

Name: Alter, Orly | <https://alterlab.org/> | **Citizenship:** Israel and U.S.
Position: Utah Science, Technology, and Research (USTAR) Associate Professor of Bioengineering and Human Genetics, Scientific Computing and Imaging Institute and Huntsman Cancer Institute, University of Utah
Google Scholar: <https://scholar.google.com/citations?user=RKh11ecAAAAI&hl=en>
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Education/Training

Institution	Degree (if applicable)	Completion Date	Field of Study
Stanford University, CA, USA	Postdoctoral Fellowship	1/2004	Genetics
Stanford University, CA, USA	Ph.D.	1/1999	Applied Physics
Tel Aviv University, Israel	B.Sc. <i>magna cum laude</i>	10/1989	Physics

Research Experience

2024– Chief Scientific Officer (CSO) and Co-Founder, Prism AI;
<https://linkedin.com/company/prism-ai/>
2016– Investigator, and Member of the Cancer Control and Population Sciences Program, Huntsman Cancer Institute (HCI), University of Utah
2011– Adjunct Associate Professor, Department of Human Genetics, University of Utah
2010– Utah Science, Technology, and Research (USTAR) Associate Professor, Department of Bioengineering and Scientific Computing and Imaging (SCI) Institute, University of Utah
2010–2016 Adjunct Associate Professor, Department of Mathematics, University of Texas at Austin
2004–2010 Assistant Professor, Department of Biomedical Engineering, and Fellow, Institute for Cellular and Molecular Biology, University of Texas at Austin
1998–2004 Postdoctoral Fellow, Department of Genetics, Stanford University
1991–1998 Graduate Research Assistant, Department of Applied Physics, Stanford University

Military Service

1983–1985 Base Defense Officer, Israeli Air Force; honorably discharged with the rank of First Lieutenant
1982–1983 Operations Researcher, Israeli Air Force Headquarters

Awards

2020 *Amazon Web Services (AWS) Education Research Webinar, “Multi-Tensor Decompositions for Personalized Cancer Diagnostics, Prognostics, and Therapeutics”*
YouTube Video: <https://youtu.be/s4ezu0OHKAs>
2018 *14th International Conference on Latent Variable Analysis and Signal Separation (LVA ICA 2018)* (Guildford, UK, 2018), Plenary Lecture, “Comparative Spectral Decompositions for Personalized Cancer Diagnostics and Prognostics”
2018 *Society for Industrial and Applied Mathematics (SIAM) Conference on Applied Linear Algebra (SIAM-ALA18)* (Hong Kong, China, 2018), Plenary Lecture, “Comparative Spectral Decompositions for Personalized Cancer Diagnostics and Prognostics”
2015–2023 NIH/National Cancer Institute (NCI) Physical Sciences in Oncology Network (PS-ON), U01 Project Grant, “Multi-Tensor Decompositions for Personalized Cancer Diagnostics and Prognostics;”
https://alterlab.org/physics_of_cancer/
2014 *American Association of Physicists in Medicine (AAPM) Science Council Session Winner (SCSW) Lecture Award, “Singular Value Decomposition Identifies Transcript Length Distribution Functions from DNA Microarray Data and Reveals Evolutionary Forces Globally Affecting Glioblastoma Multiforme Metabolism”*
2014 *Bloomberg L.P. Distinguished Speaker Lectures* (New York, NY), “Discovery of Principles of Nature from Matrix and Tensor Modeling of Large-Scale (Molecular Biological) Data,” and “(Physics-Inspired) Mathematical Vocabulary for Discovery from Data;”
https://alterlab.org/teaching/Bloomberg_L.P./
2009–2015 NSF/Division of Mathematical Sciences (DMS), Faculty Early Career Development (CAREER) Award, “Integrative and Comparative Tensor Algebra Models of DNA Microarray Data from Different Studies of the Cell Cycle”

Awards (continued)

- 2007–2015 NIH/National Human Genome Research Institute (NHGRI), R01 Project Grant, “Tensor Computations for Modeling Large-Scale Molecular Biological Data – from Discovery of Patterns to Discovery of Principles of Nature”
- 2006 *6th International Conference on Independent Component Analysis and Blind Source Separation (ICA 2006)* (Charleston, SC), Plenary Lecture, “Uncovering the Molecular Biological Principles That Govern Cellular Systems with Blind Source Separation Models”
- 2005 *International Linear Algebra Society (ILAS) Linear Algebra and its Applications (LAA) Lecture*, “Genomic Signal Processing: From Matrix Algebra to Genetic Networks;”
https://alterlab.org/in_the_news/Alter_ILAS_Bulletin_2005_Feature.pdf
- 2000–2005 NIH/NHGRI K01 Individual Mentored Research Scientist Development Award in Genomic Research and Analysis, “Mathematical Tools for Gene Expression Data Analysis”
- 1999–2003 DOE/Alfred P. Sloan Foundation, Postdoctoral Fellowship in Computational Molecular Biology, “Analytical and Computational Tools for Genome-Wide Gene Expression Data Analysis”
- 1998 American Physical Society (APS), Outstanding Doctoral Thesis Research in Atomic, Molecular, or Optical Physics (DAMOP) Award Finalist, “Impossibility of Determining the Quantum Wavefunction of a Single System and Fundamental Limit to External Force Detection;”
https://alterlab.org/in_the_news/Ripin_APS_News_1998_Feature.pdf
- 1997 *5th International Conference on Squeezed States and Uncertainty Relations (FICUSSUR 1997)* (Balatonfüred, Hungary), Plenary Lecture, “Impossibility of Determining the Quantum Wavefunction of a Single System and Fundamental Limit to External Force Detection”

Honors (see also Professional Activities and Service mostly since 2013)

- 2/2023– Invited Member, Scientific Advisory Committee, Innovative Methodologies and New Data for Predictive Oncology Model Evaluation (IMPROVE) Project, National Cancer Institute (NCI) -DOE Cancer Moonshot Collaboration
- 3/2025 Invited Member, Organizing Committee, *SIAM Conference on Computational Science and Engineering (CSE25)* (Fort Worth, TX)
- 1/2025, 1/2026, 1/2027 Invited Member, Selection Committee, International Linear Algebra Society (ILAS) Speaker to the *Joint Mathematics Meetings (JMM)* (Seattle, WA)

Publications

Corresponding author(s) underlined.

Books in Preparation

1. O. Alter, *Genomic Signal Processing: Discovery of Principles of Nature from Matrix and Tensor Modeling of Large-Scale Molecular Biological Data*. New York, NY: Wiley (in preparation).

Books

2. O. Alter and Y. Yamamoto, *Quantum Measurement of a Single System*. New York, NY: Wiley (May 2001), 136 pp.;
<https://doi.org/10.1002/9783527617128>
https://alterlab.org/publications/Alter_Yamamoto_Wiley_2001.pdf
<https://ui.adsabs.harvard.edu/abs/2001qmss.book.....A/abstract>
Citation: K. S. Thorne et al., “Noise in Gravitational-Wave Detectors and Other Classical-Force Measurements is Not Influenced by Test-Mass Quantization,” *Physical Review D* **67** (8), article 082001 (April 2003);
https://alterlab.org/in_the_news/Thorne_et_al_PRD_2003_Citation.pdf

Journal Papers in Preparation

3. O. Alter, E. Newman, S. P. Ponnappalli and J. W. Tsai, “AI/ML-Derived Mechanistically-Interpretable Whole-Genome Predictors of Patient Survival in Pre-Treatment Primary Neuroblastoma Tumors and Whole Blood” (in preparation).
4. S. P. Ponnappalli, J. W. Tsai, P. Miron, K. L. S. Miskimen, K. A. Waite, N. Sosonkina, S. E. Coppens, A. C. Bryan, E. P. Kiernan, H. Yang, J. Bowen, G. A. Nakouzi, J. S. Barnholtz-Sloan, A. E. Sloan, T. R. Hodges and O. Alter, “Prospective Validation from a Retrospective Trial That Validated an AI/ML-Derived Whole-Genome Predictor as the Most Accurate and Precise Predictor of Survival and Response to Treatment in Glioblastoma” (in preparation).

Journal Papers in Preparation (continued)

5. **O. Alter** and S. P. Ponnappalli, "Tensor Higher-Order GSVD: A Comparative Spectral Decomposition of Multiple Column-Matched but Row-Independent Large-Scale High-Dimensional Datasets" (in preparation).

