Bala Krishnamoorthy

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November 2025

EXPERIENCE

- ❑ Graduate instructor, University of North Carolina at Chapel Hill, August, 1999–July, 2001.
  - Sole instructor for five freshman and sophomore level classes in business calculus and management science, with class sizes up to 35 students.
- ❑ Summer project, IBM, Research Triangle Park, NC, May–August, 2000.
  - Worked with the Worldwide Quality Group of IBM to develop a C/C++ tool that uses integer programming and simulation to determine the optimal testing policy for the production of high quality personal computers while satisfying demand.
- ❑ Research assistant, University of North Carolina at Chapel Hill, August, 2001–July, 2004.
  - Supervised by Gábor Pataki: studying basis reduction and integer programming.
  - Supervised by Alex Tropsha and J. Scott Provan:
    studying geometry and topology of protein structure and function;
    graduate student member, BioGeometry (NSF-ITR program).
- ❑ Faculty of Mathematics, Washington State University, Pullman, August, 2004–August, 2014
  - Assistant Professor (2004–2011) and Associate Professor with tenure (2011–2014) in the Department of Mathematics and Statistics; responsibilities: research, teaching (undergraduate/graduate levels), service.
- ❑ Consultant for Avista Corporation (Energy company in Spokane, WA), May–September, 2011.
  - Using optimization techniques to determine hydroelectric power generation schedules for multiple facilities over varied time scales.
- ❑ Visiting scientist, Departments of Orthopedics & Rehabilitation (OR) and Biochemistry & Molecular Biology (BMB), Oregon Health and Science University (OHSU), August, 2012–December, 2013.
  - Research with Jung Yoo, MD, and Robert Hart, MD (OR); and Ujwal Shinde (BMB).
- ❑ Faculty of Mathematics, Washington State University, Vancouver (WA), August, 2014–now.
  N.B.: I moved to WSU Vancouver from WSU Pullman, where I was associate professor since August 2011.
  - Associate Professor with tenure (2014–2019) and Professor (August 2019–).
  - Faculty, Department of Mathematics and Statistics, WSU (previously based only in the Pullman Campus); teaching more than 50% classes at graduate level (via videoconferencing to Pullman and in Vancouver); mentoring graduate and undergraduate students (based at Pullman and Vancouver).
  - Program leader for Mathematics and Statistics at WSU Vancouver, August 2015–July 2019; responsibilities include scheduling of classes, coordinating with other programs on campus and with the Department in Pullman, hiring adjunct instructors, securing internal funds to run the program, preparing annual reviews for full-time and adjunct instructors, dealing with complaints from students and faculty, and ensuring the overall smooth running of the program.
  - Graduate Program leader for Mathematics and Statistics at WSU Vancouver, August 2023–now; working with the Program Leader to oversee the smooth running of the Graduate Program.
- ❑ VP, AI and Optimization at Cognetry Labs Inc., Portland (OR), December, 2019–December, 2023.
  - I was part of the founding team of Cognetry Labs, and led its AI/ML And Optimization Strategy Team. I drove the design and development of AI/ML modules of the cloud-native platform of Cognetry Labs, and was in charge of its patent portfolio.

EDUCATION

- ❑ Indian Institute of Technology, Madras (Chennai), India.
  B.Tech., Mechanical Engineering (May, 1999).
- ❑ University of North Carolina at Chapel Hill, North Carolina.
  PhD in Operations Research, (August, 2004).   Dissertation Topics:
  - Pre-conditioning integer programs using column basis reduction (Advisor: Gábor Pataki).
  - Geometry and topology of protein structure (Advisors: Alex Tropsha, J. Scott Provan).

PATENTS

Note: BK stands for Bala Krishnamoorthy

1. BK, Muthu Udaiyanathan, and Sandeep Nair. Slot selection for pickup scheduling and order fulfillment. Patent No. US 12,118,604 B2. Issued on October 15, 2024.

PUBLICATIONS

1. BK and Alex Tropsha. Development of a four-body statistical pseudo-potential to discriminate native from non-native protein conformations. *Bioinformatics*, 19, 12, 2003, 1540–1548. Preprint and code: bala-krishnamoorthy.github.io/DT/.

2. BK, J. Scott Provan, and Alex Tropsha. A topological characterization of protein structure. In Proceedings of the *Conference on Data Mining in BioMedicine*, 2004; edited by Panos M. Pardalos, Vladimir Boginski, and Alkis Vazacapoulos, Springer, 2007 (accepted in 2005), ISBN: 0-387-69318-1. Preprint: bala-krishnamoorthy.github.io/docs/TopoCharProteins.pdf.

3. Christopher Deutsch and BK. Four-body scoring function for mutagenesis. *Bioinformatics*, 23, 22, 2007, 3009–3015. Preprint, dataset, and code: bala-krishnamoorthy.github.io/DT/Mutate.

4. BK. Bounds on the size of branch-and-bound proofs for integer knapsacks. *Operations Research Letters*, 36, 1, 2008, 19–25. Preprint: bala-krishnamoorthy.github.io/docs/BBBounds.pdf.

5. BK and Gábor Pataki. Column basis reduction and decomposable knapsack problems. *Discrete Optimization*, 6, 3, 2009, 242–270. Preprint: arxiv:0807.1317.

6. Tamal Dey, Anil Hirani, and BK. Optimal homologous cycles, total unimodularity, and linear programming. In Proceedings of *42nd ACM Annual Symposium on Theory of Computing (STOC) 2010*, 221–230. Preprint: arxiv:1001.0338.

7. Ye Tian, Christopher Deutsch, and BK. Optimized scoring function for solubility mutagenesis. *Algorithms for Molecular Biology*, 5, 33, 2010. Dataset and code: bala-krishnamoorthy.github.io/DT/OptSolMut.

8. Svetlana Lockwood, BK, and Ping Ye. Neighborhood properties are significant determinants of temperature sensitive mutants. *PLoS ONE*, 6, 12, e28507, 2011, dx.plos.org/10.1371/journal.pone.0028507.

9. Tamal Dey, Anil Hirani, and BK. Optimal homologous cycles, total unimodularity, and linear programming. In *SIAM Journal on Computing*, 40, 4, 2011, 1026–1040. This is the expanded version, with some new results, of the STOC 2010 paper (listed as paper # 6).

10. Bethany Suderman, BK, and Anita Vasavada. Neck muscle paths and moment arms are significantly affected by wrapping surface parameters. *Computer Methods in Biomechanics and Biomedical Engineering*, 15, 7, 735–744, 2012. Preprint: bala-krishnamoorthy.github.io/Papers/WrapSurfSensitivity.pdf.

11. BK, William Webb, and Nathan Moyer. Lattice-based algorithms for number partitioning in the hard phase. *Discrete Optimization*, 9, 3, 2012, 159–171.

12. Johannes Elferich, Danielle Williamson, BK, and Ujwal Shinde. Propeptides of eukaryotic proteases encode histidines to exploit organelle pH for regulation. *The FASEB Journal*, 27, 8, 2013, 2939–2945.

13. Sharif Ibrahim, BK, and Kevin Vixie. Simplicial flat norm with scale. *Journal of Computational Geometry*, 4, 1, 2013, 133–159. Preprint: arxiv:1105.5104.

14. Tamal Dey, Anil Hirani, BK, and Gavin Smith. Edge contractions and simplicial homology. Submitted, 2013. Preprint: arXiv:1304.0664.

15. BK, Brian Bay, and Robert Hart. Bone mineral density and donor age are not predictive of femoral ring allograft bone mechanical strength. *Journal of Orthopaedic Research*, 32, 10, 2014, 1271–1276. Preprint: bala-krishnamoorthy.github.io/Papers/Allograft.pdf.

16. Nathan Hamlin, BK, and William Webb. A knapsack-like code using recurrence sequence representations. *Fibonacci Quarterly*, 53, 1, 2015, 24–33. Preprint: arXiv:1503.04238.

17. Svetlana Lockwood and BK. Topological features in cancer gene expression data. In Proceedings of the *Pacific Symposium on Biocomputing*, 20, 2015, 108–119. Preprint: arXiv:1410.3198.

18. BK and Gavin Smith. Non total-unimodularity neutralized simplicial complexes. *Discrete Applied Mathematics*, 240, 11, 2018, 44–62 (published online Feb 3, 2016). Preprint: arxiv:1304.4985.

