last Theorem*, Fall 2004.

10. *Computing With Modular Forms*, Fall 2004.

9. *Algebraic Number Theory*, Spring 2004.

8. *Modular Abelian Varieties*, Fall 2003.

7. *Freshman Seminar on Elliptic Curves*, Spring 2003.

6. *Elementary Number Theory*, Fall 2001 and Fall 2002.

5. *Linear Algebra*, Fall 2001 and Spring 2002.

University of California at Berkeley

4. *Discrete Mathematics*, Summer 1997.

3. *Calculus*, Fall 1995–Spring 1997, teaching assistant.

Northern Arizona University

2. *College Mathematics With Applications*, Spring 1995.

1. *College Algebra*, Fall 1994.

Ph.D. Students

7. **Kevin Lui**, Ph.D., June 2019.

6. **Gerardo Zelaya**, Ph.D., June 2019.

5. **Hao Chen**, Ph.D. June 2016 on *Modular points on elliptic curves*. At Microsoft Research.

4. **Simon Spicer**, Ph.D. June 2015 on *The. Explicit Formula*. At Facebook.

3. **Alyson Deines**, Ph.D. June 2014 on *Discriminant Twins*. At CCR.

2. **Robert Bradshaw**, Ph.D. June 2010 on *Provable Computation of Motivic L-function*. At Google.

1. **Robert Miller**, Ph.D. received June 2010 on *Verification of the Birch and Swinnerton-Dyer conjecture for individual elliptic curves*. At Google.

Other Activities

Workshop and Conference Organization: I (co-)organized all of the following workshops and conferences.

54. *Sage Days 70*, Nov 8-14, 2015, Berkeley.

53. *Sage Days 68: Bug Days*, August 21-27, 2015.

52. *Sage Days 61: Quaternion Orders and Brandt Modules*, August 25-29, 2014, Copenhagen, Denmark.

51. *Sage Days 48: Notebook Dev*, June 17-21, 2013, at UW.

50. *Sage Days 46: Computational number theory*, February 26-March 2, 2013, Hawaii.

49. *Reproducibility in Computational and Experimental Mathematics*, at ICERM (Brown University), Dec 10-14, 2012.

48. *SIMUW: Deep Conjectures in Number Theory*, Summer 2012.

47. *AMS Arithmetic Statistics School*, June 24-30, 2012, in Snowbird Utah.

46. *Sage Days 41: The Sage Notebook*, June 11-15, 2012, at UW.

45. *Sage Days 40.5: Bug Days*, May 24–29, 2012 in Gold Bar, WA.

44. *Sage Days 36.5: Overconvergent Modular Symbols*, April 17-22, 2012, at UW.

43. *Sage Days 36: p-adics in Sage*, Feb 2012, San Diego, CA.

42. *AMS Short Course: Computing with Elliptic Curves using Sage* at the Joint Math Meetings in 2012 in Boston.

41. *Sage Days 32: Bug Days*, at UW.

40. *REU: Elliptic Curves*, 8 weeks of summer 2011, at UW.

39. *Sage Days 31: The Sage Notebook*, June 2011, UW.

38. *Sage Days 29*, March 2011, UW.

37. *MSRI Program in Arithmetic Statistics*, Spring 2011, at MSRI in Berkeley.

36. *Sage Days 27: Bug Days*, January 2011, UW.

35. *Sage Days 26: Women in Sage*, December 2010, UW.

34. *Workshop on Elliptic Curves and Computation*, October 2010, Microsoft Research.

33. *Sage Days 25: Numerical computation*, August, 2010, in Mubmai, India.

32. *Sage Days 24: Symbolic computation*, July, 2010 at RISC in Linz, Austria.

31. *Sage Days 23: Number theory*, July, 2010 in Leiden, Netherlands.

30. *Sage Days 22: MSRI Summer Graduate Student Workshop on Elliptic Curves*, June 2010 in MSRI (Berkeley, CA).

29. *Sage Days 21: Function fields*, May 2010, UW.

28. *Sage Days 19: Bug Smash*, January 2010, UW.

27. *Sage Days 18: Computations related to the Birch and Swinnerton-Dyer Conjecture*, Dec 2009, at the Clay Mathematics Institute in Cambridge, MA.

26. *Sage Days 17: Computing with Modular forms and L-functions*, Sep. 2009, on Lopez Island.

25. *Sage Days 16: Computational Number Theory*, June 2009, in Barcelona, Spain.

24. *Sage Days 15*, May 2009.

23. *Arizona Winter School: Quadratic Forms*, March 2009.

22. *Sage Days 14: Sage and Macaulay2 for Algebraic Geometry Experimentation*, March 2009, MSRI (Berkeley).

21. *Sage Days 13: Quadratic Forms and Lattices*, March 2009, Athens, Georgia.

20. *Sage Days 12: Bug Smash*, Jan. 2009, San Diego, CA.

19. *Sage Days 11: Special functions and computational number theory meet scientific computing*, Nov. 2008, Austin, Texas.

18. *Sage Days 9: Mathematical graphics and visualization*, Aug. 2009, Vancouver.

17. *Workshop on L-functions and Modular Forms*, June 2008, UW.

16. *L-functions Summer School and Coding Sprint*, June 2008, UW.

15. *Sage Developer Coding Days*, June 2008, UW.

14. *Arizona Winter School: Special Functions and Transcendence* , March 2008, Univ. of Arizona.

13. *Sage Days 8: Number Theory and High Performance Numerical Computation*, March 2008, at UT Austin.

12. *Sage Days 7,* Feb 2008, IPAM (UCLA).

11. *SAGE Days 6,* Nov. 2007, Bristol, UK.

10. *SAGE Days 5 – Computational Arithmetic Geometry,* Oct 2007 at the Clay Math Institute in Cambridge, MA.

9. *Workshop on Modular Forms and L-functions,* Aug. 2007 at AIM (Palo Alto).

8. *Sage Days 4,* June 2007 at UW.

7. *Modular Forms: Arithmetic and Computation,* June 2007 at Banff.

6. *Arizona Winter School: p-adic Geometry,* March 2007 at Univ. of Arizona.

5. *Sage Days 3,* Feb. 2007 at IPAM (UCLA).

4. *Interactive Parallel Computation in Support of Research in Algebra, Geometry and Number Theory,* Feb 2007 at MSRI (Berkeley).

3. *Sage Days 2,* Oct. 2006 at UW.

2. *Summer Graduate Workshop on Computing with Modular Forms,* July 2006 at MSRI (Berkeley).

1. *Sage Days 1,* Feb 2006 at UC San Diego.

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