Journal Papers

6. S. P. Ponnappalli, M. W. Bradley, K. Devine, J. Bowen, S. E. Coppens, K. M. Leraas, B. A. Milash, F. Li, H. Luo, S. Qiu, K. Wu, H. Yang, C. T. Wittwer, C. A. Palmer, R. L. Jensen, J. M. Gastier-Foster, H. A. Hanson, J. S. Barnholtz-Sloan and **O. Alter**, "Retrospective Clinical Trial Experimentally Validates Glioblastoma Genome-Wide Pattern of DNA Copy-Number Alterations Predictor of Survival," *Applied Physics Letters (APL) Bioengineering* **4** (2), article 026106 (May 2020);
<https://doi.org/10.1063/1.5142559>
https://alterlab.org/publications/Ponnappalli_et_int.,_Alter_APL_Bioeng_2020.pdf
Supplemental Material: https://alterlab.org/GBM_retrospective_clinical_trial/
Press Release: J. Kiefer, "Genome-Wide Pattern Found in Tumors from Brain Cancer Patients Predicts Life Expectancy," *American Association for the Advancement of Science (AAAS) EurekAlert!* (May 15, 2020);
<https://eurekalert.org/news-releases/477030>
Mention: Among the most shared *Applied Physics Letters (APL) Bioengineering* research as of 2021, *APL Bioengineering* (October 30, 2021);
<https://aip-info.org/1XPS-7KD96-527719389D75CF2AOLGQ4XE7DE4193976FA499/cr.aspx>
7. M. W. Bradley, K. A. Aiello, S. P. Ponnappalli,* H. A. Hanson* and **O. Alter**, "GSVD- and Tensor GSVD- Uncovered Patterns of DNA Copy-Number Alterations Predict Adenocarcinomas Survival in General and in Response to Platinum," *Applied Physics Letters (APL) Bioengineering* **3** (3), article 036104 (August 2019);
<https://doi.org/10.1063/1.5099268>
https://alterlab.org/publications/Bradley_et_al_APL_Bioeng_2019.pdf
Supplemental Material: https://alterlab.org/adenocarcinomas_genotype-phenotype/
8. K. A. Aiello, S. P. Ponnappalli and **O. Alter**, "Mathematically Universal and Biologically Consistent Astrocytoma Genotype Encodes for Transformation and Predicts Survival Phenotype," *Applied Physics Letters (APL) Bioengineering* **2** (3), Special Topic: Bioengineering of Cancer invited article 031909 (September 2018);
<https://doi.org/10.1063/1.5037882>
https://alterlab.org/publications/Aiello_et_al_APL_Bioeng_2018.pdf
Supplemental Material: https://alterlab.org/astrocytoma_genotype-phenotype/
Feature: A. J. Engler and D. E. Discher, "Rationally Engineered Advances in Cancer Research," *Applied Physics Letters (APL) Bioengineering* **2** (3), Special Topic: Bioengineering of Cancer preface 031601 (September 2018);
<https://aip-info.org/1XPS-5VDRA-50C9RKAB1F/cr.aspx>
Mention: Among the top 10 most downloaded *Applied Physics Letters (APL) Bioengineering* articles as of 2019, *APL Bioengineering* (May 14, 2019);
<https://aip-info.org/1XPS-6A0AU-C5ITTQWO7B/cr.aspx>
9. K. A. Aiello and **O. Alter**, "Platform-Independent Genome-Wide Pattern of DNA Copy-Number Alterations Predicting Astrocytoma Survival and Response to Treatment Revealed by the GSVD Formulated as a Comparative Spectral Decomposition," *Public Library of Science (PLoS) One* **11** (10), article e0164546 (October 2016);
<https://doi.org/10.1371/journal.pone.0164546>
https://alterlab.org/publications/Aiello_Alter_PLoS_One_2016.pdf
Supplemental Material: https://alterlab.org/astrocytoma_prognosis/

Journal Papers (continued)

10. P. Sankaranarayanan,* T. E. Schomay,* K. A. Aiello and **O. Alter**, "Tensor GSVD of Patient- and Platform-Matched Tumor and Normal DNA Copy-Number Profiles Uncovers Chromosome Arm-Wide Patterns of Tumor-Exclusive Platform-Consistent Alterations Encoding for Cell Transformation and Predicting Ovarian Cancer Survival," *Public Library of Science (PLOS) One* **10** (4), article e0121396 (April 2015);
<https://doi.org/10.1371/journal.pone.0121396>
https://alterlab.org/publications/Sankaranarayanan_Schomay_et_al_PLoS_One_2015.pdf
 Supplemental Material: https://alterlab.org/OV_prognosis/
 Press Release: J. Kiefer, "New Method Increases Accuracy of Ovarian Cancer Prognosis and Diagnosis," *American Association for the Advancement of Science (AAAS) EurekAlert!* (April 15, 2015);
<https://eurekalert.org/news-releases/866753>
 Feature: R. Atkins, "Calculating Cancer Cures," *National Academy of Engineering (NAE) Innovation Podcast and Radio Series* (April 19, 2015);
https://alterlab.org/in_the_news/Atkins_NAE_WTOP_Radio_2015_Feature.mp3
 Feature: F. Pavlou, "Big Data, Hidden Knowledge," *The Pathologist* (June 15, 2015);
https://alterlab.org/in_the_news/Pavlou_Pathologist_2015_Feature.pdf
11. N. M. Bertagnolli, J. A. Drake, J. M. Tennessen and **O. Alter**, "SVD Identifies Transcript Length Distribution Functions from DNA Microarray Data and Reveals Evolutionary Forces Globally Affecting GBM Metabolism," *Public Library of Science (PLOS) One* **8** (11), article e78913 (November 2013);
<https://doi.org/10.1371/journal.pone.0078913>
https://alterlab.org/publications/Bertagnolli_et_al_PLoS_One_2013.pdf
 Supplemental Material: https://alterlab.org/GBM_metabolism/
 Highlight: https://alterlab.org/research/highlights/pone.0078913_Highlight.pdf
12. C. H. Lee,* B. O. Alpert,* P. Sankaranarayanan and **O. Alter**, "GSVD Comparison of Patient-Matched Normal and Tumor aCGH Profiles Reveals Global Copy-Number Alterations Predicting Glioblastoma Multiforme Survival," *Public Library of Science (PLOS) One* **7** (1), article e30098 (January 2012);
<https://doi.org/10.1371/journal.pone.0030098>
https://alterlab.org/publications/Lee_Alpert_et_al_PLoS_One_2012.pdf
 Supplemental Material: https://alterlab.org/GBM_prognosis/
 Highlight: https://alterlab.org/research/highlights/pone.0030098_Highlight.pdf
13. S. P. Ponnappalli, M. A. Saunders, C. F. Van Loan and **O. Alter**, "A Higher-Order Generalized Singular Value Decomposition for Comparison of Global mRNA Expression from Multiple Organisms," *Public Library of Science (PLOS) One* **6** (12), article e28072 (December 2011);
<https://doi.org/10.1371/journal.pone.0028072>
https://alterlab.org/publications/Ponnappalli_et_al_PLoS_One_2011.pdf
 Supplemental Material: https://alterlab.org/HO_GSVD/
 Mention: Among the top 10% most cited *Public Library of Science (PLOS) One* articles as of 2017, *PLOS One* (June 30, 2017).
 Highlight: https://alterlab.org/research/highlights/pone.0028072_Highlight.pdf
14. C. Muralidhara, A. M. Gross, R. R. Gutell and **O. Alter**, "Tensor Decomposition Reveals Concurrent Evolutionary Convergences and Divergences and Correlations with Structural Motifs in Ribosomal RNA," *Public Library of Science (PLOS) One* **6** (4), article e18768 (April 2011);
<https://doi.org/10.1371/journal.pone.0018768>
https://alterlab.org/publications/Muralidhara_et_al_PLoS_One_2011.pdf
 Supplemental Material: <https://alterlab.org/rRNA/>
 Highlight: https://alterlab.org/research/highlights/pone.0018768_Highlight.pdf
15. L. Omberg, J. R. Meyerson, K. Kobayashi, L. S. Drury, J. F. X. Diffley and **O. Alter**, "Global Effects of DNA Replication and DNA Replication Origin Activity on Eukaryotic Gene Expression," *Molecular Systems Biology (MSB)* **5**, article 312 (October 2009);
<https://doi.org/10.1038/msb.2009.70>
https://alterlab.org/publications/Omberg_et_al_MSB_2009.pdf
 Supplemental Material: https://alterlab.org/verification_of_prediction/
 Press Release: B. Rische, "Mathematical Modeling Correctly Predicts Previously Unknown Biological Mechanism of Regulation," *American Association for the Advancement of Science (AAAS) EurekAlert!* (October 13, 2009);
<https://eurekalert.org/news-releases/815594>
 Recommendation: M. Méchali, *Faculty Opinions* recommendation 1728974 (February 2010);
<https://facultyopinions.com/prime/1728974#tab=abstract>
 Highlight: https://alterlab.org/research/highlights/msb.2009.70_Highlight.pdf

Journal Papers (continued)