19. Sharif Ibrahim, BK, and Kevin Vixie. Flat Norm Decomposition of Integral Currents. *Journal of Computational Geometry*, 7, 1, 2016, 285–307. Preprint: arXiv:1411.0882.

20. BK. Thinner is not always better: Cascade knapsack problems. *Operations Research Letters*, 45, 1, 77–83, 2017. Preprint and instances: bala-krishnamoorthy.github.io/CKP/.

21. Sabina Blizzard, BK, Matthew Shinseki, Marcel Betsch, and Jung Yoo. The magnitude of angular and translational displacement of dens fractures is dependent on the sagittal alignment of the cervical spine rather than the force of injury. *The Spine Journal*, 17, 12, 1859–1865, 2017. Preprint: bala-krishnamoorthy.github.io/docs/Lordosis.pdf.

22. Philip Behrend and BK. Considerations for waste gasification as an alternative to landfilling in Washington state using decision analysis and optimization. *Sustainable Production and Consumption*, 12, 170–179, 2017. Preprint: bala-krishnamoorthy.github.io/Papers/WasteGasification.pdf.

23. Dayton Opel, Benjamin Rapone, BK, Jung Yoo, and James Meeker. Race and gender influence management of humerus shaft fractures. *Journal of Orthopaedics*, 15, 2, 2018, 540–544. Preprint: bala-krishnamoorthy.github.io/docs/Humerus.pdf.

24. Methun Kamruzzaman, Ananth Kalyanaraman, and BK. Detecting divergent subpopulations in phenomics data using interesting flares. In the Proceedings of the *9th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (BCB '18)*, 155–164, 2018.

25. Marcel Betsch, Sabina Blizzard, BK, and Jung Yoo. Association between cervical spine degeneration and the presence of dens fractures. *Zeitschrift für Orthopädie und Unfallchirurgie*, 158, 01, 2020, 46–50 (published online Apr 9, 2019). Preprint: bala-krishnamoorthy.github.io/Papers/DensFractures.pdf.

26. Kaniz F. Madhobi, Methun Kamruzzaman, Ananth Kalyanaraman, Eric Lofgren, Rebekah Moehring, and BK. A visual analytics framework for analysis of patient trajectories. In the Proceedings of the *10th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (BCB '19)*, 2019.

⇒ A shorter version of the above paper was accepted to the ACM SIGKDD Workshop titled *epiDAMIK*: Epidemiology meets Data Mining and Knowledge discovery, 2019.

27. Yunfeng Hu, Matthew Hudelson, BK, Altaa Tumurbaatar, and Kevin Vixie. Median Shapes. *Journal of Computational Geometry*, 10, 1, 2019, 322–388. Preprint: arXiv:1802.04968.

28. Methun Kamruzzaman, Ananth Kalyanaraman, BK, Stefan Hey, and Patrick S. Schnable. Hyppo-X: A scalable exploratory framework for analyzing complex phenomics data. *IEEE Transactions on Computational Biology and Bioinformatics*, 18, 4, 2021, 1535–1548 (published online in October, 2019).

29. Ananth Kalyanaraman, Methun Kamruzzaman, and BK. Interesting paths in the mapper complex. *Journal of Computational Geometry*, 10, 1, 2019, 500–531. Preprint: arXiv:1712.10197.

30. Prashant Gupta, BK, and Gregory Dreifus. Continuous toolpath planning in a graphical framework for sparse infill additive manufacturing. *Computer-Aided Design*, 127, 2020, 102880. Issue on papers accepted to Solid and Physical Modeling (SPM 2020). Preprint: arXiv:1908.07452.

31. Enrique Alvarado, Zhu Liu, Michael Servis, BK, and Aurora Clark. A geometric measure theory approach to identify complex structural features of soft matter surfaces. *Journal of Chemical Theory and Computation*, 16, 7, 2020, 4579–4587. Preprint: ChemRxiv:10.26434/chemrxiv.11988048.v1.

32. Prashant Gupta and BK. Euler transformation of polyhedral complexes. *International Journal of Computational Geometry & Applications* (IJCGA), 30, 03n04, 2020, 183–211. Preprint: arXiv:1812.02412.

33. Yunfeng Hu, Phonemany Ounkham, Ondrej Marsalek, Thomas Markland, BK, and Aurora Clark. Persistent homology metrics reveal quantum fluctuations and reactive atoms in path integral dynamics. *Frontiers in Chemistry*, 9, 2021. Preprint: ChemRxiv:10.26434/chemrxiv.13618922.

34. Joshua Mirth, Yanqin Zhai, Johnathan Bush, Enrique Alvarado, Howie Jordan, Mark Heim, BK, Markus Pflaum, Aurora Clark, Y Z, and Henry Adams. Representations of energy landscapes by sublevelset persistent homology: An example with n-alkanes. *The Journal of Chemical Physics*, 154, 11, 2021, p114114. Preprint: arXiv:2011.00918.

35. Enrique Alvarado, BK, and Kevin Vixie. The maximum distance problem and minimal spanning trees. *International Journal of Analysis and Applications*, 19, 5, 2021, 633–659. Preprint: arXiv:2004.07323.

36. Youjia Zhou, Methun Kamruzzaman, Patrick Schnable, BK, Ananth Kalyanaraman, and Bei Wang. Pheno-Mapper: An interactive toolbox for the visual exploration of phenomics data. In the Proceedings of the *12th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (BCB '21)*, Article 20, 2021, 1–10. Preprint: arXiv:2106.13397.

37. Prashant Gupta, Yiran Guo, Narasimha Boddeti, and BK. SFCDecomp: Multicriteria optimized tool path planning in 3D printing using space-filling curve based domain decomposition. *International Journal of Computational Geometry & Applications* (IJCGA), 31, 04, 2021, 193–220. Preprint: arXiv:2109.01769.

38. Matthew Broussard, BK, David Makin, Dale Willits. Extracting insights on use of force by police in encounters through topological data analysis of body-worn camera video datasets. Submitted, 2021. Preprint: bala-krishnamoorthy.github.io/docs/BWCVideosTDA.pdf.

39. Methun Kamruzzaman, Matthew Bielskas, BK, Achla Marathe, Anil Vullikanti, and Ananth Kalyanaraman. Navigating the COVID-19 data landscape: Automated hypothesis generation using topological data analysis. Submitted, 2021. Preprint: ResearchSquare (DOI: 10.21203/rs.3.rs-470082/v1).

40. Youjia Zhou, Nathaniel Saul, Ilkin Safarli, BK, and Bei Wang. Stitch Fix for Mapper and Topological Gains. *Research In Computational Topology 2*, 2022, 265–294. Preprint: arXiv: 2105.01961.

41. Hung Le, Sushant Kumar, Nathan May, Ernesto Martinez-Baez, Ravishankar Sundararaman, BK, and Aurora Clark. Behavior of linear and nonlinear dimensionality reduction for collective variable identification of small molecule solution-phase reactions. *Journal of Chemical Theory and Computation*, 18, 3, 2022, 1286–1296. Preprint: ChemRXiv.

42. Sejal Welankar, Paola Pesantez-Cabrera, BK, Lynn Mills, Markus Keller, and Ananth Kalyanaraman. Persistent homology to study cold hardiness of grape cultivars. In the Proceedings of the *Workshop on AI for Agricultural and Food Systems* (AIAFS) at the 37th AAAI Conference on Artificial Intelligence (AAAI-23) (also selected for lightning talk+poster). Preprint: arXiv:2302.05600.

43. Krishnamurthy Dvijotham, BK, Yunqi Luo, and Benjamin Rapone. Robust feasibility of systems of quadratic equations using topological degree theory. *Optimization Letters*, 18, 2024, 591–613 (published online in May 2023). arXiv:1907.12206.

44. Rounak Meyur, Kostiantyn Lyman, BK, and Mahantesh Halappanavar. Structural validation of synthetic power distribution networks using the multiscale flat norm. In Proceedings of the *International Conference on Computational Science (ICCS 2023)*, *Lecture Notes in Computer Science*, vol 10476, 2023, 55–69.

45. David Makin, Guangzhen Wu, Matthew Broussard, and BK. Predicting Police Integrity: An Application of Support Vector Machines (SVM) to The Police Integrity Instrument. *Asian Journal of Criminology*, 19, 2024, 69–93. Preprint: bala-krishnamoorthy.github.io/docs/Integrity.pdf.

46. Matthew Broussard and BK. A tight max-flow min-cut duality theorem for non-linear multicommodity flows. *Journal of Combinatorial Optimization* (JoCO), 47, 2024, article 54. Preprint: arXiv:2107.04252.