16. L. Omberg, G. H. Golub and **O. Alter**, "A Tensor Higher-Order Singular Value Decomposition for Integrative Analysis of DNA Microarray Data from Different Studies," *Proceedings of the National Academy of Sciences (PNAS) USA* **104** (47), pp. 18371–18376 (November 2007);
<https://doi.org/10.1073/pnas.0709146104>
https://alterlab.org/publications/Omberg_et_al_PNAS_2007.pdf
 Supplemental Material: <https://alterlab.org/HOSVD/>
17. **O. Alter** and G. H. Golub, "Singular Value Decomposition of Genome-Scale mRNA Lengths Distribution Reveals Asymmetry in RNA Gel Electrophoresis Band Broadening," *Proceedings of the National Academy of Sciences (PNAS) USA* **103** (32), pp. 11828–11833 (August 2006);
<https://doi.org/10.1073/pnas.0604756103>
https://alterlab.org/publications/Alter_Golub_PNAS_2006.pdf
 Supplemental Material: https://alterlab.org/harmonic_oscillator/
18. **O. Alter** and G. H. Golub, "Reconstructing the Pathways of a Cellular System from Genome-Scale Signals by Using Matrix and Tensor Computations," *Proceedings of the National Academy of Sciences (PNAS) USA* **102** (49), pp. 17559–17564 (November 2005);
<https://doi.org/10.1073/pnas.0509033102>
https://alterlab.org/publications/Alter_Golub_PNAS_2005.pdf
 Supplemental Material: https://alterlab.org/network_decomposition/
19. **O. Alter** and G. H. Golub, "Integrative Analysis of Genome-Scale Data by Using Pseudoinverse Projection Predicts Novel Correlation between DNA Replication and RNA Transcription," *Proceedings of the National Academy of Sciences (PNAS) USA* **101** (47), pp. 16577–16582 (November 2004);
<https://doi.org/10.1073/pnas.0406767101>
https://alterlab.org/publications/Alter_Golub_PNAS_2004.pdf
 Supplemental Material: <https://alterlab.org/pseudoinverse/>
20. **O. Alter**, P. O. Brown and D. Botstein, "Generalized Singular Value Decomposition for Comparative Analysis of Genome-Scale Expression Datasets of Two Different Organisms," *Proceedings of the National Academy of Sciences (PNAS) USA* **100** (6), pp. 3351–3356 (March 2003);
<https://doi.org/10.1073/pnas.0530258100>
https://alterlab.org/publications/Alter_et_al_PNAS_2003.pdf
 Supplemental Material: <https://alterlab.org/GSVD/>
 Feature: J. Wixon and J. Ashurst, "Genome Informatics," *Comparative and Functional Genomics* **4** (5), pp. 509–514 (October 2003);
https://alterlab.org/in_the_news/Wixon_Ashurst_Comp_Funct_Genom_2003_Feature.pdf
 Feature: M. E. Kilmer and C. D. Moravitz Martin, "Decomposing a Tensor," *Society for Industrial and Applied Mathematics (SIAM) News* **37** (9), (November 2004);
https://alterlab.org/in_the_news/Kilmer_Moravitz-Martin_SIAM_News_2004_Feature.pdf
21. S. P. Bohen, O. G. Troyanskaya, **O. Alter**, R. Warnke, **D. Botstein**, P. O. Brown and R. Levy, "Variation in Gene Expression Patterns in Follicular Lymphoma and the Response to Rituximab," *Proceedings of the National Academy of Sciences (PNAS) USA* **100** (4), pp. 1926–1930 (February 2003);
<https://doi.org/10.1073/pnas.0437875100>
22. T. Nielsen, R. B. West, S. C. Linn, **O. Alter**, M. A. Knowling, J. O'Connell, S. Zhu, M. Fero, G. Sherlock, J. R. Pollack, P. O. Brown, **D. Botstein** and **M. van de Rijn**, "Molecular Characterisation of Soft Tissue Tumours: a Gene Expression Study," *Lancet* **359** (9314), pp. 1301–1307 (April 2002);
[https://doi.org/10.1016/S0140-6736\(02\)08270-3](https://doi.org/10.1016/S0140-6736(02)08270-3)
https://alterlab.org/publications/Nielsen_et_al_Lancet_2002.pdf
 Commentary: L. Y. Dirix and A. T. van Oosterom, "Gene-Expression Profiling to Classify Soft-Tissue Sarcomas," *Lancet* **359** (9314), pp. 1263–1264 (April 2002);
https://alterlab.org/in_the_news/Dirix_Oosterom_Lancet_2002_Comment.pdf

Journal Papers (continued)

23. **O. Alter**, P. O. Brown and D. Botstein, "Singular Value Decomposition for Genome-Wide Expression Data Processing and Modeling," *Proceedings of the National Academy of Sciences (PNAS) USA* 97 (18), pp. 10101–10106 (August 2000);
<https://doi.org/10.1073/pnas.97.18.10101>
https://alterlab.org/publications/Alter_et_al_PNAS_2000.pdf
Supplemental Material: https://alterlab.org/singular_value_decomposition/
Feature: National Research Council, *Mathematics and 21st Century Biology*. Washington, DC: National Academies Press (July 2005), 149 pp.;
<https://doi.org/10.17226/11315>
Mention: 7th most cited *Proceedings of the National Academy of Sciences (PNAS) USA* paper of the year 2000 and 45th most cited *PNAS* paper of all time, Google Scholar (February 11, 2024).
24. **O. Alter** and Y. Yamamoto, "Fundamental Quantum Limit to External Force Detection via Monitoring a Single Harmonic Oscillator or Free Mass," *Physics Letters A* 263 (4–6), pp. 226–231 (December 1999);
[https://doi.org/10.1016/S0375-9601\(99\)00743-4](https://doi.org/10.1016/S0375-9601(99)00743-4)
https://alterlab.org/publications/Alter_Yamamoto_PLA_1999.pdf
Citation: K. S. Thorne et al., "Noise in Gravitational-Wave Detectors and Other Classical-Force Measurements is Not Influenced by Test-Mass Quantization," *Physical Review D* 67 (8), article 082001 (April 2003);
https://alterlab.org/in_the_news/Thorne_et_al_PRD_2003_Citation.pdf
25. **O. Alter** and Y. Yamamoto, "Impossibility of Determining the Unknown Wavefunction of a Single Quantum System: Quantum Non-Demolition Measurements, Measurements without Entanglement and Adiabatic Measurements," *Fortschritte der Physik* 46 (6–8), pp. 817–827 (November 1998);
[https://doi.org/10.1002/\(SICI\)1521-3978\(199811\)46:6/8<817::AID-PROP817>3.0.CO;2-Y](https://doi.org/10.1002/(SICI)1521-3978(199811)46:6/8<817::AID-PROP817>3.0.CO;2-Y)
https://alterlab.org/publications/Alter_Yamamoto_Fortschr_Phys_1998.pdf
26. **O. Alter** and Y. Yamamoto, "Reply to the Comment on 'Protective Measurement of the Wave Function of a Single Squeezed Harmonic Oscillator State,'" *Physical Review A* 56 (1), pp. 1057–1059 (July 1997);
<https://doi.org/10.1103/PhysRevA.56.1057>
https://alterlab.org/publications/Alter_Yamamoto_PRA_1997.pdf
27. **O. Alter** and Y. Yamamoto, "Quantum Zeno Effect and the Impossibility of Determining the Quantum State of a Single System," *Physical Review A Rapid Communications* 55 (4), pp. R2499–R2502 (April 1997);
<https://doi.org/10.1103/PhysRevA.55.R2499>
https://alterlab.org/publications/Alter_Yamamoto_PRA_Rapid_1997.pdf
28. **O. Alter** and Y. Yamamoto, "Protective Measurement of the Wave Function of a Single Squeezed Harmonic Oscillator State," *Physical Review A Rapid Communications* 53 (5), R2911–R2914 (May 1996);
<https://doi.org/10.1103/PhysRevA.53.R2911>
https://alterlab.org/publications/Alter_Yamamoto_PRA_Rapid_1996.pdf
29. **O. Alter** and Y. Yamamoto, "Inhibition of the Measurement of the Wave Function of a Single Quantum System in Repeated Weak Quantum Nondemolition Measurements," *Physical Review Letters* 74 (21), pp. 4106–4109 (May 1995);
<https://doi.org/10.1103/PhysRevLett.74.4106>
https://alterlab.org/publications/Alter_Yamamoto_PRL_1995.pdf

Commentaries

30. **O. Alter**, "Discovery of Principles of Nature from Mathematical Modeling of DNA Microarray Data," *Proceedings of the National Academy of Sciences (PNAS) USA* 103 (44), pp. 16063–16064 (October 2006);
<https://doi.org/10.1073/pnas.0607650103>
https://alterlab.org/publications/Alter_PNAS_2006.pdf

Book Chapters

31. **O. Alter**, "Genomic Signal Processing: From Matrix Algebra to Genetic Networks." In: M. J. Korenberg, editor, *Microarray Data Analysis: Methods and Applications*. Berlin, Germany: Springer Nature, Methods in Molecular Biology (MIMB), vol. 377, pp. 17–59 (May 2007);
https://doi.org/10.1007/978-1-59745-390-5_2
https://alterlab.org/publications/Alter_MIMB_2007.pdf
32. **O. Alter**, P. O. Brown and D. Botstein, "Processing and Modeling Genome-Wide Expression Data Using Singular Value Decomposition." In: M. L. Bittner, Y. Chen, A. N. Dorsel and E. R. Dougherty, editors, *Microarrays: Optical Technologies and Informatics*. Bellingham, WA: International Society for Optics and Photonics (SPIE), vol. 4266, pp. 171–186 (January 21, 2001);
<https://doi.org/10.1117/12.427986>
https://alterlab.org/publications/Alter_et_al_SPIE_2001.pdf
Supplemental Material: <https://alterlab.org/SVD/>
33. **O. Alter** and Y. Yamamoto, "Inhibition of the Measurement of the Wavefunction of a Single Quantum System and the Projection Postulate." In: M. Namiki, I. Ohba, K. Maeda and Y. Aizawa, editors, *Quantum Physics, Chaos Theory and Cosmology*. New York, NY: American Institute of Physics, pp. 151–172 (October 1996);
https://alterlab.org/publications/Alter_Yamamoto_Quantum_Physics_1996.pdf
<https://ui.adsabs.harvard.edu/abs/1996qpct.conf..151A/abstract>
34. **O. Alter** and Y. Yamamoto, "The Quantum Zeno Effect of a Single System is Equivalent to the Indetermination of the Quantum State of a Single System." In: F. De Martini, G. Denardo and Y. Shih, editors, *Quantum Interferometry*. New York, NY: Wiley, pp. 539–544 (October 1996);
https://alterlab.org/publications/Alter_Yamamoto_Quantum_Interferometry_1996.pdf
<https://catalog.lib.uchicago.edu/vufind/Record/2611343#toc>
35. **O. Alter** and Y. Yamamoto, "The Unknown Wavefunction of a Single System Cannot Be Inferred Using a Series of Quantum Measurements." In: K. Fujikawa and Y. A. Ono, editors, *Quantum Coherence and Decoherence*. Amsterdam, Netherlands: Elsevier Science, pp. 31–34 (May 1996);
https://alterlab.org/publications/Alter_Yamamoto_Quantum_Coherence_1996.pdf
<https://catalog.lib.uchicago.edu/vufind/Record/2611342#toc>
36. **O. Alter** and Y. Yamamoto, "Can We Measure the Wave Function of a Single Wave Packet of Light?: Brownian Motion and Continuous Wave Packet Collapse in Repeated Weak Quantum Non-Demolition Measurements." In: D. M. Greenberger and A. Zeilinger, editors, *Fundamental Problems in Quantum Theory*. New York, NY: New York Academy of Sciences, vol. 755, pp. 103–109 (January 1995);
<https://doi.org/10.1111/j.1749-6632.1995.tb38960.x>
https://alterlab.org/publications/Alter_Yamamoto_NYAS_1995.pdf
<https://catalog.lib.uchicago.edu/vufind/Record/1822256#toc>