47. Yunqi Luo, Rabayet Sadnan, BK, and Anamika Dubey. Convergence guarantees of a distributed network equivalence algorithm for distribution-OPF. Refereed paper in the *2024 INFORMS Optimization Society Conference (IOS2024)*. Preprint: arXiv:2210.17465.

48. S M Ferdous, Bhargav Samineni, Mahantesh Halappanavar, and BK. Approximate Bipartite b-Matching using Multiplicative Auction. Refereed paper in the *2024 INFORMS Optimization Society Conference (IOS2024)*. arXiv:2403.05781.

49. Nathan May, BK, and Patrick Gambill. A normalized bottleneck distance on persistence diagrams and homology preservation under dimension reduction. *La Matematica*, 3, 2024, 1486–1509. arXiv:2306.06727.

50. S M Ferdous, Bhargav Samineni, Alex Pothen, Mahantesh Halappanavar, and BK. Semi-Streaming Algorithms for Weighted k-Disjoint Matchings. In the Proceedings of the *32nd Annual European Symposium on Algorithms (ESA 2024)*, LIPIcs, 308, 2024, 53:1–53:19. arXiv:2311.02073.

51. Fabiana Ferracina, BK, Mahantesh Halappanavar, Shengwei Hu, and Vidyasagar Sathuvalli. Predictive analytics of selections of russet potatoes. In *Crop Science*, 65, e21432, 2025. arXiv:2404.03701.

52. Enrique Alvarado, BK, and Kevin Vixie. Geometry of a Set and its Random Covers. *Moroccan Journal of Pure and Applied Analysis (MJPAA)*, 11, 1, 2025, 1–29. arXiv:2112.14979.

53. Dustin Arendt, Matthew Broussard, BK, Nathaniel Saul, and Amber Thrall. Steinhaus filtration and stable paths in the Mapper. In the Proceedings of the 41st International Symposium on Computational Geometry (SoCG), LIPIcs, 332, 2025, 10:1–10:21. Full version: arXiv:1906.08256.

54. Fabiana Ferracina, Payton Beeler, Mahantesh Halappanavar, BK, Marco Minutoli, and Laura Fierce. Learning to Simulate Aerosol Dynamics with Graph Neural Networks. In *Environmental Science & Technology*, 2, 8, 2025, 1426–1438. arxiv:2409.13861.

55. Kostiantyn Lyman, Rounak Meyur, BK, and Mahantesh Halappanavar. Structural validation of synthetic power distribution networks using the multiscale flat norm. In *International Journal of Computational Geometry & Applications* (IJCGA), 2025. This is a substantially expanded version of the ICCS 2023 paper (listed as paper # 44). arXiv:2403.12334.

56. Enrique Alvarado, Prashant Gupta, and BK. Box Filtration. In *Journal of Applied and Computational Topology*, 9, 23, 2025. Preprint: arXiv:2404.05859.

57. Viraj Sawant, Kaiyi Wang, Vicky Tong, Zachary Fendler, BK, Seema Gandhi, and Deepak Rajagopal. A new heuristic framework for estimating indirect (Scope 3) emissions of large organizations. In *Nature Scientific Reports*, 15, 36539, 2025.

58. Patrick Gambill, Devesh Jha, BK, Arvind Raghunathan, and William Yerazunis. DamageEst: Accurate Estimation of Damage for Repair using Additive Manufacturing. In the Proceedings of the 36th Annual International Solid Freeform Fabrication Symposium (SFFS), 2025.

59. Jackson Elowitt, Nathan May, Yihui Wei, Enrique Alvarado, BK, and Aurora Clark. Electron Density Transport During Chemical Reactions. To appear in *Journal of Chemical Theory and Computation*, 2025. Preprint: ChemRXiv.

60. BK and Kostiantyn Lyman. Efficient Network Flow Models for Optimal Homology Problems over the Integers. Submitted, 2024 (based on arXiv:2406.19422).

61. BK and Elizabeth Thompson. A Stable Measure for Conditional Periodicity of Time Series using Persistent Homology. Submitted, 2025. Preprint: arXiv:2501.02817.

62. Shishir Lamichhane, Abodh Poudyal, Nicholas Jones, BK, and Anamika Dubey. Scalable Two-Stage Stochastic Optimal Power Flow via Separable Approximation. Submitted, 2025. arXiv:2504.13933.

63. Shishir Lamichhane, Nicholas Jones, BK, and Anamika Dubey. Scalable Stochastic Siting and Sizing of Distributed Generators using Separable Approximation. Submitted, 2025.

64. Elizabeth Thompson, Mary McMillin, Dale Willits, David Makin, Ella Schulz, BK. Does Coding Change What We See? The Influence of Annotation on Perceptions of Police Use of Force. Submitted, 2025. Preprint: crimRxiv.

65. Amber Thrall, Vidya Chhabria, S M Ferdous, Mahantesh Halappanavar, BK. LockRoute: A Spatial Locking Framework for Parallel Global Routing. Submitted, 2025.

ABSTRACTS IN MEDICAL CONFERENCES

Note: These abstracts are typically two pages long, and are peer reviewed. A small number of abstracts are elevated to oral presentations (rest are presented as e-posters).

1. BK, Brian Bay, and Robert Hart. Bone mineral density and donor age are not predictive of allograft bone mechanical strength. E-Poster in the Lumbar Spine Research Society (LSRS) Annual Meeting, 2013.

2. BK, Brian Bay, and Robert Hart. Bone mineral density and donor age are not predictive of allograft bone mechanical strength. E-Poster in the North American Spine Society (NASS) Annual Meeting, 2013.

3. Jung Yoo, Matthew Shinseki, Sabina Blizzard, Marcel Betsch, BK, and Jayme Hiratzka. Why Do Dens Fractures Occur in the Elderly and What Determines the Magnitude of Fracture Angulation and Displacement? Oral presentation in the Korean American Spine Society (KASS) Annual Meeting, 2015.

4. Jung Yoo, Sabina Blizzard, Natalie Zusman, Matthew Shinseki, Marcel Betsch, and BK. Dens Fractures Displacement Is Dependent On The Sagittal Alignment Of The Subaxial Cervical Spine Rather Than The Force Of Injury. Oral presentation in the Cervical Spine Research Society (CSRS) Annual Meeting, 2015.

5. Dayton Opel, Benjamin Rapone, BK, Jung Yoo, James Meeker. Race and Gender Influence Management of Humerus Shaft Fractures. Podium presentation at the 80th Annual Meeting of the Western Orthopaedic Association, 2016.

6. Dayton Opel, Benjamin Rapone, BK, Jung Yoo, James Meeker. Race and Gender Influence Management of Humerus Shaft Fractures. Poster at 104th Annual Meeting of the Clinical Orthopaedic Society, 2016.

POSTERS IN CONFERENCES

Note: A 1–2 page abstract is reviewed as part of the selection process. These abstracts are published as part of the proceedings of the conference.

1. Methun Kamruzzaman, Ananth Kalyanaraman, and BK. Characterizing the Role of Environment on Phenotypic Traits using Topological Data Analysis. In the 7th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics, 2016 (ACM BCB '16).
2. Gregory Dreifus, Ben Rapone, John Bowers, Xiang Chen, A. John Hart, and BK. A Framework for Tool Path Optimization in Fused Filament Fabrication. In the ACM Symposium on Computational Fabrication, 2017.
3. Ananth Kalyanaraman, Methun Kamruzzaman, and BK. Interesting paths in the Mapper. In Algebraic Topology: Methods, Computation and Science, 2018 (ATMCS8).
4. Liya Boukhbinder, Lauren McDermott, BK, and Sukanta Bose. UMAP-Based Convex Hull Separation of GW Signals vs Glitches. In the Gravitational Wave Physics and Astronomy Workshop 2025 (GWPAW).

YOUNG RESEARCHERS FORUM (YRF) SUBMISSIONS

Note: Students present talks in the YRF (part of Computational Geometry Week, CGWeek). A short abstract is reviewed for selection (not formally published). Student presenter marked with asterisk (*).

1. Tamal Dey, Anil Hirani, BK, and Gavin Smith*. Edge contractions and the optimal homologous chain problem. 2012.
2. Sharif Ibrahim*, BK, and Kevin Vixie. Multiscale simplicial flat norm. 2012.
3. BK and Gavin Smith*. Non total-unimodularity neutralized simplicial complexes. 2013.
4. BK, Nathaniel Saul*, and Bei Wang. Stitch fix for mapper. 2018.
5. Dustin Arendt, BK, and Nathaniel Saul*. Jaccard filtration and stable paths in the Mapper. 2019.

GRANTS AND CONTRACTS

1. *UBM: Foundation in Mathematical Biology through interdisciplinary research, training, and curriculum development*, NSF, $905,000 (total amount), Sep 2005–Aug 2011; Co-PI.
2. *Basis Reduction and Integer Programming*, Undergraduate Research Minigrant from College of Sciences, WSU, to support the research work of Keith Clawson, $2500, May–August 2008.

⇒ *Geometric Analysis for Data Reduction and Structure Discovery*, DOE Petascale grant ($1.2mil total amount), May 2010–May, 2013; actively participating faculty member, received RA funding for one PhD student and travel support (PI: Kevin Vixie, WSU).

3. *Collaborative Research: UBM - Institutional: UI-WSU Program in Undergraduate Mathematics and Biology*, NSF, $700,000 (total amount; WSU portion: $200,000), Oct 2010–Sep 2015; Co-PI.
4. *AF:Medium:Collaborative Research: Optimality in Homology - Algorithms and Applications*, NSF, total budget $900,000 (WSU portion $244,521), Aug 2011–Jul 2015; PI (with Tamal Dey at Ohio State University and Anil Hirani at University of Illinois as collaborative PIs).
5. REU Supplement to *AF:Medium:Collaborative Research: Optimality in Homology - Algorithms and Applications*, NSF, $15,600 (for WSU alone), 2012–2013; PI.
6. REU Supplement to *AF:Medium:Collaborative Research: Optimality in Homology - Algorithms and Applications*, NSF, $8,000 (for WSU alone), 2014–2015; PI.
7. REU Supplement to *AF:Medium:Collaborative Research: Optimality in Homology - Algorithms and Applications*, NSF, $8,000 (for WSU alone), 2015–2016 (after a 1-year no-cost extension to the parent grant); PI.
8. Oregon Health and Science University (OHSU), research appointment for Benjamin Rapone, Jun–Jul, 2015, $3000 (partially funded Ben's work on collaborative projects).
9. WSU College of Arts and Science research assistantship for Benjamin Rapone, 2015–2016, $29,720 (one award selected though applications from student-advisor teams from the Department of Mathematics).

10. *Student Travel Grant: International Workshop on Topological Data Analysis in Biomedicine, Seattle, October 2, 2016*, NSF, $8,000, 2016–2017; PI.

11. *Collaborative Research: ABI Innovation: A Scalable Framework for Visual Exploration and Hypotheses Extraction of Phenomics Data using Topological Analytics*. NSF, $1.25mil across WSU Pullman, WSU Vancouver, Iowa State University, and University of Utah (WSU Vancouver portion: $269,091), Aug 2017–Jul 2020; Co-PI.

12. *RUI: Robust Feasibility and Robust Optimization using Algebraic Topology and Convex Analysis*. NSF, $200,000, Aug 2018–Jul 2021; sole PI.

13. WSU College of Arts and Sciences Interdisciplinary Research and Innovation Seed Grant (team of three investigators), $10,000, 2019–2020.

⇒ *DELTA: Descriptors of Energy Landscape by Topological Analysis*. NSF, $846,222, Sep 2019–Mar 2022. PI is Aurora Clark from Chemistry. I was on the Scientific Advisory Board for the project, was an actively participating faculty, and had two of my Mathematics PhD students funded as RAs.

14. *Data-Driven Identification of High-Yielding Russet Potato Varieties*. USDA subcontract, $3,267, May 2022–Mar 2023. Sole PI.

15. *REU Site: Studying Race and Policing in the Complex Social Interaction Lab*. NSF, $433,081, Mar 2023–Feb 2026; Co-PI.

16. *Washington State Data Exchange for Public Safety (WADEPS)*. Washington State Attorney General's Office, $15Mil, Aug 2023–Jul 2028; Co-PI, Statistical Analysis and Optimization Lead.

17. *Developing tool path generation algorithms for additive manufacturing*. Mitsubishi Electric Research Laboratories (MERL) consulting contract, $10,000, Apr 2024–Mar 2026. Sole PI.

18. *Machine Learning Models for Predicting Performances of Russet Potato Varieties*. Oregon Stat University subcontract, $8,301, May–Aug, 2025. Sole PI.

19. *Distinguished Graduate Research Program (DGRP) Award for Amber Thrall*. Pacific Northwest National Laboratory (PNNL) subcontract, $165,177, Jan, 2026–Dec, 2027. Sole PI.

SELECTED PRESENTATIONS

Note: All presentations are **invited talks**.

1. *Decomposable knapsack problems and column basis reduction* – in the 18th International Symposium on Mathematical Programming (ISMP), Copenhagen, August 2003.

2. *Heuristics for number partitioning using basis reduction and integer programming* – seminar at IBM T.J. Watson Research Center, New York, May 5, 2008.

3. *Cascade knapsack problems* – at the Workshop on Mixed Integer Programming (MIP 2008), at Columbia University, New York, August 4–7, 2008. (Invited among 22 speakers for single-track talks over 4 days).

Optimal homologous cycles, total unimodularity, and linear programming.

4. Optimization Seminar at Department of Mathematics, University of Washington, Seattle, April 6, 2010.

5. Theory Seminar at Department of Computer Science, University of California, Irvine, April 16, 2010.

6. Algebra and Discrete Mathematics Seminar at Department of Mathematics, University of California, Davis, April 30, 2010.

7. Theory Seminar at Department of Computer Science, University of British Columbia, Vancouver, BC, May 10, 2010.

8. Theory seminar at Department of Computer Science, Brown University, Providence, RI, May 14, 2010.

9. At IBM Research India, New Delhi, June 17, 2010.

10. At Department of Computer Science and Engineering, Indian Institute of Technology Delhi, June 18, 2010.

11. At the Department of Computer Science and Automation, Indian Institute of Science, Bangalore, June 22, 2010.

12. At the Tata Institute of Fundamental Research, Mumbai, July 15, 2010.

13. In the Culminating Workshop of the Semester on Optimization at the Institute of Pure and Applied Mathematics (IPAM), UCLA, Dec 14, 2010.

14. *Lattice Problems and Discrete Optimization - A tutorial* (given as two seminar talks) at Department of Mathematics, University of California, Davis, April 29, 2010.

Computational approaches for protein mutagenesis.

15. At the TIFR Centre for Applicable Mathematics, Bangalore, June 24, 2010.

16. At the Molecular Biophysics Unit at Indian Institute of Science, Bangalore, June 25, 2010.

17. Colloquium in the Department of Mathematics and Statistics, Portland State University, October 28, 2011.

Integer optimization and algebraic topology.

18. In the Systems Science seminar at Portland State University, April 22, 2011.

19. Colloquium in Department of Mathematics, University of Portland, September 30, 2011.

20. *Multiscale Simplicial Flat Norm* – in the 2011 Applied Mathematics and Image Processing Summer Workshop at University of Texas-Pan American, June 1, 2011.

21. *Finding bottlenecks in tunnels* – colloquium in the Department of Mathematics and Statistics, University at Albany (SUNY), February 27, 2014.

Non total-unimodularity neutralized simplicial complexes.

22. In Recent Advances in Linear Optimization (RALO 2014), at Fondation Mathématiques Jacques Hadamard (FMJH), Paris, August 1, 2014.

23. In the 22nd International Symposium on Mathematical Programming (ISMP), Pittsburgh, July 2015.

24. *Flat Norm Decomposition of Integral Currents* – in the Discrete Mathematics Seminar at Department of Mathematics, Simon Fraser University, Burnaby, BC, November 25, 2014.

Linear Programming in Geometric Measure Theory

25. In the Applied Algebraic Topology Research Network Seminar, April 20, 2016 (online seminar of the Applied Algebraic Topology Network, facilitated originally by the NSF Institute for Mathematics and its Applications (IMA).

26. Topology Seminar, Dept. of Mathematics and Statistics, University of Victoria, BC, October 14, 2016.

27. Colloquium in Department of Mathematics, Oregon State University, Corvallis, OR, April 9, 2018.

Median shapes.

28. In AMS Fall Sectional Meeting, North Carolina State University, Raleigh, NC, November 2016.

29. In the Analysis seminar of the Department of Mathematics and Statistics, Portland State University, May 19, 2017.

30. *Interesting paths in the Mapper* – at the Joint Mathematics Meetings, San Diego, CA, Jan 10, 2018.