Technical Reports

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In the News

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2. **Mention:** BME 6770, Genomic Signal Processing course may "be pivotal for ... career," *Amazon Science* (April 6, 2022);
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3. **Mention:** Among the most shared *Applied Physics Letters (APL) Bioengineering* research as of 2021, *APL Bioengineering* (October 30, 2021);
<https://aip-info.org/1XPS-7KD96-527719389D75CF2AOLGQ4XE7DE4193976FA499/cr.aspx>
4. **Press Release:** J. Kiefer, "Genome-Wide Pattern Found in Tumors from Brain Cancer Patients Predicts Life Expectancy," *American Association for the Advancement of Science (AAAS) EurekAlert!* (May 15, 2020);
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<https://aip-info.org/1XPS-6A0AU-C5ITTOWO7B/cr.aspx>
6. **Feature:** A. J. Engler and D. E. Discher, "Rationally Engineered Advances in Cancer Research," *Applied Physics Letters (APL) Bioengineering* 2 (3), Special Topic: Bioengineering of Cancer preface 031601 (September 2018);
<https://aip-info.org/1XPS-5VDRA-50C9RKAB1F/cr.aspx>
7. **Mention:** Among the top 10% most cited *Public Library of Science (PLOS) One* articles as of 2017, *PLOS One* (June 30, 2017).
8. **Feature:** F. Pavlou, "Big Data, Hidden Knowledge," *The Pathologist* (June 15, 2015);
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9. **Feature:** R. Atkins, "Calculating Cancer Cures," *National Academy of Engineering (NAE) Innovation Podcast and Radio Series* (April 19, 2015);
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10. **Press Release:** J. Kiefer, "New Method Increases Accuracy of Ovarian Cancer Prognosis and Diagnosis," *American Association for the Advancement of Science (AAAS) EurekAlert!* (April 15, 2015);
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11. **Recommendation:** M. Méchali, *Faculty Opinions* recommendation 1728974 (February 2010);
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12. **Feature:** S. N. Dwivedi, "Rao Conference at the Interface between Statistics and the Sciences (Hyderabad, India, December 30, 2009 – January 2, 2010), Rao Best Poster Prize," *International Biometric Society (IBS) Bulletin* 27 (1), pp. 6–7 (January–March 2010);
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14. Excerpt: O. Alter, *International Linear Algebra Society (ILAS) Linear Algebra and its Applications (LAA) Lecture*, "Genomic Signal Processing: From Matrix Algebra to Genetic Networks," *IMAGE: ILAS Bulletin* 35, pp. 2–15 (December 2005);
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15. Feature: National Research Council, *Mathematics and 21st Century Biology*. Washington, DC: National Academies Press (July 2005), 149 pp.;
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Presentations

Presenter(s) underlined.

Invited International Webinars since 2013

O. Alter, “Multi-Tensor Decompositions for Personalized Cancer Diagnostics, Prognostics, and Therapeutics”

1. *Amazon Web Services (AWS) Education Research Webinar* (January 30, 2020), hosted by M. L. Collinson;
Slides: https://alterlab.org/presentations/Alter_AWS_Education_Research_2020_Slides.pdf
YouTube Video: <https://youtu.be/s4ezu0OHKAs>

Plenary and Keynote Lectures and Invited Talks and Tutorials at International Meetings since 2013

O. Alter, “Solving Cancer with Data: Mathematical Discovery and Computational and Experimental Validation of Whole-Genome Genotype–Survival and Response to Treatment Phenotype Relationships in Cancer”

2. *National Cancer Institute (NCI) Joint Meeting of the Cancer Systems Biology Consortium (CSBC) and the Physical Sciences in Oncology Network (PS-ON)* (Bethesda, MD, November 6–9, 2023).
3. *International High-Performance Computing (HPC) Summer School 2023 on HPC Challenges in Computational Sciences* (July 9–14, 2023).
4. *3rd Gordon Research Conference on the Physics of Cancer* (Galveston, TX, February 5–10, 2023).

O. Alter, “Multi-Tensor Decompositions for Personalized Cancer Medicine”

5. *2022 Society for Industrial and Applied Mathematics (SIAM) Conference on Mathematics of Data Science (MDS22)* (San Diego, CA, September 26–30, 2022).
6. *HPC Summer School 2022 on HPC Challenges in Computational Sciences* (Athens, Greece, June 19–24, 2022).
7. *24th International Linear Algebra Society (ILAS) Meeting* (Galway, Ireland, June 19–24, 2022).

O. Alter, “Comparative Spectral Decompositions for Personalized Cancer Diagnostics, Prognostics, and Therapeutics”

8. *26th Annual Meeting of the Society for Neuro-Oncology (SNO)* (Boston, November 18–21, 2021);
Slides: https://alterlab.org/presentations/Alter_SNO_2021_Slides.pdf
YouTube Video: <https://youtu.be/oMfYXLZfrmo>
9. *2021 SIAM Virtual Conference on Applied Algebraic Geometry* (August 16–20, 2021).
10. *International HPC Virtual Summer School 2021 on HPC Challenges in Computational Sciences* (July 18–30, 2021).
11. *Decade of the PS-ON at the NCI Virtual Symposium* (September 21–23, 2020);
Slides: https://alterlab.org/presentations/Alter_NCI_PS-ON_2020_Slides.pdf
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12. *2020 American Association for Cancer Research (AACR) Virtual Annual Meeting II* (June 22–24, 2020);
Slides: https://alterlab.org/presentations/Alter_AACR_2020_Slides.pdf
YouTube Video: <https://youtu.be/rXEbMnL8iGc>
13. *NCI Physical Sciences in Oncology Symposium* (Minneapolis, MN, September 18–20, 2019);
<https://twitter.com/NCIPhySci/status/1175068192781344768>
14. *Los Alamos National Laboratory, Sandia National Laboratories, NSF, and University of California San Diego Workshop on Artificial Intelligence and Tensor Factorizations for Physical, Chemical, and Biological Systems* (Santa Fe, NM, September 17–20, 2019).
15. *International Congress on Industrial and Applied Mathematics (ICIAM) 2019* (Valencia, Spain, July 15–19, 2019).
16. *2018 Biomedical Engineering Society (BMES) Annual Meeting* (Atlanta, GA, October 27–20, 2018).
17. *NCI Joint Meeting of the CSBC and the PS-ON* (Bethesda, MD, September 25–28, 2018).
18. *European Association for Signal Processing (EURASIP) Summer School on Tensors in Medicine* (Leuven, Belgium, August 27–31, 2018).
19. *2018 Society for Industrial and Applied Mathematics (SIAM) Annual Meeting* (Portland, OR, July 9–13, 2018).
20. *14th International Conference on Latent Variable Analysis and Signal Separation (LVA ICA 2018)* (Guildford, United Kingdom, July 2–6, 2018).
21. *9th Multidisciplinary Conference on Three-Way Methods in Chemistry and Psychology (TRICAP)* (Angel Fire, NM, June 10–15, 2018).
21. *3rd Nordic Institute for Theoretical Physics (NORDITA) Meeting on Quantitative Perspectives on Cancer* (Stockholm, Sweden, May 28 – June 1, 2018).
22. *2018 SIAM Conference on Applied Linear Algebra (SIAM-ALA18)* (Hong Kong, China, May 4–8, 2018).
23. *2017 SIAM Conference on Applied Algebraic Geometry* (Atlanta, GA, July 31 – August 4, 2017).
24. *International HPC Summer School 2017 on HPC Challenges in Computational Sciences* (Boulder, CO, June 25–30, 2017).