31. *Topology and Data* – colloquium at the Pi Mu Epsilon Induction Ceremony, Department of Mathematics, Oregon Stat University, Corvallis, OR, April 9, 2018.

32. *Optimization and Topology: Two Stories* – colloquium in the Department of Applied Mathematics and Statistics, John Hopkins University, Baltimore, MD, February 14, 2019.

33. *Robust Feasibility Using Topological Degree Theory* – in the West Coast Optimization Meeting (WCOM), at University of British Columbia, Vancouver, BC, Canada, September 28, 2019.

34. *An Introduction to Mapper* – DELTA webinar, February 11, 2020. YouTube video (viewed 6,500+ times).

35. *Steinhaus filtration and stable paths in the Mapper* – in the Seminar of the Applied Algebraic Topology Research Network (AATRN), September 16, 2020. YouTube video.

36. *Dimension reduction: An overview* – DELTA webinar, October 20, 2020. YouTube video.

37. *Applications of Geometric Measure Theory to Soft Matter Surfaces* – in Workshop on The Mathematics of Soft Matter, Institute of Mathematical and Statistical Innovation (IMSI), March 4, 2022.

38. *SFCDecomp: Multicriteria Optimized Tool Path Planning in 3D Printing* – in the SIAM Conference on Discrete Mathematics (DM22), Carnegie Mellon University, Pittsburgh, PA, Jun 14–16, 2022.

39. *Box Filtration* – in the SIAM Conference on Mathematics of Data Science (MDS22), San Diego, CA, Sep 26–30, 2022.

40. *Scale Invariance of the Normalized Bottleneck Distance on Persistence Diagrams* – in the 67th Cascade Topology Seminar, Portland, OR, Nov 12–13, 2022.

41. *A Normalized Bottleneck Distance on Persistence Diagrams and Homology Preservation under Dimension Reduction* – in the 7th Workshop on Geometry and Machine Learning at the CG Week 2023, Dallas, TX, Jun 12–15, 2023.

42. *Convergence Guarantees of a Distributed Network Equivalence Algorithm for Distribution-OPF* – in Jon-Shmuel Halfway to Twelfty, Paris, July 4–7, 2023.

43. *Median Shapes and Linear Programming* – Spotlight talk in the STOR Fest, Anniversary Celebration Of the Department of Statistics and Operations Research, UNC Chapel Hill, Sep 17–19, 2023.

44. *Box Filtration* – in the 8th Workshop on Geometry and Machine Learning at the CG Week 2024, Athens, Greece, Jun 11–14, 2024.

45. *A Stable Measure for Conditional Periodicity of Time Series using Persistent Homology* – in the Applied and Computational Mathematics Seminar at Portland State University, Feb 14, 2025.

46. *Steinhaus Filtration and Stable Paths in the Mapper* – in The 19th AIMR Seminar at the Advanced Institute for Materials Research, Tohoku University, Japan, Jun 20, 2025.

RESEARCH PROGRAMS AND WORKSHOPS

1. Selected by the Institute for Mathematics and its Applications (IMA) at University of Minnesota to attend the New Directions Short Course on Applied Algebraic Topology, June 15-26, 2009 (limited to around 25 participants, selected based on application).

2. Invited by the Institute for Pure and Applied Mathematics (IPAM) at University of California, Los Angeles (UCLA) to be a *core participant* in the long program on Modern Trends in Optimization and Its Application, September 13 - December 17, 2010 (limited to around 40 core participants).

3. Invited by the Institute for Mathematics and its Applications (IMA) at University of Minnesota to attend most of the workshops (5 out of 6) held as part of the Thematic Year on Scientific and Engineering Applications of Algebraic Topology, 2013–2014.

4. Invited by the NSF Institute for Computational and Experimental Research in Mathematics (ICERM) in Brown University to participate in the workshop on Mathematics in Data Science, July 28–30, 2015.

5. Invited by the Banff International Research Station (BIRS) for Mathematical Innovation and Discovery and the Casa Mathematica de Oaxaca (CMO) to attend the workshop on Modern Techniques in Discrete Optimization: Mathematics, Algorithms and Applications, Nov 1–6, 2015. Around 35 researchers were invited, almost all of whom were faculty.

6. Invited by the Institute for Computational and Experimental Research in Mathematics (ICERM) in Brown University to participate in the workshop on Optimization Methods in Computer Vision and Image Processing, Apr 29–May 3, 2019.

7. Invited by the Institute for Mathematical and Statistical Innovation (IMSI) in University of Chicago as a *plenary speaker* in the workshop on The Mathematics of Soft Matter, Feb 28–Mar 4, 2022.

8. Invited by the Banff International Research Station (BIRS) as a speaker and participant in the workshop on Cycle Representatives in Applied Homological Algebra, Aug 10–15, 2025.

PHD STUDENTS

1. Ye Tian (May 2011)
   – first placement: Senior Risk Analyst, JP Morgan-Chase, Columbus, OH.

2. Gavin Smith (PhD, May 2013)
   – first placement: Senior Engineer, Intel Corporation, Hillsboro, OR.

3. Sharif Ibrahim (PhD, Summer 2014; joint with Kevin Vixie)
   –first placement: Cognetry (start-up, Portland, OR); Senior Engineer, Intel Corporation, Hillsboro, OR.

4. Yunfeng Hu (PhD, May 2018; joint with Kevin Vixie)
   – first placement: Data Scientist, Emsi, Moscow, ID.

5. Benjamin Rapone (PhD, September 2019)
   – first placement: Data scientist, Washington State Governor's Office, Olympia, WA.

6. Methun Kamruzzaman (PhD in Computer Science, May 2020; joint with Ananth Kalyanaraman)
   – first placement: postdoctoral scholar at University of Virginia, Charlottesville, VA.

7. Enrique Alvarado (PhD, 2021; joint with Kevin Vixie)
   – first placement: Krener Assistant Professor at Department of Mathematics, UC Davis, CA.

8. Matthew Broussard (PhD, 2021)
   – first placement: Data Scientist, TD Bank, NJ.

9. Prashant Gupta (PhD, 2021)
   – first placement: Research Scientist at Natural Intelligence, Boise, ID

10. Yunqi Luo (PhD, 2022)
    — first placement: postdoctoral scholar at University of Science and Technology of China

11. Nathan May (PhD, 2022)
    — first placement: Data scientists at Northrup Gruman

12. Kostiantin Lyman (PhD, 2024)
    — first placement: AMD

13. Fabiana Ferracina (PhD in Statistics, 2024)
    — first placement: postdoc, Tohoku University, Japan

14. Elizabeth Thompson (PhD, current)

15. Amber Thrall (PhD, current)

16. Liya Boukhbinder (PhD, current; joint with Kevin Vixie)

17. Rommel Cortez (PhD, current)

18. Patrick Gambill (PhD, current)

19. Zachary Fendler (PhD, current)

20. Nicholas Jones (PhD, current)

21. George Filholm (PhD, current)

Other PhD students who have worked substantially with me

1. Nathan Moyer (May 2010; advisee of Bill Webb)
   – first placement: Assistant Professor in Math & CS, Whitworth University, Spokane, WA.

2. Svetlana Lockwood (PhD in Computer Science, 2016; advisee of Shira Broschat)
   – first placement: postdoctoral fellow, Allen School of Global Animal Health, WSU.