Plenary and Keynote Lectures and Invited Talks and Tutorials at International Meetings since 2013 (continued)

25. *1st Gordon Research Conference on the Physics of Cancer* (Galveston, TX, February 5–10, 2017).
26. *Australian Mathematical Sciences Institute (AMSI) BioInfoSummer 2016* (Adelaide, SA, Australia, November 28 – December 2, 2016).
27. *NCI Joint Meeting of the CSBC and the PS-ON* (Rockville, MD, August 29–31, 2016).
28. *20th International Linear Algebra Society (ILAS) Meeting* (Leuven, Belgium, July 11–15, 2016).
29. *2016 SIAM Annual Meeting* (Boston, MA, July 11–14, 2016).
30. *International HPC Summer School 2016 on HPC Challenges in Computational Sciences* (Ljubljana, Slovenia, June 26 – July 1, 2016).
31. *NCI Physical Sciences in Oncology Symposium* (Rockville, MD, February 2–3, 2016).
32. *2016 Tensor Decompositions and Applications (TDA) Workshop* (Leuven, Belgium, January 18–22, 2016).
33. *2015 Joint Statistical Meetings (JSM)* (Seattle, WA, August 8–13, 2015).
34. *International HPC Summer School 2015 on HPC Challenges in Computational Sciences* (Toronto, Canada, June 21–26, 2015).
35. *Joint Applied Mathematics, Modeling and Computational Science and Canadian Applied and Industrial Mathematics Society (AMMCS-CAIMS) Congress* (Waterloo, Canada, June 7–12, 2015).
36. *8th Multidisciplinary Conference on Three-Way Methods in Chemistry and Psychology (TRICAP)* (Zoldo Alto, Italy, May 31 – June 5, 2015).

O. Alter, “Discovery of Principles of Nature from Matrix and Tensor Modeling of Large-Scale Molecular Biological Data”

37. *48th Annual Asilomar Conference on Signals, Systems, and Computers* (Pacific Grove, CA, November 2–5, 2014).
38. *5th Association for Computing Machinery (ACM) Conference on Bioinformatics, Computational Biology and Health Informatics (ACM-BCB)* (Newport Beach, CA, September 20–23, 2014).
39. *American Association of Physicists in Medicine (AAPM) Science Council Session Winner (SCSW) Lecture Award* (Austin, TX, July 20–24, 2014).
40. *2014 SIAM Annual Meeting* (Chicago, IL, July 7–11, 2014).
41. *International HPC Summer School 2014 on HPC Challenges in Computational Sciences* (Budapest, Hungary, June 1–6, 2014).
42. *2013 BMES Annual Meeting* (Seattle, WA, September 25–28, 2013);
[https://alterlab.org/announcements/Alter_BMES_2013_Bioinformatics, Computational and Systems Biology Platform Sessions.pdf](https://alterlab.org/announcements/Alter_BMES_2013_Bioinformatics,_Computational_and_Systems_Biology_Platform_Sessions.pdf)

O. Alter, “Uncovering the Molecular Biological Principles That Govern Cellular Systems with Blind Source Separation Models”

43. *6th International Conference on Independent Component Analysis and Blind Source Separation (ICA 2006)* (Charleston, SC, March 5–8, 2006).

O. Alter, “Impossibility of Determining the Quantum Wavefunction of a Single System and Fundamental Limit to External Force Detection”

44. *5th International Conference on Squeezed States and Uncertainty Relations (FICSSUR 1997)* (Balatonfüred, Hungary, May 27–31, 1997).

Invited Presentations at Other Institutions since 2013

O. Alter, “Multi-Tensor Decompositions for Personalized Cancer Medicine”

45. *Tel Aviv University Department of Mathematics Seminar* (Tel Aviv, Israel, April 5, 2022), hosted by H. Avron and D. Batenkov.
46. *University of Southern California Ellison Institute for Transformative Medicine (EITM) Seminar* (Santa Monica, CA, March 10, 2022), hosted by D. B. Agus and A. D. Barker;
<https://twitter.com/UscEllison/status/1502058358207283202>

Invited Presentations at Other Institutions since 2013 (continued)

O. Alter, “Multi-Tensor Decompositions for Personalized Cancer Diagnostics, Prognostics, and Therapeutics”

47. *Moffitt Cancer Center Integrated Mathematical Oncology Virtual Seminar* (June 24, 2021), hosted by A. R. A. Anderson and D. G. Basanta.
48. *University of Chicago Computational and Applied Mathematics Virtual Colloquium* (February 11, 2021), hosted by L.-H. Lim and D. Sanz-Alonso.
49. *Linear Algebra and Optimization Seminar, Stanford University Institute for Computational and Mathematical Engineering (ICME)* (Stanford, CA, January 16, 2020), hosted by M. A. Saunders;
https://alterlab.org/announcements/Alter_Stanford_ICME_2020_Seminar.pdf
Slides: https://alterlab.org/presentations/Alter_Stanford_ICME_2020_Slides.pdf
YouTube Video: <https://youtu.be/opiYfUKDJ2U>
50. *Northwestern University Chemistry of Life Processes Institute Seminar* (Evanston, IL, June 5, 2019), hosted by T. V. O'Halloran.
51. *Beijing Genomics Institute (BGI) and China National GeneBank Seminar* (Shenzhen, China, May 9, 2018), hosted by K. Wu.
52. *Georgia Institute of Technology Computational Science and Engineering Seminar* (Atlanta, GA, March 29, 2018), hosted by S. Aluru.
53. *Michigan State University Science at the Edge Seminar* (East Lansing, MI, October 13, 2017), hosted by C. Piermarocchi.
54. *University of Oxford Mathematical Institute Seminar on the Mathematics of Data Science* (Oxford, United Kingdom, July 3, 2017), hosted by U. L. Tillmann.
55. *Boston University Systems Biology Seminar* (Boston, MA, March 16, 2017), hosted by S. Kasif and E. D. Kolaczyk.
56. *University of Pennsylvania Physical Sciences in Oncology Center Seminar* (Philadelphia, PA, March 13, 2017), hosted by D. E. Discher.
57. *Jožef Stefan Institute Colloquium* (Ljubljana, Slovenia, June 29, 2016), hosted by P. Ziherl and A. Studen.

O. Alter, “Discovery of Principles of Nature from Matrix and Tensor Modeling of Large-Scale Molecular Biological Data”

58. *Genentech, Inc. Research Seminar* (South San Francisco, CA, November 6, 2014), hosted by M. J. Brauer.
59. *Distinguished Speaker Lectures at Bloomberg L.P.* (New York, NY, May 5, 2014), hosted by S. P. Ponnappalli;
https://alterlab.org/teaching/Bloomberg_L.P./
Slides: https://alterlab.org/presentations/Alter_Bloomberg_L.P._2014_Slides.pdf
60. *University of Washington eScience Seminar* (Seattle, WA, October 1, 2013), hosted by C. R. Aragon.

Plenary, Keynote, and Invited Lectures, Talks and Tutorials by Lab Members since 2018

61. **S. P. Ponnappalli** and **O. Alter**, “Tensor and Higher-Order Generalizations of the GSVD with Applications to Personalized Cancer Medicine,” *European Organization for Nuclear Research (CERN) Seminar of the Large Hadron Collider (LHC) Inter-Experimental Machine Learning (IML) Working Group* (Geneva, Switzerland, April 15, 2019), hosted by S. Schramm.
62. **S. P. Ponnappalli** and **O. Alter**, “Tensor and Higher-Order Generalizations of the GSVD with Applications to Personalized Cancer Medicine,” *Stanford University ICME Seminar on Linear Algebra and Optimization* (Stanford, CA, December 6, 2018), hosted by M. A. Saunders
63. **S. P. Ponnappalli** and **O. Alter**, “Tensor and Higher-Order Generalizations of the GSVD with Applications to Personalized Cancer Medicine,” *BGI and China National GeneBank Seminar* (Shenzhen, China, May 9, 2018), hosted by K. Wu.
64. **S. P. Ponnappalli**, H. A. Hanson and **O. Alter**, “Patterns of DNA Copy-Number Alterations Revealed by the GSVD and Tensor GSVD Encode for Cell Transformation and Predict Survival and Response to Platinum in Adenocarcinomas,” *2018 SIAM Conference on Applied Linear Algebra (SIAM-ALA18)* (Hong Kong, China, May 4–8, 2018);
https://alterlab.org/announcements/Ponnappalli_Alter_SIAM-ALA_2018_Discovery_from_Data_Minisymposium.pdf
65. **S. P. Ponnappalli** and **O. Alter**, “Mathematically Universal and Biologically Consistent Astrocytoma Genotype Encodes for Transformation and Predicts Survival Phenotype,” *2018 SIAM Conference on Applied Linear Algebra (SIAM-ALA18)* (Hong Kong, China, May 4–8, 2018);
https://alterlab.org/announcements/Ponnappalli_Alter_SIAM-ALA_2018_Discovery_from_Data_Minisymposium.pdf

Plenary, Keynote, and Invited Lectures, Talks and Tutorials by Lab Members since 2018 (continued)

66. S. P. Ponnappalli and O. Alter, "Tensor Higher-Order GSVD: A Comparative Spectral Decomposition of Multiple Column-Matched but Row-Independent Large-Scale High-Dimensional Datasets," *2018 SIAM Conference on Applied Linear Algebra (SIAM-ALA18)* (Hong Kong, China, May 4–8, 2018); https://alterlab.org/announcements/Ponnappalli_Alter_SIAM-ALA_2018_Discovery_from_Data_Minisymposium.pdf