MS Students

1. John Chuba (MS, Summer 2006)
2. Andrew Fowler (MS, Summer 2006)
3. Lisa Tripp (MS, Spring 2007; PhD in Psychology, WSU, 2011)
4. Sunaina Mukherjee (MS, Summer 2007)
5. Derek Nevins (MS in Bioengineering, August 2012; joint with Anita Vasavada)
6. Didiet Anindhita (MS, August 2013)
7. Altaa Tumurbaatar (MS in Computer Science, 2015; joint with Kevin Vixie)
8. Nathaniel Saul (MS, May 2019)
9. Maryam Ehsani-Banafti (MS, Summer 2019)
10. James Asare (MS, Summer 2021)
11. Nicholas Jones (MS, May 2025)

Other Graduate Student Committee Service

1. Yuntao Zhu, PhD Committee (2007)
2. Sherod Eubanks, PhD committee (2010)
3. Limin Yang, PhD committee (2012)
4. Ben Van Dyke, PhD committee (2012)
5. Pietro Paparella, PhD committee (2013)
6. Leanne Whitmore, PhD committee, PhD in Biochemistry (2015)
7. Bo Han, PhD committee (2016)
8. Hossein Noorazar, PhD committee (2017)
9. Henry Riely, PhD committee (2019)
10. Kostyantin Lyman, PhD committee (August 2018–November 2019; became my advisee later on)
11. Mostafa Rezapour, PhD committee (2020)
12. Olga Rumyantseva, PhD committee (2021)
13. Katrina Sabochick, PhD committee (2018–2020; changed research areas and committee)
14. Srijanie Dey, PhD committee (2023)
15. Jacob Pennington, PhD committee (2021–2023; left the program)
16. Saleh Aseeri, PhD committee (current)
17. Harsita Agrawal, PhD in Statistics committee (current)
18. Curtis Michels, PhD committee (current)
19. Blake Cecil, PhD committee (current)
20. Saxton Wilson, PhD committee (current)
21. Yunjia Kou, PhD committee (current)
22. Shishir Lamichhane, PhD in Electrical and Computer Engineering committee (current)
23. Chris Kanyer, MS committee (2006)
24. Jeff Noel, MS committee (2007)
25. Lisa Ellison, MS committee (2008)
26. Andrew Nishi, MS committee (2014)
27. Andrew Miller, MS committee (2016)
28. Lori Babbick, MS committee (2020)

29. Rabayet Sadnan, MS committee, 2021
30. Tamara Trbojevic, MS Committee (2023)
31. Madhulika Gurazada, MS in Environmental Sciences committee (2024)
32. Dipesh Baral, MS committee (current)

UNDERGRADUATE STUDENTS SUPERVISED

Note: Students supported by NSF grants, except when marked by **†** when supported by WSU College of Arts and Sciences research minigrants. **‡**: Student did Honors thesis research under my guidance.

1. Christopher Deutsch, Biochemistry major, *Scoring functions for protein mutagenesis* (May 2006–June 2008). Pursued PhD in Biochemistry, Portland State University, Portland, OR.
2. Kelly Stratton, Mathematics major, *Protein decoy discrimination* (May 2006–March 2007). Currently a statistical scientist at Pacific Northwest National Laboratory (PNNL), after finishing an MS in Biostatistics from University of Washington, Seattle, WA.
3. Natalie Baerlocher, Mathematics major, *Models for optimal habitat reserve management* (May 2007–June 2008). Currently working for the Energy Authority, Bellevue, WA, after finishing an MS in Operations Research, UNC Chapel Hill, NC.
4. Konstantin Stakhovich, Mathematics major, *Modeling neck muscle geometry* (May 2007–May 2008; joint with Anita Vasavada, Bioengineering).
5. Keith Clawson**†**, Mathematics major, *Integer programming and basis reduction* (February–December 2008).
6. Svetlana Lockwood, Computer Science major, *Predicting temperature-sensitive mutations* (February 2008–August 2010; joint with Ping Ye, Molecular Biosciences at WSU, May 2009–August 2011). Pursued PhD student in Computer Science, WSU, Pullman WA (2016).
7. Derek Nevins, Bioengineering major, *Optimization in neck muscle models* (May 2009–August 2010; joint with Anita Vasavada, Bioengineering). Currently a research associate in Mechanical Engineering, WSU, after finishing MS in Bioengineering, WSU, Pullman WA.
8. Matthew Graham, Mathematics major, *simplicial approximations of currents* (May–September, 2012).
9. Joshua Cruz**‡**, Mathematics major, *flat norm signatures for shapes* (May 2012–June 2013). Currently, a PhD student in Mathematics, Duke University (since Fall 2013).
10. Anthony Olivos, Mathematics major, *finding patterns in surgical data* (May 2014–May 2015). First placement after BS: analyst with Epic Systems, Madison, WI (Jan 2016).
11. Mats Johnson, Mathematics major, *efficient algorithms for optimal homology problems* (May–August, 2015). Pursuing PhD in Mathematics at Colorado State University (since Fall 2018).
12. Philip Behrend**‡**, Mathematics major, *an optimization model for waste gasification in Washington state* (August 2015–August 2016). First placement after BS: Boeing, Seattle, WA (since Fall, 2016).
13. Christian Svinth, Mathematics major, *Analysis of sentiment curves of books using TDA* (May, 2020–August 2020). First placement after BS: MS student in CS, WSU Vancouver (since Fall, 2020).
14. Rosemary Barrass, Mathematics major, *Linear relaxations of Optimal Power Flow* (May, 2021–June 2022).
15. Josiah Cowin**†**, Mathematics major, *Sentiment analysis of books using TDA* (December, 2021–May, 2022).
16. Brandin Farris, Mathematics major, *High-throughput digital root phenomics* (January 2023–August, 2024).

DEPARTMENTAL AND PROGRAM SERVICE

- ❑ PhD qualifying exam committee: Spring 2005; Spring 2007; Fall 2009; Spring 2012, Spring 2014.
- ❑ PhD Evaluation Committee, 2005–06.
- ❑ Advising Undergraduate Math Club, August 2005–August 2008, August 2009–May 2011.
- ❑ Discrete mathematics faculty search committee, 2007–2008.
- ❑ Kallaher-Mifflin retirement committee, Spring 2011.
- ❑ Administrative manager search committee, Fall 2011.
- ❑ Math-Stat merger implementation committee, Fall 2011.
- ❑ Undergraduate studies committee, August 2011–May 2012, and August 2013–May 2014.
- ❑ Post doctoral search committee, 2013–2014.
- ❑ Actively represented the department in WSU Open House and Junior Showcase events (2005–2011).
- ❑ Mentoring committee for Hongbo Dong, assistant professor (2013–2019).

- ❑ Mentoring committee for Shiv Karunakaran, assistant professor (2014–2017).
- ❑ Mentoring committee for Leslie New, assistant professor (2015–2021).
- ❑ Mentoring committee for William Hall, assistant professor (2022–2023).
- ❑ Member of the College of Arts and Sciences Undergraduate Research Committee in WSU Vancouver (August 2014–May 2015).
- ❑ Search committees for Mathematics instructor and Director of Quantitative Skill Center, WSU Vancouver (2014–2015).
- ❑ Program leader for Mathematics and Statistics, WSU Vancouver (August 2015–July 2019).
  - Scheduling of classes, coordinating with other programs on campus and with the Department in Pullman, hiring adjunct instructors, securing internal funds to run the program, preparing annual reviews for full-time and adjunct instructors, dealing with complaints from students and faculty, and ensuring the overall smooth running of the program.
- ❑ Graduate Studies Committee, August, 2015–May, 2020; August 2025–now.
- ❑ Undergraduate Assessment Committee, January, 2017–May, 2020, August 2021–now.
- ❑ Data Analytics faculty search committee, August, 2019–April, 2020.
- ❑ Vancouver Sciences Graduate Studies Committee, August 2019–May, 2020, August–December, 2021.
- ❑ Vancouver CAS Graduate Coordinator Search Committee, January–April, 2020.
- ❑ Vancouver Graduate Program Leader Committee, September, 2022–May, 2023.
- ❑ Graduate Program leader for Mathematics and Statistics, WSU Vancouver (August 2023–now).
- ❑ Computational mathematics faculty search committee, 2025–2026.

INSTITUTIONAL SERVICE (AT WSU)

- ❑ Part of Bioinformatics curriculum planning team (faculty from various departments who worked on a Bioinformatics graduate program on campus), 2006.
- ❑ Member of Bioinformatics Faculty Search Committee, School of EECS, 2006-7.
- ❑ Member of the Faculty Status Committee, 2014.
- ❑ Member of Data Sciences Faculty Search Committee, School of EECS, 2015–16
  (search canceled in February 2016, after review of $115+$ applications).
- ❑ Member of the Council of Faculty Representatives (CFR), WSU Vancouver, 2017–May, 2020.
- ❑ Member of the Equity of Students' Outcomes Committee (ESOC), WSU Vancouver, January 2019–May, 2020.
- ❑ College of Arts and Sciences (CAS) Tenure and Promotion Committee, 2023–2026.

PROFESSIONAL SERVICE (OUTSIDE WSU)

- ❑ Organizer of the 3rd Annual Cascade Regional Applied Interdisciplinary and Numerical (RAIN) Mathematics Meeting (sites.google.com/site/cascaderain2016/), April 9, 2016 at WSU Vancouver (secured $600 in WSU funds for hosting the conference).
- ❑ Local organizing committee, 35th Intl. Symp. Computational Geometry (SoCG) and CG Week, 2019.
- ❑ Chair of Local organizing committee and member of organizing committee, 3rd Biennial Meeting of SIAM Pacific Northwest Section, 2022.
- ❑ Program committee member, 8th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB), 2017.
- ❑ Organization of workshops and sessions in conferences
  - Organizer (with four others) of the Workshop on *OR and Biology*, at the INFORMS Annual Meeting, Pittsburgh, November 2006.
  - Organizer (with three others) of the workshop on *Biomedical Applications of Algebraic Topology and Abstract Algebra*, at the Pacific Symposium on Biocomputing (PSB), 2016 (selected after review of proposals).
  - Organizer (with Bei Wang, University of Utah) of the workshop on *Topological Data Analysis in Biomedicine* at the 7th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics, ACM BCB 2016 (selected after review of proposals).
  - Organizer (with Bei Wang, University of Utah and Dmitriy Morozov, Lawrence Berkeley National Lab) of the 8th Annual Minisymposium on Computational Topology, as part of the Computational Geometry Week, SoCG 2019 (selected after review of proposals).

- Chair of invited session on *OR Applications in Computational Biology* at the INFORMS Annual Meeting, San Francisco, CA, November, 2005.
- Chair of invited session on *Optimization in Computational Biology* at the INFORMS International Meeting, Puerto Rico, July, 2007.
- Chair (with Kevin Vixie) of special session on *Analysis, geometry and data* at the Joint Mathematical Meetings, Seattle, 2016 (selected after review of proposals).
- Chair (with Nikolay Strigul) of special session on *Data-intensive modeling in ecology* at the Joint Mathematical Meetings, Seattle, 2016 (selected after review of proposals).
- Chair (with Henry Adams) of special session on *Recent Advances in Applied Algebraic Topology* at the AMS Spring Sectional Meeting, Pullman, WA, 2017 (selected after review of proposals).
- Chair (with Sudipta Sinha, Microsoft Research) of special session on *Geometry and Optimization in Computer Vision* at the AMS Spring Sectional Meeting, Pullman, WA, 2017 (selected after review of proposals).
- Organizer (with Ananth kalyanaraman, WSU) of MiniSympoisum on *Computational Advances and Challenges in Data-enabled Life Sciences* at the SIAM Conference on Computational Science and Engineering, CSE '19, Spokane, WA, 2019 (selected after review of proposals).
- Organizer (with Emilie Purvine, PNNL) of Minisymposium on Topological Data Analysis - Theory and Practice at the Biennial Meeting of SIAM Pacific Northwest Section, SIAMPNW21, Vancouver, WA, 2022.
- Chair (with Justin Curry and Greg Dreifus) of special session on *Topological and Algebraic Properties of Additive Manufacturing* at the Joint Mathematical Meetings, Seattle, 2025 (selected after review of proposals). Jon Wild, one of the invited speakers, was mentioned in the New York Times article on the JMM.

❑ Peer reviewer for
- Mathematical Programming, Mathematics of Operations Research, SIAM Journal of Discrete Mathematics, SIAM Journal of Optimization, INFORMS Journal of Computing, Algorithmica, Computational Geometry – Theory and Applications, SIAM Journal on Numerical Analysis, Discrete Applied Mathematics, Computational Optimization and Applications, Computers and Mathematics with Applications, Symposium on Discrete Algorithms (SODA 2010), Linear Algebra and its Applications, PeerJ Computer Science, International Symposium on Computational Geometry (SoCG 2020, 2024, 2025), Frontiers in AI, Journal of Machine Learning Research, Mathematics of Control, Signals, and Systems (MCSS), PRIMUS, La Matematica, Supercomputing (SC25), Journal of Applied and Computational topology, Computing in Geometry and Topology;
- Bioinformatics, Pacific Symposium on Biocomputing, Journal of Computational Chemistry, Journal of Theoretical Biology, PLoS Computational Biology, PLoS One, Frontiers in Immunology, Additive Manufacturing, Computer-Aided Design, BMC Genomics, *Clustering Challenges in Biological Networks* - book for DIMACS challenge.

❑ Review Panel Member for the NSF UBM program (2006).

❑ Review Panel Member for DOE-funded (NA-22) industrial project (Sep 2011).

❑ Panel member for the DOE Advanced Scientific Computing Research (ASCR)/Basic Energy Sciences (BES) Data Workshop, Bethesda, MD, Oct 24-25, 2011.

❑ External examiner for PhD dissertation of Piyashat Sripratak, Department of Mathematics, Simon Fraser University, Fall 2014.

❑ Virtual Review Panel Member, NSF BIGDATA program (2015).

❑ Reviewer for NSF BIGDATA Program, 2016–2017.

❑ Virtual Review Panel Member for NSF-Simons Program, 2017.

❑ Review panel member for NSF-NLM Data Science Program, 2019.

❑ Review panel member for NSF CDS&E-MSS Program, 2020.

HONORS AND AWARDS

❑ Placed in the top 0.2% (rank 210) among more than 100,000 candidates appearing for the Joint Entrance Examination (JEE 95) for admission to the Indian Institutes of Technology (IITs).

❑ Inducted into the Frank Porter Graham Graduate and Professional Student Honor Society, University of North Carolina at Chapel Hill, April, 2002.

❑ Selected by the Department of Operations Research at the University of North Carolina to participate in the Doctoral Colloquium at the INFORMS Annual Meeting, Atlanta, October 2003.

❑ Mentor for Svetlana Lockwood,
- finalist in the Outstanding Undergraduate Researchers Award competition of Computing Research Association (CRA), 2010; and
- winner of the Barry M. Goldwater scholarship for 2009-2010.

❑ Mentor for winners in the College of Sciences Undergraduate Poster Competition at WSU:
- Chris Deutsch, first prize, 2007 and 2008.
- Svetlana Lockwood, first prize, 2009 and 2010.

❑ Recognized as an *Outstanding Mentor* in 2009 by the Women and Leadership Alliance Forum, WSU.

❑ Member of the WSU Provost's Leadership Academy, 2017–2018.

❑ WSU Vancouver Chancellor's Award for Research Excellence, 2019.

❑ WSU College of Arts and Sciences Interdisciplinary Catalyst Award, 2020.

❑ Member of the WSU President's Teaching Academy, April, 2020–now.

❑ Yang "Wendy" Liu Excellence in Teaching Award from the WSU International Programs, 2022.

❑ WSU College of Arts and Sciences Excellence in Graduate Teaching Award, 2023.

COVERAGE IN POPULAR PRESS AND PUBLIC LECTURES

❑ Quantum leap: WSU grad student, adviser craft next-level cybersecurity code. In *The Spokesman Review*, April 4, 2015. spokesman.com/stories/2015/apr/04/quantum-leap-wsu-grad-student-adviser-craft-next.

❑ Study pushes trash-to-gas process: Researchers say convert garbage to 'syngas' rather than shipping to landfill. In *The Columbian*, November 4, 2017. http://www.columbian.com/news/2017/nov/04/study-pushes-trash-to-gas-scheme/.

❑ Talk on "Discovering hidden structure in big data" (https://www.ted.com/talks/bala_krishnamoorthy_discovering_hidden_structure_in_big_data) at TEDx Camas with the theme of "Seeing the Invisible", June 2019 (https://tedxcamas.weebly.com/).

COMPUTER SKILLS

❑ Packages: Matlab (Octave), Python, NTL, LATEX;
extensive use of AMPL and CPLEX, including the use of CPLEX callable libraries.

❑ Languages: C/C++, Awk and Unix shell scripts, and some use of Python.

❑ Platforms: Unix/Linux, Windows.

PROFESSIONAL AFFILIATIONS

❑ Mathematical Optimization Society (MOS); American Mathematical Society (AMS);
Society for Industrial and Applied Mathematics (SIAM);
SIAM Activity Groups: Algebraic Geometry, Optimization, Applied & Computational Discrete Algorithms, Computational Science and Engineering;
ACM Special Interest Groups: Algorithms and Computation Theory (SIGACT), Bioinformatics, Computational Biology, and Biomedical Informatics (SIGBio).

TEACHING INNOVATIONS

❑ Use of tablet PC to write on (in place of black or white board) during lectures, and capture entire lecture in video (for 15+ years). Scribes (or lecture notes) and videos from each lecture is then made publicly available online. Sample: bala-krishnamoorthy.github.io/FilesMath401/F25/LecNotes/index.html.