Professional Activities and Service mostly since 2013

- 2/2023– Invited Member, Scientific Advisory Committee, Innovative Methodologies and New Data for Predictive Oncology Model Evaluation (IMPROVE) Project, National Cancer Institute (NCI) -DOE Cancer Moonshot Collaboration
- 3/2025 Invited Member, Organizing Committee, *SIAM Conference on Computational Science and Engineering (CSE25)* (Fort Worth, TX)
- 1/2025, 1/2026, 1/2027
Invited Member, Selection Committee, International Linear Algebra Society (ILAS) Speaker to the *Joint Mathematics Meetings (JMM)* (Seattle, WA)
- 1–12/2023, 1–12/2019
Appointed Co-Chair, Steering Committee, Physical Sciences in Oncology Network (PS-ON), NCI, NIH
- 9/2015–12/2023
Appointed Member, Steering Committee, PS-ON, NCI, NIH
- 11/2023 Invited Co-Chair and Co-Organizer, Joint Meeting, *NCI Cancer Systems Biology Consortium (CSBC) and PS-ON* (Bethesda, MD)
- 11/2023 Invited Member, Program Committee, "9th NCI Computational Approaches for Cancer Workshop (CAFCW)," *Supercomputing 2023 (SC23)* (Denver, CO)
- 7/2023, 6/2022, 6/2017, 6/2016, 6/2015, 6/2014
Invited Mentor, *International High-Performance Computing (HPC) Summer School on HPC Challenges in Computational Sciences* (Atlanta, GA; Athens, Greece; Boulder, CO; Ljubljana, Slovenia; Toronto, Canada; Budapest, Hungary)
- 11/2022 Invited Member, Program Committee, and Invited Panelist, International Conference Panel, "8th NCI Computational Approaches for Cancer Workshop (CAFCW)," *Supercomputing 2022 (SC22)* (Dallas, TX)
- 9/2022 Invited Moderator and Co-Organizer, Virtual Symposium, *NCI Physical Sciences in Oncology*
- 11/2020 Invited Member, Program Committee, "6th NCI Computational Approaches for Cancer Workshop (CAFCW)," *Supercomputing 2020 (SC20) Virtual*
- 9/2020 Invited Co-Chair and Co-Organizer, Virtual Symposium, *Decade of the PS-ON at the NCI*
- 6/2020 Invited Co-Chair and Co-Organizer, Education Session, "Artificial Intelligence and Machine Learning from Research to the Cancer Clinic," *2020 American Association for Cancer Research (AACR) Virtual Annual Meeting II*
- 9/2019 Invited Co-Chair and Co-Organizer, Symposium, *NCI Physical Sciences in Oncology* (Minneapolis, MN)
- 11/2018, 3/2017
Appointed Member, Scientific Review Panel, "Emerging Questions in Cancer Systems Biology," NCI, NIH
- 10/2018 Invited Panelist, International Conference Panel, "Physical Sciences in Oncology," *2018 Biomedical Engineering Society (BMES) Annual Meeting* (Atlanta, GA)
- 5/2018 Invited Chair and Co-Organizer, Three-Session Minisymposium, "Discovery from Data:" "I. Systems Biology," "II. Personalized Medicine," and "III. Tensors," https://alterlab.org/announcements/Ponnappalli_Alter_SIAM-ALA_2018_Discovery_from_Data_Minisymposium.pdf
2018 Society for Industrial and Applied Mathematics (SIAM) Conference on Applied Linear Algebra (SIAM-ALA18) (Hong Kong, China)
- 2/2017 Invited Chair, Session, *1st Gordon Research Conference on the Physics of Cancer* (Galveston, TX)
- 10/2016 Invited Panelist, International Association Panel, "Provocative Questions for Medical Physics in Oncology," *American Association of Physicists in Medicine (AAPM)* (Boston, MA)
- 6/2016 Appointed Member, Scientific Review Panel, "Genomic Data Analysis Network," NCI, NIH
- 9/2014 Invited Panelist and Co-Organizer, International Conference Panel, "Translational Bioinformatics," *5th Association for Computing Machinery (ACM) Conference on Bioinformatics, Computational Biology and Health Informatics (ACM-BCB)* (Newport Beach, CA)

Professional Activities and Service mostly since 2013 (continued)

- 7/2014 Invited Chair and Organizer, Three-Session Minisymposium, "Discovery from Data:"
"I. Mathematical Patterns in Nature,"
"II. Cancer Genomic Signals and Systems,"
and "III. Decompositions for Big Data Applications,"
SIAM Annual Meeting (Chicago, IL)
- 3/2014, 3/2013, 4/2012, 3/2011
Appointed Member, Scientific Review Panel, "National Centers for Systems Biology," National
Institute of General Medical Sciences (NIGMS), NIH
- 9/2013 Invited Chair and Organizer, Track, "Bioinformatics, Computational and Systems Biology," 2013
BMES Annual Meeting (Seattle, WA);
[https://alterlab.org/announcements/Alter_BMES_2013_Bioinformatics, Computational and Systems Biology Platform Sessions.pdf](https://alterlab.org/announcements/Alter_BMES_2013_Bioinformatics,_Computational_and_Systems_Biology_Platform_Sessions.pdf)
- 7/2013 Invited Participant, *NSF/Japan Society for the Promotion of Science (JSPS) Connections 2013 Symposium*
(Washington, DC)
- 4/2011– Invited International Reviewer, Israel Science Foundation (ISF), Israel
- 2/2009 Invited Participant, Workshop, "Future Directions in Tensor-Based Computation and Modeling," NSF
- 2/2008 Chair and Organizer, Special Symposium, *SXSVD (South by SVD): Gene H. Golub's World Day Celebration in Austin* (Austin, TX);
https://alterlab.org/announcements/Alter_SXSVD_2008_Symposium.pdf
- 1/2008 Invited Participant, Planning Meeting, "The Cancer Genome Atlas (TCGA) Data Portal," National
Human Genome Research Institute (NHGRI), NIH
- 12/2007– Appointed Member, Scientific Review Panels, e.g., the Faculty Early Career Development (CAREER)
Award Panel and the Graduate Research Fellowships Program (GRFP) Panel, NSF
- 8/2006 Invited Participant, Workshop, "Petascale Computing in the Biosciences," NSF
- 7/2006 Chair and Organizer, Invited Session, "Genomic Signals and Systems," *17th International Symposium on the Mathematical Theory of Networks and Systems (MTNS)* (Kyoto, Japan)
- 4/2005– Appointed Member, Scientific Review Panels, e.g., "Genomes to Life," DOE
- 3/2005– Editorial Board Member and Acting Editor, Journals, e.g., *BioMed Central (BMC) Biology Direct, Public Library of Science (PLoS) Computational Biology*
- 2/2005– Invited International Reviewer, Research Foundation Flanders (FWO), Belgium
- 12/2001 Invited Participant, Planning Meeting, "A Vision for the Future of Genomics Research," NHGRI,
NIH;
<https://genome.gov/11006874/vision-acknowledgements>
- 9/1995– Reviewer, Journals, e.g., *American Statistical Association (ASA) Data Science Journal, Applied Physics Letters (APL) Bioengineering, BioMed Central (BMC) Bioinformatics, BMC Systems Biology, British Journal for the Philosophy of Science, Communications of the Association for Computing Machinery (ACM), Current Biology, Federation of European Biochemical Societies (FEBS) Letters, Genome Biology, Institute of Electrical and Electronics Engineers (IEEE)/ACM Transactions on Computational Biology and Bioinformatics, IEEE Journal of Biomedical and Health Informatics, IEEE Transactions on Signal Processing, International Linear Algebra Society (ILAS) Linear Algebra and its Applications (LAA), Journal of Scientific Computing, Leukemia, Molecular Systems Biology (MSB), Nature, Nature Biotechnology, Neural Computation, Nucleic Acids Research, Physical Review A, Physical Review Letters, Physics Letters A, Proceedings of the National Academy of Sciences (PNAS) USA, PLoS Biology, PLoS Genetics, PLoS One, Royal Society of Chemistry (RSC) Molecular Biosystems, Science Signaling, Scientific Reports, Society for Industrial and Applied Mathematics (SIAM) Journal on Matrix Analysis and Applications*

Research

<https://alterlab.org/research>

Principal Investigator (PI) of Research Grants

	Grant	PI	Sponsor	Period	Total	Share
1.	U01 CA-202144	O. Alter	NIH/NCI	9/23/2015–8/31/2023	\$3,395,986	\$3,395,986
NIH/National Cancer Institute (NCI) Physical Sciences in Oncology U01 Project, “Multi-Tensor Decompositions for Personalized Cancer Diagnostics and Prognostics;” https://alterlab.org/physics_of_cancer/ https://app.dimensions.ai/details/grant/grant.4455012 https://reporter.nih.gov/project-details/9762591						
2.	CDC 75D301 21C11016	O. Alter	CDC	5/15/2021–5/14/2023		\$149,612
Center for Disease Control and Prevention (CDC) Contract, “COVID-19 Genomics in the American Southwest/Utah Site: Multi-Tensor Decompositions for Personalized COVID-19 Diagnostics and Prognostics”						
3.		O. Alter	CR UK	3/27/2007–	\$7,500	\$7,500
Cancer Research UK (CR UK) Project, “Global Effects of DNA Replication and DNA Replication Origin Activity on Eukaryotic Gene Expression”						
4.	UL1 TR-001067	O. Alter	NIH/NCATS	1/1/2015–12/31/2016		\$25,000
NIH/National Center for Advancing Translational Sciences (NCATS) UL1 Center Subcontract, “Multi-Tensor Decompositions for Personalized Brain Cancer Therapeutics,” Co-PIs D. A. McClain and C. L. Byington						
5.	CAREER DMS-0847173	O. Alter	NSF/DMS	8/1/2009 –7/31/2015	\$400,053	\$400,053
NSF/Division of Mathematical Sciences (DMS) Faculty Early Career Development (CAREER) Award, “Integrative and Comparative Tensor Algebra Models of DNA Microarray Data from Different Studies of the Cell Cycle;” https://app.dimensions.ai/details/grant/grant.3096148 https://nsf.gov/awardsearch/showAward?AWD_ID=0847173						
6.	R01 HG-004302	O. Alter	NIH/NHGRI	8/23/2007–5/31/2015	\$1,768,525	\$1,768,525
NIH/National Human Genome Research Institute (NHGRI) R01 Project, “Tensor Computations for Modeling Large-Scale Molecular Biological Data – from Discovery of Patterns to Discovery of Principles of Nature;” https://app.dimensions.ai/details/grant/grant.2529292 https://reporter.nih.gov/project-details/7292994						
7.	K01 HG-000038	O. Alter	NIH/NHGRI	4/1/2000 –3/31/2005	\$527,367	\$527,367
NIH/NHGRI K01 Individual Mentored Research Scientist Development Award in Genomic Research and Analysis, “Mathematical Tools for Gene Expression Data Analysis;” https://app.dimensions.ai/details/grant/grant.2404577 https://reporter.nih.gov/project-details/6862432						
8.	DOE FG03-99ER62836	O. Alter	DOE/Sloan	9/1/1999 –8/31/2003	\$100,000	\$100,000
DOE/Alfred P. Sloan Foundation Postdoctoral Fellowship in Computational Molecular Biology, “Analytical and Computational Tools for Genome-Wide Gene Expression Data Analysis;” https://app.dimensions.ai/details/grant/grant.8700796						

Co-Mentor of Individual Mentee Training Grants

	Grant	PI/Co-Mentee	Sponsor	Period	Total
1.	K07 CA-230150	H. A. Hanson	NIH/NCI	7/1/2018 –6/30/2021	\$747,520
NIH/NCI K07 Mentored Cancer Prevention, Control, Behavioral and Population Sciences Career Development Award					
2.	F99/K00 CA-234943	R. G. Waller	NIH/NCI	9/1/2018 –8/31/2020	\$68,894
NIH/NCI F99/K00 Predoctoral to Postdoctoral Fellow Transition Award					

Co-Mentor of Individual Mentee Training Grants (continued)

Grant	PI/Co-Mentee	Sponsor	Period	Total
3. K12 HD-085852	H. A. Hanson	NIH/NICHHD	12/1/2015–6/30/2018	\$250,000
NIH/National Institute of Child Health and Human Development (NICHD) K12 Mentored Clinical Scientist Development Award				
4. K99/R00 GM-101341	J. M. Tennessen	NIH/NIGMS	6/1/2012–12/31/2016	\$924,470
NIH/National Institute of General Medical Sciences (NIGMS) K99/R00 Pathway to Independence (PI) Award				

Co-Mentor of Mentees on University Training Grants

Grant	PI	Sponsor	Period	Total
1. T32 GM-145431	M. S. Kay	NIH/NIGMS	7/1/2023 –6/30/2028	\$1,741,605
NIH/NIGMS T32 Medical Scientist Training Program				
2. T32 HG-008962	L. B. Jorde	NIH/NHGRI	6/1/2021 –5/31/2026	\$2,801,258
NIH/NHGRI T32 Training Program in Genomic Medicine				
3. R25 HG-009886	H. J. Yost	NIH/NHGRI	9/1/2018 –6/29/2023	\$1,311,390
NIH/NHGRI R25 Genomics Summer Research for Minorities				

Mentoring

<https://alterlab.org/people/>

Senior Industrial Research Affiliate and Ph.D. Alumna

Mentee	Department	Completion Date
1. Sri Priya Ponnappalli	Electrical and Computer Engineering	8/2010
Current:	Senior Director, Machine Learning, Google LLC (Palo Alto, CA); https://linkedin.com/in/priya-ponnapalli/	
Interview:	T. Gallagher, "The Future of Sports: Dr. Priya Ponnappalli of Amazon Web Services (AWS) on the New Emerging Technologies That are Disrupting the World of Sports," <i>Authority Magazine</i> (September 10, 2021); https://medium.com/authority-magazine/the-future-of-sports-dr-priya-ponnapalli-of-amazon-web-services-aws-on-the-new-emerging-technolo-cf494e3764a6	
Highlight:	C. Garcia, "From Genomic Signal Processing to Portfolio and Risk Analytics," <i>Scientific Computing and Imaging Institute Alumni Highlights</i> (February 6, 2013); https://sci.utah.edu/alumni-highlight/201-ponnapalli	

Ph.D. Alumni

Mentee	Department	Completion Date
1. Larsson Omberg	Physics	12/2007
Current:	Executive Vice President, Data Science, Koneksa (Seattle, WA); https://linkedin.com/in/larsson-omberg-75912610/	
2. Kayta Kobayashi	Pharmacy	5/2008
Current:	Clinical Integrated Pharmacist, Memorial Hermann Health System (Houston, TX); https://linkedin.com/in/kayta-kobayashi-1378b59a/	
3. Chaitanya Muralidhara	Cellular and Molecular Biology	12/2010
Current:	Vice President and Director, Group Scientific Affairs, Lockwood (Boston, MA); https://linkedin.com/in/cmuralidhara/	

B.Sc. Alumni

Mentee	Department	Completion Date
1. Joel R. Meyerson	Biomedical Engineering and Government	5/2007
Current:	Software Engineer, Ginkgo Bioworks, Inc., and Adjunct Professor, Physiology and Biophysics, Weill Cornell Medicine (New York, NY); https://linkedin.com/in/joel-meyerson/	
Placement:	NIH/NCI-Cambridge University Doctoral Dissertation under the guidance of Walker (1997 Nobel in Chemistry)	

B.Sc. Alumni (continued)

	Mentee	Department	Completion Date
2.	Andrew M. Gross	Biomedical Engineering and Statistical and Scientific Computing	5/2010
	Current: Bioinformatics Scientist, Guardant Health (Cincinnati, OH); https://linkedin.com/in/andrew-gross-173b1a7b/		
3.	Justin A. Drake	Biomedical Engineering and Statistical and Scientific Computing	5/2011
	Current: Assistant Professor, Department of Women's Health, Dell Medical School, and Research Associate, Texas Advanced Computing Center (Austin, TX); Award: https://linkedin.com/in/j-a-drake/ <i>Rao Conference at the Interface between Statistics and the Sciences</i> (Hyderabad, India, December 30, 2009 – January 2, 2010), Rao Best Poster Prize; https://alterlab.org/in_the_news/Dwivedi_IBS_Bulletin_2010_Feature.pdf		
4.	Nicolas M. Bertagnolli	Mathematics and Bioengineering	5/2014
	Current: Principal Machine Learning Engineer, BENlabs (Salt Lake City, UT); https://linkedin.com/in/nicolas-bertagnolli/		

K99 Postdoctoral Alumnus

	Co-Mentee	Department	Completion Date
1.	Jason M. Tennesen	Human Genetics	12/2013
	Current: Associate Professor of Biology, Indiana University (Bloomington, IN); https://linkedin.com/in/jason-tennesen-9bb369126/ Award: NIH/NIGMS K99/R00 PI Award		

Teaching

<https://alterlab.org/teaching/>

Track

- 4/2014– Founding Chair, Data Science and Computation Graduate Track;
<https://bme.utah.edu/graduate-program-overview/track-in-data-science-and-computation/>

Courses

8/2020–12/2021

Co-Instructor, Modified Course: BME 6090, Department of Bioengineering Seminar
Graduate required core course; taught over Zoom during the COVID-19 global pandemic.

8/2018– Founding Instructor, New Course: BME 6780, Data Science for Bioengineers;

<https://alterlab.org/teaching/BME6780/>

1/2006– Founding Instructor, New Course: BME 6770: Genomic Signal Processing;

<https://alterlab.org/teaching/BME6770/>

College of Engineering Top 15% Teaching Recognition in 2011, 2012, and 2017.

Mention: BME 6770, Genomic Signal Processing course may “be pivotal for ... career,” *Amazon Science* (April 6, 2022);

<https://amazon.science/working-at-amazon/helping-aws-customers-accelerate-success-via-machine-learning>

Project-oriented required core courses in the Data Science and Computation Graduate Track, and elective courses in the University of Utah Data Science certificate; for postdoctoral, graduate, and advanced undergraduate students in engineering, sciences, and medicine, and professionals in industry; consistently above the College of Engineering average course and instructor ratings.

8/2012–12/2016

Instructor, Modified Course: BME 3070/6070, Statistics for Bioengineers.

Undergraduate/graduate required core course for students in engineering, sciences, and medicine; modified to be taught from a data science perspective.

1/2012– 5/2016

Founding Co-Instructor, New Courses: PHTX 7777/7778, Applied Genomics.

Section on genomic signal processing in the core course in the School of Medicine Genome Sciences certificate; consistently above the College of Pharmacy average instructor ratings.