INSTRUCTION AND COURSE EVALUATION SCORES

Legend for the Table of Course Evaluation Scores (Table continued on the next page):

Ev/Tot: number of students filling evaluation survey (Ev) / total enrollment (Tot). Survey questions are Q1: instructor's preparation, Q2: instructor's explanations, Q3: quality of interaction, and Q4: overall impression **(scores out of 5.00)**. †: Undergraduate/graduate (466/566) level classes taught conjointly; material covered at graduate level, with 466 students graded on a lower curve (# students in 466/566 was 2/8 in Fall 2006). ‡: Replaced by substitute instructor after 8 weeks due to health reasons, and hence not evaluated. §: Taught jointly with two other instructors; evaluations reported separately for each instructor. ϒ : Course taught via videoconferencing to remote and local locations. **p**/**v**: Pullman/Vancouver (**p**+**v**: offered concurrently in both campuses; not color-coded when evals from both locations are combined).

⇓ (part of table in next page): A new online evaluation system was adapted starting in Fall 2015, with a longer survey. The overall mean/median score for the instructor and course are listed, along with scores for questions Q1–Q3. ¶: Results are not reported if the number of students taking the survey is too small. *: Math 524 was taught as Math 581 (Topics) in Falls 2015 and 2017; and Math 529 was taught as Math 574 (Topics) in Spring 2012, 2014, 2016, and 2018.

On professional leave Fall 2012–Spring 2013 and Fall 2020–Spring 2021 (no teaching responsibilities).

Table 1: Course evaluation scores from Fall 2004 to present. See next page for the rest of the scores.

Term/year	Cr No.	Course title	# Ev/Tot	Q1	Q2	Q3	Q4
Fall 2004	566	Network Optimization	7/7	4.7	5.0	4.9	5.0
Spring 2005	364	Principles of Optimization	13/19	4.7	4.3	3.5	4.2
Fall 2005	220	Introductory Linear Algebra	49/85	4.6	4.3	4.3	4.5
Fall 2005	364	Principles of Optimization	16/17	4.6	4.4	4.3	4.4
Fall 2005	567	Integer Optimization	7/7	4.9	4.3	5.0	4.7
Spring 2006	574	Optimization in Comp. Biol.	10/14	4.6	4.4	4.6	4.5
Fall 2006	466/566	Network Optimization	10/(2,8)†	4.7	4.1	4.6	4.5
Spring 2007	464	Linear Optimization	7/10	4.7	4.7	4.9	5.0
Fall 2007	220	Introductory Linear Algebra	48/85	4.5	4.3	4.0	4.3
Fall 2007	364	Principles of Optimization	20/25	4.9	4.9	4.9	5.0
Spring 2008	574	Optimization in Comp. Biol.	8/10	4.6	4.43	4.9	5.0
Fall 2008	466/566	Network Optimization	9/(1,10)†	4.9	4.9	4.8	4.8
Fall 2008	201‡	Finite Mathematics	-/108	not evaluated			
Spring 2009	567	Integer Optimization	5/5	5.0	5.0	5.0	5.0
Spring 2009	581 §	Image and Data Analysis	9/10	4.9	4.3	4.8	4.7
Fall 2009	220	Introductory Linear Algebra	57/99	4.9	4.3	4.1	4.4
Fall 2009	364	Principles of Optimization	11/17	4.8	4.8	4.7	4.7
Spring 2010	464	Linear Optimization	13/15	4.9	4.7	4.5	4.7
Spring 2011	230	Honors Intro. Linear Algebra	21/22	4.8	3.9	4.3	4.1
Spring 2011	567	Integer Optimization	7/9	4.7	4.6	4.7	5.0
Fall 2011	364	Principles of Optimization	15/21	4.8	4.4	4.7	4.8
Spring 2012	529* ϒ	Computational Topology	15/21	4.7	4.5	4.3	4.4
Fall 2013	220	Introductory Linear Algebra	59/103	4.5	3.9	4.1	4.0
Fall 2013	364	Principles of Optimization	14/21	4.6	4.5	4.3	4.6
Spring 2014	529* ϒ	Computational Topology	7/7	4.9	4.7	4.6	4.9
Fall 2014 **p**+**v**	466/566ϒ	Network Optimization	10/(5,10)†	4.9	4.7	4.6	4.8
			8/(10,0)†	4.8	3.6	3.6	3.6
Fall 2014 **v**	273	Calculus III	7/8	4.7	4.0	4.3	4.1
Spring 2015	567 ϒ	Integer Optimization	7/8	4.9	4.7	4.6	4.7

Fall 2015 **p**+**v**	524* ϒ	Algebraic Topology	5/8	5.0, 5.0 (4.6, 4.4, 4.4)
Spring 2016 **v**	464	Linear Optimization	12/29	5.0, 4.2 (5.0, 5,0, 5.0)
Spring 2016 **p**+**v**	529* ϒ	Computational Topology	2/10	*evals not reported*¶
Fall 2016 **p**+**v**	466/566ϒ	Network Optimization	10/(4,12)†	5.0, 4.2 (5.0, 5,0, 5.0)
			8/(5,4)†	4.5, 4.0 (5.0, 5,0, 5.0)
Spring 2017 **v**	364	Principles of Optimization	11/18	5.0, 4.2 (5.0, 5,0, 5.0)
Spring 2017 **p**+**v**	567 ϒ	Integer Optimization	6/9	5.0, 4.5 (5.0, 5.0, 5.0)
			2/2	*evals not reported*¶
Fall 2017 **p**+**v**	524* ϒ	Algebraic Topology	3/9	5.0, 5.0 (5.0, 5.0, 5.0)
Spring 2018 **v**	464	Linear Optimization	9/15	5.0, 4.4 (5.0, 5,0, 5.0)
Spring 2018 **p**+**v**	529* ϒ	Computational Topology	9/11	5.0, 5.0 (5.0, 5,0, 5.0)
Fall 2018 **p**+**v**	466/566ϒ	Network Optimization	14/(5,16)†	5.0, 5.0 (5.0, 5.0, 5.0)
Spring 2019 **v**	364	Principles of Optimization	9/19	3.5, 3.3 (4.0, 4.0, 4.0)
Spring 2019 **p**+**v**	567 ϒ	Integer Optimization	6/9	5.0, 5.0 (5.0, 5.0, 5.0)
Fall 2019 **p**+**v**	401 ϒ	Introduction to Analysis I	20/27	4.0, 3.5 (4.5, 4.0, 4.0)
Fall 2019 **p**+**v**	524 ϒ	Algebraic Topology	3/8	5.0, 5.0 (5.0, 5.0, 5.0)
Spring 2020 **p**+**v**	529 ϒ	Computational Topology	6/10	5.0, 5.0 (5.0, 5,0, 5.0)
Fall 2021 **p**+**v**	401 ϒ	Introduction to Analysis I	6/26	5.0, 4.3 (5.0, 4.5, 5.0)
Fall 2021 **p**+**v**	524 ϒ	Algebraic Topology	2/7	*evals not reported*¶
Spring 2022 **p**+**v**	529 ϒ	Computational Topology	4/11	4.5, 5.0 (5.0, 5,0, 4.5)
Fall 2022 **p**+**v**	466/566ϒ	Network Optimization	3/(12,9)†	4.0, 3.0 (5.0, 4.0, 5.0)
Spring 2023 **p**+**v**	464 ϒ	Linear Optimization	13/36	5.0, 4.1 (5.0, 5,0, 5.0)
Spring 2023 **p**+**v**	567 ϒ	Integer Optimization	1/7	*evals not reported*¶
Fall 2023 **p**+**v**	401 ϒ	Introduction to Analysis I	22/25	5.0, 4.1 (5.0, 5.0, 5.0)
Fall 2023 **p**+**v**	524 ϒ	Algebraic Topology	6/8	4.3, 4.5 (5.0, 5.0, 5.0)
Spring 2024 **p**+**v**	529 ϒ	Computational Topology	7/15	4.4, 4.4 (5.0, 5,0, 5.0)
Fall 2024 **v**	364	Principles of Optimization	6/16	4.2, 4.0 (4.3, 4.5, 4.5)
Fall 2024 **p**+**v**	466/566ϒ	Network Optimization	7/(6,20)†	5.0, 4.3 (5.0, 5.0, 5.0)
Spring 2025 **p**+**v**	567ϒ	Integer Optimization	6/11	4.5, 4.3 (5.0, 5.0, 5.0)