Courses (continued)

- 5/2014 Invited Consulting Instructor, *Bloomberg L.P. Distinguished Speaker Lectures*.
https://alterlab.org/teaching/Bloomberg_L.P./
Slides: https://alterlab.org/presentations/Alter_Bloomberg_L.P._2014_Slides.pdf
Continuing education for professionals in industry on (i) Discovery of Principles of Nature from Matrix and Tensor Modeling of Large-Scale (Molecular Biological) Data; and (ii) (Physics-Inspired) Mathematical Vocabulary for Discovery from Data.
- 8/2013– 5/2014
Founding Co-Instructor with R. A. Horn, New Course: MATH 7875, Seminar on Matrix Analysis.

Lectures by Guests of the Alter Lab YouTube Playlist:

https://youtube.com/playlist?list=PLhI_42SVen3Qg9evi8HR97EgnPLpTA6vk

Seminars

1. Michael R. King, J. Lawrence Wilson Professor and Department Chair of Biomedical Engineering at Vanderbilt University, "The Shear Force is All Around Us: Mechanotransduction of Cancer and Immune Cells in Fluid Flow," *Bioengineering Elevated Lecture of the Department of Bioengineering, University of Utah* (April 21, 2023);
<https://twitter.com/OrlyAlter/status/1648845225643876352>
2. Daniel L. Ruderman, Director of Digital Pathology for Oncology Biomarker Discovery at Genentech, Inc., "Meshing Quantitative Skills with Biological Curiosity: Biomedicine's New Era," *Bioengineering Elevated Virtual Lecture of the Department of Bioengineering, University of Utah* (April 23, 2021);
<https://twitter.com/OrlyAlter/status/1385996646949994509>
3. Linda M. Liau, Professor and W. Eugene Stern Chair of the Department of Neurosurgery at the David Geffen School of Medicine at the University of California at Los Angeles (UCLA), "Overcoming Immunotherapy Resistance in Glioblastoma," *Bioengineering Elevated Virtual Lecture of the Department of Bioengineering, University of Utah* (April 9, 2021).
4. Rafael Palacios, Honorary Professor and Coordinator at the International Laboratory for Human Genome Research at the National Autonomous University of Mexico (LIIGH-UNAM), with Kim Palacios-Flores, Postdoctoral Researcher at the Friedrich Miescher Institute for Biomedical Research, "Perfect Match Genomic Landscape," *Bioengineering Elevated Virtual Lecture of the Department of Bioengineering, University of Utah* (April 2, 2021);
<https://twitter.com/OrlyAlter/status/1374918347779805186>
5. Dennis E. Discher, Robert D. Bent chaired Professor and Director of NCI-Physical Sciences Oncology Center, at the University of Pennsylvania, "Convergent Science Approaches to Solid Tumors: From Mechano-Genetic Variation to a Macrophage Checkpoint," *Bioengineering Elevated Virtual Lecture of the Department of Bioengineering, University of Utah* (October 30, 2020);
<https://twitter.com/OrlyAlter/status/1319329856673361921>
6. Kristin R. Swanson, Professor and Vice Chair of Research in Neurological Surgery, Co-Director of the Precision Neurotherapeutics Innovation Program, Director of the Mathematical Neuro-Oncology Lab at the Mayo Clinic, and Professor of Mathematics at Arizona State University, "Sex, Drugs, and Radiomics of Brain Cancer," *Bioengineering Elevated Virtual Lecture of the Department of Bioengineering, University of Utah* (October 9, 2020);
<https://twitter.com/OrlyAlter/status/1314371270222340097>
7. Tom M. Mitchell, E. Fredkin University Professor of Machine Learning at Carnegie Mellon University, "Using Machine Learning to Study How Brains Represent Language Meaning," *Scientific Computing and Imaging (SCI) Institute Distinguished Seminar, University of Utah* (February 16, 2018);
https://alterlab.org/announcements/Mitchell_2018_Seminar.pdf
YouTube Video: <https://youtu.be/oENp857ATYo>
8. Cleve B. Moler, Chairman and Co-Founder of MathWorks, Inc., "Evolution of MATLAB," *Scientific Computing and Imaging (SCI) Institute Distinguished Seminar, University of Utah* (September 22, 2017);
https://alterlab.org/announcements/Moler_2017_Seminar.pdf
YouTube Video: <https://youtu.be/6QZDLUwBXro>
9. Joel S. Bader, Professor of Biomedical Engineering at Johns Hopkins University (JHU), "Quantitative Image-Based Phenotypes for Cancer Metastasis Systems Biology," *Department of Bioengineering Distinguished Seminar, University of Utah* (March 27, 2017).
10. Andre Levchenko, John C. Malone Professor of Bioengineering at Yale University, "Uniting Genetics, Signal Transduction, and Material Science in the Analysis of Cancer Invasion," *Department of Bioengineering Distinguished Seminar, University of Utah* (March 4, 2016).

Seminars (continued)

11. Peter J. Bickel, Professor of Statistics at the University of California at Berkeley, "The ENCODE Project and Us," *Scientific Computing and Imaging (SCI) Institute Distinguished Seminar, University of Utah* (April 3, 2015);
https://alterlab.org/announcements/Bickel_2015_Seminar.pdf
YouTube Video: <https://youtu.be/5JI6dD-5GkI>
12. Prabhakar Raghavan, Vice President of Strategic Technologies at Google, "Why Computer Scientists Need to Understand Consumer Behavior," *Scientific Computing and Imaging (SCI) Institute Distinguished Seminar, University of Utah* (March 28, 2014);
https://alterlab.org/announcements/Raghavan_2014_Seminar.pdf
YouTube Video: <https://youtu.be/Eh-yfFcG8rs>
13. Matthew P. Scott, Howard H. and Jessie T. Watkins University Professor and Professor of Developmental Biology, Genetics, Bioengineering and, by courtesy, Biology at Stanford University, "Communicating with Hedgehogs: Transduction and Gene Regulation," *Scientific Computing and Imaging (SCI) Institute Distinguished Seminar, University of Utah* (October 4, 2013);
https://alterlab.org/announcements/Scott_2013_Seminar.pdf
14. James E. Ferrell, Jr., Professor and Chair of Chemical and Systems Biology and Professor of Biochemistry at Stanford University, "Bistability and Trigger Waves in Mitosis," *Scientific Computing and Imaging (SCI) Institute Distinguished Seminar, University of Utah* (March 8, 2013);
https://alterlab.org/announcements/Ferrell_2013_Seminar.pdf
YouTube Video: https://youtu.be/Z36AwoLh_ic
15. Sir Richard J. Roberts, 1993 Nobel Laureate in Physiology and Medicine and Chief Scientific Officer of New England Biolabs, "COMBREX – Genomes, Computers and Experimentation in Biology," *Scientific Computing and Imaging (SCI) Institute Distinguished Seminar, University of Utah* (April 13, 2011);
https://alterlab.org/announcements/Roberts_2011_Seminar.pdf
YouTube Video: <https://youtu.be/GU7m4oNalsM>
16. Charles F. Van Loan, Ford Professor of Engineering at the Department of Computer Science at Cornell University, "Block Tensor Computations," *Scientific Computing and Imaging (SCI) Institute Distinguished Seminar, University of Utah* (April 8, 2011);
https://alterlab.org/announcements/Van_Loan_2011_Seminar.pdf
YouTube Video: <https://youtu.be/mGN3zmK3lsU>
17. Christopher R. Johnson, Director of the Scientific Computing and Imaging (SCI) Institute, Co-Director of the NIH Center for Integrative Biomedical Computing (CIBC), Distinguished Professor of Computer Science, Research Professor of Bioengineering, and Adjunct Professor of Physics at the University of Utah, and Co-Founder of Visual Influence Inc., and Co-Editor of the Visualization Handbook, "Computing and Visualizing the Future of Biomedicine," *Department of Biomedical Engineering (BME) Distinguished Seminar, University of Texas at Austin* (January 22, 2008);
https://alterlab.org/announcements/Johnson_2008_Seminar.pdf
18. John F. X. Diffley, Deputy Director of the London Institute and Director of the Clare Hall Laboratories of Cancer Research UK, "Regulation of DNA Replication by Cyclin Dependent Kinases," *Institute for Cellular and Molecular Biology (ICMB) Special Seminar, University of Texas at Austin* (November 5–7, 2006).
19. Steven Chu, Director of the Lawrence Berkeley National Laboratory, Geballe Professor of Physics and Applied Physics at Stanford University, and 1997 Nobel Laureate in Physics, "Single Molecule Studies of Complex Systems In Vitro and In Vivo," *Department of Biomedical Engineering (BME) Distinguished Seminar, University of Texas at Austin* (November 1–2, 2006);
https://alterlab.org/announcements/Chu_2006_Seminar.pdf

Symposium

1. "SXSVD (South by SVD): Gene H. Golub's World Day Celebration in Austin," *Institute for Computational Engineering and Sciences (ICES) Special Symposium, University of Texas at Austin* (February 29, 2008);
https://alterlab.org/announcements/Alter_SXSVD_2008_Symposium.pdf

Current University of Utah Service

4/2017– Member, Protected Environment Policy and Allocation Committee, Center for High-Performance Computing (CHPC)

Current College of Engineering Service

1/2017– Faculty Mentor of Junior Faculty, Women in Engineering (WiE) Faculty Advisory Council
11/2010– Member, Engineering Mathematics Committee

Current Department of Bioengineering Service

7/2018– Member, Curriculum Committee

4/2014– Founding Chair, Data Science and Computation Graduate Track;

<https://bme.utah.edu/graduate-program-overview/track-in-data-science-and-computation/>